Book of Abstracts

Digital Transformation in Teaching and Teacher Education

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Content

JURE Poster Session

JURE Poster Session SIG 11 - JURE Poster paper_type_84 session 1	**Time:** 1.30 pm – 3.45 pm	**Location:** Seminar Room II (Seminarraum II)
Assigned Chair: Barbara Moschner, Carl von Ossietzky University, Germany		

Libraries' Perspectives on cooperating with schools to foster ICT competencies during the Lockdowns

Tatjana Vogel, Institute for Diversity Studies, TU Dortmund University, Germany

Keywords: Digital learning, Literacy, Out-of-school learning, Teacher education

As a result of the Corona pandemic and the associated school closures, schools faced many new challenges. Teachers worldwide were confronted with the task of organizing their lessons digitally with the given resources (cf. UNESCO 2020).

Studies found that communication between teachers and students in Germany was difficult, especially at the beginning of homeschooling. Students stated that they learned with the help of friends via chat and online tutorials (see JIMplus 2020). The school was in fifth place among the learning aids, and only 12% of the students used online libraries (cf. ibid.).

Detailed research into educational cooperation with libraries during the lockdowns has been a research desideratum so far. Before the pandemic, library tours and events to promote reading and media literacy were an integral part of cooperations between schools and libraries (cf. dbv). Schools could benefit from the technical equipment of libraries and their expertise in media education (cf. Marci-Boehncke/ Vogel 2017). It is unclear how the lockdowns have affected the libraries' services and the cooperations with schools.

The poster presentation follows up on this and presents data from a Germany-wide questionnaire survey on educational collaborations between schools and libraries during the lockdowns. The presentation shows to what extent cooperations took place, which offers existed, and what consequences libraries drew for themselves. Finally, it shows opportunities for the hybrid design of educational cooperations, teachers' training, and further education.

References:

Deutscher Bibliotheksverband (2021): Öffentliche Bibliothek 2025. Leitlinien für die Entwicklung öffentlicher Bibliotheken. Retrieved from https://dbv-cs.e-fork.net/sites/default/files/2021-03/Positionspapier_ÖB_2025_FINAL_WEB.pdf

JIMplus 2020: Lernen und Freizeit in der Corona-Krise. Retrieved from https://www.mpfs.de/fileadmin/files/Studien/JIM/JIMplus_2020/JIMplus_2020_Corona.pdf

Marci-Boehncke, Gudrun/ Vogel, Tatjana (2017): Experts of Reading: Teachers and librarians as partners for digital readership. An evaluated teaching-model in Cooperation of TU Dortmund, the BMBF/Mercator-Initiative BiSS (Education in language and writing) and the Technical University of Cologne. ICERI 2017 Conference Paper. doi: 10.21125/iceri.2017.2331.

UNESCO (2021): The State of the global education crisis: A path to recovery. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000380128?27=null&queryId=N-9d63b76a-ee2d-4f30-80d1-55d9f59c43a1

Teacher educators' professional agency in facilitating digital competence

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Keywords: Competences, Digital transformation, In-service teacher education

Several actors, including policymakers, researchers, school leaders, and teachers have discussed the need for teacher education to integrate professional digital competence (PDC) in study programmes and to prepare future teachers for teaching with digital technologies (Gudmundsdottir & Hatlevik, 2018). Therefore, this study aims to investigate if, how and why teacher educators facilitate student teachers' development of PDC.

We will empirically explore:

1.In what ways do teacher educators facilitate student teachers' development of PDC?

2.How do teacher educators reflect on the development of student teachers' PDC?

And discuss:

3.How can these reflections be understood in terms of teacher educators' professional agency?

This qualitative study is based on interview data from 18 teacher educators from six Norwegian teacher education institutions. Preliminary results show that teacher educators promote students' PDC to varying degrees, but focus on introducing and exploring digital tools for teaching and learning as well as promoting reflection on the use of digital tools. Teacher educators' reflections suggest that their agency (Eteläpelto et al., 2013) in facilitating students' PDC emerges in the relation between their professional identity, school and society, policy documents, colleagues, their own PDC, attitudes and beliefs, and technology.

References:

Eteläpelto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2013). What is agency? Conceptualizing professional agency at work. *Educational Research Review*, 10, 45-65. https://doi.org/https://doi.org/10.1016/j.edurev.2013.05.001

Gudmundsdottir, G. B., & Hatlevik, O. E. (2018). Newly qualified teachers' professional digital competence: implications for teacher education. *European Journal of Teacher Education*, 41(2), 214-231. https://doi.org/10.1080/02619768.2017.1416085

Measuring teachers attitudes towards assessment

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Keywords: Assessment methods and tools, Attitudes and belief, Pre-service teacher education, Quantitative methods

In order to enable future teachers to properly assess their students and teaching it is necessary to help them develop a set of knowledge, skills and attitudes. Attitudes are systems consisting of the person's

beliefs, feelings and action tendencies with respect to an object. Teachers' beliefs, values, self-efficacy and their perceived behavioral control over assessment are expected to shape their assessment actions as well as their skills development (Ajzen, 1991; Bandura, 1986). In line with this argumentation it is important to first of all have empirical evidence about the characteristics of teachers attitudes towards assessment before educating them.

In this poster, an instrument to measure teachers attitudes towards assessment will be presented. Items have been generated based on the three component model of attitudes (Ajzen, 1991) as well as on previous studies (Bonner, 2016) to form the four subscales: instrumental attitude, affective attitude, self-efficacy and subjective norm. A pilot study (N = 60) has been realized to test item acceptance, comprehensibility and general practicability. First results regarding validity and reliability will be discussed.

References:

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. *Englewood Cliffs*, NJ: Prentice Hall.

Bonner, S. M. (2016). Teachers' peceptions about assessment: Competing Narratives. In G. T. L. Brown & L. R. Harris (Hrsg.), *Handbook of human and social conditions in assessment* (S. 21–39). RoutledgeTaylor & Francis Group.

Teacher students' didactical reasoning on questions of instructional design in civic education

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Keywords: Argumentation, Citizenship education, Experimental studies, Teacher education

In the university phase of teacher education, prospective civic education teachers should acquire applicable pedagogical content knowledge (Shulman, 1987; Weschenfelder, 2014). Following the "arguing to learn"-approach (Andriessen et al., 2003) and the ICAP-model (Chi & Wylie, 2014), this requires interactive learning processes that enable argumentative engagement with the subject matter. However, there is a lack of empirical findings on the acquisition of pedagogical content knowledge in civic education.The project aims to develop and evaluate such a learning environment, i.e., one that initiates the acquisition and elaboration of pedagogical content knowledge (learning product) by encouraging students to engage in collaborative argumentation on complex instructional questions in civic education (learning process). Research questions of this experimental study concern the effects of the computer-based scaffolding methods Argument-Maps and Argument-Vee-Diagrams on the quality of the collaboration phase and students´ pedagogical content knowledge. Video recording of the collaboration phase and a pre-post-test on pedagogical content knowledge will be analyzed by using quantitative research methods.

References:

Andriessen, J., Baker, M. J., & Suthers, D. (2003). Argumentation, computer support, and the educational context of confronting cognitions. In J. Andriessen, M. Baker, & D. Suthers (Eds.), *Arguing to learn: Confronting cognitions in computer-supported collaborative learning environments* (pp. 1-25). Kluwer.

Chi, M. T., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational psychologist*, 49(4), 219-243.

Nussbaum, E. M. (2021). Critical integrative argumentation: Toward complexity in students' thinking. *Educational Psychologist*, 56(1), 1-17.

Shulman, L. S. (1987). Knowledge and Teaching: Foundations of the New Reform. *Harvard Educational Review*, 57 (1), S. 1-22.

Weschenfelder, E. (2014). *Professionelle Kompetenz von Politiklehrkräften: Eine Studie zu Wissen und Überzeugungen*. Springer-Verlag.

Digital Self-Regulated Learning of Student Teachers - A Systematic Review

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Keywords: Digital learning, Pre-service teacher education, Self-regulation, Teacher professional development

Self-regulated learning (SRL; Panadero, 2017) with digital technologies is a multi-phased process that requires distinct knowledge and various skills. Continuous professional digital learning is particularly important for teachers during digital transformation; it can promote pedagogically well-designed teaching and contribute to sustainable school development (Seufert et al., 2020). Additionally, the digital SRL of student teachers could enhance the development of digital SRL in their students. Karlen et al. (2020) provide a useful framework for understanding digital SRL as a *digital learning identity.* Starkey's literature review shows that digital teaching competence was a major focus in teacher education research. Therefore, she makes a case for a more generic and holistic perspective by introducing the concept of *professional digital competence*, which also includes the professional digital learning of the student teachers. Taking these concepts as a theoretical guide, this present study systematically reviews the current state of evidence on the professional digital self-regulated learning of student teachers. The results of this review will inform a discussion on the scales that are used to measure digital SRL, the interventions that have been taken to increase digital SRL of teacher students, and how the findings relate to theoretical frameworks for understanding digital professional SRL.

References:

Karlen, Y., Hertel, S., & Hirt, C. (2020). Teachers' Professional Competences in Self-Regulated Learning: An Approach to Integrate Teachers' Competences as Self-Regulated Learners and as Agents of Self-Regulated Learning in a Holistic Manner. *Frontiers in Education*. https://doi.org/10.3389/feduc.2020.00159

Panadero, E. (2017). A Review of Self-regulated Learning: Six Models and Four Directions for Research. *Frontiers in Psychology*, 8. https://doi.org/10.3389/fpsyg.2017.00422

Starkey, L. (2020). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, 50 (1), 37–56. https://doi.org/10.1080/0305764X.2019.1625867

Seufert, S., Guggemos, J., & Sailer, M. (2020). Technology-related knowledge, skills, and attitudes of pre- and in-service teachers: The current situation and emerging trends. *Computers in Human Behavior*. https://doi.org/10.1016/j.chb.2020.106552

The potential of simulation technologies to support feedback and reflection in teacher education

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Keywords: Digital Learning, Educational technology, Pre-service teacher education, Reflection

The importance of feedback (Boud & Molloy, 2013; Hattie & Timperley, 2007) and reflection (Clarà, 2015; Dewey, 1933; Schön, 1987) on learning are widely known. In teacher education, feedback and reflection have been reported as supporting pre-service teachers' professional development (Bardach et al., 2021; Körkkö et al., 2016). However, few have explored both these concepts in the context of simulation-based learning. Simulation technologies are increasingly being used as a safe means for student teachers to practice and receive personalised feedback on skills such as classroom management and subject-specific didactics (Bondie et al., 2021; Dieker et al., 2014; Donehower Paul et al., 2020). These interactive technologies afford practice opportunities based on professionally relevant scenarios, helping better prepare students for the school practicum and future work-life. The study at hand investigates how simulation technologies potentially afford spaces for pre-service teachers to practice teaching, reflect upon their experience and receive both educator and peer-feedback. The data comprises video observations of six simulation practice sessions and post-simulation debriefings that took place after fourth-year online student teachers (n=21) either practised or observed micro-teaching in a mixed reality classroom simulation, known as TeachLivE. Developed at the University of Central Florida by an interdisciplinary team, TeachLivE is now used by over 80 universities globally for training pre-service teachers (Ersozlu et al., 2021). Using interaction analysis to analyse the content of feedback from both expert and peers, preliminary results indicate that the TeachLivE classroom simulation coupled with post-simulation debriefings, supports both meaningful feedback and facilitates reflective practice, thus impacting positively on students professional learning and development.

References:

Bardach, L., Klassen, R. M., Durksen, T. L., Rushby, J. V., Bostwick, K. C. P., & Sheridan, L. (2021). The power of feedback and reflection: Testing an online scenario-based learning intervention for student teachers. *Computers and education*, 169, 104194. https://doi.org/10.1016/j.compedu.2021.104194

Bondie, R., Mancenido, Z., & Dede, C. (2021). Interaction principles for digital puppeteering to promote teacher learning. *Journal of research on technology in education*, 53(1), 107-123. https://doi.org/10.1080/15391523.2020.1823284

Boud, D., & Molloy, E. (2013*). Feedback in higher and professional education : understanding it and doing it well*. Routledge.

Clarà, M. (2015). What Is Reflection? Looking for Clarity in an Ambiguous Notion. *Journal of Teacher Education*, 66(3), 261-271. https://doi.org/10.1177/0022487114552028

Dewey, J. (1933). *How we think : a restatement of the relation of reflective thinking to the educative process*. D.C. Heath and Company.

Dieker, L. A., Rodriguez, J. A., Lignugaris/Kraft, B., Hynes, M. C., & Hughes, C. E. (2014). The Potential of Simulated Environments in Teacher Education: Current and Future Possibilities. *Teacher Education and Special Education*, 37(1), 21-33. https://doi.org/10.1177/0888406413512683

Donehower Paul, C., Bukaty, C. A., & Dieker, L. (2020). Teacher professional learning using simulation: a Delphi study. *Teacher Development,* 24(1), 21-32. https://doi.org/10.1080/13664530.2019.1694574

Ersozlu, Z., Ledger, S., Ersozlu, A., Fiona, M., & Wildy, H. (2021). Mixed-Reality Learning Environments in Teacher Education: An Analysis of TeachLivE™ Research. *Sage Open,* 11. https://doi.org/10.1177/21582440211032155

Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, 77(1), 81-112. https://doi.org/10.3102/003465430298487

Körkkö, M., Kyrö-Ämmälä, O., & Turunen, T. (2016). Professional development through reflection in teacher education. *Teaching and Teacher Education*, 55, 198-206. https://doi.org/10.1016/j.tate.2016.01.014

Schön, D. A. (1987). *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions*. Wiley.

Transformative agency: A teacher's efforts to teach online during home schooling and Covid-19

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Keywords: Digital transformation, Online learning, Secondary education, Teaching approaches

Home schooling was introduced worldwide due to the Covid-19, which created a new space for learning (Hung et al., 2020). Students in Norway were already equipped with a personal digital device (1:1), when the pandemic emerged. Even though teachers had experience with digital tools, they lack the experience with *online teaching*. Anyhow, teachers were willing to move their teaching to online platforms and were able to find ways to cope with the challenging situation (Gudmundsdottir & Hathaway, 2020). In this study, I examine how one teacher taught two lower secondary classes online through qualitative video observations. Rooted in sociocultural theory (Vygotsky, 1978*), transformative agency* is used as an analytical lens (Lund & Vestøl, 2020) to identify the teacher's efforts to design, lead and support 9th grade students learning processes online in the subject Norwegian. The following research questions are addressed to discuss:

What characterizes the problem situations that emerge when a class moves online during Covid-19?

What characterizes the teacher's efforts to solve the challenges?

References:

Hung, R., & Wati, U. A. (2020). 'Digital Home Schooling' During the Pandemic: Possibilities and Challenges. *Knowledge Cultures*, 8(2).

Gudmundsdottir, G. B., & Hathaway, D. M. (2020). "We Always Make It Work": Teachers' Agency in the Time of Crisis. *Journal of Technology and Teacher Education*, 28(2), 239-250.

Lund, A., & Vestøl, J. M. (2020). An analytical unit of transformative agency: Dynamics and dialectics. Learning, *Culture and Social Interaction*, 25.

Vygotsky, L. S. (1978). *Mind in society: Development of higher psychological processes*. Cambridge, Mass: Harvard university press.

The VeLDi-Model: An interdisciplinary competence framework for (prospective) teachers

Ira Diethelm, Carl von Ossietzky University Oldenburg, Germany; Torben Mau, NLQ, Germany

Keywords: Digital transformation, In-service teacher education, Pre-service teacher education, Teacher Education

Digital competences of teachers are an essential part of professional development of teachers and also an emerging field in teacher education. All teacher training universities of Lower Saxony aimed at a suitable, interdisciplinary and cross-phase competence framework for teacher education in the digitally networked world. They reviewed existing models and developed the following model (see fig. 1) for Basic Competencies for Digitization (Basiskompetenzen Digitalisierung).

This poster presents the model and its implementation in a pilot seminar.

Fig.1: Competence framework "Teacher education in the digitally networked world".

A house metaphor was chosen to represent the model in order to illustrate that instruction-specific competencies in the digitally networked world build on basic digitization-related competencies of (prospective) teachers:

- Accordingly, the *foundation (F)* is composed of *basic knowledge* (from the fields of media science, media pedagogy, computer science, etc.), the teachers' own digitization-related "skills," and an open and critical attitude. It provides the basis for all further competencies and actions.
- *Reflection competence (R)* is understood here as a meta-competence, which in the house metaphor as a kind of *staircase* establishes the connection between the individual competence areas and as a necessary step is always upstream and downstream of all the others. The reflection includes, for example, that of the teachers' own competencies, those of the students as well as the (teaching) practices and the technologies used or currently not used in and outside of school.
- *The right half of the house* refers to the level of *teaching-learning resources or teaching-aids (T)* and includes lesson preparation, delivery and follow-up with digital technologies. It serves the explicit promotion of subject-related competencies and also the implicit promotion of students' digitalization-related competencies.
- *The left half of the house* is aimed at the *subject of the lesson (S)*, in this case the teaching of digitization-related phenomena, which are examined from various subject perspectives or with the help of the Dagstuhl or Frankfurt triangle, for example, and placed in the focus of the lesson. The competence area serves to explicitly promote the digitization-related competencies of the students.
- *The roof of the house* encompasses the *development (D)* of teachers' digitization-related competencies in the three sub-areas of lifelong learning, collaboration, and institutional conditions.

ILLSU – Improving teacher training for university students in Germany focusing science education in inclusive classrooms

Lisa Federkeil, Carl von Ossietzky University Oldenburg, Madeleine Morhardt, Carl von Ossietzky University Oldenburg, Tanja Jungmann, Carl von Ossietzky University Oldenburg, Anna-Maria Hintz, Carl von Ossietzky University Oldenburg, Maja Brückmann, Carl von Ossietzky University Oldenburg

Keywords: teacher training, inclusive schooling, science education

Successful implementation of inclusive education depends on educators' positive attitude towards inclusion (Avramidis & Brahm, 2002). However, teachers report uncertainties and frustration when dealing with diversity in their classrooms (Gidlund, 2018) and there is a lack of knowledge on how to create inclusive environments to meet the needs of all students (e.g., Gidlund & Boström, 2017). As a consequence, prospective teachers should be professionalized in inclusive teaching methods to learn how to deal with diversity in classrooms adequately (Baumert & Kunter, 2006; KMK, 2015). The project "Inclusive Teaching and Learning Settings in Science Education" (ILLSU) aims to develop, implement and evaluate an innovative teaching module for university students at the University of Oldenburg (Germany) who study special needs education and science education. Aim of this module named "Designing and Evaluating Inclusive Teaching and Learning Settings" is to prepare future teachers for their work, especially for teaching science education classes in inclusive learning settings on elementary level. Moreover, the module strengthens the subject of science education from an inclusive perspective and integrates the training of prospective teachers with professional competences in a research-based, process- and product-oriented manner. A longitudinal quasi-experimental intervention study with pre-posttest design is used to evaluate changes in participants' content knowledge, educational (content) knowledge, attitude towards inclusion, and self-efficacy (Baumert & Kunter, 2006). Self-developed case vignettes (e.g., Benz, 2018) are used to gain knowledge about the development of university students' professional skills (Baumert & Kunter, 2006). To assess the development of attitudes towards inclusion and self-efficacy the questionnaires EFI-L (Seifried & Heyl, 2016) and L-SWK (Jerusalem, & Schwarzer, 2003) are used. First results of the pilot study (conducted digitally in summer semester 2021) and the current project status will be presented and discussed considering the theoretical and empirical background. Implications for next steps of the ILLSU-project are derived.

References:

Avramidis, E., & Brahm, N. (2002). Teachers' attitudes towards integration / inclusion: a review of the literature. *European Journal of Special Needs Education*, 17(2), 129-147.

Baumert, J., & Kunter, M. (2006). Stichwort: Professionelle Kompetenz von Lehrkräften. *Zeitschrift für Erziehungswissenschaft*, 9(4), 469-520.

Benz, J. (2018). Vignetten. In H. M. Boelmann (Ed.), *Empirische Forschung in der Deutschdidaktik. Band 2: Erhebungs- und Auswertungsverfahren* (pp. 203-219). Hohengehren: Schneider.

Gidlund, U. (2018). Why teachers find it difficult to include students with EBD in mainstream classes. *International Journal of Inclusive Education*, 22(4), 441-455.

Gidlund, U., & Boström, L. (2017). What is Inclusive Didactics? Teachers' Understanding of Inclusive Didactics for Students with EBD in Swedish Mainstream Schools. *International Education Studies,* 10(2), 87-99.

Jerusalem, M., & Schwarzer, R. (2003). SWE. Skala zur allgemeinen Selbstwirksamkeitserwartung. In Leibniz-Zentrum für Psychologische Information und Dokumentation (ZPID) (Eds.), *Elektronisches Testarchiv*. Trier: ZPID. https://doi.org/10.23668/psycharchives.307

Kultusminister Konferenz (Eds.). (2015). *Lehrerbildung für eine Schule der Vielfalt*. https://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2015/2015_03_12-Schule-der-Vielfalt.pdf

Seifried, S., & Heyl, V. (2016). Konstruktion und Validierung eines Einstellungsfragebogens zu Inklusion für Lehrkräfte (EFI-L). *Empirische Sonderpädagogik*, 1, 22-35.

JURE Round Table Session

JURE Round Table SIG 11 - JURE Roundtable paper_type_85 session 1	**Time:** 4.00 pm – 6.00 pm	**Location:** Seminar Room II (Seminarraum II)
Assigned Chair: Clara Kuhn, University of Salzburg, Austria		

Pre-Service Biology Teachers' Professional ICT Knowledge

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Keywords: Biology, Competence development, E-learning, Pre-service teacher education

Theoretical Framework

ICTs are now, more than ever, a core element of our societies as they are highly interwoven into our daily lives. As ICTs play a growing role in future possibilities of social participation, digital competences evolved to become an integral part of educational responsibility (KMK, 2016). The true potential of our classroom's digital transformation, however, is reliant on individual, context specific implementation (Hillmayr et al. 2017). In order to successfully integrate digital education into teaching, it is therefore substantial for future teachers to be professionally trained in digital teaching methods. Thus, teaching competences and enabling future teachers to decide on the tool's context specific potential should be part of university's teacher education. The different dimensions of knowledge that are joined together when successfully integrating digital tools into lessons is described in the TPACK model (Mishra & Koehler, 2006), which serves as a theoretical basis for this work. Its three dimensions of technological, pedagogical and content knowledge are also referred to in the DiKoLAN model (Becker et al., 2020) which can be seen as a practical transfer of the TPACK dimensions for pre-service teachers in sciences.

Aims & Research Question

The goal of this work is to assess ICT-related professional knowledge and the professional competence to act in biology pre-service teachers. Therefore, it is the primary research question to study (i) which professional knowledge competences can be found in biology teacher training students regarding the connection of content, pedagogical and technological knowledge-dimensions. Furthermore, the related practical approach of DiKoLAN is included into the second question (ii) which teaching knowledge dimensions the pre-service teachers are referring to when giving reasons for created educational materials.

Methodology

To determine the pre-service teachers' ICT-related professional competences, a practice-based concept with qualitative analysis is conducted. Over the course of one semester, pre-service teachers have attended a seminar in which they create digital learning chapters in the university's learning management system which aim at school students. Qualitative data for this study comprises named e-learning chapters, a written comment on the methodological-didactical background for the e-learning chapter and an interview in seminar groups. The data is then analysed after Mayring (2015).

References:

Becker, S., Bruckermann, T., Finger, A., Huwer, J., Kremser, E., Meier, M., Thoms, L.-J., Thyssen, C., & von Kotzebue, L. (2020). Orientierungsrahmen Digitale Kompetenzen für das Lehramt in den Naturwissenschaften – DiKoLAN. In S. Becker, J. Meßinger-Koppelt, & C. Thyssen (ed.*), Digitale Basiskompetenzen – Orientierungshilfe und Praxisbeispiele für die universitäre Lehramtsausbildung in den Naturwissenschaften*, (S. 14-43). Hamburg: Joachim Herz Stiftung.

Hillmayr, D., Reinhold, F., Ziernwald, L., & Reiss, K. (2017). Digitale Medien im mathematisch-naturwissenschaftlichen Unterricht der Sekundarstufe. Einsatzmöglichkeiten, Umsetzung und Wirksamkeit. (Waxmann Verlag, ed.).

Kultusministerkonferenz. (2016). Strategie der Kultusministerkonferenz. „Bildung in der digitalen Welt". Retrieved from https://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2018/Strategie_Bildung_in_der_digitalen_Welt_idF._vom_07.12.2017.pdf.

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108(6), 1017-1054. doi:10.1111/j.1467-9620.2006.00684.x

Mayring, P. (2015). *Qualitative Inhaltsanalyse Grundlagen und Techniken*. Weinheim: Beltz.

Communication Skills of Mentor Teachers - a Systematization of Empirical Studies

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Keywords: Conversation/discourse analysis, Pre-service teacher education, Professional development interventions, Teacher professional development

Mentoring dialogues are conducive to pre-service teachers' learning in practica (Hiebert et al., 2002; Staub et al., 2014), but the literature suggests that the impact on the (pre-service) teachers' professional development is higher when mentor teachers are trained (Evertson & Smithey, 2001). For this reason, mentor teacher trainings that focus on improving mentor teachers' communication skills are a more recent area of interest in educational research. In previous research, mentoring dialogues have been studied from various perspectives, focusing contrasting mentoring approaches and using different measurement methods (Hennisen et al., 2008; Haas, 2021). However, the available empirical evidence about the effects of mentor teacher trainings is still limited and too diverse to allow definite conclusions about the influence of mentor teacher training on the development of mentor teachers' (communication) skills (Aspfors & Fransson, 2015; Crasborn et al., 2008). Hence, the aim of this review study is a) to conceptualize the key facets of mentor teachers' communication skills focused on in previous research as well as b) to map the mentor teacher trainings that aim to improve mentor teachers' communication skills. The research questions guiding this review are:

1. What facets of mentor teachers' communication skills in mentoring dialogues are examined in previous research?
2. Which mentor teacher trainings have been proven to be effective in terms of developing and improving these communications skills of mentor teachers?

Even though research on mentor teacher trainings focusing mentor teachers' communication skills is still scant, this review might contribute to a deeper understanding about these trainings and their corresponding effects. From the findings conclusions might be drawn about the further development

of mentor teacher trainings that focus on the advancement of mentor teachers' communication skills in mentoring dialogues. As this is research in progress, preliminary results shall be discussed at the conference.

References:

Aspfors, J. & Fransson, G. (2015). Research on mentor education for mentors of newly qualified teachers: a qualitative meta-synthesis. *Teaching and Teacher Education,* 48, 75-86.

Crasborn, F.; Hennisesen, P.; Brouwer, N.; Korthagen, F.; Bergen, T. (2008). Promotion versatility in mentor teachers' use of supervisory skills. *Teaching and Teacher Education*, 24, 499-514.

Evertson, C. & Smithey, M. (2001). Mentoring effects on protégé classroom practice. *Journal of Educational Research,* 93, 294-304.

Haas, E. (2021). *Mentoringprozesse in der Lehrer:innenausbildung. Gelingensbedingungen für Schulpraktika*. Klinghardt.

Hennissen, P.; Crasborn, F.; Brouwer, N.; Korthagen, F.; Bergen, T. (2008). Mapping mentor teachers' roles in mentoring dialogues. *Educational Research Review,* 3, 168-186.

Hiebert, J., Gallimore, R., & Stigler, J. (2002). A knowledge base for the teaching profession: What would it look like and how can we get one? *Educational Researcher*, 31 (5), 3-15.

Staub, F. C., Waldis, M., Futter, K. & Schatzmann, S. (2014). Unterrichtsbesprechungen als Lerngelegenheiten im Praktikum. In: K.-H. Arnold, A. Gröschner, T. Hascher (Eds.), *Schulpraktika in der Lehrerbildung. Theoretische Grundlagen, Konzeptionen, Prozesse und Effekte* (pp. 335–358). Waxmann.

Keynote by Professor Patricia A. Alexander, University of Maryland

Keynote I	**Time:** 12.30 pm – 13.30 pm	**Location:** Auditorium (Veranstaltungssaal)

Teaching and Learning in Today's Hyperconnected World: A Critical Cost-Benefit Analysis

Patricia A. Alexander, University of Maryland, United States

Keywords: Digital transformation, Reasoning, Student learning, Teaching/instrucation

There is no question that the world that most of the Earth's citizens now inhabit has been dramatically transformed by digital technologies that have forged the hyperconnected, 24/7 environments in which they live and work. The effects of this hyperconnected world permeate educational spaces as well, transforming the nature of teaching and learning. The amazing speed and pervasiveness of this transformation has left teachers and students little opportunity to reflect critically or analytically on the pedagogical, psychological, or personal costs and benefits that have arisen at the individual, institutional, or societal level. In light of these factors, the aim of this provocative presentation is to identify several salient educational costs and benefits for today's students and for those who seek to guide their learning and development. Following this critical analysis, Alexander forwards recommendations for teachers and for students meant to reduce the costs of nesting education within hyperconnected digital environments and to augment the potential benefits for all who populate those educational spaces.

Symposium I

Symposium I	**Time:** 2.30 pm – 4.00 pm	**Location:** Auditorium (Veranstaltungssaal)
Chairs: Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany; Robert Klassen, University of York, United Kingdom **Organisers:** Robert Klassen, University of York, United Kingdom; Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany **Discussant:** Heather Hill, Harvard Graduate School of Education, United States		

Capturing teaching – New approaches to measure instruction

Keywords: Assessment methods, Teacher, Teaching/Instruction, Technology

Methods for measuring the quality of instruction have evolved dramatically in the past three decades. Early research focused on measuring teacher characteristics—their background, beliefs, and knowledge. With new efforts to gauge classroom quality at large scale in the 2010s, scholars developed both content-general and content-specific instruments to characterize teaching (e.g., Grossman et al., 2013; Pianta et al., 2008), in many cases validating scores with regard to both precursors to and outcomes from instruction (e.g., Baumert et al., 2010; Kunter et al., 2013). However, two problems remain. One is measuring instruction at scale; classroom observations are typically costly to collect and analyze and, in the era of COVID, often difficult to obtain. Another is that these instruments often fail to capture the complex and contextualized nature of teachers' work – for instance, instructional moves appropriate to one setting may be inappropriate in another, or the sequencing of instructional moves may matter more than whether teachers simply used them. In this view, teachers' judgment and pedagogical reasoning (Kavanagh et al., 2020) and their use of contextualized knowledge tied directly to practice (Kersting, et al., 2016; Remillard et al., 2017) are as critical to understand and measure as their use of specific instructional practices.

In this symposium, we explore the promise of this perspective, particularly for measuring instruction at scale. Klassen and colleagues report results from a scenario-based learning intervention which asks pre-service teachers to make pedagogical judgments based on teaching scenarios. Bell and colleagues describe how virtual reality simulations were designed and used at scale to understand beginning teachers' situated judgements and enactments of three core teaching practices. Finally, Voss and colleagues take on the challenge of measuring instruction at scale during the COVID pandemic, using classroom artifacts to characterize the instruction made available by 217 secondary mathematics teachers.

Paper 1: Implementing an online scenario-based learning intervention for preservice teachers

Robert Klassen, University of York, United Kingdom; Jade Rushby, The University of New South Wales, Australia; Andreas Pfaffel, University of Vienna, Austria; Lisa Bardach, University of Tübingen, Germany

Keywords: Professional development, Self-efficacy, Teacher education, Technology

Field-based teaching placements form the cornerstone of teacher education, giving preservice teachers the opportunity to apply pedagogical knowledge to practice, developing what Loughran (2019) calls pedagogical reasoning. However, expecting preservice teachers to develop pedagogical reasoning in 'live' classroom situations without adequate preparation can be counter-productive and high-risk. We designed and implemented an online 'scenario-based learning' (SBL) intervention that aims to build preservice teachers' confidence in authentic teaching situations. The SBL intervention presents participants with a series of authentic teaching situations, an opportunity for self-reflection, and feedback from experienced teachers. We report a mixed-methods study that demonstrates how a four-session SBL intervention influences confidence to apply pedagogical reasoning in realistic teaching situations.

Method

Participants. Participants were 1305 preservice teachers (65% female) enrolled in a one-year school-led initial teacher education programme administered nationally in the UK. The mean age of participants was 24.63 years (SD = 5.01). A total of 79.8% of participants identified as white British, 10% as Asian and/or Asian British, 3.9% as Black and/or Black British, and 6.3% identified as multiple or other ethnic groups.

Procedure. A four-session SBL intervention was delivered, building on the one-session intervention developed and tested by Bardach et al. (2021). For each classroom scenario, participants (a) viewed a classroom or school scenario, (b) evaluated the appropriateness of a set of response options, (c) provided reflections for their evaluations, and (d) were provided with tailored feedback on their responses from experienced teachers. Quantitative and qualitative data from five time points (initial pre-test followed by four post-tests) were collected using well-validated scales of (a) self-efficacy to adapt instruction, maintain discipline, motivate students, and cooperate with colleagues and parents; and (b) cognitive and emotional classroom readiness. Analyses included repeated measures ANOVA, latent growth curve analysis (LGCA), and qualitative content analysis of open-ended responses. Moderating variables of sex and ethnicity were tested.

Results

Results from the quantitative analyses showed significant positive change in teaching self-efficacy and classroom readiness over the five measurement points. The growth curve was linear and there were no significant effects for sex or gender. Qualitative results showed two key themes: the crucial role of expert feedback in informing decision-making, and the value of reflecting on alternative solutions to challenging problems.

Discussion

The results suggest that SBL has the potential to raise the teaching confidence and readiness for preservice teachers about to enter the classroom for their first teaching placement. SBL interventions could play an important role in preparing preservice teachers for their teaching placements and may be particularly useful in a time when school placements may be restricted due to the current pandemic.

References:

Bardach, L., Klassen, R. M., Durksen, T. L., Rushby, J. V., Bostwick, K. C., & Sheridan, L. (2021). The power of feedback and reflection: Testing an online scenario-based learning intervention for student teachers. *Computers and Education*, 169, 104194.

Loughran, J. (2019). Pedagogical reasoning: The foundation of the professional knowledge of teaching. *Teachers and Teaching*, 25, 523-535.

Paper 2: Design and Validation of Standardized Virtual-Reality Simulation Tasks: Affordances and Constraints

Courtney Bell, University of Wisconsin, United States; Geoffrey C. Phelps, Educational Testing Service, United States

Keywords: Assessment methods and tools, Pre-service teacher education, Teaching/Instruction, Technology

Virtual reality (VR) simulation tasks are increasingly being used to support teacher learning (c.f., Cohen et al., 2020; Dieker et al., 2014). In these simulations, a teacher interacts with avatars around a core practice of teaching such a leading discussion or managing behavioral norms. The avatars, who can be artistically rendered with a wide range of ages, genders, racial, ethnic, and neurodiversities, rely on a human-in-the-loop. The human interactor enacts one or more student avatars in real-time using artificial intelligence to automate some aspects of the interaction, such as voice modulation or hand raising. These types of VR tasks are used increasingly in preservice teacher education (Mikeska et al., 2019; Mikeska & Howell,et al., 2020). There are many affordances of these types of virtual reality simulations. Most importantly, novice teachers can practice with avatars, rather than actual students. This allows novices to practice their nascent teaching skills without harming students or their relationships with students. Such practice is particularly important for white teachers working with students around more equitable teaching approaches. Further, teacher educators can design VR environments and tasks at varying levels of difficulty and complexity to support novice learning and the development of increasingly sophisticated professional judgement.

This paper describes the design approach used to create VR simulations of three core teaching practices: modeling and explaining content, leading group discussion, and eliciting and interpreting student thinking. Using evidence centered design principals, the study defined tasks, scoring criteria, and standardization materials so that inferences could be drawn across tasks and teachers at scale. The paper specifies some of the design tradeoffs made in the task and standardization materials in order to illustrate both the affordances and constraints of these types of VR simulations. Finally, we use data collected from performances of more than 400 primary grades preservice teachers in nine U.S. states to offer emergent validity evidence on three types of teaching tasks in English/language arts and mathematics in grades K-6. Analyses of descriptive statistics, task and rater reliability, teachers' perceptions of tasks, and concurrent validity evidence suggest there are both affordances and constraints of this new measurement approach. We also consider how insights from VR simulation design might be used to create face-to-face simulations of the same core practices.

References:

Cohen, J., Wong, V., Krishnamachari, A., & Berlin, R. (2020). *Teacher coaching in a simulated environment. Educational Evaluation and Policy Analysis,* 42(2), 208-–231. doi:https://doi.org/10.3102%2F0162373720906217

Dieker, L. A., Rodriguez, J. A., Lignugaris-Kraft, B., Hynes, M. C., & Hughes, C. E. (2014). The potential of simulated environments in teacher education: Current and future possibilities. *Teacher Education and Special Education*, 37(1), 21–33. https://doi.org/10.1177/0888406413512683

Mikeska, J. N., & Howell, H. (2020). Simulations as practice-based spaces to support elementary teachers in learning how to facilitate argumentation-focused science discussions. *Journal of Research in Science Teaching*, 57(9), 1356-–1399. doi: https://doi.org/10.1002/tea.21659

Mikeska, J. N., Howell, H., & Straub, C. (2019). Using performance tasks within simulated environments to assess teachers' ability to engage in coordinated, accumulated, and dynamic (CAD) competencies. *International Journal of Testing*, 19(2), 128–147.

Paper 3: Using authentic teaching materials to assess teaching quality during distance learning

Thamar Voss, University of Freiburg, Germany; Nikolaus Bönke, University of Freiburg, Germany; Verena Jörg, DIPF | Leibniz Institute for Research and Information in Education, Germany; Patrick Schreyer, DIPF | Leibniz Institute for Research and Information in Education, Germany; Uta Klusmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany; Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

Keywords: Assessment methods and tools, Mathematics, Student-teacher interactions, Teaching/Instruction

With school closures starting in March 2020, teachers needed to abruptly adapt to unprecedented forms of distance learning. Studies show that digital forms of teaching varied substantially (e.g., Jaekel et al., 2021). However, most of this research investigates quantity aspects of instruction (e.g., how many technical tools were used on which occasion). In contrast, aspects of teaching quality (e.g., how well teachers supported their students) are rarely examined. In our study, we examined the quality of distance teaching in a sample of mathematics teachers using teacher-self reports as well as authentic teaching material. The sample consisted of 217 mathematics teachers from secondary schools who completed an online questionnaire during the COVID19 pandemic in the summer of 2021. In addition, teachers also submitted teaching material used during school closures. As the sample is part of an ongoing longitudinal study, there is additional teacher data from the time before the pandemic (induction phase and beyond). To assess the quality of digital teaching, we distinguished between the potential for cognitive activation, learning support, and organizational support and developed instruments based on prior research. In self-reports, teachers rated their distance teaching in several Likert-type scales. For the teaching material, teachers uploaded examples of tasks they had set for their classes that they themselves saw as best practice. The self-report scales showed good psychometric quality (Cronbach-Alpha: .66 to .90). The three dimensions of teaching quality were positively correlated ($.21 < r < .54$). On average, teachers rated their learning support higher than the potential for cognitive activation, which they in turn rated higher than the organizational support ($F(2, 368) = 229.478$, $p < .001$, $\eta 2 = .056$). Teachers from academic track schools rated the potential for cognitive activation higher than teachers from other tracks ($F(1, 179) = 13.743$, $p < .001$, $d = 0.56$), whereas teachers from other tracks reported higher organizational support ($F(1, 181) = 8.843$, $p < .001$, $d = -0.44$). Furthermore, teachers with higher self-assessed technological knowledge reported a higher potential for cognitive activation and higher learning support. For the teaching tasks, we developed a coding scheme in which the three dimensions were rated on several codes. Codes include aspects such as technical information, feedback, explanations, or goal setting. First insights into the material show a wide variety, ranging from scans of handwritten material with purely technical instruction to highly engaging interactive tasks. The

coding of the teaching material is currently underway and we will be able to present these results at the conference, including analyses on the correlations between self-report and teaching material and further investigations of individual differences between teachers. Our study thus is one of the first studies that provides a glance into the actual teaching processes during the pandemic. Moreover, it shows the potential of authentic artifacts as an additional external data source to evaluate quality of teaching.

References:

Jaekel, A.-K., Scheiter, K., & Göllner, R. (2021). *Distance Teaching During the COVID-19 Crisis: Social Connectedness Matters Most for Teaching Quality and Students' Learning.* AERA Open.

Paper Session I

Paper Session Single Paper paper_type_1 session 7	**Time:** 2.30 pm – 4.00 pm	**Location:** Lecture Hall (Vortragssaal)
Assigned Chair: Jonathan Firth, University of Strathclyde, United Kingdom		

Re-examining classroom interaction norms and teacher professional development for dialogic teaching

Riikka Hofmann, University of Cambridge, United Kingdom; Kenneth Ruthven, Hughes Hall, Cambridge, United Kingdom

Keywords: Conservation/discourse analysis, Social aspects of learning and teaching, Student-teacher interactions, Teacher professional development

While research suggests that dialogic pedagogy drawing on students' ideas can improve learning outcomes, changing practice is often challenging even after effective teacher professional development, hindering scalable change. A recent large-scale field trial suggests that while teachers commonly succeed in increasing student contributions, making use of students' ideas is more challenging (Anon1). This presentation examines the barriers and mechanisms of changing classroom dialogic practice, informing new ways to support teacher professional learning and change.

Beyond deficit views: dialogic tools fo developing possibility knowledge in school

Riikka Hofmann, University of Cambridge, United Kingdom; Anna Pauliina Rainio, University of Helsinki, Finland

Keywords: Conservation/discourse analysis, Professional development interventions, Teacher professional development, Workplace learning

Background/Problem: Teachers in schools serving socio-economically disadvantaged communities often hold deficit views of their students. Research shows that teachers' limiting conceptualisations influence students' learning opportunities (Horn & Kane, 2015; Jackson et al., 2017). However, addressing this issue through a deficit view of teachers themselves is not helpful: teachers do their jobs because they want to help students learn. Why is changing these limiting conceptualisations then so difficult?

Conceptual framework: Approaching this question through discursive psychology (Billig et al., 1988) and cultural-historical activity theory (Engeström, 2007), this presentation's conceptual framework highlights the collective and institutional nature of teachers' limiting conceptualisations about their students. Rather than individual teacher beliefs, school-level discourses about learners are a key influence on students' opportunities in school (Opfer & Pedder, 2011). Research has demonstrated that school-level norms are difficult for individual teachers to change (Anon1): they need to be addressed at the institutional level, through the collective dialogues among teachers through which they are evoked and sustained. The presentation conceptualises teachers' collective assumptions as a lived ideology, actively sustained by stabilisation discourses in teacher professional dialogues.

Design and methods: This presentation reports on a series of analyses which examined teachers' professional dialogues from nine whole-school intervention meetings (18hrs; 500 pages) in the context of a year-long school-led development intervention. The first analysis examined the discourses about students employed by these teachers, and analysed qualitatively and quantitatively how these changed during the intervention year (Anon2). The second analysis examined the discursive devices through which the teachers' talk about their students limits/expands their sense of what is possible in their teaching (Anon3).

Findings and contribution: The first analysis found that the teachers' discourses about their students were expanded, and that positive discourses increased during the intervention (Anon2). The second analysis identified a range of discursive strategies that worked, initially, to sustain the lived ideology of students as 'disengaged' even at the face of evidence of positive student engagement. Importantly, it also identified a form of discourse that enabled the development of possibility discourse (cf. Engeström, 2007) about the students (Anon3). The presentation describes this form of discourse which we term reflexive noticing. These analyses illustrate why even positive evidence about students often fails to shift teachers' deficit views. They further outline the kind of discursive mechanisms generating possibility knowledge, informing attempts to facilitate dialogic teacher learning in institutional settings.

References:

Billig, M., Condor, S., Edwards, D., Gane, M., Middleton, D., & Radley, A. (1988). *Ideological dilemmas: A social psychology of everyday thinking*. Sage.

Engeström, Y. (2007). From stabilization knowledge to possibility knowledge in organizational learning. *Management learning*, 38(3), 271-275.

Horn, I. S., & Kane, B. D. (2015). Opportunities for professional learning in mathematics teacher workgroup conversations: Relationships to instructional expertise. *Journal of the Learning Sciences,* 24(3), 373-418.

Jackson, K., Gibbons, L., & Sharpe, C. (2017). Teachers' views of students' mathematical capabilities: Challenges and possibilities for ambitious reform. *Teachers college record*, 119(7), 1-43.

Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of educational research*, 81(3), 376-407.

Fostering Teachers' Integration of ICT in Teaching – a Systematic Review

Kirsten Gronau, Carl von Ossietzky University Oldenburg, Germany; Karen Vogelpohl, Carl von Ossietzky University Oldenburg, Germany

Keywords: Competences, Educational technology, Professional development interventions, Teacher professional development

Digital education aims to prepare learners of all ages to participate creatively, autonomously, safely, and critically reflected in a world that is characterized by digitality. In the process of educating all citizens in this field, teachers of all subjects play a vital role (Redecker, 2019). Yet, integrating information and communication technology (ICT) in teaching is a complicated matter (Nelson et al., 2019; Tondeur et al., 2019). In addition to teachers' generic digital competence, digital teaching competence is necessary to integrate digital technology into teaching. Research in this field often deploys the TPACK-framework, investigating knowledge of technology, pedagogy, and content to teach with ICT (Starkey 2020). In the past ten years, there has been an increasing number of empirical studies on teacher education and ICT.

Røkenes and Krumsvik (2014) classified pedagogical approaches to pre-service teacher training with ICT in their review but neither the format and content of the trainings nor the measurement of success were looked at more closely. In Starkey's (2020) review, under the term of professional digital competence, three types of pre-service teachers' competences in the digital age were classified: Generic digital competence, digital teaching competence, and professional digital competence. This review focusses on intervention studies about pre- and in-service teacher trainings for digital teaching competence.

With this systematic review, empirical research about teacher trainings for ICT integration is examined under the following research questions:

How is teacher's integration of ICT fostered in teacher trainings?

How is teachers' integration of ICT measured?

This review follows a systematic approach; two data bases (Web of Science, ERIC) were searched using the keywords ("technolog*" OR "ICT" OR "computer" OR "digital" OR "TPACK") AND ("initial teach*" OR "pre-service teacher" OR "in-service teacher" OR "student teacher" OR "teacher") AND ("education" OR "training") AND ("intervention"). The search has been narrowed down to the last ten years and articles in English. Qualitative, quantitative, and mixed methods intervention studies are included. The initial search was undertaken in January 2021 resulting in 1698 articles from the two databases. The analysis of these articles will be completed by April 2022. Preliminary results show a focus on the integration of specific tools in educational practice measured by teachers' motivation and self efficacy in working with these tools.

References:

Nelson, M. J., Voithofer, R., & Cheng, S. L. (2019). Mediating factors that influence the technology integration practices of teacher educators. *Computers & Education*, 128, 330–344.

Redecker, C. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu (EUR, Scientific and technical research series)*. Publications Office.

Røkenes, F. M., & Krumsvik, R. J. (2014). Development of student teachers' digital competence in teacher education - A literature review. *Nordic Journal of Digital Literacy*, 9(04), 250–280.

Starkey, L. (2020): A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education* 50(1), 37-56.

Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E. (2019). Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education. *British Journal of Educational Technology*, 50(3), 1189–1209.

Paper Session Single Paper paper_type_1 session 14	**Time:** 2.30 pm – 4.00 pm	**Location:** Big Club Room (Großer Clubraum)
Assigned Chair: Barbara Drechsel, University of Bamberg, Germany		

Does reverse mentoring promote (pre-service) teachers' competence regarding digital media?

Victoria Kramer, Goethe-University Frankfurt, Institute of Psychology, Germany; Charlotte Dignath, DIPF Leibniz Institute for Education Research Frankfurt, Germany; Franziska Baier, Goethe-University Frankfurt, Germany; Katja Knuth-Herzig, University Speyer, Germany; Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

Keywords: Cooperative learning, Pre-service teacher education, Quasi-experimental research, Teacher professional development

Although the competent use of educational technologies in the classroom is essential, teachers still show gaps in their professional knowledge and beliefs regarding digital media (Bos et al., 2014). In the context of promoting digital media skills, the method of reverse mentoring has shown to be promising in organisations (Graf & Edelkraut, 2017), schools (Zauchner-Studnicka, 2017), and teacher training (Singer & Maher, 2007) but not yet been systematically evaluated in larger quantitative research studies. We aim to address this research gap and investigate the benefit of reverse mentoring as an innovative teaching method comprising cooperative learning elements and the exchange of expertise among pre- and in-service teachers. In reverse mentoring, the traditional mentoring structures are turned around: pre-service teachers, who are more familiar with digital media, share their knowledge and experience with in-service teachers. In-service teachers, in turn, share their practical classroom expertise with pre-service teachers to jointly develop ideas for the effective use of digital media in the classroom. To answer the research question, if reverse mentoring is more effective than traditional courses in initial teacher education and in-service teacher professional development, we conduct a quasi-experimental study with several comparison groups (see figure 1). For this purpose, we designed a course with five lessons, followed by two workshop days, in which participants apply newly acquired knowledge about educational technologies to a practical situation. On the one hand, we compare reverse mentoring (TG) with cooperative (CG1) and individual learning (CG0) among pre-service teachers in initial teacher education. On the other hand, we compare reverse mentoring with professional development courses for in-service teachers (CG 3 & 4). As dependent variables, we investigate the technological-pedagogical knowledge and beliefs towards digital media use in the classroom. Initial results from the traditional courses with pre-service teachers (CG 0 & 1) indicate that the courses are suitable to promote pre-service teachers' self-reported knowledge and beliefs about digital media. The data of the reverse mentoring condition will be available by June 2022 so that the effectiveness of reverse mentoring can be compared to the traditional course. The findings will be presented at the conference and give important insights into the potential benefit of reverse mentoring to boost (pre-service) teachers' digital competence economically and effectively.

References:

Bos, W., Eickelmann, B., Gerick, J., Goldhammer, F., Schaumburg, H., Schwippert, K., Senkbeil, M., Schulz-Zander, R., & Wendt, H. (Eds.) (2014). *ICILS 2013. Computer- und informationsbezogene Kompetenzen von Schülerinnen und Schülern in der 8. Jahrgangsstufe im internationalen Vergleich.* Waxmann.

Graf, N., & Edelkraut, F. (2017). Einführung Mentoring. In N. Graf & F. Edelkraut. *Mentoring* (pp. 1-16). Springer.

Singer, J., & Maher, M. A. (2007). Pre-service teachers and technology integration: Rethinking traditional roles. *Journal of Science Teacher Education*, 18(6), 955-984.

Zauchner-Studnicka, S. (2017). A model for reverse-mentoring in education. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, 11(3), 546-553.

Digital transformations and integration of ICT tools in secondary schools in Nigeria

Rachel Atomatofa, Delta State College of Education, Mosogar, Nigeria

Keywords: Digital learning, Digital transformation, Secondary education, Teaching/instruction

Research has shown that using ICT tools to teach students bring about digital transformations and improved students learning. Through ICT, teachers and students now use various digital tools to aid teaching and learning. ICT teaching tools are the digital or technological gadgets both the teacher and learners use in the teaching learning process. Researchers have proved that proper utilization of different ICT tools help to increase access to education and help to make teaching and learning an engaging process in various school subjects. Globally, digital transformation is seen in all sectors of the economy and has also taken a hold in the education sector. In Nigeria, previous researchers argued that there are low levels of ICT integrations across the 6-3-3-4 system of Education and that the integration of ICT has not been fully achieved in spite of some recent investments by government to bring about digital transformations. The expectation is to have ICT and ICT tools integrated into all the secondary school subjects during teaching and learning for total digital transformation in education. This study examined the current level of digital transformations in secondary schools using, availability and integration of ICT tools as basis. *The specific purpose of this study was to find out the availability and level of integration of ICT tools in the teaching of Basic science, Mathematics and French*. Two research questions and hypotheses, guided this study. Are there differences in number of ICT tools available for teaching Basic Science, French and Mathematics? Are there differences in levels of integration of the available ICT tools in teaching Basic Science, French and Mathematics? 112 Junior secondary three students responded to the questionnaires used as instrument. A reliability coefficient of 0.76 was obtained using the Pearson product moment correlation on 30 students who were not part of the study. Research questions were answered using simple percentages while hypotheses were tested using Pearson's chi-square statistics. Findings show that teachers' level of integration and the availability of ICT teaching tools were generally low in the three subjects. One reason for low integration was teachers' inability to use the few available tools during instruction because they are not trained. It was recommended that the Nigeria Government should ensure adequate provision of ICT tools; train the teachers on their use and create measures to ensure high level of integration by teachers.

Cultural affinity: A secondary data analysis regarding future teachers' cultural activities

Jana Costa, Leibniz Institute for Educational Trajectories (LIfBi), Germany; Barbara Drechsel, University of Bamberg, Germany

Keywords: Competence development, Pre-service teacher education, Secondary data analysis, Teacher professional development

Regarding the central role of teachers in the transmission of cultural content, the contribution provides an insight into the cultural horizon of future teachers According to a meaning-oriented understanding of culture (Reckwitz, 2004), the orientation of activities carried out by future teachers in their spare time (e.g. playing music, voluntary engagement), can be interpreted as an indicator for a certain cultural habitus. Furthermore, the activities can also be framed as space for new experiences and potential stimulus for (profession-related) learning processes.

Nevertheless very little is known about those cultural activities outside of university. Research on learning opportunities in teacher training so far mainly focuses institutionalized learning opportunities. Research on non-university experiences in teaching (e.g. Depping et al., 2021) broadens the perspective, but it captures mainly pedagogical (pre-) experiences in teaching (e.g. tutoring) so far. Thus it is worthwhile to take a systematic look at the activities outside the formalised system and ask:

- What activities do student teachers engage in outside the university?
- Can specific patterns be found which help describing student teachers as a professional group with specific characteristics, preferences and activities?
- Do these activity patterns differ with regard to the field of study and the school type?

Our analysis is based on the representative nationwide survey of students within the framework of the National Education Panel, here the oversampling of teacher students (n=2000). Different aspects of the topic are exploratively looked at by consulting distributions, identifying patterns and testing group differences (e.g. with Two-sample t-tests; Chi2 test for independence) (Costa, in press).

The results indicate that, compared to their fellow students, student teachers are more active in the high-cultural, social and religious spheres, but less engaged in political fields. The higher activity in the religious and the lower activity in the political field is evident for the group of student teachers across different (teaching) subjects. Furthermore, teacher students are voluntarily engaged and a connection between engagement and the field of study can be identified.

The results provide a first insight into diverse experience of future teachers. It seems central that these experiences are fed back to the teachers' professionalism. Here, university teacher

References:

Costa, J. (in press). *Kultur in der Lehrerinnen- und Lehrerbildungsforschung. Perspektiven auf die Erforschung des kulturellen (Erfahrungs-) Horizonts zukünftiger Lehrkräfte.* Dissertation an der Otto-Friedrich-Universität Bamberg.

Depping, D., Ehmke, T. & Besser, M. (2021). Aus „Erfahrung“ wird man selbstwirksam, motiviert und klug: Wie hängen unterschiedliche Komponenten professioneller Kompetenz von Lehramtsstudierenden mit der Nutzung von Lerngelegenheiten zusammen? *Zeitschrift für Erziehungswissenschaft*, 24(1), 185-211.

Reckwitz, A. (2004). Die Kontingenzperspektive der ›Kultur‹. Kulturbegriffe, Kulturtheorien und das kulturwissenschaftliche Forschungsprogramm. In F. Jaeger & J. Rüsen (Hrsg.), *Handbuch der Kulturwissenschaften Forschung* (S. 1-20). Stuttgart: Metzler.

Paper Session Single Paper paper_type_1 session 22	Time: 2.30 pm – 4.00 pm	Location: Seminar Room II (Seminarraum II)
Assigned Chair: Kim van Broekhoven, Radboud University, Netherlands		

Assessment of teachers engaging messages: School year evolution and Grade differences

Samuel Falcon, University of Las Palmas de Gran Canaria, Spain; Samuel Falcon, University of Las Palmas de Gran Canaria, Spain; Carmen Álvarez-Álvarez, University of Cantabria, Spain

Keywords: Assessment methods and tools, Motivation, Secondary education, Teacher effectiveness

Teachers' engaging messages are characterized by focusing on the consequences associated to certain outcomes which can either be beneficial (*gain-framed*) or unfavourable (*loss-framed*) (Rothman & Salovey, 1997); and by supporting different types of motivations (*appeals*) (Ryan & Deci, 2020). Previous studies have already examined the impact of these messages on students. They found that teachers' messages predicted students' motivation to learn and students' performance (Author et al., 2021). They also found that students whose teachers used more gain-frame messages performed better academically (Author et al., 2022). However, the only method of data collection to assess messages was questionnaires. This method allows large sample sizes and small time of codification, but subjectivity is a strong weakness.

Thus, with this study we aimed to 1) Develop a codifying process for the recording of teachers' voices during lessons; and 2) Examine the content and evolution of messages over a school year and across Grades.

For this, we recorded eight lessons per trimester, and we transcribed them via a cloud-based transcription service. Then, we devised a list of keywords to identify the messages. Following the procedure of similar studies (Brooks et al., 2019, 2021), three coders were trained to identify the messages in the transcripts using the keywords. Researchers then discarded the false positives and proceeded to classify the messages according to the frame and the appeal

Results showed that teachers usually threaten their students with the unfavourable outcomes of missing out on things that are of value to them to get them to engage in school tasks. They rarely use the satisfaction of engaging in tasks as an appeal. There is a tendency to use more messages at compulsory secondary education, rather than at high school. Lastly, as the year progresses, benefit-centred messages decrease in all appeal categories.

Thus, present findings help to better understand the nature of these messages and their distribution. This will be useful for research to guide teachers to an adequate communication style.

References:

Author, 2021 [masked for peer review]

Author, 2022 [masked for peer review]

Brooks, C., Burton, R., van der Kleij, F., Carroll, A., Olave, K., & Hattie, J. (2021). From fixing the work to improving the learner: An initial evaluation of a professional learning intervention using a new student-centred feedback model. *Studies in Educational Evaluation*, 68(July 2020), 100943. https://doi.org/10.1016/j.stueduc.2020.100943

Brooks, C., Carroll, A., Gillies, R. M., & Hattie, J. (2019). A matrix of feedback for learning. *Australian Journal of Teacher Education*, 44(4), 14–32. https://doi.org/10.14221/ajte.2018v44n4.2

Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. In Psychological Bulletin (Vol. 121, Issue 1, pp. 3–19). *American Psychological Association*. https://doi.org/10.1037/0033-2909.121.1.3

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Examining the effect of teacher messages on student motivation to learn with sentiment analysis

Samuel Falcon, University of Las Palmas de Gran Canaria, Spain; Samuel Falcon, University of Las Palmas de Gran Canaria, Spain

Keywords: Assessment methods and tools, Motivation, Secondary education, Teacher effectiveness

Recent studies have emphasised the study of teachers' messages because they influence students' wellbeing, behaviour, engagement in school tasks and academic performance (Caldarella et al., 2020; Ntoumanis et al., 2017; Putwain & Remedios, 2014). The messages teachers use to engage students in school tasks have recently been found to influence student outcomes (Author et al., 2021, 2022). Understanding which variables mediate this effect is essential for the design of effective interventions (Kazdin, 2007). Open-ended questions let students to better express their opinions allowing researchers to gather more information. Therefore, we introduce sentiment analysis, a tool able to extract data from students' responses to open-ended questions. However, its usefulness in examining important constructs in the educational context remains unexplored (Zhou & Ye, 2020).

Thus, with this study we aimed to 1) Examine if the sentiment extracted from students' responses depends on the engaging messages the teacher uses; and 2) Determine if the student sentiment mediates the relationship between teachers' engaging messages and students' motivation to learn.

To examine these relations, we performed a multilevel SEM and a mediation analysis. Results showed that the higher the frequency of messages the teacher uses, the more positive the students' sentiment towards the teacher's communication. We also found that the students' sentiment partially mediates the relation between teachers' engaging messages and the students' motivation to learn.

These results reinforce the importance of teachers' messages, as it influences students' sentiments. Furthermore, this opens a new line for the use of sentiment analysis in the study of constructs of interest within the educational field. In the future, the implementation of open-ended questionnaires and its examination using sentiment analysis could become a key tool in improving teaching quality.

References:

Author, 2021 [masked for peer review]

Author, 2022 [masked for peer review]

Caldarella, P., Larsen, R. A. A., Williams, L., Downs, K. R., Wills, H. P., & Wehby, J. H. (2020). Effects of teachers' praise-to-reprimand ratios on elementary students' on-task behaviour. *Educational Psychology*, 40(10), 1306–1322. https://doi.org/10.1080/01443410.2020.1711872

Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Annual Review of Clinical Psychology*, 3, 1–27. https://doi.org/10.1146/annurev.clinpsy.3.022806.091432

Ntoumanis, N., Quested, E., Reeve, J., & Cheon, S. H. (2017). Need-supportive communication: Implications for motivation in sport, exercise, and physical activity. *Persuasion and Communication in Sport, Exercise, and Physical Activity*, 19(December), 155–169. https://doi.org/10.4324/9781315624365

Putwain, D., & Remedios, R. (2014). The Scare Tactic: Do Fear Appeals Predict Motivation and Exam Scores? *School Psychology Quarterly,* 29(4), 503–516. https://doi.org/10.1037/spq0000048

Zhou, J., min Ye, J., & Ye, J. min. (2020). Sentiment analysis in education research: a review of journal publications. *Interactive Learning Environments*, 0(0), 1–13. https://doi.org/10.1080/10494820.2020.1826985

What can predict the quality of technology-enhanced biology lesson plans?

Lena von Kotzebue, University of Salzburg, Austria

Keywords: Assessment methods and tools, Biology, Educational technology, Teaching/instruction

The implementation of digital technologies has a great potential to increase the quality of instruction by enabling new kinds of learning processes. However, meta-analyses show that the implementation of digital technologies is by no means a guarantee for high-quality teaching, as it depends on the quality of the implementation of digital media and the resulting didactic added value (Backfisch et al., 2021). From the research around the professional competencies of a teacher, it is assumed that the objective professional knowledge (especially PCK) and the motivational beliefs of the teacher are a central influencing factor on the quality of instruction. Teacher's professional knowledge on the use of digital technologies has so far usually been assessed by self-reports. However, studies show that self-assessments of TPACK reflect only to a small extent the actual knowledge and actions of teachers (e.g., von Kotzebue, 2022). Apart from the few studies so far analyzing the quality of instructional planning and the implementation of technologies, the different dimensions (knowledge, beliefs, quality of instruction) are mostly investigated in an isolated and subject-unspecific manner.

The present study therefore aimed:

1. objective assessment of the quality of technology-based instructional planning using theory-based criteria

2. analysis of the relationships of study-related factors (number of semesters, teaching experience), self- and performance-assessed TPACK and beliefs on the quality of biology-specific lesson plans with technology integration.

82 prospective biology teachers from an Austrian university participated in the study.

Two trained coders independently coded the theory-based criteria (e.g., self-determination, ICAP) of 20% of the lesson plans (n= 17). High intercoder reliabilities emerged (κ = 1.000 - 0.795). A path model ($\chi 2/df$ = 1.33, *CFI* = .94, *RMSEA* = .06) revealed that self-assessed TPACK was not a significant predictor of lesson planning quality. In contrast, performance-assessed TPACK is a significant predictor of the quality of lesson plans with technology integration (SAMR β = .28, *SE* = .10, p = .007, and overall quality of instruction β = .35, *SE* = .10, p < .001). Furthermore, beliefs are a significant predictor of SAMR model implementation (β = .26, *SE* = .10, p = .010). Thus, the most commonly used self-reported TPACK measures to date are not sufficient by themselves to predict the ability to engage in high-quality technology integration in the classroom. In summary, the present combination of biology-specific constructs measured simultaneously in this study is unique to date in the context of technology integration in the classroom.

References:

Backfisch, I., Lachner, A., Stürmer, K., & Scheiter, K. (2021). Gelingensbedingungen beim Einsatz digitaler Medien im Unterricht - Kognitive und motivationale Voraussetzungen von Lehrpersonen. In: N. Beck, T. Bohl, & S. Meissner (Hrsg.*). Forschungs- und Entwicklungsfelder der Lehrerbildung auf dem Prüfstand. Ergebnisse der ersten Förderphase der Qualitätsoffensive Lehrerbildung an der Tübingen School of Education*. Tübingen: Tübingen University Press. http://dx.doi.org/10.15496/publikation-52641

Von Kotzebue, L. (2022). Two is better than one — Examining biology-specific TPACK and its T-dimensions from two angles. *Journal of Research on Technology in Education*, https://doi.org/10.1080/15391523.2022.2030268

Paper Session II

Paper Session Single Paper paper_type_1 session 9	**Time:** 4.15 pm – 5.45 pm	**Location:** Auditorium (Veranstaltungssaal)
Assigned Chair: Nanette Seago, WestEd, United States		

Design and Effect of Video-based Asynchronous Mathematics Professional Development (PD)

Nanette Seago, WestEd, United States; Jill Neumayer DePiper, WestEd, United States; Angela Knotts, WestEd, United States

Keywords: Mathematics, Online learning, Teacher professional development, Teaching/instruction

To scale quality PD while attending to cost and accessibility, innovative tools and strategies are needed that do not rely on individual providers or extensive face-to-face time with small groups of teachers (Cai et al., 2017). Asynchronous PD provides participants with flexibility, choice, and access to PD anytime and anywhere, considerations that teachers report are extremely important (Parsons et al., 2019).

To address this need and support teacher learning of linear functions, the XX project is creating 40, two-hour asynchronous PD modules using a common set of design principles and structured activities. Each module is centered around a classroom video, with participants engaging in the math task from the video, analysis of classroom practice, and pedagogical reflection, all online and asynchronously. During Spring 2020, secondary mathematics teachers participated in a pilot study where they experienced four sequenced modules over eight weeks in one of three formats: (1) project staff-facilitated, (2) district leader-facilitated, and (3) structured independent. All three formats reflect key principles of effective teacher mathematics PD, where experiences are content-focused, practice-based, and coherent (Heck et al., 2019). The study addressed the research question: *How does participation support teacher learning outcomes related to instructional practice, and how do they differ by facilitation format?*

Across formats, teachers showed evidence of learning consistent with module goals. Over 92% of the 61 participants who responded to end-of-module reflections gave at least one response indicating learning related to Mathematics Teaching Practices (MTPs; NCTM, 2014). While the percent of teachers who evidenced learning about a particular MTP varied across facilitation formats, differences were not statically significant, which suggests no differential impact for one format over another. These results align with Heck et al. (2019), who suggest the participation format of PD is less critical than the presence of key design features. Analysis provides initial evidence of impact of independent, asynchronous PD, when it is well-designed and structured. Future research is needed to study the relationship among PD design structures, format and context, and teacher learning to further understand the benefits of research-based, structured, asynchronous PD.

References:

Cai, J., Morris, A., Hwang, S., Hohensee, C., Robinson, V., & Hiebert, J. (2017). Improving the impact of educational research. *Journal for Research in Mathematics Education*, 48, 2–6.

Heck, D.J., Plumley, C. L., Stylianou, D.A., Smith, A.A., & Moffett, G. (2019). Scaling up innovative learning in mathematics: Exploring the effect of different professional development approaches on teacher knowledge, beliefs, and instructional practice. *Educational Studies in Mathematics*.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all.*

Parsons, S. A., Hutchison, A. C., Hall, L. A., Parsons, A. W., Ives, S. T., & Leggett, A. B. (2019). U.S. teachers' perceptions of online professional development. *Teaching and Teacher Education*, 82, 33–42.

Teachers Adapting and Using PD Learning In Remote Settings

Karen Koellner, Arizona State University, United States; Nanette Seago, WestEd, United States; Nicora Placa, Hunter College, City University of New York, United States

Keywords: Teacher education, Teacher professional development, Teaching approaches, Teaching/instruction

High-quality professional development (PD) around mathematics education is considered vital to the improvement of mathematics learning (Borko, 2004). The Taking a Deep Dive (TaDD) study examines participants' classroom practices three to four years after their participation in large scale professional development projects to better understand what they continue to take up and use in terms of content, pedagogy and resources. This paper focuses on two case study teachers who participated in the Visual Access to Mathematics (VAM) PD project that was aimed at, among other things, building skills in mathematical problem solving and communication using visual representations. De Piper and Driscoll (2018) suggest that teacher knowledge specific to visual representations (MKT-VR) involves being able to fluently use representations in mathematics learning and teaching.

Survey, interview and classroom video data were analysed to provide an in-depth understanding of how the teachers' learning from the PD endured over time. Results indicate that the teachers remembered and continued to use visual representations in their classrooms four years beyond their participation in VAM in ways that not only aligned to the goals and intention of the PD, but also adapted them for remote use during the pandemic. The two teachers were able to explain and demonstrate the ways in which they selected and used specific representations, in particular tape diagrams and double number lines in their classrooms. Classroom video data supported their survey and interview data and demonstrated the ways in which these teachers used the visual representations to illustrate important mathematical ideas related to ratio and proportional reasoning. The teachers also used representations to foster student' communication of their mathematical thinking. This knowledge and use of representations aligned to the goals and intentions of the PD developers.

These findings provide insight into the ways in which teachers continue to take up ideas that they learned in PD, years after their participation and the ways in which they adapt and apply them to novel contexts. While the initial PD did not focus on remote settings or content areas outside of proportional reasoning, these participants were able to transfer and extend their knowledge and use of visual representations to these contexts. They were able to use online tools to provide immediate feedback on the accuracy and labelling of students' representations as well as to strategically select students' representations to share with the class. They used the online tools to allow students to communicate their thinking related to the representations they created and to allow other students to comment on and unpack the diagrams that their classmates created. This adaptation to remote learning aligned with the initial goals of the PD of having teachers strategically select visual representations and use them as communication tools.

References:

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher,* 33(8), 3-15.

DePiper, J. N., & Driscoll, M. (2018). Teacher Knowledge and Visual Access to Mathematics. In *Pedagogical Content Knowledge in STEM* (pp. 83-102). Springer, Cham.

The role of fading solution steps and revealing solutions in learning from demonstrations

Katharina Engelmann, University Hildesheim, Germany; Christof Wecker, University Hildesheim, Germany

Keywords: Instructional design, Learning approaches, Teaching approaches, Teaching/instruction

From tying one's shoes to techniques of first aid and from writing to solving equations, we learn many skills from demonstration. Strikingly, there is little research on learning from demonstrations. However, an analogue to demonstrations can be found in the thoroughly investigated instructional method of worked examples because both methods present the steps of a solution to a problem–worked examples in written form and demonstrations enacted by a person (Van Gog & Rummel, 2010). Thus, effects found in research on worked examples may have parallels in learning from demonstrations (cf. Wecker et al., 2016). For example, the *fading* of solution steps has been found to benefit learning from worked examples (Renkl & Atkinson, 2002). A parallel effect could be found for fading solution steps in demonstrations in a classroom setting (Wecker et al., 2016), which provides some support for the assumed analogy between worked examples and demonstrations. A connected issue is whether providing feedback during problem solving by *revealing solutions* (cf. Moreno et al., 2009) is beneficial for learning in demonstrations. Hence, this study addressed the research question: To what extent do the *fading* of solution steps and *revealing solutions* in demonstrations influence skill acquisition?

A 2x2 between-subjects design with *fading* and *revealing solutions* was implemented. The sample comprises 109 German university students enrolled in teacher education programs that were randomly assigned to one of the four conditions. The students saw video demonstrations of how to calculate Cohen's *k*. *Fading* was manipulated by fading the video demonstrations step-by-step (*with fading*) or alternating demonstrations with problem-solving (*without fading*); revealing was manipulated by showing (*with revealing*) or not showing (*without revealing*) the solution after problem-solving. Skill acquisition with respect to the calculation of Cohen's *k* was measured by means of two problems in a posttest. Non-parametric statistical tests had to be applied.

Learners in the conditions *with fading* produced a higher average number of correct answers in the posttest (U =1800.00, p = .04). No statistically significant effect was found for *revealing solutions* (U =1592.00, p = .48).

The beneficial effect of *fading* for skill acquisition is consistent with prior research both on worked examples (Renkl & Atkinson, 2003) and demonstrations (Wecker et al., 2016), providing further evidence that this principle of example-based learning holds also for learning from demonstrations. Further research is needed to potentially disregard *revealing solutions* as a relevant factor in learning with demonstrations.

References:

Moreno, R., Reisslein, M., & Ozogul, G. (2009). Optimizing worked-example instruction in electrical engineering: The role of fading and feedback during problem-solving practice. *Journal of Engineering Education*, 98(1), 83-92.

Renkl, A. & Atkinson, R. K. (2003). Structuring the transition from example study to problem solving in cognitive skill acquisition: A Cognitive Load Perspective. *Educational Psychologist, 38*(1), 15-22.

Van Gog, T., & Rummel, N. (2010). Example-based learning: Integrating cognitive and social-cognitive research perspectives. *Educational Psychology Review, 22*(2), 155-174.

Wecker, C., Ufer, S., & Mahl, C. (2016). Vom Vormachen zum Selbermachen: Fading von Lösungsschritten bei der Demonstration von Strategien im Mathematikunterricht. *Unterrichtswissenschaft*, (4), 442-457.

Paper Session Single Paper paper_type_1 session 20	Time: 4.15 pm – 5.45 pm	Location: Lecture Hall (Vortragssaal)
Assigned Chair: Barbara Moschner, Carl von Ossietzky University Oldenburg, Germany		

Fostering Pre-service Teachers‘ Assessment Skills: Learner Profiles in Video-based Simulations

Michael Nickl, Technical University München (TUM), Germany; Daniel Sommerhoff, Leibniz Institute for Science and Mathematics Education, Germany; Elias Codreanu, Technical University München (TUM), Germany; Stefan Ufer, Ludwig Maximilians-University (LMU), Germany; Tina Seidel, Technical University München (TUM), Germany

Keywords: Educational technology, Higher education, Pre-service teacher education, Teacher education

Every day, teachers must assess their students’ characteristics to adapt their teaching and optimize support for individual students. However, especially pre-service teachers struggle in assessing students’ characteristics (Levin et al., 2009). For fostering assessment skills, simulations have proven effective. Additional scaffolding adapted to the learners’ needs enables further learning gains (Chernikova et al., 2020). However, these needs must be identified first, which may involve (i) identifying and characterizing different learner profiles based on their learning prerequisites and (ii) analyzing how these learner profiles interact with the simulation.

In the context of fostering assessment skills in digital simulations, the role of motivational-affective traits next to professional knowledge as prerequisites was emphasized. These cognitive and motivational-affective prerequisites are expected to influence situative learning experiences (like cognitive load, motivation, authenticity, and involvement), as well as assessment skills (Heitzmann et al., 2019).

The present study analyzes (i) and (ii) in the context of a video-based simulation to measure and support assessment skills. *N = 150* pre-service teachers participated in this study. Among questionnaires on cognitive and motivational states and traits, participants were asked to complete an already validated video-based simulation, in which they had to assess students’ mathematical argumentation skills (Codreanu et al., 2020). A latent profile analysis (LPA) was conducted to identify prerequisite profiles based on professional knowledge and motivational-affective traits (interest, self-efficacy, and self-regulation). Afterwards, situative learning experiences and assessment skills of all three profiles were calculated and compared.

LPA fit indices suggest a 3-profile-solution: a knowledgeable profile, a motivated profile, and a profile with below average knowledge and motivation. While the profiles perceive the simulation equally authentic, they tend to differ in their other situative learning experiences: Regarding cognitive load and involvement, the motivated profile tends to have advantages over the other two profiles. Regarding motivation, the knowledgeable and the motivated profile show significantly more optimism to adequately assess students than the third profile. Moreover, they also navigate differently through the simulation: The motivated profile tends to engage with the simulation more superficially than the knowledgeable profile. The knowledgeable profile uses most time for the assessment process, resulting in higher assessment accuracy.

References

Chernikova, O.,Heitzmann, N., Fink, M. C., Timothy, V., Seidel, T.,& Fischer, F. (2020). Facilitating diagnostic competences in highereducation—A meta-analysis in medical and teacher education. *Educational Psychology Review,* 32(1), 157–196.

Codreanu, E., Sommerhoff, D., Huber, S., Ufer, S., & Seidel, T. (2020). Between authenticity and cognitive demand: Finding a balance in designing a video-based simulation in the context of mathematics teacher education. *Teaching and Teacher Education*, 95, 103146.

Heitzmann, N., Seidel, T., Hetmanek, A.,Wecker, C., Fischer, M. R., Ufer, S., Schmidmaier, R.,Neuhaus, B., Siebeck, M., Stürmer, K., Obersteiner, A.,Reiss, K., Girwidz, R., Fischer, F., & Opitz, A.(2019). Facilitating diagnostic competences in simulations in higher education: A framework and a research agenda. *Frontline Learning Research*, 7(4), 1–24.

Levin, D. M., Hammer, D., &Coffey, J. E. (2009). Novice teachers' attention to student thinking. *Journal of Teacher Education,* 60(2), 142–154.

The Effects of Pre-Service Teachers' Passive vs. Constructive Engagement on Technology Acceptance

Tugce Özbek, University of Augsburg, Germany; Christina Wekerle, University of Augsburg, Germany; Ingo Kollar, University of Augsburg, Germany

Keywords: Attitudes and beliefs, Digital learning, Educational technology, Pre-service teacher education

The quality of how teachers use digital technology in the classroom is influenced by their technology acceptance (Backfisch et al., 2021). The Technology Acceptance Model (Venkatesh & Bala, 2000) points to teachers' *perceived usefulness* (PU) and *perceived ease of use* (PEU) of a technology as factors that influence the *intention to use* it (ITU). When teachers encounter digital tools, they often do so on the internet (e.g., on blogs that describe the benefits of the tool). However, based on the ICAP framework by Chi and Wylie (2014), we hypothesized that encouraging pre-service teachers to engage with information about a technology in a constructive (i.e., develop usage scenarios of the tool) as compared to a passive way (i.e., reading a blog entry) might positively affect their PU, PEU, ITU and LPU (use in lesson plans) of this technology.

N=53 pre-service teachers were either asked to read a blog entry or to work on six, mostly open-ended exercises (e.g., development of tool-based classroom activities) covering the same informational aspects as the blog entry. Pre-service teachers rated the PU, PEU, and ITU of the tool before and after the intervention. Finally, participants were instructed to describe an ideal lesson in which digital technology is used. These plans were analyzed to examine the occurrence of the tool in lesson plans (LPU).

While a mixed ANOVA with condition (passive vs. constructive) as between- and time as within-subject factor showed no significant interaction for PU ($F(1,51)=1.15$, $p=.29$), a significant interaction effect for PEU was found ($F(1,51)=8.88$, $p=.004$, partial $\eta^2=.15$). Surprisingly, prompting students to read a blog entry seemed to have a stronger positive effect on PEU compared to working constructively on open-ended exercises. For ITU, the results showed no interaction effect of time and group ($F(1, 51)=1.15$, $p=.25$). Regarding LPU, a chi-square test showed no significant association between type of engagement and LPU ($\chi^2(1)=1.43$, $p=.23$). Furthermore, we found that the more students actually engaged in constructive activities in the constructive condition (operationalized via the number of words written relating to the first task), the more positively they rated the PEU of the tool ($\beta=.48$, $p=.02$).

An explanation for our findings might be that fulfilling the tasks in the constructive condition imposed high cognitive load on students, which may have prevented them from deeply elaborating the information. However, as the positive relations between actual engagement in constructive activities and PEU demonstrate, prompting students to engage in constructive activities might not too easily be dismissed as ineffective. Our results imply that students might require a closer guidance in how to engage in these activities.

References:

Backfisch, I., Lachner, A., Stürmer, K., & Scheiter, K. (2021). Variability of teachers' technology integration in the classroom: A matter of utility! *Computers & Education,* 166, 104159.

Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, 49(4), 219-243.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204.

Change in Beliefs of Pre-service Teachers about Feedback after a Video-Based Intervention

Anna Holstein, Leuphana University Lueneburg, Germany; Christopher Prilop, Leuphana University Lueneburg, Germany; Kira Weber, Leibniz Institute for Science and Mathematics Education (IPN), Germany; Marc Kleinknecht, Leuphana University Lueneburg, Germany

Keywords: Attitudes and beliefs, Pre-service teacher education, Teacher education, Video analysis

Feedback is a powerful tool to enhance student learning and achievement (e.g., Narciss, 2013). When giving feedback, teachers often focus on students' well-being (being (Black & Wiliam, 2009; Irving, et al., 2011) instead of equipping them with the necessary process skills to construct meaning themselves or self-regulate their learning efforts (Narciss, 2013). One possible reason for the lack of effective practices could be the beliefs teachers hold about educational processes). Despite the power feedback holds, there has been little research exploring (pre-service) teachers' feedback beliefs. However, the beliefs teachers hold about educational processes have an impact on their behavior, but are also difficult to change (e.g., Pajares, 1992). Therefore, in the study at hand, we investigated pre-service-teachers' feedback beliefs and carried out a video-based intervention to find out to what extent these beliefs can change. Video-interventions can have positive effects on teacher's professional competence and therefore may change feedback beliefs, especially at training stage. Five seminar sessions were structured around video analyses, where master of education students watched and analyzed other teachers' feedback practices. We employed an already existing questionnaire about feedback beliefs (see Brown, et al., 2012) before and after the invention, where we asked students to rate different statements about the following scales: *improvement, task, process, self-regulation, and encouragement*. Results show that feedback beliefs about self-regulation significantly changed. The values for the remaining scales do not show any significant differences. The fact that beliefs for the remaining scales, especially for students' well-being, did not significantly change will be further discussed at the conference.

References:

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21(1), 5-31.

Brown, G. T. L., Harris, L. R., & Harnett, J. (2012). Teacher beliefs about feedback within an Assessment for Learning environment: Endorsement of improved learning over student well- being. *Teaching and Teacher Education,* 28(7), 968-978

Gaudin, C., & Chaliès, S. (2015). Video viewing in teacher education and professional development: a literature review. *Educational Research Review*, 16, 41–67.

Irving, S. E., Peterson, E. R., & Brown, G. T. L (2008). Feedback and academic achievement: The relationship between students' conceptions of feedback and achievement. Paper presented at the 6th biennial conference of the International Test Commission, Liverpool, UK.

Narciss, S. (2013). Designing and Evaluating Tutoring Feedback Strategies for Digital Learning Environments on the basis of the Interactive Tutoring Feedback Model. *Digital Education Review,* 23, 7-26.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, 62(3), pp. 307–332. http://dx.doi.org/10.3102/00346543062003307

Paper Session Single Paper paper_type_1 session 13	**Time:** 4.15 pm – 5.45 pm	**Location:** Big Club Room (Großer Clubraum)
Assigned Chair: Ronny Scherer, University of Oslo, Norway		

Action Orientation Protects Pre-service Teachers from Stress in Field Experience

Sandra Dietrich, University of Leipzig, Germany; Brigitte Latzko, University of Leipzig, Germany

Keywords: Action research, Pre-service teacher education, Teacher education, Teacher professional development

Daily working life of teachers is undoubtedly shaped by tremendous and unforeseen professional challenges (Cramer, 2020) that might be termed VUCA. The effects of the covid pandemic illustrate this assumption most accurately (Hadar et al., 2020). That's why, starting with pre-service teachers, all education professionals need to be prepared for managing stress in a healthy way. Action control (Kuhl & Goschke, 1994) seems a promising candidate for explaining how people cope with potentially stressful situations. Action control theory postulates that action-oriented individuals are more likely to change actions flexibly and appropriate to demanding situations. Action orientation could therefore be seen as a central personal requirement supporting fit to job demands of the teaching profession as proposed by person-environment-fit-theory (Demerouti et al., 2015). Which leads us to our research question: Is action orientation a protective factor against stress? We asked teacher education students that did a mandatory field experience to take part in an online survey. Two dimensions of action orientation (action orientation after failure = AOF & decision related action orientation = AOD) were assessed by a short version of the German ACS-90 (HAKEMP-90) questionnaire, stress was measured using the short version of the Perceived Stress Questionnaire (PSQ) (Fliege et al., 2005). Simple linear regressions were calculated to predict stress based on AOF, B = -.46 and AOD, B = -.23. A significant regression equation was found for AOF, $F(1,87) = 18.94$, $p < .001$, with an R^2 of .18 and f^2 of .22, and AOD, $F(1,88) = 5.85$, $p = .018$, with an R^2 of .06 and f^2 of .06. Both for action orientation after failure as well as for decision related action orientation, participants with a tendency to action orientation reported less overall stress. We interpret this as an indicator that being able to act flexibly, even if things do not go according to plan is an important resource in the teaching context. Therefore, we highly recommend including measures of volition into future studies investigating teacher health and occupational well-being.

References:

Cramer, C. (2020). *Professionstheorien. Überblick, Entwicklung und Kritik.* https://doi.org/10.15496/publikation-45602

Demerouti, E., Bakker, A. B., & Gevers, J. M. (2015). Job crafting and extra-role behavior: The role of work engagement and flourishing. *Journal of Vocational Behavior,* 91, 87-96. https://doi.org/10.1016/j.jvb.2015.09.001

Fliege, H., Rose, M., Arck, P., Walter, O. B., Kocalevent, R.-D., Weber, C., & Klapp, B. F. (2005). The Perceived Stress Questionnaire (PSQ) reconsidered: Validation and reference values from different clinical and healthy adult samples. *Psychosomatic Medicine*, 67(1), 78–88. https://doi.org/10.1097/01.psy.0000151491.80178.78

Hadar, L. L., Ergas, O., Alpert, B., & Ariav, T. (2020). Rethinking teacher education in a VUCA world: student teachers' social-emotional competencies during the Covid-19 crisis. *European Journal of Teacher Education*, 43(4), 573–586. https://doi.org/10.1080/02619768.2020.1807513

Kuhl, J., & Goschke, T. (1994). A. theory of action control: Mental subsystems, modes of control, and volitional conflict resolution strategies. In J. Kuhl & J. Beckmann (Eds.*), Volition and personality: Action- and state-oriented models of control* (pp. 93–124). Hogrefe & Huber Publishers.

Digitalization, epistemology and transformative agency

Toril Aagaard, University of Southeast Norway; Andreas Lund, University of Oslo, Norway

Keywords: Digital transformation, Student learning, Teacher education, Teacher professional development

When digital technologies are introduced and integrated infused in schools, not just traditional learning-activities, but also traditional resources, tasks, assessment and roles, are challenged (Starkey, 2020). The reason is that digitalization causes changes in the deep and basic structure of education; how we come to knowledge, by what means, and under what conditions (Aagaard & Lund, 2019).

Despite such epistemological implications, we observe that Teacher Education (TE) still tends to focus on the mere use of digital technologies. Less attention is paid to identifying epistemic issues and prepare both teacher educators and students to face and engage in them and integrate digital technologies in pedagogical and didactical meaningful ways (Lund & Aagaard, 2020). We also find that various frameworks defining what professional digital competence entails (e.g., Kelentric, 2017; Starkey, 2020), tend to neglect the capacity to engage in such transformative agency (Sannino, 2020), and approach teaching as a design science (see e.g., Li et.al., 2022).

To contribute, we conceptualize transformation and transformative agency drawing on socio-cultural and cultural-historical perspectives, from the works of Vygotsky to more recent developments in the neo-Vygotskian tradition (e.g., Engeström, 1987/2007; Sannino 2020). The essence of transformation is located in the dialectics between a critical problem situation and the available resources invoked in order to transcend, expand on, or break out of a stifling status quo. Transformative agency involves, in our case, designing and redesigning learning environments and trajectories with a special view to how digital resources can be used to promote learning and epistemic work. To clarify this theoretical position and illustrate some promising epistemic practices developing from engaging in transformative agency, we present findings from an evaluation showing how video-based simulation might help TE to solve a recurring problem situation: preparing student teachers better for work-life.

Selected relevant literature:

Aagaard, T., & Lund, A. (2020). *Digital agency in higher education: Transforming teaching and learning.* Routledge.

Engeström, Y. (1987). *Learning by expanding: an activity-theoretical approach to developmental research.* Helsinki: Orienta-Konsultit Oy.

Engeström, Y. (2007). Putting Vygotsky to work: The Change Laboratory as an application of double stimulation. In H. Daniels, M. Cole & J. V. Wertsch (Eds.), *The Cambridge Companion to Vygotsky* (pp. 363-382). Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo: Cambridge University Press.

Kelentrić, M., Helland, K., & Arstorp, A.-T. (2017). *Professional Digital Competence Framework for Teachers*. Senter for IKT i utdanningen, Oslo. Retrieved from https://www.udir.no/kvalitet-og-kompetanse/profesjonsfaglig-digital-kompetanse/rammeverk-larerens-profesjonsfaglige-digitale-komp/ <https://www.udir.no/kvalitet-og-kompetanse/profesjonsfaglig-digital-kompetanse/rammeverk-larerens-profesjonsfaglige-digitale-komp/%0d>

Lund, A., & Aagaard, T. (2020). Digitalization of teacher education: Are we prepared for epistemic change? *Nordic Journal of Comparative and International Education (NJCIE),* 4(3-4), 56–71. https://doi.org/10.7577/njcie.3751 <https://doi.org/10.7577/njcie.3751>

Li, L., Farias Herrera, L., Liang, L., & Law, N. (2022). An outcome-oriented pattern-based model to support teaching as a design science. *Instructional Science,* 1-32.

Sannino, A. (2020). Transformative agency as warping: How collectives accomplish change amidst uncertainty. *Pedagogy, Culture & Society*, 1–25

Starkey, L. (2020) A review of research exploring teacher preparation for the digital age, *Cambridge Journal of Education,* 50:1, 37- 56. https://doi.org/10.1080/0305764X.2019.1625867

Reflection with mobile portfolios in teaching internships: collaborative process and outcomes

Konstantinos Michos, University of Zurich, Institute of Education, Switzerland; Dominik Petko, University of Zurich, Switzerland

Keywords: Content analysis, Digital transformation, Pre-service teacher education, Teacher professional development

Reflection with digital portfolios has shown various benefits to student teachers. Currently, mobile devices offer further opportunities for reflective thinking and collaboration in teacher education. Mobile apps are being used in various professional domains to support reflective activities (e.g., in medical and vocational education) but their integration in teacher education is still scarce (Baran et al., 2014). Reflective thinking with digital portfolios involves different factors related to the process, context and outcomes of teacher education (Adadan & Oner, 2018). Although mobile devices seem relevant for teacher education activities (Çelik, Baran & Sert, 2018), limited empirical studies examined the use and affordances of mobile apps to create portfolios of teaching internships and their potential benefits to students' teachers. In addition, the collaboration between student teachers and mentors is commonly acknowledged as important in teacher education internships. Based on previous empirical research, we present a study where N = 44 student teachers used a mobile portfolio app for reflection during primary school teaching internships. Student teachers collaborated with peers and mentors with the support of the mobile app to a) capture multimedia evidence (video, audio, and pictures) in the classroom and b) write reflective comments. We performed a qualitative analysis of the final portfolios' artifacts to understand whether this collaborative construction of portfolios with the mobile app related to student teachers' outcomes. Results show that mobile portfolios of teaching internships often included multimedia evidence (pictures, video and audio) of student classroom activity and reflective comments about teaching strategies. Peers mainly contributed with additional multimedia evidence while mentors often recorded videos. In addition, we found correlations between the amount of collaborative content creation in the portfolios and student teachers' outcomes with respect to self-efficacy and enthusiasm that were measured with self-report questionnaires after the teaching internship. Based on the results of this study, we suggest scaffolds and support for student teachers that relate to the *process, context* and *outcomes* of reflection with mobile portfolios in teaching internships.

References

Adadan, E., & Oner, D. (2018). Examining preservice teachers' reflective thinking skills in the context of web-based portfolios: The role of metacognitive awareness. *Australian Journal of Teacher Education (Online),* 43(11), 26-50.

Baran, E. (2014). A review of research on mobile learning in teacher education. *Journal of Educational Technology & Society*, 17(4), 17-32.

Çelik, S., Baran, E., & Sert, O. (2018). The affordances of mobile-app supported teacher observations for peer feedback. *International Journal of Mobile and Blended Learning (IJMBL),* 10(2), 36-49.

Paper Session Single Paper paper_type_1 session 11	**Time:** 4.15 pm – 5.45 pm	**Location:** Seminar Room II (Seminarraum II)
Assigned Chair: Anika Radkowitsch, Leibniz Institute for Science and Mathematics Education (IPN), Germany		

Pre-service teachers' acceptance of Artificial Intelligence

Michaela Gläser-Zikuda, University of Erlangen-Nürnberg, Institute for Educational Science, Germany; Chengming Zhang, University of Erlangen-Nuremberg, Germany; Jessica Schießl, University of Erlangen-Nuremberg, Germany; Florian Hofmann, University of Erlangen-Nuremberg, Germany

Keywords: Artificial intelligence, Educational technology, Pre-service teacher education, Quantitative methods

Artificial intelligence (AI) applications are increasingly appearing in higher education, such as learning management systems, grading/assessment, and student information system (EDUCAUSE, 2021). Acceptance of AI has been investigated in marketing, but although AI is applied in education, there is research needed (Chikobava & Romeike, 2021) how it is accepted and which individual factors determine the use of AI. Therefore, our study (funded by the BMBF – Federal Ministry of Education and Research) aimed at the analysis of pre-service teachers' acceptance of AI in testing their behavioral intentions regarding prospective AI technology use. Furthermore, gender effects, and differences between primary and secondary pre-service teachers' acceptance of AI were tested.

The study based on the Technology Acceptance Model (Venkatesh & Bala, 2008). An adapted German version of the instrument (Stephan, Markus & Gläser-Zikuda, 2019) was applied and consists of eight subscales with 3-4 items each and good reliabilities (α = .69 to .88): Perceived Usefulness; Perceived Ease of Use; AI Self-Efficacy; AI Anxiety; Perceived Enjoyment; Subjective Norm; Job Relevance, Behavioral Intention.

Over 600 pre-service teachers participated voluntary in an online-survey administered with Unipark during a lecture in December 2021 at one German university. Analyzes included a total of 405 (294 females, 108 males, 3 third gender; mean age 21.14 years; *SD* = 3.82) valid responses. 75.06% of respondents were enrolled in the first semester (*M* = 1.76, *SD* = 1.48) of teacher training programs (n = 239 primary school; n = 166 secondary school). Structural equation modeling (SEM) was performed using R software.

The results show that the participants report moderate levels in all subscales of AI acceptance, except for Behavioral Intention (M = 2.81, SD = .88). The proposed model achieved a good model fit (*X2/df*=2.28, *CFI*=.932, *TLI*=.920, *RMSEA*=.056[.051, .056], *SRMR*=.071). In the overall sample model, only AI Anxiety does not influence pre-service teachers' intentions to use AI indirectly; the remaining study variables showed all differential effects on the intention to use AI. In the calculated female model, Behavioral Intention is significantly determined by Subjective Norm (.297***); in the male model is no significant effect. Secondary school pre-service teachers Subjective Norm has an influence on Perceived Usefulness (.320***); but this is not the case for primary school pre-service teachers.

Main results of the study are presented and discussed in terms of acceptance research on AI and with respect to their relevance for teacher education and school education.

References:

Chikobava, M. & Romeike, R. (2021).Towards an Operationalization of AI acceptance among Pre-service Teachers. *WiPSCE' 21: The 16th Workshop in Primary and Secondary Computing Education*. Proceedings October 2021, (15) 1–2; https://doi.org/10.1145/3481312.3481349

Pelletier, K., Brown, M. et al. (2021). *2021 EDUCAUSE Horizon Report Teaching and Learning Edition*. Boulder, CO: EDU. Retrieved Jan. 13, 2022 from https://www.learntechlib.org/p/219489/

Stephan M., Markus S., & Gläser-Zikuda M. (2019). Students' Achievement Emotions and Online Learning in Teacher Education. *Frontiers in Education 4,* ISSN: 2504-284X; DOI: 10.3389/feduc.2019.00109

Venkatesh, V. & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences*, 39(2), 273–315.

Design of simulation-based learning environments: Does it affect pre-service teachers' interests?

Stephanie Kron, Ludwig-Maximilians-University (LMU), Germany; Daniel Sommerhoff, Leibniz Institute for Science and Mathematics Education, Germany; Maike Achtner, Chair of Mathematics Education, Department of Mathematics, LMU Munich, Germany; Christof Wecker, University Hildesheim, Germany; Matthias Siebeck, Institute of Medical Education, University Hospital, LMU Munich, Germany; Kathleen Stürmer, University of Tübingen, Germany; Stefan Ufer, Ludwig Maximilians-University (LMU), Germany

Keywords: Competence development, Mathematics, Pre-service teacher education, Quantitative methods

Simulation-based learning environments reconstruct real-life situations, which are less cognitive demanding, as disruptive factors can be controlled. As such, simulation-based learning environments attract increasing research in the field of teacher education, for example to foster professional competences. Besides criteria regarding the design of the simulation (e.g., authenticity and immersion), the role of participants' interests, which are relevant to the simulated practice, in such learning environments is undisputable (Hidi & Renninger, 2006). Recent research findings emphasize that relevant interests may trigger the activation of professional knowledge during participation in a simulation (Kron et al., under review). Similarly, it can be assumed that the authenticity of learning experiences may contribute to participants' interest development (Hidi & Renninger, 2006). However, authenticity may also increase extraneous cognitive load, which has been found to reduce individuals' interest (Park et al., 2015). For example, while role-play simulations may be perceived as more authentic and immersive than video-based simulations, they might also put higher cognitive demand on learners. Research about how such different presentation formats of simulation-based learning environments and their perceived authenticity contribute to the development of learners' interest, is scarce. Using data of N = 81 pre-service mathematics teachers who participated in four simulated diagnostic one-on-one interviews over one semester, this contribution investigates how the simulations' presentation format (role-play- vs. video-based) and participants' perception of the simulation affect the development of their interest in mathematics education and interest in diagnosis. In particular, participants' perception of the simulation as being authentic, immersive, and cognitively demanding have been investigated. Linear mixed model analyses of participants' interest, reported after each simulation, reveal that perceiving the simulation as authentic and immersing positively influenced interest ratings, whereas extraneous cognitive load showed a negative relation. This highlights, that simulation-based learning environments should be designed in an authentic and immersing way, while carefully considering potential sources of extraneous cognitive load. In fact, these requirements may run contrary to each other. Controlling for perception of the simulation, participants reported significantly higher interest in mathematics education after the first video simulation than after the first role-play simulation. However, this advantage vanished until the fourth simulation. Interest in diagnosis

decreased similarly in both formats. This indicates that the presentation format alone may only have a short-term effect on participants' interests. It is crucial to disentangle pure novelty effects of new simulation formats from long-term developments of interests. Further research should investigate effects of (other) characteristics of simulation-based learning environments, but also explicit interventions regarding their potential to sustain and develop (pre-service) teachers' relevant interests.

References:

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, 41(2), 111-127.

Kron, S., Sommerhoff, D., Achtner, M., Stürmer, J., Wecker, C., Siebeck, M., & Ufer, S. (under review). Cognitive and motivational person characteristics as predictors of diagnostic performance: Combined effects on pre-service teachers' diagnostic task selection and accuracy. *Journal für Mathematikdidaktik.*

Park, B., Flowerday, T., & Brünken, R. (2015). Cognitive and affective effects of seductive details in multimedia learning. *Computers in Human Behavior,* 44, 267-278.

Exploring the Assessment Process of Pre-service Teachers in a Simulation: A Latent Profile Approach

Anika Radkowitsch, Leibniz Institute for Science and Mathematics Education (IPN), Germany; Daniel Sommerhoff, Leibniz Institute for Science and Mathematics Education, Germany; Michael Nickl, Technical University München (TUM), Germany; Elias Codreanu, Technical University München, Germany; Stefan Ufer, Ludwig-Maximilians-University (LMU), Germany; Tina Seidel, Technical University München, Germany

Keywords: Educational technology, Pre-service teacher education, Professional vision, Quantitative methods

Assessing individual students' learning is a key task for teachers and important for making adaptive pedagogical decisions (Südkamp et al., 2012). Thus, gaining assessment skills, that is the ability to collect and to integrate case-specific information to reduce uncertainty with respect to professional decisions (Heitzmann et al., 2019), is a key challenge for teacher education. To provide authentic learning environments with adaptive instructional guidance to pre-service teachers requires a deep understanding of (1) interindividual differences in teachers' engagement in *assessment activities* (i.e., describing, evaluating, explaining, decision making, Codreanu et al., 2021) and (2) of *learner prerequisites* (e.g., knowledge, motivational-affective variables) underlying these interindividual differences.

We used data from 118 pre-service mathematics teachers who completed questionnaires assessing cognitive and motivational-affective learner prerequisites (prior knowledge, interest, self-efficacy, motivation), and diagnosed two simulated students' mathematical argumentation and proof skills in a video-based simulation. The quantity of assessment activities was coded based on notes taken during watching the videos (see Codreanu et al., 2021). The z-standardized sum scores for participants' assessment activities were used as indicators for a latent profile analysis (LPA). Participants were assigned to the most likely profile. Profiles were compared with respect to relevant learner prerequisites and assessment accuracy.

The LPA suggested three distinct participant profiles: Participants in the first profile engaged above average in decision making (decisive profile, $N = 23$), participants in the second profile engaged above average in evaluating (evaluating profile, $N = 20$), participants in the third profile engaged below average in all assessment activities (restrained profile, $N = 75$). Descriptively, the restrained profile showed a

lower assessment accuracy, had lower prior knowledge, and were less interested compared to both other profiles. In contrast, participants associated to the decisive profile had descriptively higher prior knowledge compared to both other profiles. Compared to the decisive profile, the evaluating profile showed similar assessment accuracy and interest, but lower prior knowledge and self-efficacy.

Based on these results, especially learners from the restrained and evaluating profiles need support: both profiles could benefit from further guidance to make pedagogical decisions (e.g., knowledge prompts), the restrained profile could also benefit from an intervention addressing their interest in assessment. Our results demonstrate that using pre-service teachers' notes in a simulation as indicator for assessment activities results in theoretically meaningful differentiations between activities and participants, and suggests relevant, process-based starting points for adaptive instructional support.

References:

Codreanu, E., Sommerhoff, D., Huber, S., Ufer, S., & Seidel, T. (2021). Exploring the process of preservice teachers' diagnostic activities in a video-based simulation. *Frontiers in Education*, 6, 1-16.

Heitzmann, N., Seidel, T., Opitz, A., Hetmanek, A., Wecker, C., Fischer, M., Ufer, S., Schmidmaier, R., Neuhaus, B., Siebeck, M., Stürmer, K., Obersteiner, A., Reiss, K., Raimund, G., & Fischer, F. (2019). Facilitating diagnostic competences in simulations: A conceptual framework and a research agenda for medical and teacher education. *Frontline Learning Research,* 7(4), 1-24.

Südkamp, A., Kaiser, J., & Möller, J. (2012). Accuracy of teachers' judgments of students' academic achievement: A meta-analysis. *Journal of Educational Psychology*, 104(3), 743-762.

Paper Session III

Paper Session Single Paper paper_type_1 session 8	**Time:** 9.00 am – 10.30 am	**Location:** Auditorium (Veranstaltungssaal)
Assigned Chair: Susanne Seifert, University of Graz, Austria		

Supporting diagnostic tasks and competencies of teachers in vocational schools – an interview study

Andrea Burda-Zoyke, Christian-Albrechts-University of Kiel, Germany; Juergen Seifried, University of Mannheim, Germany; Teresa Giek, University of Mannheim, Germany; Philipp Eichentopf, Christian-Albrechts-University zu Kiel, Germany

Keywords: Qualitative methods, Teacher education, Video analysis, Vocational education

Inclusion is an important challenge facing all types of schools. For vocational schools, it requires all students to have access to high-quality vocational education and training (VET) (UNCRPD, 2007; UNESCO, 2015). As heterogeneity of students in VET is particularly high (Euler & Severing, 2014), personalized learning and adaption of teaching are crucial for successful learning processes. This needs prior diagnostics, which is understood as one dimension of adaptive teaching that aims to address all learners as individuals with different prerequisites and potentials (Vogt & Rogalla, 2009; Zhang, Basham & Yang, 2020).

Although diagnostics is a central task and an important element of teacher professionality (Klug, Bruder, Kelava, Spiel & Schmitz, 2012), very different activities of teachers are subsumed under the term (Aufschnaiter et al., 2015). However, a shift from diagnostics associated with assessment and resource allocation towards an understanding and supporting perspective is called for. Supporting diagnostics has the learning process as its object. It often uses qualitative methods, is formative, and comes to informal results with the goal of (individual) support for all students. Despite its relevance, little is known so far about support-related diagnostic tasks and processes and the modelling of competencies needed to implement inclusion in VET schools (Aufschnaiter et al., 2015; Barth & Gloystein 2019).

Against this background, an empirical exploration of supporting diagnostic tasks and competencies of teachers in inclusive vocational schools is needed. Therefore, we are currently conducting guided construct interviews with approximately 50 teachers and students at commercial schools as well as experts in the field. The focus is on illuminating concrete teaching situations in which diagnostics are applied concerning the heterogeneity dimensions of language, cognition, and behavior. The results will be available by the conference date. Based on this, video vignettes will be developed as a digital tool to use in teacher education to better prepare future teachers for the challenges regarding inclusion at vocational schools.

References

Aufschnaiter, C. et al. (2015). Diagnostische Kompetenz – Theoretische Überlegungen zu einem zentralen Konstrukt der Lehrerbildung. *Zeitschrift für Pädagogik,* 61(5), 738-758.

Barth, U., & Gloystein, D. (2019). Adaptive Lehrkompetenzen im Spannungsfeld inklusiver Schule. Schwerpunkt Diagnostische Kompetenz: Erfahrungen, Vorschläge, Visionen. In M. Esefeld et al. (Eds.*), Inklusion im Spannungsfeld von Normalität und Diversität* (pp. 95-102). Klinkhardt.

Euler, D., & Severing, E. (2014*). Inklusion in der beruflichen Bildung. Daten, Fakten, offene Fragen.* Retrieved from https://www.bertelsmann-stiftung.de/de/publikationen/publikation/did/inklusion-in-der-beruflichen-bildung-hintergruende-kennen/ (13.01.2022)

Klug, J., Bruder, S., Kelava, A., Spiel, C., & Schmitz, B. (2013). Diagnostic competence of teachers: A process model that accounts for diagnosing learning behavior tested by means of a case scenario. *Teaching and Teacher education*, 30, 38-46.

United Nations (2007). *UN (2007). Convention of the Rights of Persons with Disabilities.* New York. Retrieved from https://treaties.un.org/doc/Publication/CTC/Ch_IV_15.pdf (13.01.2022)

UNESCO (2015*). Education for all. 2000-2015: Achievements and Challenges*. Paris. Retrieved from http://unesdoc.unesco.org/images/0023/002322/232205e.pdf (13.01.2022)

Vogt, F., & Rogalla, M. (2009). Developing adaptive teaching competency through coaching. *Teaching and Teacher Education,* 25(8), 1051-1060.

Zhang, L., Basham, J. D., & Yang, S. (2020). Understanding the implementation of personalized learning: A research synthesis. *Educational Research Review*, 31, 100339.

Enhancing VTE teachers' knowledge about digital transformation

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Keywords: Digital transformation, Teacher education, Technology, Vocational education

We conceptualize digital transformation as comprehensive organizational and societal change intertwining previously separate vocational fields, including the social and the technological realm. Consequently, vocational school teachers are faced with three challenges related to the curriculum: (1) because of the pace of change, curriculum reform lags behind, coping with the task of integrating technology-related content to the teachers themselves; (2) exemplary content must be distinguished from content with little exemplary value for digital transformation; and (3) civil liberties like privacy are at stake, giving urgency to the question how to support them across vocational fields: From data extraction, integration and analysis opportunities emerge to support individuals' self-determination and security, and to supervise and control them. For vocational education, the question arises how the next generation of electricians, care workers or home economists can be educated to engage actively in upholding civil liberties for themselves and others (Wittmann & Weyland 2020).

In vocational teacher education (VTE) the question emerges how, in this regard, teachers' knowledge can be enhanced. Empirical research into this question is scarce and mostly lacks theoretical underpinning. Applying a theoretical framework by Wittmann and Weyland (2020), we focus on interrelations between concepts such as data, its extraction, integration, analysis and protection, personalization of goods and services, and values like autonomy, security and trust. We contend that conceptual knowledge about interrelations between these concepts is relevant to meet the curriculum-related challenges.

Because of the abstract nature of data-related concepts and their relevance for guiding action, we follow an action-oriented approach to learning (Wittmann & Weyland 2020; Williams et al 2011). Drawing on expert interviews with business and school actors, we constructed a smart-home for the purpose of VTE in diverse fields such as technology, home economics, and health care. This environment allows for the visualization of data flows and analysis, data integration at varying levels, and the accommodation of

client needs from nutrition to fall safety. Based on vocational curriculum analysis, we designed a role-play involving an electricians', care workers' and home economists' varying professional perspective on the implementation of smart-home technology in an elderly persons' home. We videotaped the role-play and integrated it into a two-hour training, consisting of a theoretical introduction, guided observation and an evaluation phase.

Our research question is whether this training leads to an improvement in emerging teachers' conceptual knowledge about digital transformation. Applying a pre-posttest design with a sample of 70 VTE students, we use concept-mapping to evaluate changes in the conceptual knowledge about digital transformation. Regression analysis will be applied for data evaluation.

Questions for the audience include additional instruments we might apply in future research, further improvement of the application of concept-mapping and consequences of the findings.

References:

Williams, A., Ford, P., Eccles, D. & Ward, P. (2011). Perceptual-cognitive expertise in sport and its acquisition. *ACP,* 25, 432-442. doi: 10.1002/acp.1710

Wittmann, E., Weyland, U. (2020). Vocational education in the context of digital transformation. *ZBW,* 116(2), 269-291. doi: 10.25162/zbw-2020-0012

How can inclusive teaching succeed in a digital world? Results from the RegioDiff project

Susanne Seifert, University of Graz, Austria; Daniela Ender, University of Graz, Austria; Jessica Berger, University of Graz, Austria; Katharina Prinz, University of Graz, Austria; Valerie Fredericks, University of Graz, Austria; Lena Lanzenbacher, University of Graz, Austria; Lisa Paleczek, University of Graz, Austria

Keywords: Differentiated instruction, Digital learning, Mixed-method research, Primary education

The paper presents two basic strands of the project "RegioDiff" (Getting to know the regions of Styria: Differentiated factual teaching materials for inclusive teaching in the fourth grade): 1) The Graz reading comprehension test GraLeV (Paleczek et al., in prep.) was developed and standardized as a digital and print group test. It measures reading comprehension at word, sentence and text level in Grades 3 and 4. Using digital tests facilitates preparation, administration, evaluation and documentation for teachers (Neumann et al., 2019). Based on their reading scores, students were assigned to texts in one of four differentiation levels, allowing for working with materials according to their reading abilities. 2) Differentiated materials were developed and piloted to use in print or via a digital learning platform. The materials deal with regional specifics in the federal state Styria (Austria) and contain elements from evidence-based reading research (texts with associated reading comprehension tasks, reading strategy tasks, cooperative learning elements, vocabulary work as glossary words; e.g., Hattie & Zierer, 2019; Philipp & Schilcher, 2012). Through differentiation, the students may work on the same topic while considering their reading abilities (Suchán & Breitfuß-Muhr, 2009).

In the school year 2020/21, the RegioDiff-materials were used by teachers in 16 classrooms (n = 273 students), half of which worked with the print materials, while the other half worked with the tablet in the digital learning environment. Each classroom conducted at least 10 lessons (10 topics) with the materials. Two predefined topics were obligatory and we observed these lessons in each classroom. For these topics, we assessed students' level of knowledge on the respective topic before and after working on the text. Additionally, the teachers were interviewed after about half of the texts and at the end of the project. The students were interviewed at different times to investigate their opinion on the

different elements of the material. The paper presents the first results of this implementation study and discusses the advantages and disadvantages of digital and print materials and what needs to be considered in the future when designing differentiated reading materials in digital learning environments as well as in print.

References:

Hattie, J. & Zierer, K. (2019). Visible Learning Insights. Routledge. https://doi.org/10.4324/9781351002226

Neumann, M. M., Anthony, J. L., Erazo, N. A. & Neumann, D. L. (2019). Assessment and Technology: Mapping Future Directions in the Early Childhood Classroom. *Frontiers in Education*, 4, Artikel 116. https://doi.org/10.3389/feduc.2019.00116

Paleczek, L., Seifert, S., Franz, A., Riedl, S. & Wohlhart, D. (in Vorb.). *Der Grazer Leseverständnistest,* GraLeV.

Philipp, M. & Schilcher, A. (2012). *Selbstreguliertes Lesen. Ein Überblick über wirksame Leseförderansätze*. Klett/Kallmeyer.

Suchán, B. & Breitfuß-Muhr, G. (2009). Differenzierende Maßnahmen und Förderung im Leseunterricht. In B. Suchán, C. Wallner-Paschon & C. Schreiner (Hrsg.), *PIRLS 2006: Die Lesekompetenz am Ende der Volksschule – Österreichischer Expertenbericht* (pp. 177–192). Leykam.

Paper Session Single Paper paper_type_1 session 26	Time: 9.00 am – 10.30 am	Location: Lecture Hall (Vortragssaal)
Assigned Chair: Katja Franzen, Paderborn University, Germany		

Evaluation of a video-based learning module to promote a professional vision of classroom management

Jennifer Janeczko, WWU Münster, Germany; Robin Junker, Institute for psychology in education, Muenster, Germany; Manfred Holodynski, University of Münster, Germany

Keywords: Digital learning, Professional vision, Teacher professional development, Video analysis

Classroom management is a key feature of teaching quality (Klieme & Rakoczy, 2008). For promoting appropriate classroom management skills in teacher education, video-based face-to-face courses for training the professional vision of classroom management (PV-CM) have already proven to be successful (Steffensky & Kleinknecht, 2016).

However, there is a lack of digital learning opportunities that offer individually adaptable learning paths (Bremer, 2009) to deal with short presence times of student teachers in practical phases and to take different performance levels into account (Landenfeld et al., 2019). Therefore, a digital video-based learning module was developed. Its effectiveness for promoting the PV-CM as well as self-efficacy in classroom management (SE-CM) (Gold et al., 2017) was examined in comparison to a video-based face-to-face seminar.

The quasi-experimental study was conducted with 59 student teachers, who practiced the analysis of classroom management events either in a face-to-face seminar or by using the digital learning module. To measure changes in professional vision and self-efficacy beliefs, participants completed a video-based classroom management test (Gold & Holodynski, 2017) and answered items on SE-CM (Pfitzner-Eden, 2016).

Over time, PV-CM improved in both groups, $F(1.71, 99.24) = 48.88$, $p < .001$, $\eta_p^2 = .46$, so the effectiveness of the digital video-based learning module was confirmed and replicated for the video-based seminar (Gold et al., 2013). In addition, an interaction effect of measurement time and group membership existed for the PV-CM, $F(1.84, 104.77) = 7.87$, $p < .001$, $\eta_p^2 = .12$, in favor of the digital learning module. An increase in SE-CM was also generally demonstrated, $F(2, 116) = 19.94$, $p < .001$, $\eta_p^2 = .26$ (Gold et al., 2017), but no interaction effect was found, $F(2, 114) = 0.33$, $p = .717$, $\eta_p^2 = .01$.

Implications of the study are discussed in the context of digitization in teacher education.

Refereces:

Bremer, C. (2009). Szenarien und Mehrwerte des Einsatzes neuer Medien in der Lehre. https://www.researchgate.net/profile/Claudia-Bremer/publication/242536262_Szenarien_und_Mehrwerte_des_Einsatzes_neuer_Medien_in_der_Lehre/links/55feb4c008aeba1d9f7cc517/Szenarien-und-Mehrwerte-des-Einsatzes-neuer-Medien-in-der-Lehre.pdf.

Gold, B., Förster, S., & Holodynski, M. (2013). Evaluation eines videobasierten Trainingsseminars zur Förderung der professionellen Wahrnehmung von Klassenführung im Grundschulunterricht. *Zeitschrift für pädagogische Psychologie,* 27(3), 141–155. https://doi.org/10.1024/1010-0652/a000100

Gold, B., Hellermann, C., & Holodynski, M. (2017). Effekte videobasierter Trainings zur Förderung der Selbstwirksamkeitsüberzeugungen über Klassenführung im Grundschulunterricht. *Zeitschrift für Erziehungswissenschaft,* 20(1), 115-136. https://doi.org/10.1007/s11618-017-0727-5

Gold, B., & Holodynski, M. (2017). Using digital video to measure the professional vision of elementary classroom management: Test validation and methodological challenges. *Computers & Education*, 107, 13-30. https://doi.org/10.1016/j.compedu.2016.12.012

Klieme, E., & Rakoczy, K. (2008). Empirische Unterrichtsforschung und Fachdidaktik.Outcome-orientierte Messung und Prozessqualität des Unterrichts. *Zeitschrift für Pädagogik,* 54(2), 222-237.

Landenfeld, K., Priebe, J., & Eckhoff, M. (2019). I-Learning - Individualisiertes Lernen im Übergang von der Schule in die Hochschule. *Zeitschrift für Hochschulentwicklung,* 14(3), 257-271. https://doi.org/10.3217/zfhe-14-03/15

Pfitzner-Eden, F. (2016). *STSE*. *Scale for Teacher Self-Efficacy - deutsche adaptierte Fassung* [Fragebogen]. In Leibniz-Zentrum für Psychologische Information und Dokumentation (ZPID) (Hrsg.), Elektronisches Testarchiv. Trier: ZPID. https://doi.org/10.23668/psycharchives.451

Steffensky, M., & Kleinknecht, M. (2016). Wirkungen videobasierter Lernumgebungen auf die professionelle Kompetenz und das Handeln (angehender) Lehrpersonen. Ein Überblick zu Ergebnissen aus aktuellen (quasi-) experimentellen Studien. *Unterrichtswissenschaft,* 44(4), 305-321.

Effects of (standardized) feedback on student teachers' professional vision and feedback perceptions

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Keywords: Competence development, Computer-supported collaborative learning, Pre-service teacher education, Professional vision

Professional competence of teachers encompasses dispositions (i.e., knowledge, beliefs and motivational components), situation-specific skills (e.g., professional vision), and actual performance (Blömeke et al., 2015) and need to be developed in teacher education.

Teaching practicums can foster professional competence effectively by incorporating possibilities for reflection and feedback (e.g. Grossman et al., 2009). However, reflection and feedback sessions are not a standard element of teaching practicums due to time- and location-constraints (Lee & Wu, 2006). Digital practicum environments can lift these constraints and have typically applied either textual accounts (e.g., Bonk et al., 1998) or video sequences of classroom practice (e.g., Kleinknecht & Gröschner, 2016).

The studies conducted in this research project were focused on how the use of text- or video-based digital reflection and feedback environments during a practicum influenced specific components of pre-service teachers' professional competence (i.e., beliefs about teaching and learning, self-efficacy, professional vision of classroom management, feedback competence).

All studies followed a quasi-experimental, pre--post-controlgroup design. Pre-service teachers at the fourth-semester bachelor level in a German university took part in the studies and participated in a four-week teaching practicum.

The control group (CG) took part in a traditional practicum with live observations and face-to-face reflection and feedback with peers and experts. Pre-service teachers of the intervention groups reflected and received feedback in highly structured text- (IG1, IG2) or video-based (IG3, IG4) digital environments. Furthermore, IG1 and IG3 participants only received feedback from peers, IG2 and IG4 pre-service teachers also received expert feedback.

Mixed methods were applied by generating quantitative and quantitative-qualitative data with questionnaires, a standardized video-based test and content analysis.

The studies demonstrated that video-based digital reflection and feedback environments can effectively enhance pre-service teachers' professional competence more than face-to-face feedback and reflection and text-based digital environments.

Furthermore, expert feedback enabled pre-service teachers to perceive crucial teaching situations that would have otherwise gone unnoticed. Expert feedback can be seen as a lens reducing classroom complexity and additionally a model for high-quality feedback.

Consequently, video-based digital reflection and feedback environments with expert feedback can significantly improve pre-service teachers' professional competence during teaching practicums and, thus, better prepare pre-service teachers for future classroom challenges.

References

Blömeke, S., Gustafsson, J.-E., & Shavelson, R.J. (2015). Beyond dichotomies: Competence viewed as a continuum. *Zeitschrift für Psychologie,* 223(1), 3–13.

Bonk, C.J., Malikowski, S., Angeli, C., & East, J. (1998). Web-based conferencing for preservice teacher education: Electronic discourse from the field. *Journal of Educational Computing Research*, 19(3), 269–306.

Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: Theory and Practice*, 15(2), 273–289.

Kleinknecht, M., & Gröschner, A. (2016). Fostering preservice teachers' noticing with structured video feedback: Results of an online- and video-based intervention study. *Teaching and Teacher Education,* 59, 45-56.

Lee, G.C., & Wu, C.-C. (2006). Enhancing the teaching experience of pre-service teachers through the use of videos in web-based computer-mediated communication (CMC). *Innovations in Education and Teaching International*, 43(4), 369-380.

An expert model to support teacher students' video analyses of classroom situations

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Keywords: Instructional design, Pre-service teacher education, Professional vision, Video analysis

Noticing relevant classroom situations and their knowledge-based interpretation, or commonly called professional vision (van Es & Sherin, 2002), is necessary for effective classroom management (Blömeke

et al., 2015). Professional vision is fostered through the guided analysis of classroom videos (Stürmer et al., 2013). Because teacher students lack sufficient prior knowledge to analyze classroom situations, novices benefit from instructional support in their video analysis (Seidel et al., 2013). An expert model (Collins, 1991) as a worked example (Renkl, 1997) equipped with self-explanation prompts and instructional explanations can disclose expert cognitive processes (Berliner, 2001) that support teacher students in deriving principles: a) to interpret classroom situations, b) to focus on students' actions and cognitions, and c) to deploy their professional knowledge for the selection and interpretation of classroom situations.

In an eight-week course 292 teacher students (M_{age}=23.70, *SD*=2.85; 85.53% female) conducted video analyses on classroom management: 214 teacher students were given an expert model, while the control group (*n*=78) did not receive one. In a pre- and post-test teacher students' professional knowledge (Kurz & Lenske, in preparation; Cronbach's α=.47) and professional vision (Gold & Holodynski, 2017; Cronbach's α=.86) were surveyed. For data analyses using repeated-measures ANOVA, 78 case-control matched pairs were selected.

Results showed that both groups increased their professional vision (F(1,154) =96.38, p<.001, η_p^2=.39) and professional knowledge (F(1,154)=15.25, p<.001, η_p^2=.09). In their development of professional knowledge (F(1,153)=5.23, p=.024, η_p^2=.03), the control group – in contrast to our assumptions – showed higher increases (M_{t1}=.727, *SD*=.078; M_{t2}=.759 *SD*=.063) than the experimental group (M_{t1}=.754, *SD*=.070, M_{t2}=.763, *SD*=.060). The groups did not differ in their development of professional vision (F(1,153)=1.05, p=.307, η_p^2=.01).

The presentation of an expert model of video analysis did not enhance the acquisition of professional vision and even seems to be hindering for the acquisition of professional knowledge. Possible interpretations and implications for further studies are discussed.

References:

Berliner, D. C. (2001). Learning about and learning from expert teachers. *International Journal of Educational Research*, 35(5), 463–482.

Blömeke, S., Gustafsson, J.-E. & Shavelson, R. J. (2015). Beyond dichotomies. *Zeitschrift für Psychologie*, 223(1), 3–13.

Collins, A. (1991). Cognitive Apprenticeship and Instructional Technology. In L. Idol & B. F. Jones (Eds.), *Educational Values and Cognitive Instruction: Implications for Reform* (pp.121-138). Routledge.

Gold, B. & Holodynski, M. (2017). Using digital video to measure the professional vision of elementary classroom management: Test validation and methodological challenges. *Computers & Education,* 107, 13–30.

Kurz, E. & Lenske, G. (in preparation). Skala zur Erfassung des Wissens um Klasseführung.

Renkl, A. (1997). Learning from Worked-Out Examples: A Study on Individual Differences. *Cognitive science,* 21(1), 1–29.

Seidel, T., Blomberg, G. & Renkl, A. (2013). Instructional strategies for using video in teacher education. *Teaching and Teacher Education*, 34, 56–65

Stürmer, K., Seidel, T. & Schäfer, S. (2013). Changes in professional vision in the context of practice. *Gruppendynamik und Organisationsberatung,* 44(3), 339–355.

van Es, E. A. & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, 10(4), 571–596.

Paper Session Single Paper paper_type_1 session 23	Time: 9.00 am – 10.30 am	Location: Big Club Room (Großer Clubraum)
Assigned Chair: Kim van Broekhoven, Radboud University, Netherlands		

Perceptions and practices of Flemish teacher educators to deal with diversity

Benjamin Ponet, University of Ghent, Belgium; Hanne Tack, Ghent University, Belgium; Ruben Vanderlinde, Ghent University, Belgium; Wendelien Vantieghem, Ghent University, Belgium

Keywords: Diversity, Qualitative methods, Teacher educator, Teacher educator professional development

Many (inter)national policy agendas state the ambition to ensure equity and justice in education for all, regardless of someone's personal traits (European Commission, 2017; UNESCO, 2017). As such, all educational professionals are challenged to deal with the diversity in society to help realize this ambition (Gay, 2018; Vantieghem et al., 2020). Teacher educators in particular have an important responsibility in this. They are tasked to prepare and train (future) teachers who, in turn, will educate future generations (Cochran-Smith et al., 2016; European Commission, 2013). Nevertheless, research on higher education-based teacher educators in general is still limited (Vanderlinde et al., 2021), and there is specific scarcity with regard to research on how teacher educators deal with diversity (Ponet et al., 2021). This paper tries to fill in this gap by exploring how Flemish teacher educators perceive and engage in practices to deal with diversity. For this, semi-structured interviews were organised with teacher educators (n=13). The participants worked in three different institutions (two teacher colleges and one university), in three different roles (domain-specific, pedagogical/didactical and practicum-oriented), and in different teacher education programmes (kindergarten, primary and lower/upper secondary education). The interviews were intended to identify perceptions on diversity and dealing with diversity, as well as practices teacher educators engage in with regard to dealing with diversity. Moreover, the intention was to validate if the clusters of teacher educator practices we found in a prior literature review study were also present in the Flemish context (xxx[1]). These clusters were: (1) creating inclusive learning environments, (2) challenging student teachers' frames of reference, (3) explicit modelling for diversity, (4) challenging one's own frames of reference, and (5) raising societal diversity sensitivity. A thematic analysis (Patton, 1990) was conducted to find commonalities and differences in perceptions and practices. The results show that Flemish teacher educators, at first glance, hold mostly similar perceptions with regard to diversity and dealing with diversity. For example, diversity was mostly perceived as all differences between humans imaginable, and all teacher educators considered it their job to model ways to deal with diversity in their interactions with student teachers. However, when teacher educators talked about their practices, this was not always consistent with their expressed perceptions. As such, more variation was dissolved in their deeper perceptions. Furthermore, in general, all clusters of practices found in the prior literature review were also apparent in the interviews, validating our earlier findings. Meanwhile, the variety found in concrete practices teacher educators engage in to deal with diversity could be ascribed to more factors than just their perceptions of diversity. Examples of these factors are classroom sizes, diversity policy of the institution, programme curriculum and field experience. Therefore, this study mainly brings a theoretical contribution to the field of teacher educator research by presenting factors that influence the practices teacher educators engage in. Additionally, also an empirical contribution is made by validating earlier literature review findings, giving teacher educators and policy makers possible guidance for professional development initiatives.

[1] This reference would not allow anonymous reviewing.

References

Cochran-Smith, M., Ell, F., Grudnoff, L., Haigh, M., Hill, M., & Ludlow, L. (2016). Initial teacher education: What does it take to put equity at the center? *Teaching and Teacher Education*, 57, 67-78.

European Commission. (2013). *Supporting teacher educators for better learning outcomes.* https://ec.europa.eu/assets/eac/education/policy/school/doc/support-teacher-educators_en.pdf

European Commission. (2017*). Preparing teachers for diversity: The role of initial teacher education.* Public Policy and Management Institute. https://op.europa.eu/en/publication-detail/-/publication/b347bf7d-1db1-11e7-aeb3-01aa75ed71a1.

Gay, G. (2018). *Culturally Responsive Teaching: Theory, Research, and Practice* (3rd ed.). Teachers College Press.

Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods*. (2nd ed.). Sage.

Ponet, B., Tack, H., Vantieghem, W., Van Avermaet, P., & Vanderlinde, R. (2021). Hoe lerarenopleiders omgaan met diversiteit: Naar een conceptueel raamwerk. *Tijdschrift voor Lerarenopleiders,* 42(4), 45-60.

UNESCO. (2017). *A guide for ensuring inclusion and equity in education.* UNESCO.

Vanderlinde, R., Smith, K., Murray, J., & Lunenberg, M. (2021). Teacher educators' professional development: Looking to the future. In R. Vanderlinde, K. Smith, J. Murray & M. Lunenberg (Eds.), *Teacher Educators and their Professional Development: Learning from the past, looking for the future* (pp. 158-171). Routledge.

Vantieghem, W., Roose, I., Gheyssens, E., Griful-Freixenet, J., Keppens, K., Vanderlinde, R., Struyven, K., & Van Avermaet, P. (2020). Professional vision of inclusive classrooms: A validation of teachers' reasoning on differentiated instruction and teacher-student interactions. *Studies in Educational Evaluation*, 67, 100912.

The potential of the podcast as a resource for learning and developing oral skills

Agnete Bueie, University College of Southeast Norway, Norway; Toril Aagaard, University of Southeast Norway, Norway

Keywords: Case studies, Competence development, Literacy, Qualitative methods

The number of podcast listeners and the variety of podcasts produced is increasing (Discover Pods, n.d.). Consequently, podcasting is a trend, and the genre might hold potentials when it comes to training orality in school. However, will what motivates young people to listen to- and create podcasts out of school, be transferred into the educational contexts? Or does a schoolish podcast-genre emerge which impact the interest in it? We explore these questions in this project, which we recently started.

Even if Norwegian pupils (1 – 13) due to the curriculum, are supposed to develop oral skills in all subjects, professionalizing orality has been paid restricted attention (Svenkerud, Klette, & Hertzberg, 2012). A brief look at international research (from higher education), indicates that working with podcasts for

instance can strengthen professional identity, engage in critical reflection and connect society and education (e.g., Ferrer et al., 2020). Such potentials will of course depend on the purpose and context of the production, age, etc. However, across age and educational levels, it can be used as a source of knowledge, and let students learn to express themselves orally through production. Potentially they can also reach out to an audience outside the classroom.

In the presentation, we will look at a selection of young people's podcast habits and what potentials they themselves see in listening to and in particular producing podcasts at school. We will present findings from a survey that maps students' podcast habits, and preliminary analyzes of interviews with students who have produced podcasts at school. Because podcasts originally are produced and listnened to outside school, we draw on studies of formal and informal arenas for learning (such as Erstad, 2020), and studies that deal with the podcast as medium and genre (such as Drew, 2017).

References:

Drew, C. (2017). Educational podcasts: A genre analysis. *E-Learning and Digital Media,* 14(4), 201–211. https://doi.org/10.1177/2042753017736177

Discover Pods (n.d.) https://discoverpods.com/podcast-statistics/

Erstad, O. (2020). Grenseflater i unges læringsliv.I Elf, N., Høegh, T., Kabel, K., Krogh, E. Piekut, A. & Rørbech, H. (red.), Grænsegængere og grænsedragninger i nordiske modersmålsfag. Syddansk Universitetsforlag og Nordisk Netværk for Modersmålsdidaktisk Forskning

Ferrer, I., Lorenzetti, L., & Shaw, J. (2020). Podcasting for social justice: Exploring the potential of experiential and transformative teaching and learning through social work podcasts. *Social Work Education*, 39(7), 849-865.

Svenkerud, S., Klette, K., & Hertzberg, F. (2012). Opplæring i muntlige ferdigheter. *Nordic studies in Education,* 32(1), 35-49.

Teachers' guidance in students' creative idea selection process

Kim van Broekhoven, Radboud University, Netherlands; Martina van Uum, Radboud University, Department of Teacher education, Netherlands; Paulien Meijer, Radboud University, Department of Teacher education, Netherlands; Evelyn Kroesbergen, Radboud University Nijmegen, Behavioural Science Institute, Netherlands; Jojanneke Huck, Radboud University Medical Center, Netherlands

Keywords: Higher education, Problem-based learning, Qualitative methods, Teaching approaches

While teachers' practices to foster divergent collaborative creativity among students is widely investigated (Sawyer, 2004, 2011, 2017), little is known on how teachers perceive the process of students revising and narrowing down ideas that may be implemented, and how teachers can facilitate this process. The aim of the present study is to explore how teachers think about and foster convergent collaborative creativity among students in higher education. In this qualitative study, semi-structured interviews were conducted with a purposive sample of seventeen teachers who all taught in the so-called 'innovation project' at Radboud University in the Netherlands. In this project, teachers supervise first-year students of medicine and biomedical sciences who - in groups of 4-6 students - identify and define a health(care) problem, and develop an innovative solution to it. Preliminary results show that the process of convergent collaborative creativity is perceived as an iterative and dynamic process including numerous back and forth movements between students and external stakeholders in revising and refining their ideas. Secondly, teachers' facilitation of this process seems to be an intuitive process

where teachers are exposed to novel situations and decide just-in-time how to facilitate students. Together, the preliminary results imply that while most theoretical models impose a certain linearity to the process of convergent collaborative creativity, in reality, teachers characterize this process as an iterative and dynamic process. Further, in line with disciplined improvisation, teachers know how to apply their expertise in improvisational practice (Sawyer, 2011). In the proposed paper, we will illustrate how teachers characterize the process of convergent collaborative creativity, and how teachers apply their expertise in the facilitation of this process. For doing this, we will present examples of teachers' practices in the facilitation of convergent collaborative creativity among students. Furthermore, suggestions will be provided on how the results apply for teachers who would like to professionalize their teaching for creativity (e.g., in teacher education or teacher professionalization programs).

References:

Sawyer, R. K. (2004). Creative teaching: Collaborative discussion as disciplined improvisation. *Educational researcher,* 33(2), 12-20.

Sawyer, R. K. (Ed.). (2011). *Structure and improvisation in creative teaching.* Cambridge University Press.

Sawyer, R. K. (2017). Teaching creativity in art and design studio classes: A systematic literature review. *Educational research review,* 22, 99-113.

Paper Session Single Paper paper_type_1 session 4	**Time:** 9.00 am – 10.30 am	**Location:** Seminar Room II (Seminarraum II)
Assigned Chair: Kerstin Göbel, University of Duisburg-Essen, Germany		

Effects of multiple source coherence and of source type on source integration

Theresa Wilkes, Saarland University, Germany; Martin Greisel, University of Augsburg, Germany; Christina Wekerle, University of Augsburg, Germany; Ingo Kollar, University of Augsburg, Germany; Robin Stark, Saarland University, Germany

Keywords: Pre-service teacher education, Reflection, Teacher professional development, Video analysis

Teachers can draw on different types of sources to address pedagogical issues, such as ineffective groupwork. Sources can be context-based (e.g., background information about students), experience-based (e.g., anecdotal experiences about the effects of interventions), or evidence-based (e.g., empirical results about the effects of interventions). Given the demand for evidence-informed practice, teachers should be able to integrate information from multiple sources to make professional decisions (Hartmann et al., 2021).

Integrating information from multiple sources poses various challenges, especially if information from different sources is incoherent with each other, i.e., if contradictory conclusions can be drawn from them. However, it is unclear to what extent (1) the (in)coherence of information from multiple sources and (2) the source type (i.e., context-based, experience-based, evidence-based) has an influence on (a) the level of engagement with a source, and (b) the level to which its information is integrated to address a pedagogical issue.

N=120 student teachers were asked to reflect on a classroom video showing problematic group work. Therefore, information about the heterogeneity of the class (=context-based source), a link to an internet forum in which teachers exchange ideas about collaborative learning in heterogeneous classes (=experiential-based source), and a handbook excerpt on collaborative learning in heterogeneous classes (=evidence-based source) were provided. In an experimental between-subjects design, the coherence of information from the evidence-based and the experience-based source was systematically varied so that either similar (=coherent) or contradictory (=incoherent) conclusions could be derived to handle the problem. After reflecting on the problem in written form, students were asked to indicate for each source to what extent (a) they had engaged with it, and (b) they had used its information when reflecting on the problem (=integration).

A mixed ANOVA showed that source coherence did not affect (1a) the level of engagement with the sources or (1b) the level to which the information was used. However, the results differed with source type: participants indicated that they had (2a) engaged more with the context-based and the experience-based than with the evidence-based source (p<.05), and that they had (2b) used the context-based and the experience-based information more intensively than the evidence-based information (p<.05). There was no significant interaction between coherence of information and source type.

The findings are in line with recent findings from literature showing that pre-service teachers prefer experience-based sources in pedagogical issues (Kiemer & Kollar, 2021). The results indicate the need for interventions promoting student teachers to weigh the potentials of different types of sources, and to apply coherent and incoherent information profitably. To complement the subjective data, objective

data on the quality of source integration are currently being evaluated to be discussed at the conference against the background of evidence-informed practice.

References:

Hartmann, U., Kindlinger, M., & Trempler, K. (2021). Integrating information from multiple texts relates to pre-service teachers' epistemic products for reflective teaching practice. *Teaching and Teacher Education,* 97, 103205.

Kiemer, K., & Kollar, I. (2021). Source selection and source use as a basis for evidence-informed teaching. *Zeitschrift für Pädagogische Psychologie*, 35(2-3), 127-141.

Learning with video lessons: The role of emotion and reflection for changes in self-efficacy

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Keywords: Motivation and emotion, Reflection, Self-efficacy, Video analysis

Theoretical background and research question

Analyzing videos from other teachers is widely used for integrating practice into teacher education (Gaudin & Challies, 2015). Empirical studies show that the use of video lessons promotes self-efficacy (e.g. Gold, Hellermann & Holodynski, 2017). Other studies point to the effectiveness of emotional and cognitive processes in this context (Kleinknecht & Poschinski, 2014). However, the question of the mechanisms that lead to an increase in self-efficacy remains open. The aim of the present study was to investigate student teachers' changes in self-efficacy during a video-based intervention. It was hypothesized that emotions (H1) and depth of reflection (H2) will predict changes in self-efficacy.

Methods

In a pre-post-experimental-design, a 90-minute intervention on heterogeneity was administered to student teachers who were randomly assigned to three groups. After a theory section, students analyzed two instructional videos or, in the control group (CG), two equivalent written case studies. In the experimental groups (EG), students were asked to observe the videos using either open-ended (EG1; e.g., "What did you notice positively in the video sequence?") or closed-ended observation tasks (EG2; e.g., "How do you think students feel about task instruction?"). A total of 158 (non-systematic-dropout n = 62) students participated in the study (83% female). The following scales were used: Self-efficacy for instructional differentiation and promotion (Meschede & Hardy, 2020; $\alpha_{pretest}$=.81); positive and negative affect schedule (Breyer & Bluemke, 2016; positive affect: $\alpha_{pretest}$=.86; negative affect: $\alpha_{pretest}$=.82), reflection (three subscales; Reinders, 2016): description of thoughts and feelings ($\alpha_{pretest}$=.76), theoretical contextualization ($\alpha_{pretest}$=.66), and theoretical evaluation ($\alpha_{pretest}$=.86).

Results

Repeated measures ANOVA show a significant increase in self-efficacy in EG2; $F(1,17) = 7.84$, $p = .012$. However, EG1 ($F(1,32) = 1.36$, $p = .253$) and CG ($F(1,20) = .03$, $p = .871$) show no significant changes in self-efficacy. Further regression analyses will be conducted to test the hypotheses. The results are discussed in light of existing research regarding video lessons in initial teacher education and sources of self-efficacy

References:

Breyer, B. & Bluemke, M. (2016). Deutsche Version der Positive and Negative Affect Schedule PANAS (GESIS Panel).

Gaudin, C., & Chaliès, S. (2015). Video viewing in teacher education and professional development: A literature review. Educational *Research Review,* 16, 41-67.

Gold, B., Hellermann, C., & Holodynski, M. (2017). Effekte videobasierter Trainings zur Förderung der Selbstwirksamkeitsüberzeugung über Klassenführung im Grundschulunterricht. *ZfE,* 20(1), 115-136.

Kleinknecht, M., & Poschinski, N. (2014). Eigene und fremde Videos in der Lehrerfortbildung. Eine Fallanalyse zu kognitiven und emotionalen Prozessen beim Beobachten zweier unterschiedlicher Videotypen. *Zeitschrift für Pädagogik*, 60(3), 471-490.

Meschede, N. & Hardy, I. (2020). Selbstwirksamkeitserwartungen von Lehramtsstudierenden zum adaptiven Unterrichten in heterogenen Lerngruppen. Zeitschrift für Erziehungswissenschaft, 23(3), 565–589.

Reinders, H. (2016). Service Learning - Theoretische Überlegungen und empirische Studien zu Lernen durch Engagement. Weinheim, Basel: Beltz; Juventa.

Cooperative Video-Supported Reflection Settings and Reflection-Related Attitudes

Kerstin Göbel, University of Duisburg-Essen, Germany; Julia Bönte, University of Duisburg-Essen, Germany; Katharina Neuber, University of Duisburg-Essen, Germany

Keywords: Pre-service teacher education, Quasi-experimental research, Reflection, Video analysis

Reflection on teaching is a basic competence of teachers to improve the quality of their teaching and is meant to be a systematic, in-depth examination with reference to theoretical knowledge (Beisiegel et al., 2018). As reflection during teacher training differs in quality and depths of reflection, structures to improve both, reflection quality and outcomes should be envisaged. Thereby, video-supported classroom reflection can play a significant role. Classroom videos represent realistic representations of practice and video-supported reflection formats and do offer benefits to train teachers' professional skills (e.g., McCoy & Lynam, 2021). Video-supported classroom reflection in practical phases of teacher education strengthens the connection between practical and theoretical knowledge (Blomberg et al., 2013). Both, own teaching videos and teaching videos of peers or others do offer an opportunity to reflect on teaching processes independent from the pressure to act, while offering different perspectives.

The paper presents results from the project *FLECTT* (cooperative teaching video reflection in Re*FLECT*ing *T*eams) focusing on video-supported reflection during practical phases in teacher education programs in Germany to improve video-based reflection and reflection-related attitudes. We investigated the effects of collegial reflection in a special reflection setting – so-called *Reflecting Teams,* which structures the reflection process by reflection supporting questions and stimuli and by a specific phasing of the reflection process. Own teaching videos and teaching videos of peers have been reflected in the context of a quasi-experimental pre-post-control-group design. The sample (n = 83 student teachers) was divided into the control group (n=26), IG_1 (n = 36), in which participants reflected

on a peer video, and IG_2 (n = 21), in which participants reflected on their own teaching video. The following research questions were in focus of the study:

- Q1: Do the reflective attitudes of pre-service teachers who receive collegial video-supported reflection on teaching change more compared to a control group without video-supported reflection?
- Q2: Does the level of pre-service teachers' attitudinal change towards reflection in general and video-supported reflection depend on the video type?

Results indicate a positive change in attitudes towards feedback and video-supported reflection and reveal that the type of video in the reflection process seems decisive for an improvement of teacher students' reflection related attitudes. The rather small sample size must be mentioned as a limitation. The study provides valuable indications for video-supported cooperative reflection in teacher training.

References:

Beisiegel, M. Mitchell, R., & Hill, H. C. (2018). The design of video-based professional development: An exploratory experiment intended to identify effective features. *Journal of Teacher Education*, 69(1), 69–89. http://dx.doi.org/10.1177/0022487117705096

Blomberg, G., Renkl, A., Gamoran Sherin, M., Borko, H., & Seidel, T. (2013). Five research-based heuristics for using video in pre-service teacher education. *Journal für Bildungsforschung,* 5, 90–114.

McCoy, S., & Lynam, A. M. (2021). Video-based self-reflection among pre-service teachers in Ireland: A qualitative study. *Education and Information Technologies,* 26(2), 921–944. https://link.springer.com/article/10.1007/s10639-020-10299-w

Poster Session

Poster Session Poster Presentation paper_type_2 session 3	**Time:** 10.45 am – 12.15 pm	**Location:** Auditorium (Veranstaltungssaal)
Assigned Chair: Ariadne Warmoes, Vrije Universiteit Brussel (VUB), Belgium		

Implementation of a digital competency framework in special education teacher training in Germany

Hannah Wirths, Institute of Special Education, Leipzig University, Germany; Christian W. Glück, Institute of Special Education, University of Leipzig, Germany

Keywords: Competences, Digital transformation, Higher education, Special education

The relevance of digital media and information and communication technologies (ICT) for special needs education became more apparent not least due to the Corona pandemic. Competent use of these technologies is often expected of young teachers in particular, as they have grown up with digital media as so-called digital natives. However, they have hardly any experience with the didactic use of digital technologies from their own school years, which is why the digital competencies of future teachers need to be trained and both the opportunities and limitations for special education work addressed (BMBF, 2018). "Digital Competence is the set of knowledge, skills, attitudes (thus including abilities, strategies, values and awareness) that are required when using ICT and digital media […]" (Ferrari, 2012, S. 3-4) in a wide variety of application areas and to solve a broad range of tasks. While teachers' digital competencies have been described many times, there is not yet a comprehensive theoretical model for special education teachers available. Existing models of digital competencies (e.g., TPACK, DigCompEdu) are also relevant for special education, but neglect the specific tasks of special education as it is structured in Germany. For the curricular embedding of the acquisition of competencies in higher education, a competency framework was developed within the Digi-LA-SOP[1] project. The framework describes the required digital competencies of special needs teachers and, in particular, speech, language and communication needs teachers. It provided the foundation for the development of a *digital curriculum* adjusted to more digital professional environment, which was elaborated to enable students of the special education teacher training at Leipzig University to acquire digital competencies as part of their university education. This includes both digital basic skills and technologies as well as specialised tools and application scenarios for special needs assessment. The *digital curriculum* is currently being tested exemplarily on the speech-language-communication assessment course and evaluated by means of a pretest-posttest self-assessment and knowledge testing in a control group design (piloting: winter semester 2021/2022). Furthermore, the pilot study will be evaluated after the completion of the treatment in focus groups with five to ten study participants. First results will be available in spring 2022 and will be used to revise both the treatment and the instrument. The implementation of the main study is planned for the subsequent winter semester.

[1] This project is part of the “Qualitätsoffensive Lehrerbildung”, a joint initiative of the Federal Government and the *Länder* which aims to improve the quality of teacher training. The project is funded by the Federal Ministry of Education and Research (FKZ: 01JA2017A).

References:

Bundesministerium für Bildung und Forschung (Hrsg.). (2018). *Eine Zwischenbilanz der „Qualitätsoffensive Lehrerbildung“.* Retrieved: 04.01.2021. Download from: https://www.qualitaetsoffensive-

lehrerbildung.de/files/BMBFZwischenbilanz_Qualitaetsoffensive_Lehrerbildung_Einsatz%20digitaler%20Medien%20in%20der%20Lehrerbildung.pdf

Ferrari, A. (2012). *Digital Competence in Practice: An Analysis of Frameworks. Luxembourg: European Union.* Download from: https://ifap.ru/library/book522.pdf

How Augmented Reality is used as a digital Element in Biotech-Experiments

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Keywords: Biology, Digital transformation, Inquiry learning, Teacher education

The digital transformation does not mean that analog is banned from everyday school life. Rather, especially in STEM education, experimenting with real objects continues to be a fixed part of the lessons to open up natural phenomena. But the Augmented Reality (AR) technology creates new opportunities to understand (natural)scientific contexts with experiments in STEM-Education. STEM-Education includes the areas of Science, Technology, Engineering and Mathematics. Experiments, as a central method of research, has long-term effects towards the development of scientific knowledge. Furthermore, it should be noted that experimentation is not to be understood as a cooking recipe. Experimentation is a specific problem-solving process. So, in addition to develop knowledge, it also shows the students an image of science and scientific work and teaches them to work scientifically on their own. But the importance of experiments in the classroom goes far beyond the development of interests. Knowledge about and experience with this method enable students to participate in authentic scientific discovery processes, to reflect on them, to evaluate them and to integrate processes and structures of thoughts into their personal lives. This includes the development of „inquiry competences“. The combination of scientific knowledge and competences contributes to a fundamental understanding of the characteristics of science. Therefore, students should enjoy an experimental and inquiry-based design in STEM-Education.

But there are currently many obstacles to conducting experiments in schools. Due to the unavailable equipment and the limited repertoire of school experiments teachers often reach their limits. To integrate knowledge and methods from current (natural)scientific research into school education, it is necessary to support the teachers, to develop and evaluate inquiry-based experiments in learning concepts. In combination to supporting teachers, digital elements have the potential to enhance learning content and experimentation processes.

Previous studies already show that AR has potential in the field of education in many ways. In addition to opening up new horizons to conduct experiments, AR allows us to better understand the scientific process during an experiment in the field of STEM-Education. But this creats the question of “How it is possible to use these potentials of AR in combination with experiments to create basic science knowledge and integrate it into inquiry-based learning in STEM-Education?”.

To answer the question, the dependent variables cognitive load and conceptual knowledge will be evaluated in a quantitative study with students. It can be expected that the AR application is to be able to reduce the cognitive load and to increase the conceptual knowledge, an effect that has already been shown in past studies. Motivation and interest should also be increased, which results in the general aim to inspire future researchers for the (natural)sciences through the combination of AR with the experimental process in STEM-Education. Moreover, interviews with teachers will be conducted in a qualitative study to identify the challenges of using AR in experimentation as well as the necessary prerequisites regarding equipment, personal competencies and media skills of the teacher. The paper

will present initial study results and highlight success factors for AR use in experimentation in STEM education.

Implementation of digital competences in teacher training at the University of Oldenburg

Wibke Duwe, Carl von Ossietzky University Oldenburg

Keywords: Action research, Developmental processes, Digital transformation, Teacher education

In order to improve the education of students to meet the many requirements that teachers face in school with regard to digitalisation, the project DiOLL from the University of Oldenburg pursues a symbiotic implementation strategy in which many actors with different expertise from educational sciences as well as from informatics, informatics education, chemistry education, German language studies and primary education studies work together with many other lectures and experts from the field of teacher education in a cyclic process to achieve innovation.

Besides the development of teaching concepts for university and teaching material, one important part of this innovation process uses a participatory approach that is focuses on the digital competences of student teachers. We try to investigate those competences that are intended by the lecturers and their courses at university. Many theoretical models like TPACK (Köhler and Mishra, 2006) or the DigCompEdu (JRC, 2017) give an overview on the competences teachers should have. But we do not know if and which of them are intended by the many different lectures.

Therefore, we use a quantitative survey addressing the staff. These surveys are not designed to produce representative results about the competencies of the students or results regarding the staff. They produce data that can be discussed in the subsequent parts of the process so that they support the reflection process which is essential for symbiotic implementation and help to negotiate a common understanding as an important step towards innovation. They function as a central occasion to communicate about the intended learning outcomes regarding digital competences of the students and their future role to support the digital competences of their students as well.

The items for this survey are taken from the official requirements for teacher education (KMK, 2019) and the VeLDi model (Mau et al. 2022, in print) which is a suitable mixture of other models. In addition to the competence areas of TPACK and others, the VeLDi-Model also points out a competence area about reflection and outlines several fundamental competences from media pedagogy, informatics, media education and other domains each teacher should have.

This poster presents the survey instrument as well as the first results of a teacher survey from spring 2021 and the first observable changes in teacher training triggered with the help of reflection of these results.

References:

European Commission's Joint Research Centre (JRC): *"European Framework for the Digital Competence of Educators: DigCompEdu",* EUR 28775 EN, ISBN 978-92-79-73494-6 , doi:10.2760/159770, JRC107466, http://europa.eu/!gt63ch.

Mishra, P., & Koehler, M. Technological pedagogical content knowledge: A framework for teacher knowledge. *The Teachers College Record*, 108(6), 1017–1054. 2006

Kultusministerkonferenz (KMK): *Standards für die Lehrerbildung: Bildungswissenschaften,* 2019

Mau, T., Diethelm, I., Friedrichs-Liesenkötter, H., Schlöndorf, C., Weich, A. (in print). Lehrkräftebildung in der digital vernetzten Welt. Ein interdisziplinärer Kompetenzrahmen für (angehende) Lehrkräfte und dessen Umsetzung in einem Pilotseminar. In R. Knackstedt, J. Sander, J. Kolomitchouk (Hrsg.). *Kompetenzmodelle für den Digitalen Wandel*. Springer, 2022

Exploring teaching behaviour of team teachers in the context of compulsory education

Aron Decuyper, Ghent University, Belgium; Hanne Tack, Ghent University, Belgium; Mathea Simons, Universiteit Antwerpen, Belgium; Ruben Vanderlinde, Ghent University, Belgium

Keywords: Collaborative learning, Competences, Teacher effectiveness, Video analysis

This poster presentation provides insight in a recently initiated research project with the primarily aim to advance insight in team teachers' teaching behaviour. Teaching behaviour has been a topic of interest in the field of teacher effectiveness research for more than 50 years (e.g., Scheerens, 2015). Empirical research has repeatedly found certain behaviours to be important predictors of students' learning. There are six dimensions according to the ICALT framework (van der Grift, 2007): safe and stimulating learning climate, efficient classroom management, clarity of instruction, activating teaching, teaching learning strategies and differentiation. Although research has generally acknowledged the significant role of effective teaching behaviour, there is surprisingly no research in the context of team teaching. Therefore, the goal of this research project is to gain a better understanding of the teaching behaviour of team teachers. To target this goal, two research lines with two studies are designed: 1) large-scale survey research and 2) video-based observation research. Study 1 involves the development and validation of a measurement instrument to map the practices of team teaching. While several models of team teaching (e.g., Baeten & Simons, 2014) exist, there is no measurement instrument available - yet - to adequately capture the practice of team teaching. A measurement instrument will be developed based on a large-scale survey study with about 600 team teachers. Study 2 attempts to contribute to the research on team teaching in a theoretical and empirical way by providing a clear picture of how the practice of team teaching relates to teachers' self-perceived teaching behaviour. To answer the research question, a large-scale survey is administered to team teachers in compulsory education (n > 600). This study will assess teachers' practice of team teaching (i.e., the earlier developed instrument) and their teaching behaviour (i.e., ICALT, van de Grift, 2007). Study 3 is a descriptive study, examining which teaching behaviour teachers exhibit during a team teaching lesson. Twenty team teaching teams (i.e., 10 primary and 10 secondary education) will be asked to videotape five team teaching lessons. Trained observers will code the type, quality and duration of teaching behaviour (i.e., ICALT, van de Grift, 2007). Finally, study 4 investigates, by means of the video-based observation study (n = 20), the relationship between the practice of team teaching and observed teaching behaviour. In this way, a statement can be made about whether there is a difference between self-reported and observational data of teaching behaviour in the context of team teaching. As such, the project pioneers theoretical, empirical and methodological insight in the field of team teaching research.

References:

Baeten, M. & Simons, M. (2014). Student teachers' team teaching: Models, effects, and conditions for implementation. *Teaching and Teacher Education*, 41, 92-110.

Scheerens, J. (2014). School effectiveness research. In *international encyclopedia of social and behavioral sciences* (2nd edition). Elsevier.

van de Grift, W. (2007). Quality of teaching in four European countries: A review of the literature and application of an assessment instrument. *Educational Research,* 49(2), 127-152.

School-external collaborations as a strategy to stimulate teachers' data use skills

Ariadne Warmoes, Vrije Universiteit Brussel (VUB), Belgium; Iris Decabooter, Hasselt University, Belgium; Els Consuegra, Vrije Universiteit Brussel, Belgium; Katrien Struyven, Hasselt University / Vrije Universiteit Brussel, Belgium; Roos Van Gasse, University of Antwerp, Belgium

Keywords: Collaborative learning, Inquiry learning, Synergies between learning teaching and research, Teacher professional development

The use of data or "data-based decision-making" (DBDM) in education has been an important research topic as research shows it can contribute to school improvement (e.g. Schildkamp, 2019). Mandinach and Gummer (2016) indicate that data literacy is a key competence of DBDM. However, data literacy is generally poorly developed in schools (e.g. Verhaeghe et al., 2010). Rincon-Gallardo and Fullan (2016) suggest collaborations with external parties to gain expertise that is needed but lacking in one's team.

Previous research acknowledged the importance of collaboration for DBDM (e.g. Schildkamp et al., 2015). Various types of within-school collaborations have been studied but little is known about how teachers learn in school-external collaborations. In this study a systematic literature review is conducted to investigate which school-external collaborations in DBDM exist and how they contribute to teachers' DBDM.

Articles were searched in WoS using a search string containing variations of data use and school-external collaborations. The search produced 153 hits from which 13 articles were selected and 4 articles were added after snowballing.

In the reviewed studies a variety of external partners for DBDM are reported such as researchers, data coaches, content experts and learning networks. External partners are involved in DBDM in different phases of the data use cycle but not all. Coaches and data experts mainly brought aid and support in identifying problems and framing questions, using data and turning data into information. Content experts supported schools in making instructional decisions. Collaborations with other schools in learning networks reported sharing strategies and a repertoire of actions. Overall it showed that external collaborations brought in new perspectives, fostered dialogue, which led to a co-construction of ideas and sometimes to a change in instruction.

The reviewed articles did not allow for drawing conclusions about *how* external collaborations contribute to teachers' DBDM. These collaborations are mostly investigated as one of many components in a DBDM intervention and despite it being studied in general, the underlying processes remain unaddressed. Based on this review we call for more research to investigate under which conditions these external collaborations are most effective.

References:

Mandinach, E. B., & Gummer, E. S. (2016). What does it mean for teachers to be data literate: Laying out the skills, knowledge, and dispositions. *Teaching and Teacher Education*, 60, 366–376. https://doi.org/10.1016/j.tate.2016.07.011

Rincón-Gallardo, S., & Fullan, M. (2016b). Essential features of effective networks in education. *Journal of Professional Capital and Community,* 1(1), 5–22. https://doi.org/10.1108/jpcc-09-2015-0007

Schildkamp, K. (2019). Data-based decision-making for school improvement: Research insights and gaps. *Educational Research,* 61(3), 257–273. https://doi.org/10.1080/00131881.2019.1625716

Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2015). Data teams for school improvement. *School Effectiveness and School Improvement,* 27(2), 228–254. https://doi.org/10.1080/09243453.2015.1056192

Verhaeghe, G., Vanhoof, J., Valcke, M., & Van Petegem, P. (2010). Using school performance feedback: perceptions of primary school principals*. School Effectiveness and School Improvement*, 21(2), 167–188. https://doi.org/10.1080/09243450903396005

Poster Session Poster Presentation paper_type_2 session 2	**Time:** 10.45 am – 12.15 pm	**Location:** Lecture Hall (Vortragssaal)
Assigned Chair: Jannis Gluth, TU Dortmund University, Germany		

Motivational antecedents of teacher enthusiasm in early stages of teacher education

Christin Lotz, University Leipzig, Germany; Patrick Hawlitschek, Freie Uninersität Berlin / Institute for Educational Quality Improvement (IQB) Berlin, Germany; Anne Deiglmayr, Universiy of Leipzig, Germany

Keywords: Beginning teachers, Motivation, Teacher education, Teacher professional development

Theoretical Background: Teacher enthusiasm, that is, the enjoyment, excitement, and pleasure experienced during teaching, is a relevant aspect of teachers' professional competence (Kunter et al., 2011). Prior studies on teacher enthusiasm showed its predictive power for instructional-related variables as, for example, instructional quality, students' motivation, and even students' achievements. However, examining how teacher enthusiasm emerges still calls for research. Thus, this study investigated which motivational aspects for choosing to study teacher education contributed to the development of teacher enthusiasm during the early stages of teacher education. Moreover, we examined whether education-specific teacher self-concept explains the relation between career choice motivation and teacher enthusiasm.

Research questions: The research aims of this study were twofold. First, we examined the differential relations between motivational aspects and teacher enthusiasm. We expected that especially the motivational aspects of the value component are more pronounced predictors than aspects of the expectancy component or social influences because teacher enthusiasm is considered an affective characteristic of enjoyment and intrinsic motivation. Second, we expected teacher self-concept to substantially mediate the relation between motivation and teacher enthusiasm as students with higher competence beliefs are likely to be more enthusiastic about their teaching.

Method: A sample of N=209 teacher education students reported their motivation for choosing to pursue a teaching degree (FEMOLA; Pohlmann & Möller, 2010), education-specific teacher self-concept of prospective teachers (ERBSE-L; Retelsdorf et al., 2014), and teacher enthusiasm (Kunter et al., 2011). First, we inspected regression coefficients among the six motivational subscales and teacher enthusiasm. Second, we established manifest mediation models for those motivation subscales that significantly predicted teacher enthusiasm. Each mediation model comprised motivation as predictor, teacher self-concept as mediator, and teacher enthusiasm as outcome. Significance of the mediation effects were determined according to 95% bias-corrected confidence intervals based on 10,000 bootstrap samples in Mplus.

Results: Results indicated that educational interest and subject-specific interest (as two of the three motivational aspects that tap the intrinsic value component) and ability beliefs (as one aspect of the expectancy component) were substantial predictors for teacher enthusiasm. Utility, low difficulty of the study and social influences were non-substantial predictors. Referring to the mediation models, education-specific teacher self-concept mediated the relation between educational interest and teacher enthusiasm as well as between ability beliefs and teacher enthusiasm, but not between subject-specific interest and teacher enthusiasm.

Discussion: Motivational aspects for choosing to study teacher education exhibited differential effects on teacher enthusiasm and teacher self-concept partly explained those relations. Implications on the early stages of university training of teacher education students will be discussed.

References:

Kunter, M., Frenzel, A., Nagy, G., Baumert, J., & Pekrun, R. (2011). Teacher enthusiasm: Dimensionality and context specificity. *Contemporary educational psychology,* 36(4), 289-301.

Pohlmann, B., & Möller, J. (2010). Fragebogen zur Erfassung der Motivation für die Wahl des Lehramtsstudiums (FEMOLA) 1Dieser Beitrag wurde unter der Herausgeberschaft von D. Leutner und DH Rost bearbeitet. *Zeitschrift für pädagogische Psychologie*.

Retelsdorf, J., Bauer, J., Gebauer, S. K., Kauper, T., & Möller, J. (2014). Erfassung berufsbezogener Selbstkonzepte von angehenden Lehrkräften (ERBSE-L). *Diagnostica*.

Differences in implicit beliefs between student teachers preparing for different school types

Franziska Frohberg, University Leipzig, Germany; Anne Deiglmayr, Universiy of Leipzig, Germany

Keywords: Attitudes and beliefs, Beginning teachers, Self-efficacy, Survey research

Teachers' implicit beliefs about their students' intelligence (teachers' mindset regarding their students) has been shown to have an important effect on students' learning (Yeager et al., 2021). This project assesses whether student teachers in different preparatory tracks (regular vs. special needs education) differ in their mindset regarding their students' intelligence, as well as related pedagogical beliefs.

A sample of student teachers (N = 404; M = 22.67 years; SD = 3.68) answered an online survey that contained scales assessing general mindset, mindset regarding one's (prospective) students, self-efficacy, reference standard orientation, and constructivism and transmission.

The student teachers came from three preparatory tracks, covering all secondary school types in the part of Germany where this study was conducted (Gymnasium, Oberschule, Förderschule), whereby students in the “Förderschule” track specialize in special needs education. Because of the emphasis given to adaptive and personalized instruction in special needs education, we hypothesized that students in this track might show more growth-oriented mindsets (H1), as well as a higher constructivist orientation (H2) and less emphasis on social reference standards (H3).

A one-factor ANOVA was calculated to examine the effect of school track specialization. Against our hypothesis (H1), there was no statically significant effect of specialization on general mindset (M = 2.86; SD = 0.08; Cronbach's α = .84; (F (df 2; 401) = 0.561; p = .571), or mindset regarding one's (prospective) students (M = 3; SD = 0.93; Cronbach's α = .90; F (df 2; 401) = 1.157; p = .316).

There was a statically significant effect of school track on constructivism (M = 4.64; SD = 0.62; Cronbach's α = .84), but the difference was against our hypothesis (H2), with student teachers preparing for regular school tracks in fact showing stronger constructivist beliefs than students in special needs education (F (df 2; 401) = 37.62; p < .001).

Finally, in line with our last hypothesis (H3), student teachers preparing for regular school tracks indeed showed higher social reference standard orientation than student teachers preparing for special needs education (M = 2.45; SD = 1.03; Cronbach's α = .73; F (df 2; 401) = 10.157; p < .001).

In summary, differences between teacher students in the different tracks regarding their pedagogical beliefs were small and did not extent to their implicit theories about intelligence.

Developing an instrument to assess professional digital competence beliefs of (prospective) teachers

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Keywords: Assessment methods and tools, Attitudes and beliefs, E-learning, Teacher education

Teachers‘ digital competencies and digital competence beliefs are required to effectively integrate digital media in their classes. Digital competence beliefs are defined as self-evaluated competencies related to the use of digital media and are divided into basic (non-work-related) and professional (work-related) digital competence beliefs (Krumsvik, 2014). The European Framework for the Digital Competence of Educators (DigCompEdu; Redecker & Punie, 2017) focuses, for example, on teachers‘ professional digital competence beliefs and separates them into six dimensions with 22 competencies, e.g., competence for professional engagement, teaching and learning, or assessment. However, this framework has not thoroughly been empirically tested for its structure. Thus, the submitted study aims to present first results on the development and validation of an instrument to assess teachers‘ professional digital competence beliefs based on the DigCompEdu framework. We investigated whether the instrument can be validated across three professional stages in teachers’ profession: student teachers, pre-service teachers and in-service teachers. This study seeks to answer the following questions:

(1) Which dimensions of professional digital competence beliefs can empirically be proven guided by the DigCompEdu framework?

(2) To what extent is the developed instrument valid to assess professional digital competence beliefs among student teachers, pre-service teachers and in-service teachers?

The study used data from N = 1386 (prospective) teachers (73% females) from Germany who participated in an online survey between May and June 2020. The sample composes of 38% student teachers, 12% pre-service teachers and 50% in-service teachers.

We developed 33 items guided by the DigCompEdu framework (Redecker & Punie, 2017). The goal was to assess competence beliefs in the six defined competence dimensions and 22 related competencies with at least one item each. Items were rated on a five-point Likert scale ranging from 1 (not competent at all) to 5 (very competent).

Data were analysed using exploratory factor analysis, confirmatory factor analysis and multigroup analysis in Mplus 8. We tested serval models against each other. Results of the EFA (excluding items with low factor loadings and items loading on multiple factors) point to a 7-factor solution as the best solution. The 7-factor solution was tested in a CFA and fits the data well: $\chi 2$ (355) = 856.07, p < 0.001, RMSEA = 0.06, CFI = 0.95, SRMR = 0.03. The theoretically described 6-factor solution in the

DigCompEdu framework fits the data less well: $\chi 2$ (480) = 3931.51, $p < 0.001$, RMSEA = 0.07, CFI = 0.90, SRMR = 0.05. Scalar measurement invariance of the instrument was confirmed among the three groups. This result points to the validity of the instrument among student teachers, pre-service teachers and in-service teachers.

The study indicates the suitability of the DigCompEdu framework for assessing professional digital competence beliefs across all stages of teacher education. The extension of the theoretically assumed six competence dimensions will be discussed.

References:

Krumsvik, R. J. (2014). Teacher educators' digital competence. *Scandinavian Journal of Educational Research,* 58(3), 269–280.

Redecker, C., & Punie, Y. (2017). European framework for the digital competence of educators: Digcompedu. *Publications Office of the European Union*.

Teacher education for digital literacy - what are pre-service teachers' motivations to use ICT?

Nadine Dittert, University of Oldenburg, Germany; Kirsten Gronau, University of Oldenburg, Germany

Keywords: Educational technology, Motivation, Pre-service teacher education, Self-efficacy

Pre-service teachers are multipliers for digital literacy and therefore need competences in learning and teaching with ICT (Redecker, 2017). Previous research has pointed out that teachers' motivational beliefs are decisive for using ICT when teaching (Backfisch et al., 2020). Therefore, these motivational aspects need to be taken into account when transforming teacher education for the digital age. Based on previous research, we developed online questionnaires and asked pre-service teachers about their motivation to use ICT as a tool, to use it for designing, and whether they are interested in understanding how it works (Janneck et al., 2012). Further, we gathered data regarding their self-efficacy (Bandura, 1982). Questionnaires were filled out by pre-service teachers once at the beginning of the online studying experiences due to the pandemic (April to June 2020; n=106) and again in June and July 2021 after they had experienced online learning for more than one year (n=52).

Both surveys led to similar results; differences in pre-service teachers‘ motivation to use ICT were found. Generally, the participants were more interested in understanding ICT itself than simply using it as a tool. Further, pre-service teachers were more inclined to use ICT for designing than to use it as a tool only. Correlations were found between participants’ motivation to use ICT and their self-efficacy. That is, pre-service teachers with higher self-efficacy are more interested in understanding ICT and designing with it than colleagues with lower self-efficacy. Although the effects reduced in 2021, they did not change significantly from 2020 to 2021. Further, a negative correlation between self-efficacy and motivation to use ICT as a tool only was found in the first survey.

Our results indicate that the online learning situation due to the pandemic did not affect pre-service teachers’ motivation to use ICT for teaching and learning. Further, we derive that teacher training should include activities that increase participants’ self-efficacy including designing as well as gaining an understanding of underlying principles about how ICT works. As others have shown before, the activities might include digital fabrication, such as designing with microcontrollers and alike (e.g. Katterfeldt et al., 2015). Overall, it is vital to support students in understanding ICT and as a means to creating digital artefacts.

References:

Backfisch, I., Lachner, A., Hische, C., Loose, F., Scheiter, K. (2020). Professional knowledge or motivation? Investigating the role of teachers' expertise on the quality of technology-enhanced lesson plans. *Learning and Instruction,* 66, 101300.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist,* 37(2), 122.

Janneck, M., Vincent-Höper, S., Ehrhardt, J. (2012), Das computerbezogene Selbstkonzept: Eine gendersensitive Studie. *Mensch&Computer 2012,* S. 243-252.

Katterfeldt, E.-S., Dittert, N., & Schelhowe, H. (2015). Designing digital fabrication learning environments for Bildung: Implications from ten years of physical computing workshops. *International Journal of Child-Computer Interaction*, 5, 3 - 10.

Redecker, C. (2017). European Framework for the Digital Competence of Educators: DigCompEdu (EUR, Scientific and technical research series*). Publications Office*.

Animated videos of civic education lessons as a tool to foster teacher students´ professional vision

Dorothee Gronostay, TU Dortmund University, Germany; Katrin Hahn-Laudenberg, University of Leipzig, Germany; Sabine Manzel, University Duisburg-Essen, Germany; Simon Filler, TU Dortmund University, Germany; Frederik Heyen, University Duisburg-Essen, Germany; Marcus Kindlinger, University of Wuppertal, Germany; Jutta Teuwsen, TU Dortmund University, Germany

Keywords: Citizenship education, Professional vision, Social sciences, Teacher education

Generally, there is a broad consensus among researchers and teacher educators that videos of classroom practice provide meaningful learning opportunities for pre-service teacher education. Compared to other representations of practice (Grossmann et al. 2009), videos are particularly useful in fostering teachers´ professional vision, i.e. paying selective attention to classroom events that are important for students´ learning ("noticing") and knowledge-based interpretation of significant features of classroom situations or events ("reasoning", Seidel & Stürmer, 2014; Sherin & van Es, 2009). Moreover, using classroom videos in pre-service teacher education might serve as an important step in fostering "high-leverage practices" or "core practices" of teaching (Forzani, 2014; Grossman et al., 2018). In civic education research, the concept of professional vision has not gained much attention yet. Only in a current study in Germany, Jordan and Achour (2019) investigate aspects of teacher students´ professional vision using classroom recordings on the controversial topic of a "minimum wage".

The joint research project presented here aims to foster pre-service teachers´ professional vision using animated videos of classroom practice (considered as core practices in civic education). Three complementary part projects investigate different aspects of animated classroom videos and their potential to foster teacher students´ professional vision. Since animations of real classroom scenes present a new tool for teacher education, Filler and Gronostay investigate effects of the vignette representation type (animation vs. classroom recording and transcript) using an experimental design. Heyen and Manzel conduct a pre-post evaluation study to investigate learning outcomes of a blended learning environment using animations of classroom vignettes. Kindlinger and Hahn-Laudenberg employ design-based research to explore the promotion of reflexivity (epistemic cognition) relevant to social science didactics when learning with animations. The poster will give an overview of the interrelated research projects and present conceptual features of the animation videos as a new tool in teacher education.

References:

Forzani, F. M. (2014). Understanding “core practices” and “practice-based” teacher education: learning from the past. *Journal of Teacher Education,* 65(4), 357–368.

Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. W. (2009). Teaching practice: a cross-professional perspective. *Teachers College Record*, 111(9), 2055–2100.

Grossman, P., Schneider Kavanagh, S., & Pupik Dean, C. G. (2018). The turn towards practice in teacher education: An introduction to the work of core practice consortium. In P. Grossman (Ed.), *Teaching core practices in teacher education* (pp. 1–14). Harvard Education Press.

Jordan, A., & Achour, S. (2019). Professionelle Wahrnehmung angehender Politiklehrer*innen – Entwicklung einer videofallbasierten Lehr-Lerngelegenheit zum Formulieren politischer Urteile [Professional vision of pre-service teachers – developing a videobased learning environment on the formulation of political judgements]. In M. Lotz & K. Pohl (Hrsg.), *Gesellschaft im Wandel!? Neue Herausforderungen für die politische Bildung und ihre Didaktik* (pp. 214–222). Frankfurt am Main: Wochenschau.

Seidel, T., & Stürmer, K. (2014). Modeling and measuring the structure of professional vision in preservice teachers. *American Educational Research Journal,* 51(4), 739-771.

Sherin, M. G., & van Es, E. A. (2009). Effects of video club participation on teachers’ professional vision. *Journal of Teacher Education,* 60 (1), 20–37.

Poster Session Poster Presentation paper_type_2 session 1	**Time:** 10.45 am – 12.15 pm	**Location:** Big Club Room (Großer Clubraum)
Assigned Chair: Barbara Moschner, Carl von Ossietzky University Oldenburg, Germany		

Development of digital teacher education programs based on teaching-learning labs

Elisa Könnel, TU Kaiserslautern, Germany; Lena Geuer, TU Kaiserslautern, Germany; Roland Ulber, TU Kaiserslautern, Germany

Keywords: Learning technologies, Teacher education, Vocational education, Workplace learning

In regard to the digital transformation, teachers need to be trained about the different accessible educational technologies and the possibilities to implement these in their teaching practice. In order to establish the topic of digitalization in the teacher's education, our Project U.EDU aims the professionalization of teachers in terms of teaching and learning with digital assets. With "TransferLAB", we want to present an U.EDU sub-project in which online further education programs for vocational teachers are developed. The main aspects of these programs are so-called teaching-learning labs about digitalization, which focus on the learning and teaching processes by means of digital assets as well as the inclusion of digitalization topics in school lessons. We connect university and school life, by using new developed digital technologies, made available for teachers to integrate those in their teaching lessons. In this context, we want to forward the implementation of Augmented Reality (AR) into the learning process of pupils and programs. With this, we want to achieve a better consolidation of the pupils' knowledge in the areas of science and engineering for a sustainable STEM (science, technology, engineering, mathematics)-education in schools.

In addition, aspects of the handling and use of digital media will also be addressed. The development of educational programs and teaching concepts on the topics of opinion-forming through digital media, algorithms in social media, filter bubbles and risks on the Internet plays a major role here. In this way, the teacher education programs include aspects of media education and media didactics.

Our training courses target on STEM teachers as well as teachers with general training needs in the field of information and media technology competence of vocational schools.

Due to the process of digital transformation, the developed teacher education programs are offered in less face-to-face training programs, but virtual self-study programs in the form of synchronous training courses and asynchronous videos accessible on an online platform. This form of education programs can easily be included in the teacher's everyday working life since it provides high flexibility, regardless of date and location, with the videos that can be retrieved from anywhere at any time.

The central research aspects of this project are the further investigation of the impact of digital transformation within the teacher education programs in terms of the use of digital media, and how those influence the teacher's connection of theoretical knowledge and their practical application by doing the online training programs compared to doing face-to-face training programs.

The project "TransferLab" as a sub-project of "U.EDU: Unified Education – Medienbildung entlang der Lehrerbildungskette" (grant number: 01JA202) is part of the "Qualitätsoffensive Lehrerbildung", a joint initiative of the Federal Government and the Länder which aims to improve the quality of teacher training. The programme is funded by the Federal Ministry of Education and Research. The authors are responsible for the content of this publication.

Designing Teacher Design Teams for the interdisciplinary course Project Integrated General Subjects

Tina Gryson, Ghent University, Belgium; Katrien Strubbe, Ghent University, Belgium; Tony Valcke, Ghent University, Belgium; Ruben Vanderlinde, Ghent University, Belgium

Keywords: Qualitative methods, Secondary education, Teacher professional development, Vocational education

In Flemish vocational secondary education, the general subjects are clustered in the course 'Project Integrated General Subjects' (PGS). The purpose of this course is to enhance vocational students' motivation for general subjects on the one hand and to make them self-reliant and resilient in their professional life on the other hand (Janssens, De Smet, De Mesmaeker & Van Looy, 2012; Placklé et al., 2014; Smet, 2008). The course aims to achieve this by focussing on cross-curricular, problem-based and project-oriented learning. However, these objectives are not reflected in studies on students' motivation or learning outcomes for PGS. Creten, Lens and Simons (2001) state that vocational students perceive the subject matter of PGS as little useful for their future life resulting in a lack of motivation. Additionally, assessment and evaluation research of the Flemish Government examined if vocational students in the second year of the third grade met the attainment targets for PGS (Van Nijlen et al., 2014). The results show that more than half of the students do not meet the basic level for three out of the four examined attainment target clusters. A follow-up study showed that PGS teachers often lack the knowledge and skills to develop instructional materials since most PGS teachers lack specific training for this course (Sierens et al., 2017). Cooperation in Teacher Design Teams (TDTs) could allow teachers to reinforce each other with their expertise. TDTs are defined as "*a group of at least two teachers, from the same or related subjects, working together on a regular basis, with the goal to (re)design and enact (a part of) their common curriculum*" (Handelzalts, 2009, p.7). TDTs offers two outcomes: the professional development of teachers and curriculum materials (Binkhorst, Handelzalts, Poortman & Van Joolingen, 2015).

To implement TDTs in vocational education, preliminary research is necessary since most of TDTs are set up in other contexts, mainly in higher education. To examine how TDTs can be effective for vocational education and more specific for PGS, five focus groups were conducted with relevant stakeholders: education inspectors (n=3), educational counsellors (n=6), teacher educators (n=6) and teachers (n=11). The results show the need for a long-term TDT programme consisting of school-based TDTs where instructional materials get designed and a networked TDT to provide support through knowledge exchange and feedback. In the school-based TDTs, an internal coach takes a prominent role, while an external coach is present in the networked TDTs. Autonomy and voluntary commitment of the teachers, and support and trust from the school management are central. Finally, registration of progress made and an online platform to share designed materials are desirable.

References:

Binkhorst, F., Handelzalts, A., Poortman, C. L., & Van Joolingen, W. R. (2015). Understanding teacher design teams – A mixed methods approach to developing a descriptive framework. *Teaching and Teacher Education,* 51, 213–224.

Creten, H., Lens, W., & Simons, J. (2001). The role of perceived instrumentality in student motivation. In A. Efklides, J. Kuhl, & R.M. Sorrentino (Eds.), *Trends and prospects in motivation research* (pp. 37-45). Dordrecht: Kluwer Academic Publishers.

Handelzalts, A. (2009). *Collaborative curriculum development in teacher design teams.* Enschede: University of Twente.

Janssens, I., De Smet, E., De Mesmaeker, E., & Van Looy, L. (2012). PAV: Project Algemene Vakken of Praktisch, Alternatief en Veelzijdig? In I. Janssens, L. Van Looy, I. Placklé, E. De Smet, & E. De Mesmaeker (Eds.). *Expeditie PAV: Project Algemene Vakken in theorie en praktijk* (pp. 85-117). Brussel: ASP.

Placklé, I., Könings, K. D., Jacquet, W., Struyven, K., Libotton, A., van Merriënboer, J. J., & Engels, N. (2014). Students' preferred characteristics of learning environments in vocational secondary education. *International Journal for Research in Vocational Education and Training (IJRVET),* 1(2), 107-124.

Sierens, S., Verbyst, L., Ysenbaert, J., Roose, I., Cochuyt, J., & Vanderstraeten, W. (2017). *Onderzoek naar verklaringen voor de peilingsresultaten Project Algemene Vakken (PAV): Eindrapport.* Gent: Universiteit Gent, Steunpunt Diversiteit & Leren.

Smet, R. (2008). Project Algemene Vakken: een wijze van kijken. *Vonk,* 37(3), 15-24.

Van Nijlen, D., Willem, L., Crynen, M., Engels, N., & Janssens, R. (2014*). Peiling Project Algemene Vakken in de derde graad van het beroepssecundair onderwijs*. Eindrapport. Leuven: KU Leuven, Steunpunt Toetsontwikkeling en Peilingen.

Design Thinking - Shedding light into trainees' educational needs in digital transformation

Susanne Weber, Ludwig-Maximilians-University, Germany; Frank Hiller, Ludwig-Maximilians-University (LMU), Germany; Stefanie Zarnow, Ludwig-Maximilians-University (LMU), Germany; Tobias Hackenberg, Ludwig-Maximilians-University (LMU), Germany; Frank Achtenhagen, University of Göttingen, Germany

Keywords: Digital transformation, Problem solving, Vocational education, Workplace learning

Problem

The digital transformation challenges workplaces in manifold ways by triggering trainees' educational needs in VET. To educate next generation of trainees in business, to remain an attractive and competitive VET system more insights into trainees' educational needs influenced by these digital transformation processes are necessary. Therefore, the OECD calls for close cooperation between the social partners (OECD, 2020).

Within our governmentally supported project we aim to initiate processes of "rethinking" the VET structure and processes from the perspective of trainees' needs in digital transformation. Simultaneously, we aim to get hints for innovation and change by applying a digital Design Thinking Workshop (Winograd et al., 2003).

Theory

Design thinking is a method for initiating and supporting creative, complex problem solving, activating varying knowledge, skills and abilities, and processes that lead to the generation of new objectives, innovative ideas, manifestations, perspectives, as well as changed organizational structures and processes (Goldman & Kabayadondo, 2017, p. 3). This "thinking out of the box" process gets stimulated by running through five typical phases: (1) Empathize, (2) Define, (3) Ideate, (4) Prototype and (5) Test. The goal of our study was to develop feasible initiatives for trainees on the various need topics occuring through digital transformation, both in companies and in vocational schools.

Research questions

RQ 1: What are the trainees‘ educational needs in digital transformation?

RQ 2: By which measures these trainees‘ needs can be met?

Method

Within our Design Thinking workshop 19 multidisciplinary stakeholders of VET participated (universities, ministry, city department, study seminar, vocational schools, training companies, trainees, teachers' association, trade union). The one-day workshop was run virtually using the Miro-board. The results were analyzed by MAXQDA.

Findings and implications

The results show that trainees were deeply affected by digital transformation and challenges in VET.

They express fear of the uncertain future, are afraid that they are not being trained adequately for the new challenges, and being left alone with the transformation process. They claim for newly required competencies, wish to get supported by scaffolding and fading concepts experiencing competence, get organized by open and structured educational resources offering autonomy and self-regulation, and want to work in teams securing social embeddedness. These results correspond with core components of the theory of self-determination (Reeve, Ryan & Deci, 2018) (RQ 1). But some of these needs stroke the stakeholders thinking. The final prototype resembles an „open house of education“, where trainees‘ can select different measures for meeting their needs (RQ 2).

Limitation and Outlook

The paper will critically discuss the results and elaborate measures for meeting trainees‘ needs.

References:

Goldman, S., & Kabayadono, Z. (2017). *Taking Design Thinking to School.* Routledge.

OECD (2020). *OECD-Beschäftigungsausblick 2020. Beschäftigungssicherheit und die COVID-19-Krise.*

Reeve, J., Ryan, R. M., & Deci, E. L. (2018). Sociocultural influences on student motivation as viewed through the lens of self-determination theory. In G. A. D. Liem & D. M. McInerney (Eds.), *Big Theories Revisited 2*, (pp. 15-40). Information Age Publishing.

Winograd, T., Leifer, L., & Kelley, D. (2003). *Design Thinking.* Stanford.

What is the impact of formal and informal activities on VET-teachers’ professional development?

Marjanne Hagedoorn, Landstede Groep, Netherlands; Maaike Koopman, HU University of Applied Sciences Utrecht, Netherlands; Elly de Bruijn, Open University, Netherlands

Keywords: Qualitative methods, Teacher professional development, Vocational education, Workplace learning

Schools for vocational education and training (VET) need to continuously innovate to adapt to an ever-changing environment and student characteristics. Professional development of VET teachers is crucial to accommodate these changes. Although teacher professional development (TPD) has been well represented in literature, the impact of informal and formal activities on VET teachers professional development are an underresearched area.

The purpose of this study is to improve understanding of the relationship between undertaken professional development activities and professional development of experienced VET teachers. Research question: *What is the impact of experienced VET-teachers' involvement in formal and informal activities on their professional development, and what factors do teachers indicate that explain this impact?*

In this study, professional development is defined as a continuous process in which teachers engage in formal and informal activities that change their knowledge, beliefs, and skills. Formal activities can be described as organized activities for the purpose of learning and improving teaching, such as participating in a team-training program on latest digital tools. Informal activities are rather implicit and spontaneous and embedded in work activities, such as experimenting with an online teaching tool. Factors to explain the development of TPD can be found in various features (McChesney & Aldridge, 2021). For example, when activities are connected to teachers' own practice or when teachers reflect on actions.

A longitudinal research design was used to follow 24 experienced VET teachers via learner reports and interviews during a period of three years. The first analysis shows a wide range of formal and informal activities VET teachers engage in. Further data analysis will provide insight into perceived change, and the factors that explain teachers' professional development as perceived by teachers. Teachers perceived professional development are discussed in this poster presentation. Following, teachers' perception of factors that explain their professional development.

References:

McChesney, K., & Aldridge, J. M. (2021). What gets in the way? A new conceptual model for the trajectory from teacher professional development to impact. *Professional Development in Education,* 47(5), 834–852. https://doi.org/10.1080/19415257.2019.1667412

Structural approaches to digital literacy training for STEM teachers

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Keywords: Digital learning, Digital transformation, Learning technologies, Teacher professional development

The prerequisite to shape digitalisation in schools according to specifications of the Kultusministerkonferenz (KMK 2016) is that necessary digital competences and concepts must be identified. This has currently only been done to a limited extent at the subject-specific level, so such competences can be optimized among teachers. Therefore, setting a focus on subject-related digital qualification and professional mentoring of teachers addressing the potentials of technological developments for subject teaching at school is necessary.

There is a basic willingness to integrate digital media more frequently (Thyssen et al., 2021), but only a small percentage of teachers participate in digitalisation-related training courses (Schulze-Vorberg et al. 2020). Obviously, teachers' preferences regarding teacher training addressing the use of digital media also need to be considered and general conditions for a successful participation must be adapted to everyday (school) life to create the incentive to deal with the training content (Schulze-Vorberg et al. 2020)

Following these considerations, further teacher training should be based on established subject related teaching concepts and principles to generate curriculum-related teaching scenarios demonstrating

efficient use of digital technologies and media to develop Technological Pedagogical Content Knowledge according to the TPACK model (Koehler et al., 2014).

The project eduTAP (U.EDU, TU Kaiserslautern, BMBF), addresses the development of such training formats, subsequent testing, and evaluation. The trainings intend to professionalise teachers in the field of digital competences relevant for science teaching by covering competency areas of the framework for Digital Competencies for Teaching in Science Education (DiKoLAN, Finger et al. 2020). The development of digital competences is contextualized via concrete science teaching examples integrating the supportive use of digital technologies and media in three competence areas of DiKoLAN (Data Acquisition, Data Processing, Presentation) and cloud teaching.

The accompanying research study examines the acceptance and effectiveness depending on three different teacher training formats: face-to-face, online training or as a self-learning course.

References:

Thyssen, C., Pankow, A., Klaeger, K. & Chernyak, D. (2021). Kompetenzen und Nutzungsperspektiven von Lehrkräften zum Einsatz digitaler Medien zur Erkenntnisgewinnung im naturwissenschaftlichen Unterricht. In T. Reuter, A. Weber, S. Nitz & M. Leuchter (Hg.), *Empirische Pädagogik: 1-2021. Problemlösen in digitalen Kontexten*. Verlag Empirische Pädagogik

Schulze-Vorberg, L., Krille, C., Fabriz, S. & Horz, H. (2021). Hinweise und Empfehlungen für die Konzeption von Lehrkräftefortbildungen zu digitalen Medien. *Zeitschrift für Erziehungswissenschaft*, 24 (5), 1113-1142.

Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S. & Graham, C. R. (2014). The Technological Pedagogical Content Knowledge Framework. In J. M. Spector, M. D. Merrill, J. Elen & M. J. Bishop (Hrsg.), *Handbook of Research on Educational Communications and Technology* (S. 101-111). New York: Springer

KMK (2016). *Strategie der Kultusministerkonferenz. „Bildung in der digitalen Welt".* Verfügbar unter: https://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2018/Strategie_Bildung_in_der_digitalen_Welt_idF._vom_07.12.2017.pdf

Becker, S., Bruckermann, T., Finger, A., Huwer, J., Kremser, E., Meier, M., Thoms, L.-J., Thyssen, C. & von Kotzebue, L. (2020). *DiKoLAN: Digitale Kompetenzen für das Lehramt in den Naturwissenschaften. Arbeitsgruppe Digitale Basiskompetenzen*.

Poster Session Poster Presentation paper_type_2 session 4	Time: 10.45 am – 12.15 pm	Location: Seminar Room II (Seminarraum II)
Assigned Chair: Marco Rüth, University of Cologne, Germany		

Teaching and learning about disinformation: Phenomenon-based learning of multiliteracy

Michael Fasching, Karl-Franzens University of Graz, Austria

Keywords: Competence development, Digital learning, Qualitative methods, Teaching approaches

The increasing amount of digital disinformation that is distributed and shared amongst young people (Starbird, 2019) means that we need to consider what role formal school education can play in developing digital competences (Loveless & Williamson, 2013). Equally we need to know how to prepare future teachers for such challenges. Especially when it comes to manipulated content, advertisements or influencers, young people need to develop digital awareness (Perez-Escoda et al., 2021) and a better understanding about how digital information may shape themselves or information they consume or share (Otrel-Cass & Fasching, 2020).

This presentation examines a pedagogical approach that may support teaching/learning about disinformation in classrooms (Burnett & Merchant, 2011). The model *for phenomenon-based learning of multiliteracy* is said to train a variety of digital skills of pupils (Kangas & Rasi, 2021). The model's focus is on learners investigating and solving problems using their own questions (Symeonidis & Schwarz, 2016). Kangas and Rasi (2021) suggest that pupils independently search, evaluate and compare information sources and present their findings creatively using digital tools. Pupils should learn the basics of digital literacy in cross-curricular project lessons together with different subject teachers. The term multiliteracy expands the understanding of the targeted digital competences and stands as an "umbrella term encompassing concepts such as media literacy, visual literacy and advertising literacy" (Kangas & Rasi, 2021, 3).

In this contribution I will discuss what Austrian secondary teachers and experts think about the model for phenomenon-based learning of multiliteracy. Part of a wider PhD project that utilises a design-based approach to build teachers' multiliteracy competencies, this was an initial step meant to use teacher and expert feedback to refine the theoretical teaching approach (Bell, Hoadley & Linn, 2004).

Results: Feedback from focus group interviews was collected from 7 secondary school teachers and 10 media experts. Experts and teachers agreed that phenomenon-based learning of multiliteracy as a type of open learning seems practical and pedagogically meaningful and could be implemented as project work. However, teachers raised concerns about the time spent on preparations as well as bureaucratic barriers coming from school administrators or colleagues if they had to implement a cross-subject teaching activity. Dealing with pupils' prior knowledge and their ability to work autonomously in combination with teachers' varying knowledge on digital information processing was another cause for concern. Experts point at the difficulty to find motivated teachers and that they are not sure whether Austrian schools are prepared for open learning approaches yet. But they see the immersion through project lessons - preferably longer than 50-minute blocks - as strengths. According to experts, it is essential to learn to link real-life knowledge and skills in school.

A planned pilot of phenomenon-based learning of multiliteracy will include implementations of a refined model that takes the above mentioned points into account. Based on the interviews, changes will

include a detailed guideline for teachers about the background, the model and the achieved intention, an example of project lessons, additional checkpoints or lesson designs with time indications.

References:

Bell, P., Hoadley, C. M., & Linn, M. C. (2004). Design-based research in education. Internet environments for science education, 2004, 73-85.

Burnett, C., & Merchant, G. (2011). Is There a Space for Critical Literacy in the Context of Social Media?. English Teaching: Practice and Critique, 10(1), 41-57.

Kangas, M., & Rasi, P. (2021). Phenomenon-based learning of multiliteracy in a Finnish upper secondary school. Media Practice and Education, 1-18.

Loveless, Avrile; Williamson, Ben (2013) Learning identities in a digital age. Routledge, London

Otrel-Cass, K., & Fasching, M. (2021). Postdigital Truths: Educational Reflections on Fake News and Digital Identities. Postdigital Humans: Transitions, Transformations and Transcendence, 89-108.

Pérez-Escoda, A., Pedrero-Esteban, L. M., Rubio-Romero, J., & Jiménez-Narros, C. (2021). Fake News Reaching Young People on Social Networks: Distrust Challenging Media Literacy. Publications, 9(2), 24.
Starbird, K. (2019). Disinformation's spread: bots, trolls and all of us. Nature, 571(7766), 449-450.

Symeonidis, V., & Schwarz, J. F. (2016, December). Phenomenon-based teaching and learning through the pedagogical lenses of phenomenology: The recent curriculum reform in Finland. In Forum Oświatowe (Vol. 28, No. 2 (56), pp. 31-47). University of Lower Silesia.

Evaluation of a learning unit for the further development of student teachers' reflection skills

Carola de Groote, Leipzig University, Germany

Keywords: Competence development, Professional development interventions, Reflection, Teacher education

Theory

Teacher reflective competence is an essential factor for the establishment and further development of professional action (Baumert & Kunter, 2013), but cannot yet be meaningfully assessed according to the current state of science. There are models about aspects and development of reflection skills (Aeppli & Lötscher, 2017), but it is difficult to specifically promote them and to assess them validly and quantifiably.

Aims & Research Questions

The research project is intended to show how university support for short-term placements can promote positive learning processes in relation to the reflection skills of student teachers and how to assess them.

The research project is aims at:

1) evaluating a course designed to foster student teachers' reflection competence

2) assessing student teachers' reflection competence by using learning diaries during their practical assignment

3) exploring correlations between reflection competence and pedagogical beliefs.

Planned Design

The study design includes an experimental group consisting of two cohorts of student teachers (different placement time) and a control group of student teachers. A two-part project seminar for the experimental group is being implemented. The first part of the project seminar aims to enhance the students' knowledge about self-directed and strategic learning strategies in the pedagogical double-decker

For the second part of the project seminar the experimental group has the opportunity to use the knowledge and skills they have acquired in a three-month placement to support small groups of pupils in grade six at a German grammar school.

Measures

Each student teacher participates in three main measurement points: at the start of the seminar (t1), at the end of the seminar (t2) and during the placement (t3). A knowledge test should reflect the state of the pedagogical-psychological knowledge of the students in a one-group pre-test-post-test design. A questionnaire on the transmissive and constructivist beliefs of the students should be used to map a possible change in the students' beliefs. The students will reflect on their school activities in a theory-based learning diary (Aeppli & Lötscher, 2017).

Current State of the Project

The first round of the research project is almost complete. The data for t1, t2 and t3 of the first cohort are available and the student teachers of the first cohort each submitted three entries on specific reflection occasions during their internship.

References:

Aeppli, J. & Lötscher, H. (2017). Charakterisierung der Reflexionskategorien zum Rahmenmodell für Reflexion EDAMA. In C. Berndt, T. H. Häcker & T. Leonhard (Hrsg.), *Studien zur Professionsforschung und Lehrerbildung. Reflexive Lehrerbildung revisited: Traditionen - Zugänge - Perspektiven* (S. 159–175). Verlag Julius Klinkhardt.

Baumert, J., & Kunter, M. (2013). The COACTIV model of teachers' professional competence. In *Cognitive activation in the mathematics classroom and professional competence of teachers* (pp. 25-48). Springer, Boston, MA.

Immersive VR in elementary science education: from student conceptions to theoretical implementation

Nicolas Arndt, University of Oldenburg, Germany; Marisa Holzapfel, University of Oldenburg, Germany; Silke Bakenhus, University of Oldenburg, Germany; Maja Brueckmann, University of Oldenburg, Germany

Keywords: Digital learning, Educational technology, Primary education. Science education

Nowadays, digital technology such as tablets and smartphones are part of everyday life for many children. As they watch movies, play games, or communicate with their friends, they participate actively and autonomously—within the limits of their possibilities and competencies—in our digital society. The covid-19 pandemic has brought digitalization and learning with digital media into even sharper focus. Furthermore, the past two years have shown that considerations of digital learning cannot be limited to the secondary school level, but that good concepts for creating digital learning opportunities are also needed for elementary education. One subject into which digital learning could easily be integrated is elementary science education, which has the task of helping children to understand and participate in their environment and everyday life by offering them opportunities to acquire a wide range of relevant skills (Gesellschaft für Didaktik des Sachunterrichts, 2013).

Extracurricular places of learning are particularly well suited offering children experiences that might not be accessible to them in everyday life, such as a fire department. The pandemic conditions in particular have brought increased attention to extracurricular learning spaces in the form of virtual environments, such as Google Expeditions. These virtual reality (VR) media have the potential to promote skill-building and constructivist learning in addition to impart subject knowledge, as well as to create new ways of supporting inclusive learning (Buchner, 2021; Hellriegel & Čubela, 2018).

This poses a special challenge for (student) teachers to recognize and use the didactic and methodological possibilities of digital media and digital learning environments for teaching and learning (Kultusministerkonferenz, 2016). When designing and didactically preparing suitable digital learning opportunities and experiences for their students, it is important that teachers take into consideration the learners' prior knowledge and experiences (Huang et al., 2010). Eliciting and transforming student perceptions therefore forms an important part of teachers' professional competences.

In the current poster presentation, we will present selected research findings concerning the attitudes and values of student teachers in elementary science education, regarding their students' pre-existing conceptions of and prior experiences with VR. Based on these insights, we will then illustrate what the theoretical implementation of learning opportunities with virtual reality (VR) for primary science education could look like, using Mulders, Buchner, and Kerres' (2020) *Meaningful-immersive Virtual Reality-Learning framework (M-iVR-L)* and the example of already existing 360° images of the German deep ocean research vessel *Sonne.*

In addition to the importance of building on students' prior knowledge, the adequate degree of immersion as well as the explicit integration of opportunities for learning-relevant interaction will be discussed. We will also provide suggestions for dividing the iVR learning environment into smaller sequences and ways of guiding immersive learning through prior training and guided assistance by pedagogical agents. The goal of these steps is to minimize the cognitive load and the associated risk of overwhelming learners. Similarly, providing learners with specific, problem-oriented tasks can actively support a constructive learning process and thus promote the long-lasting acquisition of knowledge within the iVR learning environment (Mulders et al., 2020).

References:

Buchner, J. (2021). Generative learning strategies do not diminish primary students' attitudes towards augmented reality. *Education and Information Technologies*. https://doi.org/10.1007/s10639-021-10445-y

Gesellschaft für Didaktik des Sachunterrichts (Hrsg.). (2013). *Perspektivrahmen Sachunterricht* (Vollständig überarb. und erw. Ausg). Klinkhardt.

Hellriegel, J., & Čubela, D. (2018). Das Potenzial von Virtual Reality für den schulischen Unterricht—Eine konstruktivistische Sicht. *MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung*, 58–80. https://doi.org/10.21240/mpaed/00/2018.12.11.X

Huang, H.-M., Rauch, U., & Liaw, S.-S. (2010). Investigating learners' attitudes toward virtual reality learning environments: Based on a constructivist approach. *Computers & Education,* 55(3), 1171–1182. https://doi.org/10.1016/j.compedu.2010.05.014

Kultusministerkonferenz. (2016). *Strategie der Kultusministerkonferenz „Bildung in der digitalen Welt".* https://www.kmk.org/fileadmin/pdf/PresseUndAktuelles/2018/Digitalstrategie_2017_mit_Weiterbildung.pdf

Mulders, M., Buchner, J., & Kerres, M. (2020). A Framework for the Use of Immersive Virtual Reality in Learning Environments. International Journal of Emerging Technologies in Learning (IJET), 15(24), 208. https://doi.org/10.3991/ijet.v15i24.16615

Computer science in elementary education: What competencies are important for student teachers?

Nicolas Arndt, University of Oldenburg, Germany

Keywords: Competence development, Competences, Primary education, Science education

Information technology is already deeply anchored in the everyday life and the living environment of many young children (Borgstedt et al., 2015). In a German survey of 1,216 children between the ages of six and thirteen, 65% said that they used their cell phones regularly, while 47% used them every day or almost every day (Feierabend et al., 2021). In addition, children also unconsciously interact with IT systems that are often not perceived as such. Examples of this include increasingly widespread smart home technologies in the form of intelligent speakers, lighting or vacuum cleaning robots.

However, children who grow up in a digital society do not automatically become competent users of digital technologies. For example, around one third of the eighth-graders tested in Germany as part of an international comparative study in 2018 only had rudimentary and basic computer- and information-related skills (Eickelmann et al., 2019).

In order to ensure that children can successfully participate in our society, which is increasingly shaped by technology, it is therefore important to teach computer science even at the elementary school level. Elementary science education, with its task to "support students in understanding their [...] environment [...] and in orienting, participating, and acting in it" (Gesellschaft für Didaktik des Sachunterrichts, 2013), seems to be an appropriate forum for this.

However, integrating computer science into the elementary science education curriculum poses new challenges for the design of appropriate teaching programs in the first phase of teacher education. Student teachers themselves usually have little or no prior knowledge in the field of computer science, apart from their own experiences as users, and display a wide range of motivations and attitudes towards computer science and computer literacy more generally.

In this poster presentation, I will discuss the results of a literature review that explored the question of what competencies student teachers need to provide computer science and informatics education at the elementary school level (Gesellschaft für Informatik, 2018; Kultusministerkonferenz, 2016). The findings suggest that teacher training should cover not only the relevant subject knowledge, but also the handling and use of technologies such as the internet, tablets, and apps, as well as their didactically appropriate use in the classroom. However, in addition to technological, pedagogical, and content knowledge (cf. TPACK model, Mishra & Koehler, 2006), motivation and attitudes of student teachers regarding computer science and computer literacy should also be considered. All of these factors will be incorporated into a course curriculum for student teachers, which I will develop as part of my further doctoral studies and subsequently evaluate in an intervention study.

References:

Borgstedt, S., Rätz, B., von Schwartz, M., Schleer, C., & Ernst, S. (2015). *DIVSI U9-Studie | Kinder in der digitalen Welt* (S. 148).

Eickelmann, B., Bos, W., Gerick, J., Goldhammer, F., Schaumburg, H., Schwippert, K., Senkbeil, M., & Vahrenhold, J. (Hrsg.). (2019). *ICILS 2018 #Deutschland: Computer- und informationsbezogene Kompetenzen von Schülerinnen und Schülern im zweiten internationalen Vergleich und Kompetenzen im Bereich Computational Thinking.* Waxmann.

Feierabend, S., Rathgeb, T., & Reutter, T. (2021). *KIM-Studie 2020. Kindheit, Internet, Medien. Basisuntersuchung zum Medienumgang 6- bis 13-Jähriger.*

Gesellschaft für Didaktik des Sachunterrichts (Hrsg.). (2013). *Perspektivrahmen Sachunterricht* (Vollständig überarb. und erw. Ausg). Klinkhardt.

Gesellschaft für Informatik. (2018). *Kompetenzen für informatische Bildung im Primarbereich: Empfehlungen der Gesellschaft für Informatik e. V.* 36.

Kultusministerkonferenz. (2016). *Strategie der Kultusministerkonferenz „Bildung in der digitalen Welt“.* https://www.kmk.org/fileadmin/pdf/PresseUndAktuelles/2018/Digitalstrategie_2017_mit_Weiterbildung.pdf

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record,* 108(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Keynote by Professor Kari Smith, Norwegian University of Science and Technology

Keynote II	**Time:** 12.30 pm – 1.30 pm	**Location:** Auditorium (Veranstaltungssaal)

What did the COVID-19 lockdown teach us about education in a future perspective?

Kari Smith, Teacher Education Department, Norwegian University of Science and Technology (NTNU), Norwegian Research School in Teacher Education (NAFOL), Norway

Keywords: Blended learning, Student learning, Teacher education, Teacher educator professional development

The global COVID-19 pandemic appeared to be a Black Swan for educational systems worldwide. Schools and tertiary education, including teacher education, were forced to turn online overnight, without planning, preparation and sufficient knowledge about and competence in online teaching. Students, either they were in school or at the university, were isolated at home, and learning became an exercise in self-discipline.

The COVID-19 Black Swan offered, however, multiple learning and development opportunities for all actors, driven by a reality out of the control of the individual. Now it is time to look back at the lessons learned when planning the future of education. Getting back to the old normal is out of the question.

In my talk I will discuss lessons learned from various studies I have been involved with in the last two years. I will share what we have learned by listening to upper secondary school students, teachers, and decisions makers, and not least, experiences of an international group of teacher educators. The focus will not be on the many challenges most actors experienced, but on what to keep in mind when planning for an unknown future.

Symposium II

Symposium II	**Time:** 2.30 pm – 4.00 pm	**Location:** Auditorium (Veranstaltungssaal)
Chairs: Nicoletta Bürger, University of Hildesheim, Germany **Organisers:** Alina Hase, Leuphana University Lueneburg, Germany; Leanie Kahnbach, Leuphana University Lueneburg, Germany **Discussant:** Ronny Scherer, University of Oslo, Norway		

Teacher factors influencing their use of digital technology for high quality instruction

Keywords: Attitudes and beliefs, Educational technology, Pre-service teacher education, Teacher effectiveness

Since digital transformation developed its way into nearly all areas of education, questions about how the digital technology can be used effectively have become particularly relevant. Considering digital technology for teaching in primary and secondary education, the use of digital technology can contribute to the provision of individualized student support. Whether these advantages can be used depends, among other things, on the technological-pedagogical knowledge and affective-motivational characteristics of the teachers. Therefore, it is of high importance to train teachers with respect to knowledge as well as attitudes and beliefs to effectively use digital technologies in order to be able to provide high quality teaching.

As the teacher´s intention to use digital technology is key to its actual use, the symposium starts off by presenting results from a cross-sectional survey study among primary school teachers, which focused on non-cognitive factors that make primary school teachers use digital technology and student data as a basis for individualized student practice.

Complementary to this, the second contribution addresses metacognitive factors in the context of pre-service teachers´ technological-pedagogical knowledge (TPK), focusing on the gap between teacher´s actual and self-reported TPK.

Finally, the third contribution will provide meta-analytical findings on the relationship between both cognitive and non-cognitive teacher characteristics on the instructional quality of digitalization-related teaching. Cognitive factors include professional knowledge, and non-cognitive factors include attitudes, beliefs, self-efficacy, and teacher enthusiasm.

The results will be discussed by Ronny Scherer with regard to a transformation of teacher education and training to increase teachers' willingness and capability to effectively use educational technology.

Paper 1: The relationship between teachers' acceptance and use of educational technology and student data

Leonie Kahnbach, Leuphana University Lueneburg, Germany; Alina Hase, Leuphana University Lueneburg, Germany; Dirk Lehr, Leuphana University Lueneburg, Germany; Poldi Kuhl, Leuphana Universität Lüneburg, Germany

Keywords: Attitudes and beliefs, Educational technology, Learning analytics, Teacher education

In times of growing student heterogeneity and increasing implementation of inclusive primary schools, educational technologies, here referred to as digital learning platforms (DLP), provide learning data and, therefore, display an opportunity for teachers to create individualized instruction (Ma et al., 2014; Mandinach & Schildkamp, 2020). Though the Corona-pandemic catalyzed the use of technologies in education, the effective use of digital learning applications including the use of data for individualized instruction is still scarce in German schools (S-CLEVER-Konsortium, 2021). Additionally, there is still a lack of research on the factors explaining the use of educational technologies and generated student data (Jude et al., 2020; Schaumburg, 2021) and their interrelations.

Therefore, the research questions are:

(1) What makes teachers use educational technologies and the resulting student data for individualization?

(2) How are the intention to use DLP and the intention to use data interrelated?

Additionally, we aim to generate an overview on how many teachers already intend to use DLP and data as well as to capture the intensity of the intention.

To, first, identify potential key factors for teacher´s usage intention and, second, check for interrelations, a reference to theories of (technology) acceptance is useful. Accordingly, we used the unified theory of acceptance and use of technology (UTAUT; Venkatesh et al., 2003) to explain teacher´s intention to use DPL and the theory of planned behavior (TPB; Ajzen, 1985) to explain teacher´s intention to use data as theoretical frameworks. To be able to examine interrelations, intention to use DLP and data was measured using the same set of three items.

We conducted a cross-sectional online survey study on N = 272 German primary school teachers (86% female, 56% between 40-59 years old). Data collection took two months until December 2021. The study was preregistered before data access (10.17605/OSF.IO/PG6R4).

Preliminary results show that 91% of the teachers intend to use DLP. From this group of teachers 83% also intend to use data from DLP. More precisely 5% only think about using the data, 18% plan to use the data and 61% are sure that they will use the data. Noteworthily, from the 9% of the teachers who do not intend to use DLP 17% still intend to use data. Next, we plan to perform multiple regression analyses to find key factors which explain teacher´s intention to use DPL and data. For this we consider the following predictors: attitude, effort expectancy, facilitating conditions, performance expectancy, self-efficacy, and social influence from UTAUT and TPB as well as additional factors which were found to possibly influence intention to use in educational contexts, for example pedagogical concepts (Tappe, 2017). Furthermore, we expect that the intention to use data is strongly associated with the intention to use DLP. Therefore, we analyze the interrelations of the intention to use DLP and the intention to use data. The results will be discussed with regard to their potential to transform teacher education to increase teacher's ability and willingness to effectively use educational technologies for individualized practice.

References:

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckman (Hrsg.), *Action-control: From cognition to behavior* (p. 11-39). Heidelberg: Springer. https://doi.org/10.1007/978-3-642-69746-3_2

Jude, N., Zieh, J., Goldhammer, F., Drachsler, H. & Hasselhorn, M. (2020). *Digitalisierung an Schulen – eine Bestandsaufnahme* [Digitalization in schools – Examination of the status quo]. Frankfurt am Main: DIPF. https://doi.org/10.25656/01:20522

Ma, W. et al. (2014). Intelligent tutoring systems and learning outcomes: A meta-analysis. *Journal of educational psychology,* 106(4), 901-918. https://doi.org/10.1037/a0037123

Mandinach, E. B. & Schildkamp, K. (2020). Misconceptions about data-based decision making in education: An exploration of the literature. *Studies in Educational Evaluation, 69*. https://doi.org/10.1016/j.stueduc.2020.100842

Schaumburg, H. (2021). Personalisiertes Lernen mit digitalen Medien als Herausforderung für die Schulentwicklung. Ein systematischer Forschungsüberblick [Personalized learning with digital media as a challenge for school development. A systematic research overview]. *MedienPädagogik,* 41, 134-166. https://doi.org/10.21240/mpaed/41/2021.02.24.X

S-CLEVER-Konsortium (2021). S-CLEVER. *Schulentwicklung vor neuen Herausforderungen. Erste Ergebnisse der Schulleiter*innen-Befragung September und Oktober 2020 für Deutschland* [S-CLEVER. School development facing new challenges. First Results of the Head Teacher Survey September and October 2020 for Germany]. Online: www.s-clever.org

Tappe, E.-H. (2017). „Lernen durch Mediengestaltung – Entwicklung eines Konzeptes zur Unterstützung mediendidaktischer Lehre im Schulalltag". Dissertation [Learning through media instruction - Development of a concept to support media didactic teaching in everyday school life]. Münster: Westfälische Wilhelms-Universität.

Venkatesh, V. et al. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly,* 27(3), 425-478.

Paper 2: "I know I don't know" - Does metacognitive accuracy moderate the validity of TPK selfassessments?

Ulrike Franke, University of Tübingen, Germany; Iris Backfisch, University of Tuebingen, Germany; Armin Fabian, University of Tuebingen, Germany; Patrizia Breil, University of Tuebingen, Germany; Katharina Scheiter, Leibnitz-Institut für Wissensmedien, Germany; Andreas Lachner, University of Tübingen, Germany

Keywords: Educational technology, Metacognition, Teacher education, Teacher professional development

Valid test instruments of technological-pedagogical knowledge (TPK; Mishra & Koehler, 2006) are important means to provide adequate support in the course of teacher education. However, to date, mostly distal indicators have been used to measure TPK via self-report instruments. Self-reports have often been criticized for their poor validity (Lachner et al., 2019). Nevertheless, still to date, it is an open question whether TPK self-reports correspond to objective TPK-test assessments. To this end, metacognitive research postulated that the correspondence between TPK-self reports and objective TPK instruments may depend on teachers' monitoring accuracy (Maki & McGuire, 2009). Monitoring

accuracy refers to the ability to accurately assess one's own current knowledge. To investigate the correspondence between subjective and objective TPK-assessments, we conducted two cross-sectional studies with pre-service teachers (Study 1: *N* = 183, 76.5% female; *M* = 24 years) and in-service teachers (Study 2: *N* = 64, 56,3% female; *M* = 38 years). The participants in both studies assessed their generic TPK (TPK self-report, see Schmidt et al., 2009) and answered an objective TPK-test based on Lachner et al. (2019). Before answering the TPK test, participants rated their potential performance on the TPK-test via Judgement of Learning (JOL) items (Maki & McGuire, 2009). To measure metacognitive accuracy, a difference between JOLs and performance on the objective TPK test was determined. Positive values indicate an overestimation, negative values an underestimation of one's own TPK knowledge. Values around zero show an accurate metacognitive accuracy. Across both studies, we only found a weak positive relation between TPK self-reports and the objective TPK test (Study 1: β* = .16; Study 2: β* = .20). This effect was moderated by monitoring accuracy (Study 1: β* = 2.20; Study 2: β* = 2.20), as the correspondence between subjective and objective TPK was higher, when participants demonstrated higher monitoring accuracy. This effect reversed for lower levels of monitoring accuracy. Further analysis with the Johnson-Neyman technique (Hayes & Matthes, 2009) showed for study 1 that a significant correlation between TPK self-assessments and the objective TPK test in the middle range of metacognitive accuracy (-0.16 < x < 0.60; p < .05). Significant underestimations (< -.16) and significant overestimations (> 0.60) showed no significant correlations. No significant correlations were found for underestimates (< -.16) and overestimates (> 0.60). These findings suggest that self-reports may not optimally capture teachers' TPK regardless of their working experience. These negative effects are more pronounced when teachers are not capable to assess their own knowledge.

References:

Lachner, A., Backfisch, I., & Stürmer, K. (2019). A test-based approach of modeling and measuring technological pedagogical knowledge. *Computers & Education,* 142, 103645. https://doi.org/10.1016/j.compedu.2019.103645

Hayes, A., & Matthes, J. (2009). Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. *Behavior Research Methods,* 41, 924-936.

Maki, R. H., & McGuire, M. J. (2009). Metacognition for text: Findings and implications for education. In T. J. Perfect & B. L. Schwartz (Hrsg.), *Applied metacognition* (S. 39-67). Cambridge University Press. https://doi.org/10.1017/CBO9780511489976.004

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record,* 108(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers. *Journal of Research on Technology in Education,* 42(2), 123–149. https://doi.org/10.1080/15391523.2009.10782544

Paper 3: The influence teacher factors on teaching quality: A meta-analysis

Nicoletta Bürger, University of Hildesheim, Germany; Jürgen Menthe, University of Hildesheim, Germany; Barbara SchmidtThieme, University of Hildesheim, Germany; Christof Wecker, Universität Hildesheim, Germany

Keywords: Attitudes and beliefs, Educational technology, Teacher education, Teacher effectiveness

While teaching with digital technology and fostering skills for a digital world are not entirely new challenges for teachers, there is a lack of designated instructional approaches for teacher training with respect to these issues. An important prerequisite for identifying target outcomes of such interventions is research-based knowledge about the influence of cognitive and non-cognitive teacher characteristics on the instructional quality of digitalization-related teaching. Competence models of teacher professionalism (Baumert and Kunter, 2006; Gess-Newsome, 2015) postulate that teachers' professional knowledge (i. e. content knowledge, pedagogical content knowledge, and pedagogical knowledge) as well as beliefs and motivational orientations of teachers predict different aspects of instructional quality (Kunter 2011; Voss et al. 2011). The influence of these variables on the instructional quality of digitalization-related teaching is of particular interest, as meta-analyses have indicated that the effectiveness of teaching with digital technology depends on how it is used (e. g., Rosen & Salomon, 2007).

Because the research base on these relationships is narrow, a broader meta-analysis on the influence of teacher characteristics on instructional quality in both digitalization-related teaching as well as teaching in general is currently being conducted. Drawing on theories of instructional quality and teacher professionalism, we identified a broad array of teacher characteristics that might influence instructional quality (Klieme et al. 2009, Baumert and Kunter 2006). The inclusion criteria were that (a) at least one cognitive or non-cognitive teacher characteristic was examined as an independent variable and (b) instructional quality or one of its sub-dimensions (Klieme et al. 2009) was included as a dependent variable. In addition, the study had to (c) be carried out at a mainstream school, (d) address face-to-face classroom teaching, (e) follow a quantitative methodology, and (f) be published in English (g) in a journal with peer-review. The literature search was carried out in ERIC and PsycINFO. A Boolean search expression was created, which is composed of terms for inclusion criteria a) through d). Inclusion criteria f) and g) were implemented using the settings of the EBSCO and ProQuest frontends. The search query resulted in 3582 records (13 December 2021). After coding all titles and abstracts with respect to the inclusion criteria (including criterion (e)), 792 studies were classified as potentially relevant. Currently, the full texts of these articles are being coded with respect to the inclusion criteria, and effect sizes as well as moderator variables (e. g. level and domain taught by the teachers, years in teaching, type of instructional quality measure) are being extracted. The meta-analysis will provide an overview of the current state of research of the relationships between cognitive and non-cognitive teacher characteristics and instructional quality. Findings concerning digitalization-related teaching will be available at the time of the conference and be discussed in the context of the role of teacher characteristics for instructional quality in general.

References:

Baumert, J., & Kunter, M. (2006). Keyword: Professional competencies of teachers (translated). *Zeitschrift für Erziehungswissenschaft,* 9(4), 469–520.

Gess-Newsome, J. (2015). A model of teacher professional knowledge and skill including PCK. In A. Berry, R. J. Friedrichsen & J. Loughran (Hrsg.), *Teaching and learning in science series. Re-examining pedagogical content knowledge in science education* (S. 28–42). London: Routledge.

Kunter, M. (2011). Motivation als Teil der professionellen Kompetenz – Forschungsbefunde zum Enthusiasmus von Lehrkräften. In M. Kunter, J. Baumert, W. Blum, U. Klusmann, S. Krauss & M. Neubrand (Hrsg.), *Professionelle Kompetenz von Lehrkräften: Ergebnisse des Forschungsprogramms COACTIV* (S. 259–275). Münster: Waxmann.

Rosen, Y., & Salomon, G. (2007). The differential learning achievements of constructivist technology intensive learning environments as compared with traditional ones: A meta-analysis. *Journal of Educational Computing Research,* 36(1), 1-14.

Vogel, F., Kollar, I., Wecker, C., & Fischer, F., (2013). *The Impact of CSCL Scripts on the Acquisition of Knowledge and Skills: A Meta-Analysis.* Paper presented at the 15th Biennial Conference of the European Association for Research on Learning and Instruction (EARLI), 2013. Munich, Germany.

Voss, T., Kleickmann, T., Kunter, M., & Hachfeld, A. (2011). Überzeugungen von Mathematiklehrkräften. In M. Kunter, J. Baumert, W. Blum, U. Klusmann, S. Krauss & M. Neubrand (Hrsg.), *Professionelle Kompetenz von Lehrkräften: Ergebnisse des Forschungsprogramms COACTIV* (S. 235–258). Münster: Waxmann.

Paper Session IV

Paper Session Single Paper paper_type_1 session 12	**Time:** 2.30 pm – 4.00 pm	**Location:** Lecture Hall (Vortragssaal)
Assigned Chair: Jan Henning-Kahmann, University of Education, Freiburg		

Assess the competencies for digital teaching of student teachers

Leilei Xie, Technical University Braunschweig, Germany; Marcus Friedrich, Technical University Braunschweig, Germany; Luzie Semmler, Technical University Braunschweig, Germany; Barbara Thies, Technical University Braunschweig, Germany

Keywords: Assessment methods and tools, Computer-assisted learning, Digital learning, Teacher education

Digital media are being used more and more in the classroom. On the one hand, this serves to prepare students for the digital world. On the other hand, the appropriate use of digital media in the classroom promotes learning achievement and motivation (Hillmayr et al. 2020). The appropriate use of digital media in the classroom requires special competencies from teachers, though (Voogt et al., 2013). These competencies are often measured through self-assessments. To date, however, there are only a few proficiency tests that capture the extent to which teachers have the competence to use digital media in the classroom in a motivating and learning-promoting manner (Lachner et al., 2019). This paper presents the development and testing of a corresponding test based on Schaumburg and Prasse's (2019) five functions of media use in the classroom: 1) motivating, 2) presenting and illustrating, 3) activating and elaborating, 4) individualizing and differentiating, 5) communicating and cooperating. The test consists of 83 items. The test was piloted in a cross-sectional study with 164 students. In addition to the newly developed test, measures of self-assessment of technological pedagogical knowledge, media-related self-efficacy, and intrinsic motivation to teach with digital media were also collected. Initial, preliminary analyses, which also included many items that were too easy, point to a 4-factor solution. In pending analyses, the factor analysis will be repeated without the too-easy items and the resulting factors will be correlated with the measures of self-assessment, self-efficacy, and intrinsic motivation for the construct validation of the test. The results are discussed with regard to the validity criteria of classical test theory and the benefits for teacher research.

References:

Hillmayr, D., Ziernwald, L., Reinhold, F., Hofer, S. I., & Reiss, K. M. (2020). The potential of digital tools to enhance mathematics and science learning in secondary schools: A context-specific meta-analysis. *Computers & Education,* 153. https://doi.org/10.1016/j.compedu.2020.103897

Lachner, A., Backfisch, I., & Stürmer, K. (2019). A test-based approach of Modeling and Measuring Technological Pedagogical Knowlege. *Computers & Education,* 142, 10365. https://doi.org/10.1016/j.compedu.2019.103645

Schaumburg, H. & Prasse, F. (2019). *Medien und Schule.* Bad Heilbrunn: Verlag Julius Klinkhardt.

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J. and van Braak, J. (2013), Technological pedagogical content knowledge – a review of the literature. *Journal of Computer Assisted Learning,* 29, 109-121. https://doi.org/10.1111/j.1365-2729.2012.00487.x

Structuring and measuring digital competencies of pre-service science teachers with DiKoLAN

Lena von Kotzebue, University of Salzburg, Austria; Sebastian Becker, University of Cologne, Germany; Christoph Thyssen, TU Kaiserslautern, Germany; Till Bruckermann, Leibniz University Hannover, Germany; Johannes Huwer, University of Konstanz, Germany; Alexander Finger, University of Leipzig, Germany; Monique Meier, University of Kassel, Germany; Erik Kremser, TU Darmstadt, Germany; Lars-Jochen Thoms, University of Konstanz, Germany

Keywords: Competences, Digital learning, Digital transformation, Teacher education

Teachers need subject-specific technology-related competencies for planning the implementation of digital technologies into lessons. Thus, especially for teacher education a structured description of relevant competencies is of central importance. However, most existing competency frameworks take just a general perspective into account and do not explicitly address subject-specific issues, e.g. DigCompEdu (Redecker, 2017). To overcome this limitation the framework for Digital Competencies for Teaching in Science Education (DiKoLAN), a subject-specific framework for pre-service science teachers, was developed (von Kotzebue et al. 2021). DiKoLAN, defines competency areas highly specific to science-subjects, as well as more general competency areas that include science aspects as well as aspects common to all subjects. The competency areas (Documentation, Presentation, Communication/Collaboration, Information Search/Evaluation, Data Aquisition, Data Processing, Simulation/Modeling) are based on typical planning areas of teaching and five identified use cases of ICT for learning activities in lessons (Eickelmann et al., 2017). All competency areas of DiKoLAN are described by competency expectations, which, in turn, are structured with reference to the TPACK framework (i.e., Technological Knowledge) and three levels of performance (Name, Describe, Use/Apply). Derived from DiKoLAN a corresponding self-assessment instrument (DiKoLAN-Grid) was developed and tested for two competency areas, Presentation (n = 118) and Information Search/Evaluation (n = 90) with pre-service biology teachers. The theory-based components (TK, TCK, TPK, TPACK) of both competency areas could be reliably assessed (Cronbach's α). Significant differences between the self-assessed competencies in the two areas were evident for TK ($t(87) = 7.33$, $p < 0.001$), TCK ($t(87) = 3.22$, $p < 0.01$), and TPK ($t(87) = -4.62$, $p < 0.001$), but not for TPACK ($t(87) = 0.15$, $p = 0.88$). For both competency areas path models were used to analyze structural relationships of each of the four TPACK components. The results indicate that TPACK is predicted by TK, TCK, TPK to a different extent depending on the competency area, e.g. for Information Search/Evaluation TK was a predictor of TPACK ($\beta = 0.19$, $SE = 0.112$, $p = 0.027$) whereas it was not for Presentation ($\beta = 0.00$, $SE = 0.089$, $p = 0.959$). The differing results obtained for both competency areas may indicate, that the relevance of the individual components in terms of their specific influence on TPACK differ in dependence on the competency area under consideration, which might explain varying results in subject-unspecific surveys and studies focusing on different contexts.

References:

Eickelmann, B., Lorenz, R., & Endberg, M. (2017). Lernaktivitäten mit digitalen Medien im Fachunterricht der Sekundarstufe I im Bundesländervergleich mit besonderem Fokus auf MINT-Fächer. In R. Lorenz, W. Bos, M. Endberg, B. Eickelmann, S. Grafe & J. Vahrenhold (Hrsg.), *Schule digital – der Länderindikator 2017* (S. 231–260). Waxmann.

Redecker, C. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu*; Publications Office of the European Union Luxembourg.

Von Kotzebue, L., Meier, M., Finger, A., Kremser, E., Huwer, J., Thoms, L.-J., Becker, S., Bruckermann, T., Thyssen, C. (2021). The Framework DiKoLAN (Digital Competencies for Teaching in Science Education) as Basis for the Self-Assessment Tool DiKoLAN-Grid. *Education Sciences,* 11(12), 775. doi:10.3390/educsci11120775

Student teachers' demands for digital teaching competencies: instrument development and evaluation

Jan Henning-Kahmann, University of Education, Freiburg, Germany; Katharina Hellmann, University of Education Freiburg, Germany

Keywords: Assessment methods and tools, Competences, Digital learning, Teacher education

In order to adequately support young learners in gaining digital learning competencies, teachers need to hold not only digital competencies themselves, but also profound *digital teaching competencies* (Redecker, 2017). However, findings show that preservice and inservice teachers in Germany generally strive for a better preparation for teaching and learning with digital media throughout all phases of professionalization (Lorenz, Endberg & Eickelmann, 2019). Universities, as first formal educational institutions of teachers' professionalization process, play a central role in offering preservice teachers adequate learning opportunities, thus allowing for the development of profound digital competencies. Tailoring university actions for fostering such competencies to different target groups and needs, however, requires to identify and describe student teachers` demands. Lacking a reliable and valid instrument to capture such needs, this paper describes the development and psychometric evaluation of a questionnaire to measure student teachers' demands for acquiring and/or improving digital teaching competencies. Based on a heuristic theoretical framework of teachers' digital key competencies (FLDCB, 2017), a set of 19 items was developed that covers teachers' needs with regard to digital competencies in all phases of the teaching process.

In two studies with primary and secondary level student teachers participating in an online survey at a German University of Education, we applied the „detection of misspecification"-approach (Saris, Satorra & van der Veld, 2009) within confirmatory factor analyses to investigate the instruments` structure as well as reliability and validity. In the first study (N = 254) we could provide evidence for a 4-factorial measurement model, but also uncovered necessary item revisions. Evaluating the revised instrument in a second study (N = 232), results showed the model to comprise an additional factor conceptualizing the demands for digital teaching competencies by five dimensions (Planning, Development, Implementation, Evaluation, Sharing). Additionally, a bifactor-(S-1) model revealed that a general factor (representing the more global aspects of Planning) could not explain a substantial amount of variance, thus supporting the use of reliable subscale scores instead of a sum score. Also, indications of criterion validity support a valid interpretability of the scores. These findings will be discussed in light of the instruments` potential for supporting the alignment of teacher education to the demands of digital transformation as well as its possible use in research contexts.

References:

Forschungsgruppe Lehrerbildung Digitaler Campus Bayern (FLDCB, 2017). Kernkompetenzen von Lehrkräften für das Unterrichten in einer digitalisierten Welt. *Merz Medien + Erziehung, Zeitschrift für Medienpädagogik,* 4, 65–74.

Lorenz, R., Endberg, M. & Eickelmann, B. (2019). Medienbezogene Kompetenzen von Lehrpersonen – Empirische Befunde und Perspektiven für die Lehrerausbildung. In T. Ehmke, P. Kuhl & M. Pietsch

(Hrsg.), *Lehrer. Bildung. Gestalten. Beiträge zur empirischen Forschung in der Lehrerbildung* (S. 142–152). Weinheim: Beltz-Verlag.

Redecker, C. (2017). European Framework for the Digital Competence of Educators: DigCompEdu. Punie, Y. (ed). EUR 28775 *EN. Publications Office of the European Union,* Luxembourg.

Saris, W. E., Satorra, A. & van der Veld, W. M. (2009). Testing Structural Equation Models or Detection of Misspecifications? *Structural Equation Modeling: A Multidisciplinary Journal,* 16(4), 561–582.

Paper Session Single Paper paper_type_1 session 2	Time: 2.30 pm – 4.00 pm	Location: Big Club Room (Großer Clubraum)
Assigned Chair: Tonje Stenseth, University of South-Eastern Norway, Norway		

Identifying factors for teachers' different ways of initiating digital learning activities

Anne Lohr, Ludwig-Maximlians-University Munich, Germany; Michael Sailer, LMU Munich, Germany; Matthias Stadler, LMU Munich, Germany; Frank Fischer, Ludwig-Maximilians-University (LMU), Germany

Keywords: Digital learning, Teacher, Teaching/instruction, Technology

The aim of this empirical study is to, first, address the lack of systematic research on teachers' initiation of learning activities with digital technologies. Second, it is to identify school-related and teacher-related factors associated with their occurrence.

Based on a representative survey of N = 670 teachers in primary and secondary schools in Germany (region: Bavaria), we investigate (a) to what extent we can identify teacher profiles based on how often teachers initiate different types of digital learning activities. We differentiate passive digital learning activities as well as active, constructive and interactive digital learning activities ("active learning") (Chi & Wylie, 2014). For students' acquisition of declarative knowledge, passive and active learning activities are sufficient, whereas constructive and interactive learning activities can foster the acquisition of complex skills. We further investigate (b) to what extent school-related factors (engagement of school administration; technical and pedagogical support; institutional infrastructure) and teacher-related factors (basic digital skills; technology-related teaching skills) are associated with teachers' profiles and (c) to what extent the type of school influences teachers' profiles.

Results of an exploratory cluster analysis showed two distinct profiles of teachers: teachers who mostly initiated passive and active digital learning activities (N = 238; profile 1); and teachers who initiated all four digital learning activities to a similar degree (N = 349; profile 2). A structural equation model with the profiles as binary, dependent variable showed that only technology-related teaching skills were significantly positively correlated with teachers' affiliation with profile 2. We found no evidence that school-related factors and teachers' basic digital skills were directly related to teachers' profiles. In secondary schools, compared to primary schools, profile 2 occurred more often.

In conclusion, we found that teachers initiate active learning in two different ways. Compared to a study by Lohr et al. (2021) in higher education, we did not find a profile in which teachers only fostered students' passive learning. Teachers in profile 1 foster students' acquisition of declarative knowledge whereas teachers in profile 2 additionally foster students' complex skills. Technology-related teaching skills seem to be essential for teachers fostering students' complex skills. School-related factors and teachers' basic digital skills do not seem to make a difference. This highlights the importance to more systematically support teachers in fostering their technology-related teaching skills. The results further highlight the role of type of school. Possible reasons why secondary school teachers are providing a broader spectrum of learning activities are higher age and better self-regulation skills of secondary school students, which allow teachers to pursue different learning goals and different ways to conduct lessons.

References:

Chi, M. T. H., & Wylie, R. (2014). The ICAP Framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, 49(4), 219–243. https://doi.org/10.1080/00461520.2014.965823

Lohr, A., Stadler, M., Schultz-Pernice, F., Chernikova, O., Sailer, M., Fischer, F., & Sailer, M. (2021). On powerpointers, clickerers, and digital pros: Investigating the initiation of digital learning activities by teachers in higher education. *Computers in Human Behavior*, 119, 106715. https://doi.org/10.1016/j.chb.2021.106715

Assessing sources used by teacher trainees while preparing lesson plans — log-file data analysis

Jennifer Fischer, Johannes Gutenberg-Universitaet, Germany; Olga Zlatkin-Troitschanskaia, Johannes Gutenberg University, Germany; Marie-Theres Nagel, Johannes Gutenberg University Mainz, Germany; Ann-Kathrin Bültmann, Johannes Gutenberg- University, Germany; Susanne Schmidt, Johannes Gutenberg- University Mainz, Germany; Andreas Maur, Johannes Gutenberg- University Mainz, Germany

Keywords: Assessment methods and tools, Beginning teachers, Pre-service teacher education, Teacher professional development

The competent use of online media while preparing lessons, e.g. to research a teaching topic, is highly significant for teachers (König et al., 2020b). However, studies show they often lack a critical-reflective approach when dealing with (online) media (Amin, 2016; Hague & Payton, 2010). To properly prepare teachers for work in their profession, it is important to analyse and foster teacher trainees' use of (online) media in job-related education and working practice. The "Referendariat," the practical post-university phase of teacher training in Germany, serves as an important transition between the (more fundamental and theoretical) education at university and the start of teachers' professional careers. During this phase, teacher trainees develop graded lesson plans and teach lessons based on them (König et al., 2020a). To prepare high-quality lesson plans, the use of (online) information sources, a crucial facet of teacher professional competence, is relevant (König et al., 2020b; Bäsler, 2019).

To research teacher trainees' actual media use in professional situations, we captured the sources used while they prepared lesson plans in a realistic online environment and gathered process data (e.g. time-stamped log files and an activity log) and performance data (e.g. test results). The use of non-digital sources was captured via additional online self-reports (for details, Authors et al., 2021).

To classify online sources teacher trainees used while preparing their lesson plans regarding their general quality, we developed a categorization framework and corresponding rating scheme based on an integration of research approaches and models (Authors et al., 2020, Schudson, 2001; Urban & Schweiger, 2013). This scheme consists of five main categories and sub-categories (Table 2). Additionally, the sources were evaluated by experts from teacher training and practice with regard to the topicality, topic relevance, reliability of the source and its overall quality (Table 3). For a descriptive sample description, see Table 1.

On average, participants used 8–9 sources. Remarkably, the participants used fewer non-digital (N=44) than online sources (e.g., Wikipedia articles; N=77) in total. Online sources that were either classified as the highest or lowest category make up 77% of all sources used. Strong differences between participants' search behaviour, i.e. number and category of sources used, were observed. In the lowest category, the subcategories online shops and social media sites (e.g. YouTube or various teacher

forums/platforms) were consulted primarily. The most frequently used websites were those of government bodies. Although non-digital sources used were exclusively educational and research textbooks, thus classified high regarding credibility, they were not always suitable in terms of relevance or general quality (Table 3).

These and additional results from analyses allow a unique insight into the use of media by teacher trainees in real, practical job situations and into how this skill influences the quality of lessons plans (and potentially of lessons themselves). It becomes evident which skill requirements for competently using high-quality online information teacher trainees already fulfil and where they still lack the required skills, which can then help improve the education and training of (prospective) teachers.

References:

Authors et al. (2020)

Authors et al. (2021)

Amin, J. (2016). Redefining the Role of Teachers in the Digital Era. *International Journal of Indian Psychology*, 3(3). https://doi.org/10.25215/0303.101

Bäsler, S.-A. (2019). *Lernen und Lehren mit Medien und über Medien: Der mediale Habitus und die Ausbildung medienpädagogischer Kompetenz bei angehenden Lehrkräften* [Dissertation]. Technische Universität Berlin.

Hague, C., and Payton, S. (2010). *Digital Literacy Across the Curriculum*. Futurelab.

König, J., Bremerich-Vos, A., Buchholtz, C., Fladung, I., & Glutsch, N. (2020a). Pre-service teachers' generic and subject-specific lesson-planning skills: On learning adaptive teaching during initial teacher education. *European Journal of Teacher Education*, 43 (2), 131-150.

König, J., Jäger-Biela, D., & Glutsch, N. (2020b). Adapting to online teaching during COVID-19 school closure: Teacher education and teacher competence effects among early career teachers in Germany. *European Journal of Teacher Education*, 43(4), 608-622.

Schudson, M. (2001). The Objectivity Norm in American Journalism. *Journalism,* 2(2), 149–170.

Urban, J. & Schweiger, W. (2013). News Quality from the Recipients‘ Perspective. *Journalism Studies*, 15(6), 821–840.

Teachers’ transformative agency and technology use in one-to-one classrooms - a descriptive study

Tonje Stenseth, University of South-Eastern Norway, Norway; Gunstein Egeberg, University of South-Eastern Norway, Norway; Line Ingulfsen, University of South-Eastern Norway, Norway

Keywords: Digital learning, Digital transformation, Quantitative methods, Teaching/instruction

The introduction of tablets in schools creates new opportunities for teaching and learning. However, the complexity of technology-supported learning processes also poses several challenges for teachers. For example, the digital transition might produce a gap between teachers’ existing didactical competence and digital classroom contexts requiring new competence when designing teaching and learning activities (Yeh, Chan & Hsu, 2021). This gap prepares the ground for transformative agency (TA), in which according to Haapasaari and Kerosuo (2015, p.37), “manifests itself when practitioners solve conflicts and disturbances during the development of their local activity

and work practices". In this paper, we use and understand double stimulation (Vygotsky, 1978) as an underlying principle of TA, with the first stimulus (S1) representing a challenging situation (here; teaching in technology-rich classrooms), and the second stimulus (S2) representing a series of stimuli or actions taken in order to improve on the current situation (here; teachers' didactical use of iPads).

Given empirical findings demonstrating teachers' narrow and limited uptake of ICT for pupils' learning in technology-rich classrooms (Blikstad-Balas & Klette, 2020), we need more insight in teachers' TA related to technology use. More specifically, the current paper will focus on teachers' TA in relation to the use of iPads in one-to-one classrooms.

Based on this background, we propose the following research questions:

What characterizes teachers' expectations regarding their didactical use of iPads in one-to-one classrooms?

How does teachers' use of tablets in one-to-one classrooms relate to TA?

The study builds on survey data collected from three municipalities in South-East Norway which have implemented tablets (iPads) as a learning resource for all pupils. The survey concerns teachers' experiences with the use of one-to-one iPad at their respective schools using a repeated cross-sectional design utilizing a 124-item questionnaire (*N*=801, participation = 78.9 %).

Preliminary, descriptive findings reveals that 24-44% of the participants score between 1-3 on a 7-point Likert scale addressing to what extent teachers master didactic facilitation of iPads in teaching activities (1 = do not master, 7 = master to a large extent). Hence, this indicates that a considerable group of the current teachers having challenges related to didactic competence in digital classrooms (S1s). Furthermore, almost 70% of the participants reported pupils' task-unrelated work on their individual iPads as a significant problem during time in class (S1). These and other findings will be elaborated in the presentation.

References:

Blikstad-Balas, M. & Klette, K. (2020). Still a long way to go. Narrow and transmissive use of technology in the classroom. *Nordic Journal of Digital Literacy,* 15(1), 55-68.

Haapasaari, A. & Kerosuo, H. (2015). Transformative agency: The challenges of sustainability in a long chain of double stimulation. Learning, Culture and Social Interaction, 4, 37-47.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Yeh, Y.-F., Chan, K.K.H. & Hsu, Y.S. (2021). Toward a framework that connects individual TPACK and collective TPACK: A systematic review of TPACK studies investigating teacher collaborative discourse in the learning by design process. *Computers & Education,* 171.

Paper Session Single Paper paper_type_1 session 18	Time: 2.30 pm – 4.00 pm	Location: Seminar Room II (Seminarraum II)
Assigned Chair: Frank Hellmich, Paderborn University, Germany		

Teachers' intentions to deal with heterogeneity in inclusive and non-inclusive primary schools

Marwin Felix Loeper, Paderborn University, Germany; Gamze Görel, Paderborn University, Germany; Frank Hellmich, Paderborn University, Germany

Keywords: Attitudes and beliefs, In-service teacher education, Primary education, Self-efficacy

With the ratification of the UN-Convention on the Rights of Persons with Disabilities, questions concerning the conditions for successful inclusive education arose. It is currently a crucial request of inclusive research to clarify the role of teachers' professional competencies and personal qualifications for the implementation of beneficial learning processes for all students in the inclusive classroom.

In recent years, the 'Theory of Planned Behavior' (Ajzen, 1991) was considered to verify determinants of teachers' professional behavior in inclusive education. By means of his theory, Ajzen (1991) initially tried to explain human behavior in ordinary and challenging situations. Therefore, he assumed that an individual's intention to cope with a challenging situation is predicted by the persons' attitude towards the challenging situation, the behavioral control, and the perceptions of social norms – such as significant other's expectations. In the context of inclusive education, the 'Theory of Planned Behavior' (Ajzen, 1991) has been applied to verify determinants of teachers' intentions to deal with heterogeneity in the classroom. Thus, it has been examined if teachers' intentions to deal with heterogeneity can be explained by their attitudes towards inclusion, their self-efficacy, and their perceptions of significant other's expectations (e.g., school principals' expectations). So far, the 'Theory of Planned Behavior' (Ajzen, 1991) has only been confirmed to some extent in several studies (e.g., Malak, Sharma, & Deppeler, 2018). It remains unclear if primary school teachers with and without experiences from inclusive education differ in the prediction of their intentions to deal with heterogeneity by their attitudes, their self-efficacy, and their perceived school principals' expectations.

In our study, N=290 primary school teachers (inclusive schools: *n*=148 teachers; non-inclusive schools: n=138 teachers) completed a questionnaire on their attitudes, their self-efficacy, their principals' expectations, and their intentions to deal with heterogeneity. To examine if teachers in inclusive and non-inclusive schools differ in the explanation of their intentions to deal with heterogeneity, we conducted a multi-group comparison of a structural equation model in Mplus. At first, we found scalar measurement invariance. Beyond that, the results indicate significant differences in the explanation of teachers' intentions to deal with heterogeneity. Thus, the intentions of teachers in inclusive schools are predicted by their attitudes and their self-efficacy, but not by their perceived principals' expectations. In contrast, the intentions of teachers in non-inclusive schools can be explained by their perceived principals' expectations and their self-efficacy, but not by their attitudes. Overall, our study contributes to clarify the role of personal determinants (e.g., attitudes and self-efficacy beliefs) and perceived social norms for the intentions to deal with heterogeneity of teachers in inclusive and non-inclusive primary schools.

References:

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.

Malak, S., Sharma, U., & Deppeler, J. M. (2018). Predictors of primary schoolteachers' behavioural intention to teach students demonstrating inappropriate behaviour in regular classrooms. *Cambridge Journal of Education,* 48(4), 495–514.

Digital learning materials in inclusive settings in teaching of history. An eye-tracking study

Keywords: Digital learning, Learning disabilities, Learning technologies, Primary education

Ines Oldenburg, University of Oldenburg, Germany; Dorthe Behrens, University of Oldenburg, Germany

School-based learning processes often start with the use of visual information (Jarodzka et al., 2017, p. 2). Cognitive Load Theory (Sweller, 1988) and Cognitive Theory of Multimedia Learning (Mayer, 2001) focus on crucial variables for successful learning, particularly relevant for pupils with learning problems (Gold, 2018). Especially in regard to visual processing of multimedia content which comprises text and pictures, e-learning strategies (split-attention effect, spatial contiguity principle) provide important and empirically founded background for devising effective digital learning environments.

Eye tracking is a method for measuring visual attention (Lehner, 2016). Educational research is showing increasing interest in it (Jarodzka et al. 2017, Lai et al., 2013) to design effective learning environments: (Jarodzka et al., 2017, p. 3). Nevertheless little research has been done on the eye movements of primary school children during the visual perception of illustrated texts (Hannus & Hyöna, 1999, Jarodzka et al., 2017),esp. in history lessons in primary schools.

This study focuses on pupils´ eye movement while viewing learning material for history lessons examining the question, which factors have to be considered for the design of digital learning materials for inclusive learning groups in primary social sciences contexts.

The research question is:

How do heterogeneous student groups differ in regard to their visual perception of illustrated learning material?

The sample consists of 60 third grade students, which is a large sample in terms of eye tracking studies. Differences in performance are operationalised through reading competences (Salzburger Lesescreening). Their eye movements (fixations, saccades) during work with an illustrated text are recorded. The analysis of the data show– contrary to expectations – that low level as well as high level readers fixate illustrations with negligible quantities. Illustrations remain unnoticed as decorative elements (Jarodzka et al., 2017, p. 3). The further analyses compare the visual attention of high and low level readers, taken into account the aforementioned *split-attention effect* and the *spatial contiguity principle*.

Findings offer evidence for designing digital learning materials for inclusive teaching, e.g. the necessity of content-related combination of text and graphic elements.

References:

Gold, A. (2018). *Lernschwierigkeiten. Ursachen, Diagnostik, Intervention.* Stuttgart: Kohlhammer.

Hannus, M. & Hyönä, J. (1999). Utilization of Illustrations during Learning of Science Textbook Passages among Low-and High-Ability Children. *Contemporary educational psychology 24*, Issue 2, pp. 95-123.

Jarodzka, H. et al. (2017). Eye tracking in Educational Science: Theoretical frameworks and research agendas. *Journal of Eye Movement Research*, 10(1), pp. 1–18.

Lai, M.-L., Tsai et al. (2013). A review of using eye-tracking technology in exploring learning from 2000 to 2012. *Educational Research Review*, 10, pp. 90–115.

Lehner, F. (2016). Eyetracking als Methode der Erforschung des visuellen Verstehens. In Glas, A. et al. (Hrsg), Sprechende Bilder .... München: kopaed, pp. 567-578.

Mayer, R. E. (2001). *Multimedia Learning*. Cambridge: Cambridge University Press.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, Issue 2, pp. 257-285.

Pre-service teachers' team-teaching practices and children's competence development

Frank Hellmich, Paderborn University, Germany; Fabian Hoya, Paderborn University, Germany; Jan R. Schulze, Paderborn University, Germany; Eva Blumberg, University of Paderborn, Germany

Keywords: Competences, In-service teacher education, Motivation, Primary education

Currently, there are numerous questions concerning the implementation of inclusive learning processes in primary schools. One important question concerns the enhancement of teachers' competencies for inclusive learning in schools. In particular, the cooperation of primary school teachers and special needs teachers is regarded as an important prerequisite for children's successful learning processes in inclusive schools. Following Saloviita and Takala (2010), cooperation in inclusive classrooms occurs if two or more teachers equally manage learning processes and assume the responsibility for all children. Inclusive learning processes mastered by teachers cooperatively in teams are correlated to the best possible support of all learners in the classroom (Saloviita & Takala, 2010). However, studies give evidence that there are various challenges if teachers cooperate in inclusive classrooms, such as different ideas of managing learning processes, working agreements and role clarities (Nel, Engelbrecht, Nel, & Tlale, 2014; Shaffer & Thomas-Braun, 2015). Teachers evaluate team-teaching as not successful, if essential structures are missing or if personal relationships are difficult (e.g., Gurgur & Uzuner, 2011). Currently, there are hardly any studies concerning the role of the composition of teams for students' competence and motivational development in inclusive classrooms. Thus, we investigated children's competence development depending on a variation of the team composition.

In our study, N = 142 pre-service primary school teachers and pre-service special needs teachers participated in a training to acquire competencies concerning their cooperation in inclusive education. Afterwards, they were assigned to one of our study groups. While half of the pre-service teachers could choose their tandem partners, the other half was arranged in pairs randomly. The pre-service teachers planned in tandems science lessons on the subject of renewable energies and taught groups of children in inclusive primary schools over a period of three lessons. On the basis of pre- and post-questionnaires, we investigated N = 804 primary school students' competence and motivational development. Children who were taught by pre-service teachers in freely selected teams showed significant knowledge growth in a test on the subject of renewable energies compared to children who were taught by pre-service teachers in not freely selected teams. Significant differences between the study groups could not be proven concerning children's learning motivation.

In summary, the results of our study give indications that the well-considered composition of teams who teach in inclusive classrooms is an important prerequisite for students' competence development.

References:

Gurgur, H. & Uzuner, Y. (2011). Examining the implementation of two co-teaching models: Team teaching and station teaching. *International Journal of Inclusive Education*, 15(6), 589–610.

Nel, M., Engelbrecht, P., Nel, N., & Tlale, D. (2014). South African teachers' views of collaboration within an inclusive education system. *International Journal of Inclusive Education,* 18(9), 903–917.

Saloviita, T. & Takala, M. (2010). Frequency of co-teaching in different teacher categories. *European Journal of Special Needs Education,* 25(4), 389–396.

Shaffer, L. & Thomas-Brown, K. (2015). Enhancing teacher competency through co-teaching and embedded professional development. *Journal of Education and Training Studies,* 3(3), 117–125.

Paper Session V

Paper Session Single Paper paper_type_1 session 24	**Time:** 4.15 pm – 5.45 pm	**Location:** Auditorium (Veranstaltungssaal)
Assigned Chair: Jan R. Schulze, Paderborn University, Germany		

Computer modeling in geography teacher education

Rieke Ammoneit, Philipps University of Marburg, Germany

Keywords: Computer-supported collaborative learning, Design based research, Model-based reasoning, Science education

Epistemological understanding and discipline-specific content knowledge require an understanding of the basics of the corresponding technology in many fields. Information and computer technology are, thus, not only educational goals but also means of acquiring subject-specific knowledge needed for teaching. Modeling, for example, is an important scientific practice that relies on computer implementation. This design-based research study presents a geography course in computer modeling. It was implemented in a teacher-student and a bachelor of science class. Three accompanying interviews monitored the learning process to investigate the interconnections between the learning process and outcome and the difference between the two study groups. The study combines two qualitative strands using a concurrent multi-method approach to describe learning processes and outcomes. (1) The learning process was recorded in interviews about difficulties and key moments, which were conducted at three points in time and evaluated using inductive content analysis. (2) The students' final reports were assessed to measure their final modeling performance, and the results were evaluated in a deductive approach along with a competency model and then clustered. There were no noticeable differences between the bachelor and teacher training students; clustering and analysis identified four types of learners: reproductive, technical, reconstructive, and conceptual. The types of learners reacted differently to the methodical and technological challenges they were confronted with during the course. Overall, the gap in technological understanding was surprisingly big, and by avoiding challenges, some students did not progress during the course.

References:

Ammoneit, R., Reudenbach, C., Turek, A., Nauss, T., & Peter, C. (2019). Geographische Modellierkompetenz – Modellierung von Raum konzeptualisieren. GW-Unterricht(4), 19–29. https://doi.org/10.1553/gw-unterricht156s19

Ammoneit, R., Reudenbach, C. & Peter, C. (unter revision). Developing geographic computer modeling competencies in higher education. *Journal of Geography in Higher Education*.

NGSS. (2013). *Next Generation Science Standards: For States, By States.* The National Academies Press. https://www.nap.edu/catalog/18290/next-generation-science-standards-for-states-by-states https://doi.org/10.17226/18290

Upmeier zu Belzen, A., Krüger, D., & van Driel, J. (Eds.). (2019). *Models and Modeling in Science Education: v.12. Towards a competence-based view on models and modeling in science education* [electronic resource]. Springer.

Vasconcelos, L., & Kim, C. (2020). Coding in scientific modeling lessons (CS-ModeL). *Educational Technology Research and Development,* 68(3), 1247–1273. https://doi.org/10.1007/s11423-019-09724-w

Wilensky, U. (1999). *NetLogo [Computer software].* Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL. http://ccl.northwestern.edu/netlogo/

Gaining Online Teaching Skills through High-Quality Online Courses

Christian Müller, University of Passau, Germany

Keywords: Competences, Design based research, E-learning, Higher education

The main idea of this paper is that using well-designed online courses as a method in teacher education can improve skills of future teachers. This may cause learning experiences that can have an impact on future teaching styles in the participants' professional future (Kiehne 2015). Positive experiences in taking online courses can potentially help gain digital teaching and learning skills of future teachers. A prerequisite for that is dealing with high-quality and well tutored online courses.

Covid-19 forced teachers and learners into distance learning and teaching formats. Classroom habits have often been transformed into online classroom scenarios in synchronous online teaching without considering specific research on online teaching. Researchers in online and distance learning have used a specific term to describe the special circumstances during crisis periods: emergency remote teaching (Hodges et al. 2020).

Teaching online requires skills that are mapped in the European Framework for the Digital Competence of Educators (DigCompEdu) as digitally related competencies (EU 2017). The use of virtual learning environments and the implementation of online learning activities, as well as scaffolding through supporting moderation (Salmon 2011) are some more specific key competencies for 21st century teachers. Both, learners and teachers, have to know how to deal with online courses (Best & MacGregor 2017). These skills should be considered as an additional learning target for future educators in online courses and they should be communicated very clear as learning targets in online courses (Reichelt et al. 2019) independently from subject matters.

In the presented example of a university online course (3 ECTS) in Media Education with 239 participants, a pre-post-test was conducted on the use of virtual learning environments. The students were asked to self-evaluate before and after taking the online course. The course was implemented by an interdisciplinary expert team and has been externally evaluated and certified for its quality in technical and curricular aspects.

References:

Best, Marnie; MacGregor, Denise (2017): Transitioning Design and Technology Education from physical classrooms to virtual spaces: implications for pre-service teacher education. In: *Int J Technol Des Educ 27* (2), S. 201–213. DOI: 10.1007/s10798-015-9350-z .

EU, Europäische Kommission (2017). *Europäischer Rahmen für die Digitale Kompetenz von Lehrenden (Dig-CompEdu)*. https://ec.europa.eu/jrc/sites/jrcsh/files/digcompeduleaflet de-2018-09-21pdf.pdf. last access 19.01.2022.

Hodges, C.; Moore, S.; Lockee, B.; Trust, T. and Bond, A. (2020): *The Difference Between Emergency Remote Teaching and Online Learning. EDUCAUSE*. Online verfügbar unter

https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning, last access 19.01.2022.

Kiehne, Bjorn (2015): *Die Biografie lehrt mit: eine qualitative Untersuchung zum Zusammenhang von Lernbiografie und Lehrüberzeugung bei Nachwuchslehrenden*. Place of publication not identified: Waxmann Verlag Gmbh. Online https://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=1135850.

Reichelt, Maria; Kämmerer, Frauke; Finster, Ludwig (2019): *Lehrziele und Kompetenzmodelle beim E-Learning*, S. 1–16. DOI: 10.1007/978-3-662-54373-3_15-1 .

Salmon, G. (2011). *E-moderating: The key to teaching and learning online* (3rd ed.). New York: Routledge.

Teachers' and primary school students' experiences of online inquiry project

Norbert Erdmann, University of Turku, Finland; Mirjamaija Mikkila-Erdmann, University of Turku, Finland

Keywords: Inquiry learning, Primary education, Science education, Self-efficacy

Introduction

This study investigates class teachers' and six-graders' experiences of online inquiry in science context. The learning in schools is changing. Traditionally, supporting students' learning of literacy has been important. Nowadays online inquiry is emphasized in current European curricula even in primary education. By online inquiry we mean the process of searching for information in the Internet, evaluating the reliability of retrieved sources and writing a synthesis based on the sources (Zhang & Quintana, 2012). Teachers as key agents for educational change play a critical role in teaching this competence (Shin, 2015). However, current studies indicate that online inquiry still seems to be a challenge in schools (Kiili et al., 2017). So, this study explores: How do teachers find teaching online inquiry in science context? How do six-graders experience online inquiry?

Methodological design

The participants were three primary school teachers and their students (n=56) who took part in science online inquiry project concerning "energy". The project took place in an authentic classroom environment and covered 12 lessons. The students learnt online inquiry skills, basic knowledge about energy based on a textbook, and finally, they did online inquiry tasks like:" What will happen if insects disappear?". Group interview was conducted with teachers covering challenges of teaching online inquiry and role of textbooks. The students answered a questionnaire concerning their self-efficacy, expectations, experiences and perceptions of online inquiry.

Findings

The results indicate that teachers were satisfied with the project supporting learning about energy using online inquiry. The role of motivating inquiry tasks was emphasised that facilitated students' comprehension of an abstract concept like energy. Teachers need help in designing meaningful online inquiry tasks. Also the role of textbooks was found important for knowledge construction. Considering the didactic structure while using online inquiry is challenging. Every single step of online inquiry has to be taught, and time consuming. Furthermore, the online inquiry should be performed without interruptions. This requires manifold scaffolding and individual support from teacher.

When considering students experiences, they have a high self-efficacy in online-inquiry. They use and learn to use the Internet mainly on their own at home, seldom at school. Their expectations from school to support them in Internet learning were modest. They were moderately satisfied with the project.

The Internet as learning environment for online inquiry seems to be challenging for both the children and the teacher.

1. How to support teachers in teaching online inquiry?
2. How can students' informal online inquiry practice support learning at school?
3. What is the role textbooks in the era of Internet?

References:

Kiili, C., Leu, D. J., Marttunen, M., Hautala, J., & Leppänen, P. H. T. (2018). Exploring early adolescents' evaluation of academic and commercial online resources related to health. *Reading and Writing,* 31(3), 533–557.

Shin, W. S. (2015). Teachers' use of technology and its influencing factors in Korean elementary schools. *Technology, Pedagogy and Education,* 24(4), 461-476.

Zhang, M., & Quintana, C. (2012). Scaffolding strategies for supporting middle school students' online inquiry processes. *Computers & Education*, 58(1), 181-196.

Paper Session Single Paper paper_type_1 session 19	**Time:** 4.15 pm – 5.45 pm	**Location:** Lecture Hall (Vortragssaal)
Assigned Chair: Anika Radkowitsch, Leibniz Institute for Science and Mathematics Education (IPN), Germany		

How Can Case Comparison Support Knowledge Acquisition?

Julia Kienzler, University Freiburg, Germany; Thamar Voss, University of Freiburg, Germany; Joerg Wittwer, University of Freiburg, Germany

Keywords: Beginning teachers, Case studies, Knowledge creation, Teacher education

The career entry phase is challenging for many teachers (Tynjälä & Heikkinen, 2011). One reason is that beginning teachers feel inadequately prepared to manage classroom situations (e.g., Schmidt et al., 2016). Therefore, having classroom management skills is a central resource for teachers and buffers against emotional exhaustion (e.g., Dicke et al., 2015). An important aspect of classroom management is knowledge about operant conditioning, such as how to reinforce positive student behavior. Operant conditioning can be used to prevent student misbehavior and maximize time on task (Little & Akin-Little, 2003). However, teachers are often skeptical of the potential of operant conditioning and have a poor understanding of its principles (e.g., Dovey et al., 2017; Maag, 2001). One way to enhance student teachers' acquisition of conceptual knowledge is the method of

case comparison (Alfieri et al., 2013). Learning with multiple cases prompts learners to develop a conceptual understanding by making analogies. The resulting representation enables learners to flexibly transfer their knowledge to future cases (Schwartz et al., 2011). However, how to design case comparison most effectively remains an open question. Thus, in our study, we examined how case comparison should be effectively implemented to promote the student teachers' acquisition of conceptual knowledge about the principles of operant conditioning.

N = 181 student teachers participated in the experimental study following a 2 x 2 factorial design. We experimentally varied the degree of instructional guidance during case comparison by (a) presenting theoretical input about the principles of operant conditioning *before* or *after* case comparison and (b) *providing* or *withholding* key features (i.e. prompts) for case comparison.

We examined the effects of different levels of instructional guidance during case comparison on learning, instructional efficiency, and beliefs about operant conditioning.

Our results showed that case comparison effectively promoted the acquisition of knowledge about operant conditioning. Knowledge acquisition was higher with more guidance during case comparison: We found a large and significant main effect of key features provided (vs. witholded), $F(3, 169) = 6.533$, $p < .001$, $\eta^2 = .11$. Furthermore, more guidance was associated with higher instructional efficiency as student teachers learned with lower mental effort, $F(1, 175) = 15.57$, $p < .001$, $\eta^2 = .08$. In addition, the results of a multi-categorical mediation analyses (Hayes & Preacher, 2014) showed that higher germane load and lower extraneous load mediated the effect of instructional guidance on learning. In a repeated-measurement analysis of variance with *measurement point* as the within-subject factor we found evidence that case comparison was also associated with a shift in student teachers' beliefs, with more appropriate beliefs about operant conditioning after case comparison ($F(1, 169) = 105.16$, $p < .001$, $\eta^2 = .38$).

Thus, the results indicate that case comparison is an effective approach to promote the acquisition of conceptual knowledge and positive beliefs about operant conditioning. Based on these results, we have

developed a digital learning unit on classroom management, which is now being used successfully in our teacher training program.

References:

Alfieri, L., Nokes-Malach, T. J., & Schunn, C. D. (2013). Learning through case comparisons: A meta-analytic review. *Educational Psychologist*, 48(2), 87–113. https://doi.org/10.1080/00461520.2013.775712

Dicke, T., Elling, J., Schmeck, A., & Leutner, D. (2015). Reducing reality shock: The effects of classroom management skills training on beginning teachers. *Teaching and Teacher Education*, 48, 1–12. https://doi.org/10.1016/j.tate.2015.01.013

Dovey, T. M., Francis, R., Corbett, S., & Dibb, B. (2017). Perception and use of reinforcement by special education teachers. *Journal of Research in Special Educational Needs,* 17(4), 282–293. https://doi.org/10.1111/1471-3802.12386

Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*, 67(3), 451– 470. https://doi.org/10.1111/bmsp.12028

Little, S. G., & Akin-Little, K. A. (2003). Classroom management. In W. T. O'Donohue, J. E. Fisher, & S. C. Hayes (Eds.), *Cognitive behavior therapy: Applying empirically supported techniques in your practice* (pp. 75–82). Wiley.

Maag, J. W. (2001). Rewarded by punishment: Reflections on the disuse of positive reinforcement in schools*. Exceptional Children,* 67(2), 173–186. https://doi.org/10.1177/001440290106700203

Schwartz, D. L., Chase, C. C., Oppezzo, M. A., & Chin, D. B. (2011). Practicing versus inventing with contrasting cases: The effects of telling first on learning and transfer. Journal of Educational Psychology, 103(4), 759–775. https://doi.org/10.1037/a0025140

Tynjälä, P., & Heikkinen, H. L. (2011). Beginning teachers' transition from pre-service education to working life. *Zeitschrift für Erziehungswissenschaft,* 14(1), 11–33. https://doi.org/10.1007/s11618-011-0175-6

Applying the signaling principle to preservice teachers' learning with classroom videos

Swantje Tannert, University of Erfurt, Germany; Inga Glogger-Frey, University of Freiburg, Germany; Alexander Eitel, University of Giessen, Germany; Monika Martin, Albert-Ludwigs-University Freiburg, Germany; Johanna Marder, University of Tuebingen, Germany; Alexander Renkl, University of Freiburg, Germany

Keywords: Digital learning, Instructional design, Noticing, Teacher education

Digital learning is an upcoming format in teacher education. Not only does it enable students to continue their education despite special circumstances during the COVID-19 pandemic and offer new ways of teaching from a distance in an increasingly globalized world but also does it give rise to new approaches especially in the context of example-based learning or practical education. Learning from videos illustrating classroom situations offers a good approximation to teaching practice and has been shown to support effective learning of preservice teachers (Martin et al., 2021). However, the complexity and transiency of information in videos may impose very high cognitive load, so that learners may overlook

central aspects. The method “signaling” can mitigate the disadvantage: It guides learners’ attention to central aspects of a video by means of signals (van Gog, 2014), thereby reducing extrinsic cognitive load and enhancing learning outcomes (Paas & Sweller, 2014).

Several researchers found positive effects of signaling in knowledge acquisition videos on retention and transfer. However, until now there is little evidence on the usefulness of signals in learning from classroom videos. Classroom videos often serve as examples to learn principles in teaching. So, does signaling of key moments in video examples help learning? This is an open question because learning with this kind of material is rather subtle and complex and goes beyond pure knowledge acquisition or understanding. Instead, the goal is to apply a concept on multiple different situations in order to evaluate scenes, interactions or behavior from different perspectives including a multitude of contextual information and to find an appropriate strategy of handling the situation.

Therefore, we conducted a set of three small experiments investigating the effect of signaling in classroom videos that were presented in the context of a digital learning tool that teaches preservice teachers how to identify and prompt learning strategies. In order to emphasize scenes containing those learning strategy prompts three different signals, namely written key phrases, a tone (i.e. an audio signal), or a frame were implemented. The signaling types were either detrimental to learning or did not yield advantages. A fourth study explores several new implementations of signaling in classroom videos identifying one with high potential.

Based on the cognitive load theory and the theory of multimedia learning (Mayer, 2005) it is discussed, under which circumstances signaling might or might not promote example-based learning in the context of learning from classroom videos in teacher education.

References:

Martin, M., Farrell, M., Seidel, T., Rieß, W., Könings, K.D., van Merriënboer, J.J.G., & Renkl, A. (2021). *Focused self-explanation prompts and segmenting foster pre-service teachers‘ professional vision – But only during training!* [Manuscript submitted for publication]. Institute for Psychology, University of Freiburg, Germany.

Mayer, R. E. (2005). Cognitive theory of multimedia learning. *The Cambridge Handbook of Multimedia Learning*, 41, 31-48.

Paas, F., & Sweller, J. (2014). Implications of cognitive load theory for multimedia learning. *The Cambridge Handbook of Multimedia Learning,* 27, 27-42.

Van Gog, T. (2014). The signaling (or cueing) principle in multimedia learning. R.E. Mayer (Ed.), The Cambridge handbook of multimedia learning (2nd ed.), *Cambridge University Press*, New York, NY (2014), pp. 263-278

Potential benefits of lesson-specific university-based training prior to teaching internships

Christof Wecker, University Hildesheim, Germany; Fara Semmelies, University Hildesheim, Germany; Katharina Engelmann, University Hildesheim, Germany

Keywords: Beginning teachers, Pre-service teacher education, Quantitative methods, Teacher education

Extended practical phases are considered as an essential part of university-based teacher education programs by many practitioners, and they appear to have an impact on teacher candidates’ self-

assessed development of professional skills (Gröschner & Hascher, 2019; Ulrich et al., 2020). However, this positive view is challenged by research on the effectiveness of internships (Hascher, 2012): What might be more relevant than the duration of practical phases is their quality. This raises the question as to how high quality in internships can be achieved. On part of university-based teacher education programs, teacher candidates could be supported by designated training interventions in which they prepare specific lessons to be taught during an internship based on research-based knowledge and practice their implementation in rehearsals (Grossman, 2018). Therefore, we investigated to what extent university-based lesson training might improve teacher candidates' teaching during an internship.

This study was conducted in the context of a teacher-training program at a German university in connection with a four-week internship during which each teacher candidate taught three lessons. A mixed design was implemented with the between-subjects factor *lesson training* and the within-subjects factor *prepared lesson*, which was nested within the condition with lesson training. In the condition *with lesson training*, teacher candidates' preparation for the internship included the preparation and rehearsal of one lesson to be taught during the internship, whereas in the condition *without lesson training*, rehearsals did not cover lessons to be taught during the internship. Within the condition with lesson training, the within-subjects factor *prepared lesson* differentiated between the two lessons that were not prepared and rehearsed during training and the lesson that had been prepared and rehearsed during training. After teaching each lesson during the internship, the teacher candidates rated to what extent (1) they felt well-prepared by the university-based teacher education program (*preparation*), (2) their pupils had made progress (*pupils' learning gains*), and (3) their own teaching skills had improved as a consequence of preparing and teaching the lesson (*own growth*). The sample of participants comprises 148 teacher candidates, of which 13 participated in the condition *with lesson training*. Data for 438 lessons were collected.

Multilevel analyses revealed that the *prepared lessons* in the condition *with lesson training* received significantly higher ratings for the level of *preparation* attributed to the university-based teacher education program than the lessons in the condition *without lesson training*, whereas the corresponding difference for *pupils' learning gains* failed to reach statistical significance. However, within the condition *with lesson training* the *prepared lessons* received significantly higher ratings than the other two lessons in terms of both *preparation* and *pupils' learning gains*. No statistically significant differences were found with respect to the teacher candidates' *own growth*.

Although simple self-report measures were used and no differences concerning teacher candidates' own growth could be detected in this study, these findings suggest that the university-based preparation of lessons to be taught in an internship should be further investigated as a potentially fruitful way to improve the quality of practical phases in teacher education.

References:

Gröschner, A., & Hascher, T. (2019). Praxisphasen in der Lehrerinnen- und Lehrerbildung. In M. Harring, C. Rohlfs, & M. Gläser-Zikuda (eds.), *Handbuch Schulpädagogik* (pp. 652–664). Münster: Waxmann.

Grossman, P. (ed.) (2018). *Teaching core practices in teacher education*. Cambridge, MA: Harvard Education Press.

Hascher, T. (2012). Lernfeld Praktikum – Evidenzbasierte Entwicklungen in der Lehrer/innenbildung. *Zeitschrift für Bildungsforschung*, 2(2), 109–129.

Ulrich, I., Klingebiel, F., Bartels, A., Staab, R., Scherer, S., & Gröschner, A. (2020). Praxissemester im Lehramtsstudium: ein systematischer Review. In I. Ulrich & A. Gröschner (eds.) *Praxissemester im Lehramtsstudium in Deutschland: Wirkungen auf Studierende* (pp. 1–67). Wiesbaden: Springer VS.

Paper Session Single Paper paper_type_1 session 17	Time: 4.15 pm – 5.45 pm	Location: Big Club Room (Großer Clubraum)
Assigned Chair: Marwin Felix Loeper, Paderborn University, Germany		

Media usage behaviour and digital literacies of pre-service teachers

Carina Dolch, University of Oldenburg, Germany; Victoria I. Marín Juarros, University of Lleida, Spain; Olaf Zawacki-Richter, University of Oldenburg, Germany

Keywords: Competences, Educational technology, Literacy, Pre-service teacher education

The digitalisation of higher education (HE) in Germany has been recognised as a key component in shaping the future of teaching and learning (Rampelt et al., 2019). A particular emphasis has been placed on the development of digital competencies and skills (European Commission, 2018), including digital skills for information retrieval and modification, communication and collaboration, and manipulation. However, the digital competence of German citizens has also been cause for concern. The latest D21-Digital-Index (Initiative D21, 2021) has risen by two points, but it shows that, as in the past, the main drivers of this increase are the areas of access and usage behavior. By contrast, the areas of digital competence and openness to digitization are stagnating or even declining slightly (p.9). Further, the confidence that schools can teach the necessary digitalisation skills is low with a decreasing tendency (p.31) and 78% agree with the statement that teachers should receive mandatory in-service training on digital teaching and learning in the future (p.55). This raises questions as to how prepared German HE students, and especially pre-service teachers, are for the new digital age.

Considering the importance of digital literacy for pre-service teachers, who are the ones that are going to educate the new generations, the aim of this study is to explore the differences in terms of digital competencies and acceptance of digital media for learning between pre-service teachers and students with other professional goals. In 2018 an online questionnaire was conducted in order to analyze the media usage of German HE students. 1,928 HE students (mean age=25, SD=6.65) participated. The items and scales of the instrument focus on the access to digital media and mobile devices, students' attitudes toward technology and the use of social networks for learning (Dolch et al., 2018). Out of the total, 9.6% (N=160) are pre-service teachers (26% STEM subjects, 74% other). The results of the questionnaire show that the availability of mobile devices is not an issue but in most of the areas of digital competency pre-service teachers rank lower than other HE students in aspects such as basic use of information and communication technologies, knowledge of computer hardware and software, Internet connections and digital media. However, their acceptance rates towards social media, instant messaging, virtual learning platforms, online library services, e-portfolios or mindmaps, among others, are better than the of other students. As limitation of the study, we should acknowledge the difference in sample size for comparison.

Based on our findings, we discuss the need to further develop teacher education programmes to include digital literacies, and consequently, to meet the demands of student teachers.

References:

Dolch, C., Zawacki-Richter, O., Bond, M., & Marín, V. I. (2021). Higher education students' media usage: A longitudinal analysis. *Asian Journal of Distance Education,* 16(1), 31-53.

European Commission (2018). *Digital Education Action Plan.*

Initiative D21 (2019). *D21-Digital-Index 2020/2021. Jährliches Lagebild zur Digitalen Gesellschaft* [D21-digital-index 2020/2021. Annual survey of digital society].

Rampelt, F., Orr, D., & Knoth, A. (2019). *Bologna Digital 2020: White Paper on Digitalisation in the European Higher Education Area.*

Lesson planning competence - A scoping review of the literature

Madlena Kirchhoff, Leibniz University Hannover, Germany; Katharina Mueller, Leibniz University Hannover, Germany

Keywords: Competences, Instructional design, Pre-service teacher education, Teacher education

Planning lessons is considered a core task of teachers (Munthe & Conway, 2017). The planning task is context-dependent, complex and multi-layered (Koni & Krull, 2018) and seems to be a "cross-sectional-matter" (Seel, 2011, 41). Empirical research is thus challenged, when measuring lesson planning competence (LPC), to think about methodological issues to account for this complex "contextual nature" (König et al. 2020). However, even though existing studies embed their research in (some aspects of) the research context on LPC, it remains unclear which and how competence facets regarding lesson planning (e.g. professional knowledge) have been examined internationally. To be more precise, how is LPC defined in empirical studies and to what theoretical frameworks does empirical research on teacher´s LPC refer and what designs and methods are used in empirical studies to measure LPC of pre-service and in-service teachers? This review can hence provide a systematic overview of theoretical frameworks/definitions referred to and test instruments/methods used to portray what is already known about LCP and thereby can direct future research. According the methodological procedure (e.g. Siddaway et al. 2019), the search was conducted with various search terms (in English and German) in three databases regarding empirical studies, published in the last two decades, on lesson planning competence of pre- or in-service teachers. Coding n=7674 search results, the studies included (n=53) inter alia refer to different terminology (e.g. planning skills, planning competence), mostly deal with pre-service teachers, apply various methods for data collection but mostly analysis of documents to date. At the conference, further important finding according to competence facets and methods shall be presented and discussed.

References:

König, J., Bremerich-Vos, A., Buchholtz, C., & Glutsch, N. (2020). General pedagogical knowledge, pedagogical adaptivity in written lesson plans, and instructional practice among preservice teachers. *Journal of Curriculum Studies,* 52(6), 800–822.

Koni, I. & Krull, E. (2018). Differences in novice and experienced teachers' perceptions of planning activities in terms of primary instructional tasks. *Teacher Development*. 1-17. 10.1080/13664530.2018.1442876 .

Munthe, E., & Conway, P. F. (2017). Evolution of research on teachers' planning: Implications for teacher education. In D. J. Clandinin & J. Husu (Eds.), *The sage handbook of research on teacher education* (pp. 836–852). SAGE Reference. https://doi.org/10.4135/9781526402042.n48

Seel, A. (2011). Wie angehende Lehrer/innen das Planen lernen: Empirische Befunde zur ausbildungsbezogenen Unterrichtsplanung [How prospective teachers learn to plan: empirical findings on education-related lesson planning]. In K-H. Arnold & T. Bohl (Eds.), *Jahrbuch für Allgemeine Didaktik 2011. Entwicklung und Weiterentwicklung allgemein-didaktischer Modelle der Unterrichtsplanung* (pp. 31-45). Baltmannsweiler.

Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019). How to do a systematic review: A best practice guide for conducting and reporting narrative reviews, meta-analyses, and meta- syntheses. *Annual Review of Psychology,* 70, 747–770.

The professional vision of mentor teachers: A video-based comparative judgement study

Aron Decuyper, Ghent University, Belgium; Hanne Tack, Ghent University, Belgium; Karolien Keppens, Ghent University, Belgium; Ruben Vanderlinde, Ghent University, Belgium

Keywords: Competences, Pre-service teacher education, Professional vision, Teacher educator

As field experiences are one of the most essential parts of student teachers' education, mentor teachers play a crucial role in the education of future teachers (Ellis et al., 2020). However, despite their crucial role, evidence on mentor teachers' roles in supporting student teachers' learning has been limited to date. The present study tackles this gap by investigating 137 mentor teachers' professional vision. Professional vision represents an ability to identify (i.e., noticing) and interpret (i.e., reasoning) what is happening in a classroom (Sherin, 2001) by focusing on crucial classroom events that have an impact on students' learning. The concept of professional vision is consistent with mentor teacher's responsibility. The mentor teacher must master effective teaching competencies to adequately support student teachers. Particularly, it is important for mentor teachers to be able to analyse classroom practices as they are required to model and provide feedback. This study assesses two dimensions of effective teaching: teacher-student interactions and differentiated instruction. Both dimensions have a significant impact on the cognitive, affective, and motivational outcomes of students (van de Grift, 2014). Mentors' professional vision is investigated by using the validated e-PIC instrument (Gheyssens et al., 2017). This instrument includes 1) a video-based comparative judgement measurement to investigate mentors' noticing and 2) rating items to examine mentors' reasoning. In the comparative judgement, mentors are asked to choose, for ten pairs of video clips, which clip they consider to be most effective regarding teacher-student interactions and differentiated instruction. Rating items are subsequently used to indicate how decisive aspects are. The results show that mentor teachers have a high professional vision. It can thus be assumed that the mentor teacher can support student teachers in their professional development. Additionally, their professional vision is compared with other groups: regular classroom teachers (n = 996) and student teachers (n = 2168). The results show no significant difference between mentor teachers and regular classroom teachers, but did show a significant difference between mentor teachers and student teachers. Hence, mentor teachers and regular classroom teachers are equally able to identify and interpret crucial aspects of effective teaching behaviour, but both groups are more able to identify and interpret what is happening in a classroom than student teachers. Although research on professional vision has increased, this study is the first to gain empirical insight into mentor teachers' professional vision. Furthermore, it has a unique character by comparing the professional vision among reference groups. As such, this study has a theoretical, empirical and methodologically contribution.

References:

Ellis, N., Alonzo, D., & Nguyen, H. (2020). Elements of a quality pre-service teacher mentor: A literature review. *Teaching and Teacher Education*, 92.

Gheyssens, E., Keppens, K., & Roose, I. (2017). *Video-based assessment of teachers' professional vision of inclusive classrooms*. Paper presented at the 17th Biennal EARLI.

Sherin, M. (2001). Developing a professional vision of classroom events. In T. Wood, B. Nelson, & J. Warfield (Reds.), *Beyond classical pedagogy: Teaching elementary school mathematics* (pp. 75-93). Hillsdale: Erlbaum.

van de Grift, W. (2014). Measuring teaching quality in several European countries. *School Effectiveness and School Improvement,* 25(3), 295-311.

Paper Session Single Paper paper_type_1 session 16	**Time:** 4.15 pm – 5.45 pm	**Location:** Seminar Room II (Seminarraum II)
Assigned Chair: Gamze Görel, Paderborn University, Germany		

Use of digital technologies by special education teachers

Carolin Reinck, Universtität Oldenburg, Germany; Moritz Börnert-Ringleb, Leibniz University Hannover, Germany; Gino Casale, Bergische University Wuppertal, Germany; Clemens Hillenbrand, Carl-von-Ossietzky University Oldenburg, Germany

Keywords: Digital learning, Self-efficacy, Special education, Teacher

Both the OECD (2018) and the KMK (2017) see the responsibility of schools in the digital world in "ensuring full participation of children in 21st century society" (OECD, 2018) and enabling students to "participate actively and self-determinedly" (KMK, 2017, translation by the authors). Teachers have the crucial task of preparing learners for this digital world, teaching them how to use the technologies and to reflect critically on their use (KMK, 2016, OECD, 2018). On the one hand, this requires that teachers have the appropriate knowledge, which is theoretically structured in the TPACK model (Technological and Pedagogical Content Knowledge) and has been empirically tested many times (Herring, Koehler, Mishra, 2016, Willermark, 2018). On the other hand, teachers' use of technology is dependent on factors such as the perceived usefulness of technology and the perceived effort to use technology (Scherer et al., 2019). These factors and their influencing variables, such as digital self-efficacy, are described in the "Technology Acceptance Model" (TAM) according to Davis (1985) and have also been empirically confirmed (Marangunić & Granić, 2015). So far, there is little known about how the use of digital technologies is perceived by special educators. Börnert-Ringleb, Casale & Hillenbrand (2021) have shown that in the field of special needs education, general self-efficacy does not correlate with specific, digital self-efficacy. Special educators estimate the self-regulation skills of children and adolescents as an important influencing variable for the use of digital learning opportunities (Börnert-Ringleb, Casale & Hillenbrand, 2021). In the context of the submitted paper, these findings will be extended, and further questions will be in focus. For this purpose, the data collected with an online questionnaire from teachers (N=765) throughout Germany will be analysed in more detail. It will be examined which individual teacher characteristics (including gender, teaching experience, qualification) have an influence on the use of technology during the school closures. A cluster analysis will be used to identify possible competence groups that differ regarding the acceptance of digital learning. The aim of the work is to generate conclusions for potential qualification needs of teachers about the use of digital technologies.

References:

Börnert-Ringleb, M., Casale, G. & Hillenbrand, C. (2021) What predicts teachers' use of digital learning in Germany? Examining the obstacles and conditions of digital learning in special education, *European Journal of Special Needs Education,* 36:1, 80-97, https://doi.org/10.1080/08856257.2021.1872847.

Burns, T. & F. Gottschalk (eds.) (2019). *Educating 21st Century Children: Emotional Well-being in the Digital Age, Educational Research and Innovation*. Paris: OECD Publishing, https://doi.org/10.1787/b7f33425-en.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. (PhD). Cambridge, MA: Massachusetts Institute of Technology. Retrieved from https://dspace.mit.edu/bitstream/handle/1721.1/15192/14927137-MIT.pdf?sequence=2.

Herring, M.C., Koehler, M.J., & Mishra, P. (Eds.). (2016). *Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators* (2nd ed.). Routledge, https://doi.org/10.4324/9781315771328.

Kultusministerkonferenz (2017). *Strategie der Kultusministerkonferenz „Bildung in der digitalen Welt".* Berlin, Retrieved from https://www.kmk.org/fileadmin/Dateien/pdf/PresseUndAktuelles/2018/Digitalstrategie_2017_mit_Weiterbildung.pdf

Marangunić, N., Granić, A. (2015). Technology acceptance model: a literature review from 1986 to 2013. *Universal Access in the Information Society,* 14, 81–95. https://doi.org/10.1007/s10209-014-0348-1.

Scherer, R., Siddiq, F., Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education, *Computers & Education,* 128, Pages 13-35, https://doi.org/10.1016/j.compedu.2018.09.009.

Willermark, S. (2018). Technological Pedagogical and Content Knowledge: A Review of Empirical Studies Published From 2011 to 2016. *Journal of Educational Computing Research,* 56(3), 315–343. https://doi.org/10.1177/0735633117713114

How to explain primary school teachers' self-efficacy to teach in inclusive classrooms

Katja Franzen, Paderborn University, Germany; Barbara Moschner, Carl von Ossietzky University Oldenburg, Germany; Frank Hellmich, Paderborn University, Germany

Keywords: Primary education, Self-efficacy, Teacher, Teacher effectiveness

Following the ratification of the UN-Convention on the Rights of Persons with Disabilities, questions arise concerning the best preparation of teachers for their upcoming tasks in inclusive classrooms. Capable teachers are considered to be key factors for high-quality inclusive learning environments. In this respect, teachers' self-efficacy towards inclusive education is regarded as a main personal resource that underlies the successful implementation of inclusion (e.g., Martínez, 2003). Self-efficacy is understood as the confidence in one's competences to achieve desired goals, even if the circumstances are challenging (Bandura, 1997). The formation of self-efficacy is supposedly based on four sources: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. According to Bandura (1997), mastery experiences are the most and physiological and affective states the least influential predictor of self-efficacy. Several studies confirm a positive relationship between prior experiences and teachers' self-efficacy to inclusive teaching (e.g., Leyser, Zeiger, & Romi, 2011). However, despite the apparent importance of self-efficacy, there are only few studies that take into account the other sources of teachers' self-efficacy to teach in inclusive classrooms (e.g., Taliaferro, 2010). Thus, it is the aim of our study to investigate whether German primary school teachers' self-efficacy to teach in inclusive classes can significantly be explained by the four assumed sources. Moreover, we suppose a predictive effect of teachers' self-efficacy on their willingness to inclusive education. In our study, a sample of *N*=524 German primary school teachers filled in a paper-pencil-questionnaire which contains scales regarding their self-efficacy in and willingness to inclusive education as well as concerning the associated four sources. Results from structural equation

modeling emphasise the importance of the different assumed predictors of teachers' self-efficacy in inclusive education. In total, the sources explained half of the variance in self-efficacy scores (R^2=.50, p≤.001). Mastery experiences proved to be the most powerful predictor of teachers' self-efficacy in inclusive education (*Beta*=.42, p≤.001). Furthermore, a significant predictive value was found for vicarious experiences (*Beta*=.21, p≤.001) and affective states (*Beta*=.13, p≤.05), however not for verbal persuasion. Teachers' self-efficacy (*Beta*=.40, p≤.001) in turn proved to be a significant predictor of teachers' willingness to inclusive education (R^2=.16, p≤.001). Thus, our results partially support the theoretical assumptions made by Bandura (1997), who considered mastery experiences to be the most influential predictor of self-efficacy.

References:

Bandura, A. (1997). *Self-efficacy – The exercise of control.* New York: Freeman.

Leyser, Y., Zeiger, T., & Romi, S. (2011). Changes in self-efficacy of prospective special and general education teachers: Implication for inclusive education. *International Journal of Disability, Development and Education,* 58(3), 241–255.

Martínez, R. S. (2003). Impact of a graduate class on attitudes toward inclusion, perceived teaching efficacy and knowledge about adapting instruction for children with disabilities in inclusive settings. *Teacher Development*, 7(3), 473–494.

Taliaferro, A. R. (2010). *Validation of an instrument to explore physical educators' beliefs toward inclusion: Application of self-efficacy theory*. Ann Arbor, MI: ProQuest LLC.

Characteristics of good inclusive teaching from primary school teachers' perspective

Gamze Görel, Paderborn University, Germany; Katja Franzen, Paderborn University, Germany; Frank Hellmich, Paderborn University, Germany

Keywords: Primary education, Special education, Teacher, Teaching/instruction

An essential aspect of teaching and learning concerns instructional quality and characteristics of effective teaching constitute an important area of research (e.g., Hattie, 2009; Seidel & Shavelson, 2007). With the ratification of the UN-convention on the Rights of Persons with Disabilities and the development of inclusive education, it seems necessary to reconsider the organisation of teaching and learning. The underlying goal of inclusion is to provide appropriate learning opportunities for students with and without special educational needs. This raises the question of how to realise education for all students and to organise inclusive teaching. In this regard, especially differentiated teaching is seen as central for meeting the different needs of students (Lawrence-Brown, 2020). However, for the development of high-quality inclusive education, it is crucial to take a more detailed look at the elements of good inclusive teaching. Since teachers are key figures for the realisation of inclusive education, the aim of this study is to investigate their understanding of good inclusive instruction. Therefore, a qualitative study approach was adopted with N = 24 primary school teachers from Germany. The teachers were individually interviewed on the basis of an interview guide, which comprised questions regarding, for example, teachers' understanding of inclusion and inclusive education, their attitudes towards inclusion, their self-efficacy beliefs with respect to teaching in the inclusive classroom, and the quality of inclusive teaching. With regard to the purpose of the study, the teachers were asked the question: "What is good inclusive instruction from your point of view?". The audiotaped interviews were transcribed and analysed with the methodology of Grounded Theory, which is characterised by the

development of a theory from the gathered data (Corbin & Strauss, 2008). The results of this study reveal several factors that the interviewed primary school teachers consider as crucial characteristics of good inclusive teaching. In particular, the teachers emphasise the importance of differentiated and individualised teaching practices in the inclusive classroom. Another factor concerns, for instance, the support of community. However, for some of the teachers, there seems to be no difference between good inclusive teaching and good regular teaching. Overall, this investigation contributes to research on the quality of inclusive teaching and provides a deeper insight into characteristics of good inclusive teaching from teachers' perspective.

References:

Corbin, J., & Strauss, A. (2008*). Basics of qualitative research. Techniques and procedures for developing grounded theory* (3rd ed.). Thousand Oaks, CA: Sage.

Hattie, J. (2009). Visible learning. *A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.

Lawrence-Brown, D. (2020). *Differentiated instruction and inclusive schooling*. Oxford Research Encyclopedia of Education.

Seidel, T., & Shavelson, R. J. (2007). Teaching effectiveness research in the past decade: The role of theory and research design in disentangling meta-analysis results. *Review of Educational Research,* 77(4), 454–499.

JURE Keynote by Dr. Christopher N. Prilop, Leuphana University Lueneburg / University of Hamburg

JURE Keynote & JURE Award	Time: 9.00 am – 10.30 am	Location: Auditorium (Veranstaltungssaal)

Fostering pre-service teachers' professional competence with digital practicum environments

Christopher N. Prilop, Leuphana University Lueneburg / University of Hamburg, Germany

Keywords: Competence development, Computer-supported collaborative learning, Pre-service teacher education, Professional vision

Professional competence of teachers encompasses dispositions (i.e., knowledge, beliefs and motivational components), situation-specific skills (e.g., professional vision), and actual performance (Blömeke et al., 2015) and need to be developed in teacher education.

Teaching practicums can foster professional competence effectively by incorporating possibilities for reflection and feedback (e.g. Grossman et al., 2009). However, reflection and feedback sessions are not a standard element of teaching practicums due to time- and location-constraints (Lee & Wu, 2006). Digital practicum environments can lift these constraints and have typically applied either textual accounts (e.g., Bonk et al., 1998) or video sequences of classroom practice (e.g., Kleinknecht & Gröschner, 2016).

The studies conducted in this research project were focused on how the use of text- or video-based digital reflection and feedback environments during a practicum influenced specific components of pre-service teachers' professional competence (i.e., beliefs about teaching and learning, self-efficacy, professional vision of classroom management, feedback competence).

All studies followed a quasi-experimental, pre--post-controlgroup design. Pre-service teachers at the fourth-semester bachelor level in a German university took part in the studies and participated in a four-week teaching practicum.

The control group (CG) took part in a traditional practicum with live observations and face-to-face reflection and feedback with peers and experts. Pre-service teachers of the intervention groups reflected and received feedback in highly structured text- (IG1, IG2) or video-based (IG3, IG4) digital environments. Furthermore, IG1 and IG3 participants only received feedback from peers, IG2 and IG4 pre-service teachers also received expert feedback.

Mixed methods were applied by generating quantitative and quantitative-qualitative data with questionnaires, a standardized video-based test and content analysis.

The studies demonstrated that video-based digital reflection and feedback environments can effectively enhance pre-service teachers' professional competence more than face-to-face feedback and reflection and text-based digital environments.

Furthermore, expert feedback enabled pre-service teachers to perceive crucial teaching situations that would have otherwise gone unnoticed. Expert feedback can be seen as a lens reducing classroom complexity and additionally a model for high-quality feedback.

Consequently, video-based digital reflection and feedback environments with expert feedback can significantly improve pre-service teachers' professional competence during teaching practicums and, thus, better prepare pre-service teachers for future classroom challenges.

References:

Blömeke, S., Gustafsson, J.-E., & Shavelson, R.J. (2015). Beyond dichotomies: Competence viewed as a continuum. *Zeitschrift für Psychologie*, 223(1), 3–13.

Bonk, C.J., Malikowski, S., Angeli, C., & East, J. (1998). Web-based conferencing for preservice teacher education: Electronic discourse from the field. *Journal of Educational Computing Research,* 19(3), 269–306.

Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: Theory and Practice,* 15(2), 273–289.

Kleinknecht, M., & Gröschner, A. (2016). Fostering preservice teachers' noticing with structured video feedback: Results of an online- and video-based intervention study. *Teaching and Teacher Education,* 59, 45-56.

Lee, G.C., & Wu, C.-C. (2006). Enhancing the teaching experience of pre-service teachers through the use of videos in web-based computer-mediated communication (CMC). *Innovations in Education and Teaching International,* 43(4), 369-380.

Paper Session VI

Paper Session Single Paper paper_type_1 session 10	**Time:** 10.45 am – 12.15 pm	**Location:** Auditorium (Veranstaltungssaal)
Assigned Chair: Susanne Jurkowski, University Erfurt, Germany		

Examining epistemic processes when preservice teachers reflect on a pedagogical situation

Marcus Kindlinger, University of Wuppertal, Germany; Kati Trempler, University of Wuppertal, Germany; Anna-Lena Molitor, University of Wuppertal, Germany; Ulrike Hartmann, DIPF | Leibniz Institute for Research and Information in Education, Germany

Keywords: Cooperative learning, Knowledge creation, Reflection, Teacher education

To develop a professional and reflective classroom practice, prospective teachers must learn to interpret classroom events based on the knowledge acquired in the course of their university studies. Several models of teacher education emphasize the role of epistemic cognition in engaging with classroom situations (e.g., Buehl & Fives, 2016). A conceptual background is provided by the AIR model (Chinn et al., 2014), which can be used to investigate how teachers reflect on pedagogical situations to generate explanations and make knowledge-based decisions (Barnes et al., 2020). Research also suggests that people use different epistemic processes depending on the format of reflection (individual or discourse-based; Kuhn, 2015).

Research questions:

What kinds of epistemic processes can be identified in pre-service teachers' reflections on a pedagogical situation?

How do these processes differ depending the format of reflection?

To what extent do differences in the type and quality of processes relate to pre-service teachers' epistemically informed praxis (Buehl & Fives, 2016)?

Design: In a quasi-experimental design, we examine reflections of 29 pre-service teachers (62% female, M = 27.6 years) on a classroom vignette. 15 students wrote essays in which they explained the situation referring to external sources from education, as well as to own experiences. 14 students completed the same assignment in a discourse-based format. Both groups then produced written conclusions for their own future teaching practice. The two groups were comparable in terms of their epistemological beliefs, their educational knowledge, and their choices of literature used to explain the situation.

Coding: Coding was based on previous studies on epistemic processes. Three categories of processes were identified: a) linking the situation vignette to literature, b) linking it to own school/teaching experiences, c) formulating initial interpretations. Each process was also coded with regard to epistemic quality (three levels). The material was analyzed by two independent coders (κcategories: 0.92, κquality: .68).

Quality assessment of conclusions: The quality of the conclusions was assessed by 12 experts from educational research and school-based teacher education regarding two constructs of Buehl and Fives' (2016) theoretical model.

Results: All categories of reliable processes occur in both reflection formats. MANOVA shows significant differences between the two groups with regard to both the categories and the quality of processes. The analyses of research questions 2 and 3 have not yet been completed.

References:

Barnes, N., Fives, H., Mabrouk-Hattab, S., & SaizdeLaMora, K. (2020). Teachers' epistemic cognition in situ: Evidence from classroom assessment. *Contemporary Educational Psychology,* 60, 101837.

Buehl, M. M., & Fives, H. (2016). The Role of Epistemic Cognition in Teacher Learning and Praxis. In J. A. Greene, W. A. Sandoval, & I. Bråten (Eds.), *Handbook of Epistemic Cognition* (pp. 247–264). Routledge.

Chinn, C. A., Rinehart, R. W., & Buckland, L. A. (2014). Epistemic Cognition and Evaluating Information: Applying the AIR Model of Epistemic Cognition. In D. N. Rapp & J. L. G. Braasch (Eds.), *Processing inaccurate information: Theoretical and applied perspectives from cognitive science and the educational sciences* (pp. 425–453). MIT Press.

Kuhn, D. (2015). Thinking Together and Alone. *Educational Researcher*, 44(1), 46–53.

Pre-Service Teachers' Collaborative Lesson Planning and their Self-Concepts in Inclusive Education

Jan R. Schulze, Paderborn University, Germany; Eva Blumberg, University of Paderborn, Germany; Frank Hellmich, Paderborn University, Germany

Keywords: Cooperative learning, Pre-service teacher education, Primary education, Teacher education

The continuous qualification of (pre-service) teachers is one of the indispensable goals for effective inclusive education. Teacher collaboration, defined as working toward a common goal (Friend & Cook, 1992), is an essential characteristic for inclusive education that aims for every student's achievement (Friend & Bursuck, 2014). Teacher collaboration impacts teachers' self-centered cognitions (e.g., Hamman, Lechtenberger, Griffin-Shirley, & Zhou, 2013), for instance, their professional self-concept of collaboration.

Self-concept describes a person's self-perceptions (Shavelson, Hubner, & Stanton, 1976). It is a hierarchical, multi-faceted model categorized into several domains, such as teachers' professional self-concept which describes teachers' self-perceptions of their own teaching effectiveness (Yeung, Craven, & Kaur, 2014). It is a crucial domain in teaching which is changeable, for example, by university training in teacher education (Yeung et al., 2014).

Unfortunately, research regarding teachers' professional self-concept in inclusive education is insufficient, despite its significance for teachers' behavior, motivation, and values and the responsibility of teacher qualification to enhance teaching properties and settings (e.g., collaboration) (Yeung et al., 2014).

According to Frommherz and Halfhide (2003), people who may choose a cooperation partner voluntarily are more fertile, satisfied, and effective than randomly assigned dyads. Based on these results, we assume voluntarily composed teams to develop higher teacher self-concepts with regard to collaboration than randomly assigned tandems.

In our study, N=131 pre-service primary school teachers and pre-service special education teachers from a German university have attended a subject-didactical seminar on renewable energies in inclusive primary schools. Participants attend this seminar in two different types of dyads. Students of the

experimental group may pick a partner of choice whereas students of the control group are assigned to a partner. Based on pre- and post-questionnaires we have examined whether planning a teaching unit collaboratively on the subject of renewable energies in inclusive primary schools affects pre-service teachers' self-concepts with regard to collaboration. Our study results highlight, that pre-service teacher tandems of choice in the experimental group develop significantly higher professional self-concepts with regard to collaboration in inclusive education than assigned pre-service teacher tandems in the control group.

References:

Friend, M., & Bursuck, W. D. (2014). *Including students with special needs: A practical guide for classroom teachers*. Essex: Pearson.

Friend, M., & Cook, L. (1992). *Interactions: Collaboration skills for school professionals*. White Plains, NY: Longman.

Supporting teachers' use of cooperative learning through teacher training based on collaboration

Susanne Jurkowski, University Erfurt, Germany; Anna Abramczyk, Dolnośląska Szkoła Wyższa, Poland

Keywords: Attitudes and beliefs, Cooperative learning, Professional development interventions, Teacher education

Cooperative learning can have positive effects on students' academic achievements, social-emotional skills, and peer relationships (Ginsburg-Block et al., 2006; Kyndt et al., 2013). Despite these benefits, teachers use cooperative learning rather infrequently in class and report concerns about the effectiveness and challenges in preparing students as well as materials (Abramczyk & Jurkowski, 2020; Völlinger et al., 2017). Thus, the question arises how teacher training could foster teachers' implementation of cooperative learning.

Collaboration between teachers can promote their professional development (Vangrieken et al., 2015) and might support teachers in implementing newly acquired knowledge and skills about cooperative learning in class. In an experimental design with a pre-test and a post-test of teachers' beliefs and use of cooperative learning, we provided 53 teachers with training on cooperative learning. First, teachers received an introduction on the theoretical background, empirical results, and methods of cooperative learning (eight hours), and then they used cooperative learning in class (six weeks), and finally reflected upon their experiences (eight hours). In the experimental group, during the six weeks of practice teachers went into pairs and exchanged ideas for lesson planning and experiences with cooperative learning.

Analyses show that in both groups, teachers' self-efficacy beliefs for the implementation of cooperative learning increased, $F(1,51) = 8.023$, $p = .007$. At the post-test, teachers in both groups reported more positive attitudes towards cooperative learning, $F(1,51) = 23.560$, $p < .001$, and a higher quality of implementation in class, $F(1,51) = 23.564$, $p < .001$. For these variables, no interaction effects were found. In both groups, the frequency of cooperative learning increased, $F(1,51) = 60.598$, $p < .001$; this increase was greater in the training condition with teacher collaboration, $F(1,51) = 3.997$, $p = .051$. However, only half of the participants had used the opportunity to collaborate continuously.

Issues to be discussed: (1) How did collaboration have an impact on the integration of cooperative learning in class? (2) What are the benefits of collaboration in teacher education? (3) Under which conditions do teachers collaborate?

References:

Abramczyk, A. & Jurkowski, S. (2020). Cooperative learning as an evidence-based teaching strategy: What practitioners know, believe, and how they use it. *Journal of Education for Teaching*, 46, 296–308.

Ginsburg-Block, M. D., Rohrbeck, C. A., & Fantuzzo, J. W. (2006). A meta-analytic review of social, self-concept, and behavioral outcomes of peer-assisted learning. *Journal of Educational Psychology*, 98, 732–749.

Kyndt, E., Raes, E., Lismont, B., Timmers, F., Cascallar, E., & Dochy, F. (2013). A meta-analysis of the effects of face-to-face cooperative learning. Do recent studies falsify or verify earlier findings? *Educational Research Review*, 10, 133–149.

Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2015). Teacher collaboration: A systematic review. *Educational Research Review,* 15, 17–40.

Völlinger, V. A., Supanc, M., & Brunstein, J. C. (2018). Kooperatives Lernen in der Sekundarstufe [Cooperative learning in secondary school]. *Zeitschrift für Erziehungswissenschaft*, 21, 159–176.

Paper Session Single Paper paper_type_1 session 1	**Time:** 10.45 am – 12.15 pm	**Location:** Lecture Hall (Vortragssaal)
Assigned Chair: Sandra Fischer-Schöneborn, Leuphana University Lüneburg		

Teaching Through the Storm: Resilience and Burnout Trajectories of Expatriate Teachers in the UAE

Antje von Suchodoletz, New York University Abu Dhabi, United Arab Emirates; Christopher Bryan, New York Univesity Abu Dhabi, United Arab Emirates

Keywords: Educational policy, Quantitative methods, Teacher effectiveness, Workplace learning

Understanding resilience amongst teachers during COVID-19 is a complex issue. Psychological resilience is understood to comprise of both environmental and individual factors. An approach to develop psychological resilience proposed by Fletcher and Sarkar (2016) suggests that the combination of both challenge and support are fundamental for facilitative resilience building environments. At the start of the pandemic, educational institutions had to quickly respond to an unexpected and 'forced' transition to remote teaching causing an increase in teachers' job demands (Erfurth & Ridge, 2020). However, positive influences of the organizational supportive environment may counteract or even compliment job demands reducing teacher burnout and developing resilience during or as the pandemic continues.

We use a longitudinal design to follow expatriate teachers in the United Arab Emirates (UAE) through three distinct periods: disrupted education (June, 2021); initial return (November, 2021); and final transition back to in-person teaching (May, 2022). The aim of the present study was to examine the effect of organizational climate factors such as support, pressure, cohesion, intrinsic recognition, impartiality and pride alongside both life and job demands to predict both burnout and resilience delivering education throughout the COVID-19 pandemic. The secondary research aim is to explore whether the added burden on expatriate teachers has "gone under the skin" after one year of disrupted education since the COVID-19 outbreak, that is, can be seen at a physiological level; specifically changes in the cortisol awakening response and heart rate variability during one day of delivering education.

The study sample comprised of n=303 teachers across three waves of data collection. These expatriate teachers spanned 34 nationalities across 11 different education syllabuses from both local public schools and international private schools. A total of n=30 teachers answered all waves of data collection.

A total of four separate latent structural equation models (SEM) were used to examine the strengths of the relationships of factors at each wave and overtime. Measurement invariance across both gender, nationality and time was validated before the main analyses. The SEM models revealed that both individual and environmental resources contributed to burnout directly and indirectly through resilience at each timepoint and at future timepoints. Job demands did not directly affect resilience at any one timepoint. However, additional stressors such as social isolation and daily stress effected resilience at all each timepoint and at future timepoints. These results suggest that resilience development may be facilitated by a combination of both environmental support and life stressors overtime which in turn effects burnout.

The findings are to be discussed in the context of the theoretical resilience development model with additions of the physiological results related to stress outcomes "under the skin". Theoretically, results from this research may lead to a better understanding of resilience globally in education; practically, it

may inform policy and practice for creating facilitative teaching environments that support expatriate teachers and build resilience as the world transitions back to full-time in-person education.

References:

Erfurth, M., & Ridge, N. (2020). The impact of COVID–19 on education in the UAE (Report No. 1*). Sheikh Saud bin Saqr Al Qasimi Foundation for Policy Research.* http://dx.doi.org/10.18502/aqf.0143

Fletcher, D., & Sarkar, M. (2016). Mental fortitude training: An evidence-based approach to developing psychological resilience for sustained success. *Journal of Sport Psychology in Action,* 7(3), 135-157. doi:10.1080/21520704.2016.1255496

Educational Trajectories as Study Entrance Characteristics of Student Teachers in Germany

Nadine Twele, Leibniz University Hannover, Germany; Seyma Gülen, Leibniz University Hannover, Germany; Katharina Mueller, Leibniz University Hannover, Germany

Keywords: Higher education, Motivation, Quantitative methods, Teacher education

Empirically analyzing student teachers in Germany, researchers find themselves confronted with limited options in terms of large-scale educational studies. Apart from teacher data collected in widely known studies such as PISA, TIMSS, PIRLS and TALIS, an interesting yet insufficiently used dataset is the student teacher oversample of the National Educational Panel study (NEPS-LAP). First administered to student teachers in the German higher education track at the beginning of the winter term 2010/2011, the study provides panel data on educational trajectories of student teachers throughout formal teacher training and onto entering the teaching profession during the last decade. Other than most large-scale educational studies, the NEPS-LAP is a panel study, enabling both cross-sectional and longitudinal analysis (Blossfeld et al., 2011).

Putting the NEPS-LAP to use, we aimed to investigate study entrance characteristics of student teachers in Germany and addressed the question, whether these characteristics function as a motivation for the choice of a specific teaching degree program in teacher education. So far, the subject has been discussed primarily with regard to whether someone chooses the teaching profession altogether, and under consideration of socioeconomic background characteristics, personal motivation for career choices, and the study entry situation, mostly represented by the grade of university admission (*Note der Hochschulzugangsberechtigung*). So far, little attention has been paid to additional entrance characteristics, for example pedagogical experiences theorized as formal and informal learning opportunities. Informal learning opportunities include voluntary educational and social commitments, whereas formal learning opportunities emerge from one's own institutionalized educational trajectories, that are pedagogical experiences gathered in school. Formal learning opportunities can be further distinguished into linear, that are direct, and non-linear, that are indirect, educational trajectories (Kohli, 2007).

We hypothesized that students with more pedagogical experiences, gathered either through informal learning opportunities or non-linear educational trajectories are, more likely to choose a pedagogically oriented teaching degree program, for example primary (*Grundschule*) or lower secondary (*Sekundarstufe I*) teaching, rather than a discipline-oriented teaching degree program, such as higher secondary teaching (*Gymansiallehramt*).

Gradually building a multinominal logistic regressions model applied to a cross-sectional dataset drawn from the NEPS-LAP, we found the following: Linear and non-linear educational trajectories have a significant impact on the choice of a specific teaching degree program. In line with our hypothesis, student teachers with a linear educational history are more likely to choose the higher secondary

teaching program, and students with a non-linear educational history tend to choose primary (*Grundschule*) and lower secondary (*Sekundarstufe I*) teaching degree programs.

Following up on our findings, we aim to conduct longitudinal analysis using the NEPS-LAP as well, analyzing educational trajectories of student teachers with regard to successfully completing a specific teaching degree program and entering the teaching profession.

References:

Blossfeld, H.-P., H.-G. Roßbach, and J. von Maurice (eds.) (2011). Education as a Lifelong Process - The German National Educational Panel Study (NEPS). *Zeitschrift für Erziehungswissenschaft*, Special Issue 14.

Kohli, Martin (2007): *The institutionalization of the life course: Looking back to look ahead.* Research in Human Development 4: 253-271.

Working in research-practice partnerships: Empirical findings on motivation and co-construction

Sandra Fischer-Schöneborn, Leuphana University Lüneburg, Germany; Timo Ehmke, Leuphana University of Lüneburg, Germany

Keywords: Collaborative learning, Communities of practice, Quantitative methods, Teacher education

University-school partnership involving various stakeholder groups such as researchers, practitioners, policy-makers and students have received increasing attention in teacher education (Lillejord & Børte, 2016) for improving the “theory-practice link” between academic expertise and professional practice (Villiger, 2015). In the project of the Quality Initiative Teacher Training, "ZZL-Netzwerk" (Future Center for Teacher Education - Network) of the Leuphana University Lüneburg, nine cross-institutional so called „development teams“ have been established since 2016, in which representatives from university, school, extracurricular institutions as well as teacher students (altogether n=105) are to further develop university teaching and improve school teaching practice in co-constructive cooperation. The research on these development teams is part of the investigations on research-practice partnerships (RPPs) and communities of practice (Straub & Dollereder, 2019).

A quantitative online survey of all development team members in May/June 2021 (response rate 74%; n=78) aimed to 1) uncover commonalities and differences between the respective actor groups with regard to motivational aspects, co-constructive collaboration, perceived competence development and individual returns as well as 2) identify possible existing modes of co-constructive collaboration.

First results:

1) Single factor analysis of variance and t-tests point out differences between the actor groups regarding the motivation to participate as well as the modes of co-construction with small and medium effect sizes. Additionally, across all actor groups, the motivation to participate in the teams stems more from motives of personal development and professional contacts rather than from a motivation that´s "externally" conditioned or stems from motives of professional advancement. But despite individual actor group-specific differences, there is a fundamental consensus on satisfaction with the work in the development teams.

2) High levels of agreement with the practice-based mode of co-construction, as well as highly significant correlations, suggest the practice-based mode of co-construction as the predominant one (compared to the research-informed and research-based mode).

First conclusions:

- for science: Participants of RPPs do - although not exclusively - act differently depending on their actor group affiliation. An analysis of these differences enables a precise improvement of collaboration and benefits. Therefore, this research should be intensified.
- for practice: The importance of practical experience for the work in RPPs should be emphasized. School representatives should be more involved in the research contexts and be informed about associated added values. For recruiting new members for the teams, the personal enrichment and further development should be emphazised as a special value of the collaboration.

References:

Lillejord, S. & Kristin B. (2016). Partnership in teacher education – a research mapping. *European Journal of Teacher Education* 39 (5): 550–63. https://doi:10.1080/02619768.2016.1252911 .

Straub, R. & Dollereder, L. (2019). Transdisciplinary development teams in the ZZL-network, Leuphana University Lüneburg. In K. Kleemann, J. Jennek & M. Vock (Eds.), *Promoting cooperation between university and school. Strengthening schools, improving teacher education* (pp. 57-82). Barbara Budrich.

Villiger, C. (2015). Teacher education between theory and practice: discussions on an unresolved issue. In C. Villiger, U. Trautwein (Eds.), *Between theory and practice. Demands and possibilities in teacher education*; Festschrift for the 65th birthday of Alois Niggli (pp. 9-18). Waxmann.

Paper Session Single Paper paper_type_1 session 5	Time: 10.45 am – 12.15 pm	Location: Big Club Room (Großer Clubraum)
Assigned Chair: Marcus Friedrich, Technical University Braunschweig, Germany		

On the relevance of goal orientations in mentoring - an explorative interview study

Clara Kuhn, University of Salzburg, Austria; Gerda Hagenauer, University of Salzburg, Austria; Alexander Groeschner, Friedrich Schiller University Jena, Germany

Keywords: Goal orientation, Motivation, Teacher education, Teacher educator

The school practicum is an essential part of teacher education and considered as highly relevant for student teachers' professionalization (Clarke et al., 2014). While research in the field of mentoring is generally increasing, the motivation of teachers to become mentors has rarely been investigated yet (van Ginkel et al., 2016). Recent studies show that mentor teachers' motivation is related to duration and quality of mentoring (Ronfeldt et al., 2020).

Regarding mentor teachers' motivation, this study focuses on goal orientation theory (GO) distinguishing between five GOs, which influence experience and behaviour (Butler, 2012). Previous research has mainly focused on teacher GOs (e.g. Watt et al., 2021); findings on mentors' GOs are not yet available. Thus, an explorative qualitative design was pursued aiming to explore mentor teachers GO's in the practicum.

Semi-structured interviews were conducted with 23 purposively selected Austrian mentor teachers. Interviews were recorded, transcribed verbatim and analysed according to Mayring's (2015) structuring content analysis using MAXQDA software. A coding scheme was developed both deductively and inductively. The interrater agreement was satisfactory.

Results indicate that mentors' GOs can be classified as more learning goal-oriented, i.e., mentor teachers' stress their motivation to expand their own competencies through supervision of school practica. Other GOs occur less strongly in the mentoring context, although mentor teachers' relational goal orientation, i.e. the desire to build and maintain positive relationships with student teachers, was also frequently mentioned as significant. It is therefore important for mentor teachers' motivation not only to develop their own competencies further, but also to build positive, professional relationships with student teachers. Findings also show mentors do not only report GOs related to themselves, but also GOs relating to the student teachers. Here, mentor teachers often state they feel successful when students expand their competencies, which reflects a learning GO directed to the student teachers.

Results are discussed considering GO theory and regarding its transferability to the mentoring context. Practical implications for the professionalization of mentors and the design of school internships are derived.

References:

Butler, R. (2012). Striving to connect: Extending an achievement goal approach to teacher motivation to include relational goals for teaching. *Journal of Educational Psychology* (104(3)), 726-742.

Clarke, A., Triggs, V., & Nielsen, W. (2014). Cooperating teacher participation in teacher education: A review of the literature. *Review of Educational Research*, 84(2), 163-202.

Mayring, P. (2015). *Qualitative Inhaltsanalyse: Grundlagen und Techniken* (12th ed.). Beltz.

Ronfeldt, M., Bardelli, E., Truwit, M., Mullman, H., Schaaf, K., & Baker, J. C. (2020). Improving preservice teachers' feelings of preparedness to teach through recruitment of instructionally Effective and experienced cooperating teachers: A randomized experiment. *Educational Evaluation and Policy Analysis,* 42(4), 551-575. https://doi.org/10.3102/0162373720954183

van Ginkel, G., Verloop, N., & Denessen, E. (2016). Why mentor? Linking mentor teachers' motivations to their mentoring conceptions. *Teachers and Teaching,* 22(1), 101-116.

Watt, H. M. G., Butler, R., & Richardson, P. W. (2021). *Antecedents and consequences of teachers' goal profiles in Australia and Israel. Learning and Instruction*, 76, 101491.

The BilApp – An Application to Support Competence-oriented Studying in Teacher Education

Tobias Hirmer, Center of Teacher Education, Otto-Friedrich University of Bamberg, Germany; Nora Heyne, Center of Teacher Education, Otto-Friedrich-University of Bamberg, Germany; Jennifer Paetsch, University of Bamberg, Germany; Daniel Mann, University of Bamberg (Otto-Friedrich-University Bamberg), Germany

Keywords: Educational technology, Goal orientation, Self-regulation, Teacher education

To meet professional challenges, teachers must have a wide range of knowledge and skills of teaching. The acquisition of these basic teaching competencies is a major goal of the first part of teacher training at the University of Bamberg, the educational science program (ESP). The ESP offers courses of various disciplines and focus areas, from which students can individually determine the content of their studies in order to achieve their curriculum goals.

According to the importance of goal orientation in self-regulated learning (Zimmerman, 2000), it is expected that knowledge of curriculum goals and available courses to achieve these goals is an essential prerequisite for a competence-oriented and successful study. Self-regulated learning as demanded in teacher education requires setting one's own goals, participating purposefully in courses, and reflecting on the achievement of learning goals. Therefore, the knowledge of learning goals and competencies taught in courses is the base for successfully navigating through a competence-oriented study.

In order to support teacher students in this process, a web application is currently being developed at the University of Bamberg: The BilApp (Hirmer et al., 2021). It offers an overview of available courses in the ESP and therefore facilitates a competence-oriented course selection. In the application, the competencies taught in courses are visualized and made available to the students. The visualizations are based on data that was entered in the app by the respective docents. This data represents the time spent on the different competence goals. In addition to this visualization, the app offers several further functions, e.g., the setting of individual aims regarding specific competence fields, to support the competence-oriented course selection. How these functions are used and perceived by the students was investigated in an initial evaluation of the application.

For this purpose, 125 students attending major courses of the ESP participated in an online survey. The results showed a slight positive consent in the utility of a digital tool to support the competence-oriented studying. Currently, this process is mostly supported by official documents (e.g., module handbooks) and the social environment (other students, lecturers). The usefulness and the basic functions of the application were rated slightly positive by most of the students. Regarding the sustainable use of the app, however, the results show that students demand an expanded scope of the

included courses beyond courses of the ESP as well as an integration of existing tools for the study planning. Based on our results and in order to provide an effective tool to support teacher students in their competence-oriented teacher study, future directions in the development and implementation of the BilApp will be discussed.

References:

Hirmer, T., Heyne, N. & Henrich, A., (2021). Die kompetenzorientierte Studienplanung - Entwicklung eines Tools zur Unterstützung von (Lehramts-)Studierenden. In: Kienle, A., Harrer, A., Haake, J. M. & Lingnau, A. (Hrsg.), *DELFI 2021.* Bonn: Gesellschaft für Informatik e.V. (S. 121-126).

Zimmerman, B. J. (2000). Attaining self-regulation. A social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Hrsg.), *Handbook of self-regulation* (S. 13-39). San Diego: Academic Press.

Can intrinsic motivation to teach digitally be explained by teaching enthusiasm and interest in ICT?

Marcus Friedrich, Technical University Braunschweig, Germany; Luzie Semmler, Technical University Braunschweig, Germany; Barbara Thies, Technical University Braunschweig, Germany; Leilei Xie, Technical University Braunschweig, Germany

Keywords: Digital transformation, Motivation, Motivation and emotion, Teacher

Enthusiasm is a significant predictor of teachers' classroom behaviors and students' learning outcomes. Enthusiasm can be defined as a form of intrinsic motivation that relates to specific content or activities. The teacher's enthusiasm for the subject, however, has no influence on his or her instructional behavior and the learning performance of the students, while very positive effects on these variables can be found for the teacher's enthusiasm for teaching (Kunter et al., 2008). In schools, teaching is increasingly done digitally. During the school closings due to the Corona pandemic, teaching was even exclusively digital for a while. Therefore, the question arises whether the enthusiasm to teach digitally can be fully explained by the enthusiasm to teach and what role, if any, the interest in information and communication technologies (ICT) has for the enthusiasm to teach digitally. To this end, a cross-sectional study was conducted with 164 student teachers. Among other things, the students completed a scale on teaching enthusiasm (Kunter et al., 2019), an adapted version of this scale regarding enthusiasm for teaching using digital media, and a scale on interest in ICT (Mang et al., 2018). Initial analyses show significant correlations ranging from $r = .26$ to $.52$ between all three variables. Enthusiasm to teach digitally showed greater correlations with interest in ICT at $r = .52$ than with teaching enthusiasm at $r = .39$. This is even more surprising since the two scales for enthusiasm include very similarly worded items and the same response scale. The results are discussed in terms of teacher proficiency and teacher education with regard to digital teaching. The relationships are currently also being further investigated in a continuation of the study longitudinally.

References:

Kunter, M., Leutner, D., Seidel, T., Dicke, T., Holzberger, D., Hein, N., Kunina-Habenicht, O., Maurer, C., Schmidt, M., Wolf, K., & Hartl, A. (2019). *Ertrag und Entwicklung des universitären bildungswissenschaftlichen Wissens - Validierung eines Kompetenztests für Lehramtsstudierende (BilWiss-UV).* Frankfurt: Goethe-Universität.

Kunter, M., Tsai, Y.-M., Klusmann, U., Brunner, M., Krauss, S., & Baumert, J. (2008). Students' and mathematics teachers' perceptions of teacher enthusiasm and instruction. *Learning and Instruction*, 18, 468-482.

Mang, J., Ustjanzew, N., Leßke, I., Schiepe-Tiska, A., & Reiss, K. (Hrsg.) (2019). *PISA 2015 Skalenhandbuch. Dokumentation der Erhebungsinstrumente.* Münster/New York: Waxmann. URN: urn:nbn:de:0111-pedocs-174495

Paper Session Single Paper paper_type_1 session 15	Time: 10.45 am – 12.15 pm	Location: Seminar Room II (Seminarraum II)
Assigned Chair: Jonathan Firth, University of Strathclyde, United Kingdom		

The Impact of Career Choice Motives on the Career Paths of Teacher Education Graduates in Germany

Sebastian Franz, Leibniz Institute for Educational Trajectories (LIfBi), Germany; Claudia Menge, German Centre for Higher Education Research and Science Studies (DZHW), Germany; Stefanie Gaeckle, German Centre for Higher Education Research and Science Studies (DZHW), Germany

Keywords: Beginning teachers, Motivation, Quantitative methods, Teacher professional development

Entering the preparatory phase or the teaching profession after graduation from teacher training is considered as a crucial step that often results in a practical shock. However, not all graduates transition directly into teaching but take detours or even decide to withdraw from their teaching career. Sometimes graduates are even forced to postpone their transition since, e.g. in Germany, entering the teaching profession usually can only take place with the beginning school year.

Horvath et al. (2018) reported positive effects of teacher identity, such as satisfaction with university instructors, on the intention and actual entry into the teaching profession of secondary teachers in the field of STEM in the US. For teacher graduates in Belgium, Rots et al. (2014) showed that a high level of initial teaching motivation is predictive for entering teaching after graduation. This study however, implemented a unidimensional measure of initial teaching motivation neglecting its multiple facets as well as its intrinsic and extrinsic components. Furthermore, different pathways after graduation are not considered but only the direct entries into teaching up to six months after graduation.

These limitations in mind, we aim in answering the following research questions: Which different pathways do teacher graduates take three years after graduation? How are intrinsic and extrinsic components of initial teaching motivation related to different pathways? Do sociodemographic and study-related factors (such as teaching subject and school type) influence the career paths?

Based on a sample of N = 1,108 teacher education graduates from data of starting cohort 5 (“students”) of the German National Educational Panel Study (NEPS; doi:10.5157/NEPS:SC5:15.0.0), we applied sequence analysis that allows us to find different career pathways after three years following graduation. We then use multinomial logistic regression to predict different pathways based on initial teacher motivation and other influencing factors.

We differentiate seven status groups or phases on a monthly basis: teacher preparatory service, employment as teacher, non-teacher related employment, further educational phases, unemployment, parental leave and other.

First results show that 75 % of all respondents enter preparatory service within three years following their graduation. The most prevalent transition pattern is hallmarked by the sequence “non-teacher related employment – preparatory service – employment as teacher” (14 %). Only 9 % belong to the pattern “preparatory service – employment as teacher”.

In the proposed presentation, we want to present all identified patterns and discuss their connection to different motives for choosing teaching as a career. Our results contribute to the broad discussion

about teacher shortage and give insights about the predictive validity of initial teacher motivation on the entry and retention of teachers three years after graduation.

References:

Horvath, M., Goodell, J. E., & Kosteas, V. D. (2018). Decisions to enter and continue in the teaching profession: Evidence from a sample of US secondary STEM teacher candidates. *Teaching and Teacher Education*, 71, 57–65.

Rots, I., Aelterman, A., & Devos, G. (2014). Teacher education graduates' choice (not) to enter the teaching profession: Does teacher education matter? *European journal of teacher education*, 37(3), 279–294.

Long-term Effects of the Induction Phase on Beginning Teachers' Wellbeing. A longitudinal Analysis

Stefanie Gaeckle, German Centre for Higher Education Research and Science Studies (DZHW), Germany; Claudia Menge, German Centre for Higher Education Research and Science Studies (DZHW), Germany

Keywords: Beginning teachers, Induction, Motivation and emotion, Teacher professional development

Mismatch between occupational preparation on the one hand and occupational competences on the other hand lead to a high amount of stress in teachers. These strains can be high emotional exhaustion as well as low occupational satisfaction (Lauermann & König 2016; Klusmann et al. 2008b) and both can lead to increasing rates of job drop-outs (Skaalvik & Skaalvik 2011). Teaching as a career and especially the transition into the induction phase are described as stressing factors (Voss et al. 2020). The induction phase in German teacher education is meant to help the beginning teachers to gain practical experiences – in contrast to the more theoretical education during their study program (see Klusmann et al. 2008a). It is a formal learning environment and can be characterized along various distinctive features such as "support" or "challenge".

The proposed paper analyses the effects of selected dimensions of the learning environment "induction phase" (instrumental support given by mentors, peers and seminar leaders, challenge in form of interaction styles with their mentors) on wellbeing (emotional exhaustion, occupational satisfaction) of (beginning) teachers. In doing so we want to answer the research questions if experiences made in the induction phase can contribute relaxing influences on the stressing transitions of teachers and if those effects stay stable over time.

The analysis draws on data of the starting cohort 5 ("students") of the German National Educational Panel Study (NEPS; doi:10.5157/NEPS:SC5:15.0.0) . The sample consists of N = 1,072 teachers for which the data contains information about both measurement times (t1 = induction phase and t2 = first measurement of wellbeing after entering the teaching workforce). Longitudinal structural equation models (SEM) were conducted (with Mplus) and various control variables will be included in the final model.

The first SEM (RMSEA = 0.031; CFI = 0.964; TLI = 0.959) shows significant effects of the learning environment on wellbeing and that the relation between the wellbeing-factors remains stable over time.

In the presentation the complete model will be presented and the results discussed.

References:

Klusmann, U.; Kunter, M.; Trautwein, U.; Lüdtke, O.; Baumert, J. (2008a): Engagement and Emotional Exhaustion in Teachers: Does the School Context Make a Difference? *Applied Psychology: An International Review*, 57. 127-151.

Klusmann, U., Kunter, M., Trautwein, U., Lüdtke, O., Baumert, J. (2008b): Teachers´occupational well-being and quality of instruction: The important role of self-regulatory patterns. *Journal of Educational Psychology,* 100(3). 702-715.

Lauermann, F. & J. König (2016): Teachers' professional competence and wellbeing: Understanding the links between general pedagogical knowledge, self-efficacy and burnout. *Learning and Instruction*, 45. 9-19.

Skaalvik, E. M. & S. Skaalvik (2011): Teacher job satisfaction and motivation to leave the teaching profession: Relations with school contexts, feeling of belonging, and emotional exhaustion. *Teaching and Teacher Education*, 27. 1029-1038.

Voss, T. & M. Kunter (2020): "Reality Shock" of Beginning Teachers? Changes in Teacher Candidates' Emotional Exhaustion and Constructivist-Oriented Beliefs. *Journal of Teacher Education*, 71(3). 292-306.

Factors affecting teacher burnout: Implications for teacher education and policy

Jonathan Firth, University of Strathclyde, United Kingdom; Ivana Mašková, University of South Bohemia in Ceske Budejovice, Czech Republic

Keywords: Beginning teachers, Educational policy, Motivation and emotion, Teacher professional development

Teaching is a demanding occupation which bears increased mental health risks compared to other professions, including the risk of burnout (Nübling et al., 2011). It is also a profession from which many practitioners leave before the standard retirement age, a phenomenon linked to stress and burnout (Riechl et al, 2014). As such, these psychological problems present a practical and ethical challenge for governments, and one that is only likely to worsen under the present strains involved in pandemic working and blended/online teaching.

However, not every teacher is equally susceptible to stress, and some display healthier approaches than others both to their work and to coping. Schaarschmidt and Fischer (2003) summarised four patterns of work-related coping behavior: 'healthy-ambitious', 'unambitious', 'excessively-ambitious', and 'prone to burnout'. These link to teachers' time off sick, their desire for early retirement, and their evaluation of their own working conditions (Kieschke & Schaarschmidt, 2008). Compared to other professions, teachers are more prone to the two least healthy coping patterns – excessively-ambitious and prone to burnout (Kieschke & Schaarschmidt, 2008).

Patterns of coping behaviours are not fixed, and there is longitudinal evidence that teachers who can at one point in their career be described as unambitious or excessively-ambitious may later show the behaviour pattern of the burnout group (Kieschke & Schaarschmidt, 2008). It is therefore important to understand factors that lead teachers to cope in healthy or unhealthy ways throughout their careers, as well as ways to promote healthy coping among student and in-service teachers.

As such, this paper has two goals. First, we will address the theoretical underpinnings of this area in the context of motivational theory. While previous research has tended to take a quantitative view of teacher motivation, we argue that a more nuanced and dynamic view is essential to understanding the

path to teacher burnout. Self-determination theory (Ryan & Deci, 2017) can provide the basis for this, and indeed, research based on this theory has previously shown a link between autonomous types of motivation and better teacher wellbeing (e.g. Fernet et al., 2012). We seek to connect the research into coping patterns and burnout with theoretical research into motivation.

Secondly, we are currently carrying out a review of the factors that correlate with unhealthy forms of coping and susceptibility to burnout among student teachers and in-service teachers. This part of the research is currently still ongoing, but we note that recent research from Germany and the Czech Republic has indicated that teachers' ability to cope may be moderated by individual differences in personality (Mašková et al, 2022; Riechl et al., 2015) as well as cultural norms (Mašková et al, 2022). Evidence from China, meanwhile, has suggested that teachers' autonomous engagement with a professional learning community can improve wellbeing (Liang et al, 2019). These findings provide useful indicators ahead of a full-scale review.

From this work, we aim to provide recommendations to teacher educators, and also to identify the most urgent areas of future research that will help to tackle the problem of teacher burnout.

References:

Fernet, C., Guay, F., Senécal, C., & Austin, S. (2012). Predicting intra-individual changes in teacher burnout: The role of perceived school environment and motivational factors. *Teaching and Teacher Education*, 28, 514–525.

Kieschke, U., & Schaarschmidt, U. (2008). Professional commitment and health among teachers in Germany: A typological approach. *Learning and Instruction*, 18, 429–437.

Liang, W., Song, H., & Sun, R. (2020). Can a professional learning community facilitate teacher well-being in China? The mediating role of teaching self-efficacy. *Educational Studies*, 1–20.

Mašková, Mägdefrau, J., & Nohavová, A. (2022). Work-related coping behaviour and experience patterns, career choice motivation, and motivational regulation of first-year teacher education students: Evidence from Germany and the Czech Republic. *Teaching and Teacher Education*, 109, 103560.

Nübling, M., Vomstein, M., Haug, A., Nübling, T., & Adiwidjaja, A. (2011). *Europeanwide survey on teachers work related stress-assessment, comparison and evaluation of the impact of psychosocial hazards on teachers at their workplace.* European Trade Union Committee for Education.

Reichl, C., Wach, F. S., Spinath, F. M., Brünken, R., & Karbach, J. (2014). Burnout risk among first-year teacher students: The roles of personality and motivation. *Journal of Vocational Behavior*, 85, 85–92.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.* Guilford Publications.

Schaarschmidt, U., & Fischer, A. W. (2003). *AVEM e Arbeitsbezogenes Verhaltens- und Erlebensmuster [AVEM e Patterns of work-related coping behavior]* (2nd ed.). Swets & Zeitlinger.

Paper Session VII

Paper Session Single Paper paper_type_1 session 3	**Time:** 1.00 pm – 2.30 pm	**Location:** Auditorium (Veranstaltungssaal)
Assigned Chair: Marco Rüth, University of Cologne, Germany		

Digital competences unleashed: Developing a curriculum for in- and pre-service teachers

Katharina Maitz, University of Graz, Austria; Angela Fessl, Graz University of Technology, Austria; Lisa Paleczek, University of Graz, Austria; Monica Divitini, Norwegian University of Science and Technology (NTNU), Norway; Majid Rouhani, Norwegian University of Science and Technology (NTNU), Norway; Thomas Köhler, Dresden University of Technology, Germany

Keywords: Digital transformation, In-service teacher education, Online learning, Pre-service teacher education

At the beginning of the COVID-19 pandemic, a sudden shift from mainly face-to-face teaching and learning to exclusively online teaching and learning took place and posed challenges especially for in-service teachers. But also pre-service teachers, i.e. students who are preparing themselves in order to become teachers, are challenged by the new profile of competencies demanded. Suddenly, all teachers had to orient themselves in a completely digital world of teaching in which acquiring digital competences was no longer an option but a real necessity.

In this context, we are investigating which digital competences are necessary for pre- and in-service teachers to have in the current COVID-19 pandemic and beyond to ensure high quality teaching and learning (Schaarschmidt et al., 2021). Based upon the European DigComp 2.1 (Carretero et al., 2017) and DigCompEdu (Redecker, 2017) frameworks, and the Austrian Digi.kompP (Virtuelle PH, 2021) framework, we developed a curriculum tailored to the specific needs of our European level target group. Our curriculum addresses the individual digital media competence (two modules), and the media didactic competence (three modules). For each of these modules, we developed competence-based learning goals (Bloom et al., 1956; Krathwohl & Anderson, 2010, Fessl et al., 2021) that serve as a guideline or structure of what the learners should be able to do after their specific learning experience. The learning content will be prepared as micro learning units to be lightweight and flexible as time constraints are known to be challenging for any professional development.

In three sequentially conducted workshops (Sept. 2021, Nov. 2021, Feb. 2022), we discuss with different stakeholders (researchers, in-service and pre-service teachers, policy makers) the developed curriculum and the corresponding learning goals. The workshops are conducted online with the help of methods and tools that allow for collaboration and intensive discussion. First preliminary results of the two workshops already conducted showed that the workshop format allows for intensive exchange of experiences and ideas as well as creative design activities. Further, our developed curriculum is relevant to the target groups and the digital competences specified are perceived as crucial for successful online teaching by the workshop participants. In our presentation, we will present the methods and results of all three workshops, discuss the theoretical underpinnings of our approach and the curriculum, and provide insights on how we plan to convey the digital competences to educators using strategies such as reflective learning and micro learning in an online learning environment.

References:

Bloom, B.S., et al. (1956). *Taxonomy of educational objectives. vol. 1: cognitive domain*. New York: McKay.

Carretero, S., Vuorikari, R., & Punie, Y. (2017). *The digital competence framework for citizens. Publications Office of the European Union*.

Fessl, A., Maitz, K., Dennerlein, S., & Pammer-Schindler, V. (2021). The Impact of Explicating Learning Goals on Teaching and Learning in Higher Education: Evaluating a Learning Goal Visualization. In *European Conference on Technology Enhanced Learning* (pp. 1-15). Springer, Cham.

Krathwohl, D. R., & Anderson, L. W. (2010). Merlin C. Wittrock and the revision of Bloom's taxonomy. *Educational psychologist*, 45(1), 64-65.

Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu* (No. JRC107466). Joint Research Centre (Seville site).

Schaarschmidt, N., Schulze-Achatz, S., Köhler, T., Paraskevopoulou K. & Rahm, L. (2021). *Distanzlernen während der Pandemie-bedingten Schulschließungen im deutschsprachigen Raum (2020).* Eine vergleichende Analyse. Erhebungszeitraum der untersuchten Studien: 24. März – 14. April 2020.; OAP via https://doi.org/10.25368/2021.66.

Virtuelle PH (2021). *Digi.kompP: Digitale Kompetenzen für Pädagoginnen und Pädagogen*. Eisenstadt: Virtuelle PH.

Longitudinal changes in stress experiences and self-efficacy beliefs of German preschool teachers

Julia Steigleder, Eberhard Karls University Tübingen, Germany; Lilly Buhr, Eberhard Karls University Tübingen, Germany; Jan-Henning Ehm, Center for Research on Education and Human Development (DIPF), Germany; Antje von Suchodoletz, New York University Abu Dhabi, United Arab Emirates; Caterina Gawrilow, Eberhard Karls University Tübingen, Germany

Keywords: Pre-service teacher education, Self-efficacy, Survey research, Teacher

In Spring 2020, the first epidemic wave of the COVID-19 pandemic led to a unique and novel situation, with immediate actions taken in preschools (Autorengruppe Corona-KiTa-Studie, 2020a, 2020b, 2021), including closures to limit the spread of the disease. Due to different epidemic waves, the incidence rates changed significantly, resulting in a constant shift between closing and opening educational institutions, like preschools (Blum & Dobrotić, 2021). The different phases of the pandemic (Tolksdorf et al., 2021) had different impacts on the working conditions in German preschools and brought new challenges and stressors for preschool staff. Since high proportions of preschool teachers in Germany show a significantly increased stress experience (Jungbauer & Ehlen, 2015), the pandemic-related demands represent a possible threat to the subjective stress experience of preschool teachers. Therefore, it is important to identify factors that could potentially buffer the negative impact of the COVID-19 pandemic on teacher's stress. Based on Bandura's theory, one of that factors can make an important contribution to stress management, can be self-efficacy beliefs. According to this, individuals with high levels of self-efficacy consider stressful events to be more controllable and their coping skills to be more stable (Bandura, 1986).

The aim of the current study was to investigate to what extent subjective stress experiences and self-efficacy beliefs of preschool teachers changed during different phases of the COVID-19 pandemic in

Germany and how they were related to one another at an inter- and intra-individual level. It is important to understand how the pandemic-related challenges and stressors not only affect preschool teachers' subjective stress experiences but also their self-efficacy beliefs as those beliefs may play a particularly important role when adapting to the uncertain and changing circumstances of the COVID-19 pandemic.

Therefore, we collected monthly data between September 2020 and August 2021 to document the consequences of the COVID-19 pandemic for German preschool teachers' subjective stress experiences and self-efficacy beliefs. This period covered phases 2-5 of the COVID-19 pandemic in Germany: Phases 2 and 5 represent the summer plateaus in 2020 and 2021, and phases 3 and 4 reflect the second and third epidemic wave. Participants were 284 German preschool teachers (Mage= 37.45 years, SD = 11.44) with different positions within their preschool, who completed a monthly online survey.

Multilevel models were used to analyze the data on a between-person (BP) and within-person (WP) level as they fit the structure of the data best and are especially useful for examining changes over time inter- and intra-individually. Analyses showed phase-specific changes in subjective stress experiences and interindividual differences in its change rates. While no systematic increase was observed across the entire study period, subjective stress experiences increased significantly in Phase 3, the second epidemic wave. Together, the present findings are a first, important step in examining the impact of theCOVID-19 pandemic on preschool teachers and also highlight the importance ofself-efficacy beliefs as a personal resource for preschool teachers, which should be strengthened to better face stress experiences.

References:

Autorengruppe Corona-KiTa-Studie. (2021). 4. Quartalsbericht der Corona-KiTa-Studie (II/2021). *DJI.* https://corona-kita-studie.de/quartalsberichte-der-corona-kita-studie

Autorengruppe Corona-KiTa-Studie. (2020). 1. Quartalsbericht der Corona-KiTa-Studie (III/2020) [1st quarterly report of the Corona-KiTa study (III/2020)]. *DJI.* https://corona-kita-studie.de/quartalsberichte-der-corona-kita-studie

Autorengruppe Corona-KiTa-Studie. (2020). 2. Quartalsbericht der Corona-KiTa-Studie (IV/2020) [2nd quarterly report of the Corona-KiTa study (IV/2020)]. *DJI.* https://corona-kita-studie.de/quartalsberichte-der-corona-kita-studie

Tolksdorf, K., Buda, S., & Schilling, J. (2021). Aktualisierung zur „Retrospektiven Phaseneinteilung der COVID-19- Pandemie in Deutschland“ [Update on the "Retrospective phase classification of the COVID-19 pandemic in Germany"]. Epid Bull, 37, 3-4. https://doi.org/10.25646/8961

Jungbauer, J., & Ehlen, S. (2015). Stressbelastungen und Burnout-Risiko bei Erzieherinnen in Kindertagesstätten: Ergebnisse einer Fragebogenstudie [Stress burdens and burnout risk among kindergarten teachers in day care centers: results of a questionnaire study]. *Gesundheitswesen 2015,* 77(6), 418–423. https://doi.org/10.1055/s-0034-1381995

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc.

How pre-service teachers' intentions to teach with games relate to their personal characteristics

Marco Rüth, University of Cologne, Germany; Adrian Birke, University of Cologne, Germany; Kai Kaspar, University of Cologne, Germany

Keywords: Game-based learning, Pre-service teacher education, Survey research, Technology

Digital games have been shown to effectively promote learning in school teaching (Clark et al., 2016: Huizenga et al., 2017). They can be integrated into school teaching as learning tools (to teach knowledge or skills) and as objects of reflection (to foster media-critical reflection processes). Anyhow, teachers ultimately decide whether and how they consider digital games as effective and suitable for their school teaching. In this regard, it is largely unclear to what extent pre-service teachers intend to use digital games in their future school teaching and which personal characteristics are related to their intention. Hence, we surveyed pre-service teachers to investigate how personal characteristics are related to pre-service teachers' intention to (not) use digital games in school teaching as learning tools or objects of reflection. In an online survey, 402 pre-service teachers from German-speaking universities participated. To answer our research question, two multiple linear regression analyses with the intention to teach with digital games as *learning* tools or objects of reflection as dependent variables. Following previous studies, the independent variables we included in the regression models were scales for technology acceptance constructs (Venkatesh & Bala, 2008), complemented by scales for game-related technological pedagogical content knowledge, need for cognition enjoyment, and curriculum relatedness of digital games. The regression models explained 68% of the variance in the intention to teach with digital games in school teaching as learning tools ($F(21, 376) = 38.50$, $p < .001$) and 38% of the variance in the intention to use digital games in school teaching as objects of reflection ($F(21, 379) = 11.07$, $p < .001$). The intention to teach with digital games was positively related to the perceived usefulness and curriculum relatedness of digital games, while relationships with other factors varied. Our results suggest that pre-service teachers are more likely to use digital games in school teaching as learning tools or objects of reflection if they consider them useful and see references to the curriculum. The difference in explained variance by the models also suggests different qualities of the two educational contexts. We discuss possible avenues for future research and implications for practice, particularly for teacher education. Overall, these findings support further efforts to more effectively address teaching with digital games in teacher education.

References:

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences*, 39(2), 273–315.

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research*, 86(1), 79–122.

Paper Session Single Paper paper_type_1 session 25	**Time:** 1.00 pm – 2.30 pm	**Location:** Lecture Hall (Vortragssaal)
Assigned Chair: Laura Ohmes, Carl von Ossietzky University Oldenburg, Germany		

Learning from the expert? Exploring expertise differences in the perception of classroom disruptions

Mandy Klatt, University Leipzig, Germany; Christin Lotz, University Leipzig, Germany; Gregor Kachel, University of Leipzig, Germany; Anne Deiglmayr, Universiy of Leipzig, Germany

Keywords: Competence development, Professional vision, Student-teacher interactions, Teacher education

Expert and novice teachers differ in their ability to perceive classroom events, a competence also termed “professional vision” (Wolff et al., 2016). Mobile eye-tracking data can provide new insights in how expertise differences in teacher´s professional vision manifest in teacher-student interactions. Therefore, this multimodal study examines expertise differences in teachers’ professional vision, using mobile eye-tracking, interview and questionnaire data. Based on the existing literature, we expect expert teachers to outperform novices by showing more fixations on relevant areas with shorter fixation durations (van den Bogert et al., 2014), feeling more confident in dealing with disruptions, and having higher scores in strategic knowledge of classroom management (Gold et al., 2016).

The study specifically assesses how teachers perceive and deal with classroom disruptions in a controlled, micro-teaching setting. Each participant teaches a 15-minute, self-prepared lesson in a laboratory setting in front of a “class” of three actors who perform nine (order balanced) typical classroom disruptions (e.g., chatting with neighbor or clicking with pen). During the lesson, mobile eye-tracking is used to assess the subject’s fixations on relevant areas (e.g., the student performing the disruption). After the lesson, in a stimulated recall interview, the teacher re-watches the recorded eye-tracking video together with the experimenter and rates each disruption on how disturbing it was and how confident the subject felt in dealing with it. Finally, the teacher´s strategic knowledge of classroom management is assessed (SJT, Gold & Holodynski, 2015).

The current sample consists of n = 7 experts (teacher training completed, active in the teaching profession) and n = 14 novices (student teachers, first internship completed). Data collection is still ongoing, and will continue until the planned sample size of n = 40 experts and n = 40 novices is reached.

Mean differences between expertise groups are examined by t-tests and Cohen’s d for all three hypotheses. In addition, the correlations of the main variables are analyzed, and differences in the strength of the correlations between the expertise groups are quantified by the effect size q. Preliminary results from the current sample show that the expert teachers indeed felt more confident in dealing with the implemented disruptions than the novice teachers. At the conference, data on all hypotheses will be presented.

References:

Gold, B., & Holodynski, M. (2015). Development and construct validation of a situational judgment test of strategic knowledge of classroom management in elementary schools. *Educational Assessment,* 20(3), 226-248.

Gold, B., Hellermann, C., & Holodynski, M. (2016). Professionelle Wahrnehmung von Klassenführung–Vergleich von zwei videobasierten Erfassungsmethoden. *Der Forschung–Der Lehre–Der Bildung: Aktuelle Entwicklungen der Empirischen Bildungsforschung*, 103-118.

van den Bogert, N., van Bruggen, J., Kostons, D., & Jochems, W. (2014). First steps into understanding teachers' visual perception of classroom events. *Teaching and Teacher Education*, 37, 208–216.

Wolff, C. E., Jarodzka, H., van den Bogert, N., & Boshuizen, H. P. (2016). Teacher vision: expert and novice teachers' perception of problematic classroom management scenes. *Instructional Science,* 44(3), 243-265.

Continuing education strategies of teachers in VET - An activity-theoretical perspective

Susanne Weber, Ludwig-Maximilians-University, Germany; Stefanie Zarnow, Ludwig-Maximilians-University (LMU), Germany; Frank Hiller, Ludwig-Maximilians-University (LMU), Germany; Tobias Hackenberg, Ludwig-Maximilians-University (LMU), Germany; Susan Seeber, Georg-August-University Göttingen, Germany; Patrick Geiser, Georg-August-University Göttingen, Germany; Frank Achtenhagen, University of Göttingen, Germany; Matthias Schumann, Georg-August-University Göttingen, Germany; Julian Busse, Georg-August-University Göttingen, Germany

Keywords: Competence development, Digital transformation, Teacher education, Teacher educator professional development

Problem

With an increasing digitalization, changes in work organizations, job profiles and activity structures as well as the use of digital tools and new qualification and competence expectations can be observed. At the same time, learners' expectations of learning and training culture are changing.

For teachers in vocational schools, there are consequences for their entire teaching practice, especially for teaching with a view to the three levels of the curriculum-instruction-assessment-triad. Nevertheless, digitalization still does not play the role it should in teacher education and training (Backfisch et al., 2021). Existing measures are very fragmented and do not support an overarching ecosystem.

Politically, it is assumed that digital transformation will bring about a 'new continuing education culture' that should be jointly developed and shaped by all stakeholders involved in vocational education and training. Thereby, digital transformation shifts from an individual to a collective level of action and thus the unit of analysis from single individuals and organizations to an overarching system of activity (Engeström & Sannino, 2010). The aim of this paper is to analyze continuing educational strategies of vocational school teachers in the context of digitalization from an activity theory perspective.

Theory

Cultural-Historical Activity Theory (CHAT) (Engeström & Sannino, 2010) can be used to visualize complex, process-oriented work activities across different system levels. It is most often modeled as a triangle with seven constituent components (see Fig. 1).

Since all actors do not share the same objective and vision, differences in responsibility occur and adequate instruments are insufficiently perceived, 'tensions' arise. In CHAT, therefore, mediated discourse is used to first try to develop a commonly shared object and vision. In addition, learning and

development processes are initiated and supported, in which new, previously non-existent solutions are developed, implemented and tested with regard to their feasibility.

Research questions

RQ 1: How can the continuing education strategies of teachers at vocational schools in the context of digitalization be described using CHAT?

RQ 2: Which are the central 'tensions'?

RQ 3: Which recommendations and measures can be 'derived' from the analyses for the actors?

Method

In our governmentally-funded project, we conducted a sub-study in which we interviewed 46 teachers from 18 vocational schools about their continuing education strategies in the digital transformation process (using MAXQDA). The activity system served as framework for the content analyses.

Results and first indications

The continuing education strategies of teachers at vocational schools can be meaningfully visualized (FF1) and tensions can be clearly identified (FF2). The results suggest to establish structures like professional communities to support teachers‘ continuing education strategies, and appropriate organizational structures, but also open access (FF3).

Limitations, Outlook

In the paper, we will critically discuss the results and elaborate recommendations for action.

References:

Backfisch, I., Lachner, A., Stürmer, K., & Scheiter, K. (2021). Variability of teachers’ technology integration in the classroom: a matter of utility! *Computers & Education*, 166(8), 104159.

Engeström, Y. & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review* 5(1) 1–24.

The effect of student teachers’ media use on the acquisition of teaching skills using digital tools

Katharina Frank, Johannes Gutenberg-Universitaet Mainz, Germany; Jasmin Schlax, Johannes Gutenberg-University Mainz, Germany; Olga Zlatkin-Troitschanskaia, Johannes Gutenberg University of Mainz, Germany; Sebastian Brueckner, Chair of business education, Germany; Moritz Schneider, Johannes Gutenberg-University Mainz, Germany; Christian Dormann, Johannes Gutenberg University of Mainz, Germany; Anja Müller, Johannes Gutenberg University of Mainz, Germany

Keywords: Competence development, Instructional design, Multimedia learning, Teacher education

In times of digital transformation and reinforced by the COVID-19 pandemic, innovative digital teaching-and-learning concepts in teacher education are urgently required [1,2,3]. This includes teaching with digital tools [4] to promote action-oriented teaching skills [3]. In the collaborative project ANONYMIZED, we have developed digital teaching-and-learning tools to address the current deficit [4]. Problem-oriented, multimedia approaches (incl. video vignettes) offer teacher training in typical, authentic instructional situations [1,4]. Thus, we used problem-centered instructional designs (incl. Pebble-in-the-pond model [5]) to develop digital learning tools for university teacher education [4]. To evaluate the

effectiveness of these newly developed tools, we conducted an intervention study with a pre-post-assessment and control groups to investigate the first research question (RQ): Does learning with a new digital teaching-and-learning tool lead to an increase of intended action-oriented skills in post-test (t2) when compared to pre-test (t1)? In this paper, we exemplary present the results of two digital learning tools focusing on the promotion of conversational skills and language development skills in classroom respectivly.

Since the effectiveness of digital teaching-and-learning tools may significantly depend on student teachers' general digital skills such as their individual media use experiences [e.g,. predominant use of digital vs. analogue media, 3,4], we pose a second RQ: Is the learning success with the digital tool (i.e., an increase in conversational skills or in language development skills) influenced by students' individual media use experiences?

To gain cross-domain insights, student teachers from two domains – economics didactics (ED) and German didactics (GD) – used the teaching-and-learning tools to promote the specific action-oriented skills (ED: language development skills, GD: conversational skills) in classrooms, in the context of regular (digital) teaching. Before (t1) and after the four-week-intervention with the digital tools (t2), a controlled online survey was conducted, in which the target skills were assessed using validated tests, and the students' central personal characteristics (gender, age etc.) were surveyed. Students' media use was measured using a validated scale with twelve items [3,6], which asked about the average study-related weekly use of digital and analog learning media.

Regarding RQ1, changes in the respective promoted skills were identified for the ED-group (n=36) regarding language development skills between t1(xt1=2.98,SDt1=1.341) and t2(xt2=3. 65,SDt2=1.286; t(45)=-3.065,p=.004,d=.452) and for the GD-group (n=46) regarding conversational skills from t1(xt1=8.33,SDt1=2.575) to t2(xt2=9.56,SDt2=1.594; t(35)=-2.743,p=.010,d=.394). Consequently, as expected, the digital teaching-and-learning tools show positive effects on the respective target skills.

Regarding RQ2, the effect of study-related media use was significant with respect to the difference test score from t1 to t2. Use of recommended textbooks had a significant positive impact on skill development (β=.351,SE=.167,p=.034). The use of social media platforms negatively influenced skill development (β=-.380,SE=.091,p=.028). These results indicate that students' general media use plays a significant role in study-related learning and greatly impacts learning with digital tools.

These and additional results from the intervention study are critically discussed in terms of limitations (e.g., sample selection, generalizability) and implications for future research and teacher education practice.

References:

[1] Mulenga, E. M. & Marbán, J. M. (2020). Is COVID-19 the Gateway for Digital Learning in Mathematics Education? *Contemporary Educational Technology,* 12(2), ep269. doi:10.30935/cedtech/7949

[2] UNESCO (2020). *Education: From disruption to recovery.* https://en.unesco.org/covid19/educationresponse

[3] Authors (2020). *Blinded for review.*

[4] Authors (2021). *Blinded for review.*

[5] Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development*, 50(3), 43–59. doi:10.1007/BF02505024

[6] Nagel, M.-T., Reichert-Schlax, J. Zlatkin-Troitschanskaia, O., Klose, V., Weber, M. & Roeper, J. (2021). The relationship between medical students' media use and learning progress. *Studies in Higher Education*, 46(10), 2063–2073. doi:10.1080/03075079.2021.1953334

Paper Session Single Paper paper_type_1 session 21	Time: 1.00 pm – 2.30 pm	Location: Big Club Room (Großer Clubraum)
Assigned Chair: Matthias Schulden, Department of Special Needs Education and Rehabilitation, University of Oldenburg, Germany		

Effectiveness of a digital professional development program for history teachers

Matthias Schulden, Department of Special Needs Education and Rehabilitation, University of Oldenburg, Germany; Viktoria Pöchmüller, Department of Special Needs Education and Rehabilitation, University of Oldenburg, Germany; Dr. Clemens Hillenbrand, University Oldenburg, Institute for Special Education and Rehablitation, Germany

Keywords: History, Self-efficacy, Special education, Teacher professional development

In 2017, only four of sixteen German states had concrete requirements for the "acquisition of professional competencies for dealing with digital media" in university teacher training (Schmid et al., 2017, p. 6, translation by the author). This illustrates the importance of the third phase of professional development (PD): "In view of lifelong learning and the rapid technological and conceptual development in the field of digital media, professional development is of particular importance" (Kultusministerkonferenz der Länder, 2016, p. 29, translation by the author).

Among its many affordances, digitalization opens up new opportunities and challenges for differentiating instruction when it comes to implementing inclusive education and thus consistently meeting the "diverse needs" (UNESCO, 1994, p. 11) of an increasingly heterogeneous student body. In order to design learning opportunities according to the diverse needs of learners while minimizing potential barriers, the internationally widely accepted principle of Universal Design for Learning (UDL) can serve as an orienting framework (Cook & Rao, 2018; Rose & Meyer, 2002).

Heterogeneous needs and requirements challenge teachers in different ways. Especially the combination of requirements of a fast-moving digital media landscape and the simultaneous implementation of inclusive education emphasizes the urgent need for continuous training opportunities for teachers of all school types. Teacher self-efficacy became a key aspect for effective teaching and acting (Schmitz & Schwarzer; Schwarzer & Jerusalem, 2002) especially in the inclusive digitized classroom.

The central object of the KLUG project (inklusiv Geschichte unterrichten - teaching history inclusively) is the development and evaluation of a theoretically based PD program for secondary school history teachers using digital tools, which extends over a total of six months and consists of two full-day trainings and six 90-minute virtual e-sessions (with live moderation). The synchronous elements are complemented by extensive blended learning offers. All events and materials pursue the goal of combining history didactic topics with the qualification for evidence based, digitally supportive and inclusive teaching.

To test the effectiveness of the PD program, a randomized control group design (intervention group vs. waiting control group, n=85) with pre- and post-test is used to examine, among other things, the attitudes towards inclusive education (PREIS, Lüke & Grosche, 2017) and Teacher's Self-Efficacy (Schwarzer & Jerusalem, 1999; TSES, Tschannen-Moran & Hoy, 2001).

In addition to a description of the theoretical foundation and a differentiated presentation of the training, longitudinal results on the described scales will be presented. Preliminary descriptive analyses suggest that attitudes toward inclusion may be a relevant factor, which in turn seems to be related to other aspects of prior experience and attitudes.

References:

Cook, S. C., & Rao, K. (2018). Systematically Applying UDL to Effective Practices for Students With Learning Dis-abilities. *Learning Disability Quarterly*, 41(3), 179–191.

Kultusministerkonferenz der Länder. (2016). *Bildung in der digitalen Welt: Strategie der Kultusministerkonferenz*. https://www.kmk.org/fileadmin/Dateien/pdf/PresseUndAktuelles/2018/Digitalstrategie_2017_mit_Weiterbildung.pdf

Rose, D. H., & Meyer, A. (2002). *Teaching every student in the Digital Age: Universal design for learning*.

Schmid, U., Goertz, L., Radomski, S., Thom, S., & Behrens, J. (2017). *Monitor Digitale Bildung: Die Hochschulen im digitalen Zeitalter.* Bertelsmann Stiftung. https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/DigiMonitor_Hochschulen_final.pdf

Schmitz, G. S., & Schwarzer, R. Selbstwirksamkeitserwartung von Lehrern: Längsschnittbefunde mit einem neuen Instrument. *Zeitschrift Für Pädagogische Psychologie*, 14, 12–25.

Schwarzer, R., & Jerusalem, M. (1999). *Skala zur Allgemeinen Selbstwirksamkeitserwartung*. https://www.researchgate.net/profile/Ralf-Schwarzer/publication/238580838_Skala_zur_Allgemeinen_Selbstwirksamkeitserwartung/links/02e7e5281261f8f15f000000/Skala-zur-Allgemeinen-Selbstwirksamkeitserwartung.pdf?_sg%5B0%5D=nehA4aHplNv2SQtfeoLku5RrY67fYXiQdGlnkU5UMVZRifhCtcIf0eKXdA0W_lmtNEVHU1DYXoFkurL605qaJA.IfXv2xi6F3MiXrm8CLwBsrLxYe50pPZJFQzvylSC0AftNqPaqyFv4xt968mKulsBYubF3aSX8mvPW8lUlCjjEw&_sg%5B1%5D=Uqy4Q6O2W81CLOfJFwTbGgRnprvuADnqvwBENxJW653m-_c6G1LdSepJ-1q65jXGsecchpkD7Nbl6FQPbL-jggBMGAgfEICaGYXIociC7YkP.IfXv2xi6F3MiXrm8CLwBsrLxYe50pPZJFQzvylSC0AftNqPaqyFv4xt968mKulsBYubF3aSX8mvPW8lUlCjjEw&_iepl=

Schwarzer, R., & Jerusalem, M. (2002). Das Konzept der Selbstwirksamkeit. *Zeitschrift Für Pädagogik,* Beiheft 44, 28–53. https://www.pedocs.de/volltexte/2011/3930/pdf/ZfPaed_44_Beiheft_Schwarzer_Jerusalem_Konzept_der_Selbstwirksamkeit_D_A.pdf

Lüke, T. & Grosche, M. (2017). *Professionsunabhängige Einstellungsskala zum Inklusiven Schulsystem (PREIS).* https://www.researchgate.net/profile/Timo-Lueke/publication/294870179_Professionsunabhangige_Einstellungsskala_zum_Inklusiven_Schulsystem_PREIS/links/594bb2ac458515e7034873a3/Professionsunabhaengige-Einstellungsskala-zum-Inklusiven-Schulsystem-PREIS.pdf?_sg%5B0%5D=kXwMmPN_ODMF2jHj-BIs3V4PLHcDTFePcblpkB7uDeT0Ukk2DsgHPJybuHfeyXPbpbcRTD6Mjl_Z29IzBbDfvg.gFx8AAvf7oOaZ_QHCOKj8PW610aoEcL3IrT7r376UI_uKctzSjYPoSmUb02Sa9mdRCQR2pyHACviQ06O-ubNlw&_sg%5B1%5D=jRU9DdTXEuYFyBucW0HuS292TOQb8koNN5BzkGfQqwXoPHLXJeiYrZASHGADSAtiLl3EJaNx41HtFQw3n98kt7_0amUeqlCcABnZ73LQOldI.gFx8AAvf7oOaZ_QHCOKj8PW610aoEcL3IrT7r376UI_uKctzSjYPoSmUb02Sa9mdRCQR2pyHACviQ06O-ubNlw&_iepl=

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: capturing an elusive construct. *Teaching and Teacher Education,* 17(7), 783–805. https://doi.org/10.1016/S0742-051X(01)00036-1

UNESCO. (1994*). The Salamanca Statement and Framework for Action on Special Needs Education.*

Early-career teachers' experiences with innovative professional potential in secondary schools

Julia van Leeuwen, Radboud Teachers Academy, Radboud University Nijmegen, Netherlands; Harmen Schaap, Radboud University Nijmegen, Netherlands; Femke Geijsel, Radboud University Nijmegen, Netherlands; Paulien Meijer, Radboud University Nijmegen, Netherlands

Keywords: Beginning teachers, Qualitative methods, Secondary education Teacher professional development

Early career teachers (ECTs) can contribute to educational innovation and development in schools. Just graduated from teacher education, they bring new ideas and have up-to-date knowledge of their fields – such as use of technology (cf. Ulvik & Langørgen, 2012). Despite that, ECTs are often not sought as resources by their schools or their ideas receive resistance from colleagues (Correa et al., 2015; Ulvik & Langørgen, 2012). We have defined the potential resource for educational innovation and development of ECTs as innovative professional potential (IPP).

In this paper, we focus on the experiences of ECTs with IPP to eventually foster understanding of ways to utilize and strengthen IPP within the school ecosystem. The main research question is: What are the experiences of ECTs with IPP in secondary schools? We conducted interviews with 19 ECTs (3-7 years of experience) in secondary education, yielding 105 narrated experiences. Analyses of these experiences focused in the first place on typifying the experiences: what they were about and where in the school they took place. In the second place, our analyses focused on understanding the interactions in the school ecosystem that were considered relevant by the ECTs for their IPP.

Findings show that the experiences described by the ECTs are mainly activities in the broader school organisation, such as tasks concerning pupils and education (e.g. coordinating the care for children with dyslexia or developing educational materials together with colleagues). In addition, we identified multiple interaction processes within each experience. These interaction processes could be characterized as stimulating, neutral or hindering. Most often, the stimulating interaction processes were with one or multiple direct colleagues, and primarily contained working together on educational development. On the contrary, the hindering interaction processes were most often with school management, and primarily contained feelings of not being heard or listened to.

However, the hindering experiences appeared to not simply be about being allowed to set up or engage in desired (innovative) activities. They seemed to be characterized more by the feeling of being taken seriously by management in relation to the schools' or departmental goals for educational improvement. For instance, a laissez-faire attitude of a manager ('do whatever you like') was not considered as IPP-stimulative by a particular ECT.

Our findings indicate that from the beginning of their career, ECTs actively want to participate meaningfully as a professional in the school organization, and that is where IPP can flourish. Moreover, interactions with others in the school ecosystem are important for IPP to be either stimulated or hindered: we thus need commitment of everyone in the school ecosystem to incorporate the ECT as a professional in the school and let IPP flourish.

References:

Correa, J. M., Martínez-Arbelaiz, A., & Aberasturi-Apraiz, E. (2015). Post-modern reality shock: Beginning teachers as sojourners in communities of practice. *Teaching and Teacher Education*, 48, 66–74. https://doi.org/10.1016/j.tate.2015.02.007

Ulvik, M., & Langørgen, K. (2012). What can experienced teachers learn from newcomers? Newly qualified teachers as a resource in schools. Teachers and Teaching: *Theory and Practice*, 18(1), 43–57. https://doi.org/10.1080/13540602.2011.622553

Paper Session Single Paper paper_type_1 session 6	Time: 1.00 pm – 2.30 pm	Location: Seminar Room II (Seminarraum II)
Assigned Chair: Fleur van Gils, KU LEUVEN, Belgium		

Developing & evaluating a pedagogically driven technology training program for language teaching

Maha Alghasab, University of York, Kuwait; Zoe Handley, University of York, United Kingdom

Keywords: Design based research, Language, Teacher education, Technology

In this talk we will discuss the development and evaluation of pedagogically-driven technology professional development training program we have developed for trainee Kuwaiti primary school teachers of English as a Foreign Language (EFL). Acknowledging that technology is "protean, unstable and opaque" (Koehler & Mishra, 2009, p.61), that new applications are emerging at a "dazzling speed" (Karatay & Hegelheimer, 2021, p. 275), and it is impossible to evaluate the effectiveness of all innovations, our training program focuses on equipping teachers with the knowledge required to make their own decisions about what technologies to use when and how in their teaching.

The training program builds upon student teachers' existing Pedagogical Content Knowledge (PCK; Shulman, 1987) to develop Technological Pedagogical Content Knowledge (TPACK) i.e., PCK-TPACK (Koehler & Mishra, 2009) and adapts Starkey's (2010) model of technology professional development for EFL. There are four main steps in the training: (1) comprehension of Second Language Acquisition (SLA) theories and associated and pedagogical principles, (2) enabling teachers to make connections between pedagogical principles and technological affordances, that is to identify appropriate technologies, and ways of using those technologies, to facilitate and enhance learning, (3) experience teaching in this way, and (4) developing new comprehension through reflection on that experience.

The first step focuses on revising the theories and pedagogies of SLA with a focus upon conditions for optimal language learning environment (Egbert, Hanson-Smith & Chao, 2007). The second step focuses on helping teachers to apply what they have learned about SLA theories in designing activities that promote language learning. Following activity type approach (Koehler et al., 2013), participants will be asked to engage in (a) selecting teaching materials from primary school textbook and formulate a goal for students learning, (b) transforming it to teachable content by choosing appropriate method, activities, and effective pedagogies, (c) selecting technologies that can promote language learning and teaching, and (d) adapting and tailoring what they have prepared to match students' characteristics. The third step involves "learning about technology" and "teaching with technology". Learning about technology involves experiencing technology as learners and engage in different activities and teaching with technology includes presentation of a lesson that integrates technology. The fourth step invites student teachers to engage in critical reflection about using technologies.

Our evaluation of the training comprised pre- and post-intervention surveys and semi-structured interviews based on the Technology Pedagogy Content Knowledge (TPACK) framework (see Bostancioglu & Handley, 2018).

The findings of this project will help identify gaps in teachers' TPACK, refine the design of our training program and contribute to the wider understanding of what makes effective technology professional development.

References:

Bostancioglu, A., & Handley, Z. (2018). Developing and validating a questionnaire for evaluating the EFL 'Total PACKage': Technological Pedagogical Content Knowledge (TPACK) for English as a Foreign Language (EFL). *Computer Assisted Language Learning.* 31.pp. 572-598.

Egbert, J., Hanson-Smith, E., & Chao, C. C. (2007). Introduction: Foundations for teaching and learning. In J. Egbert & E. Hanson-Smith (Eds.), CALL environments: Research, practice, and critical issues (2nd ed.) (pp. 1-18). Alexandria, VA: TESOL.

Karatay, Y., & Hegelheimer, V. (2021). CALL teacher training—Considerations for low resource environments: Overview of CALL teacher training. *CALICO Journal,* 38(3)

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.

Koehler, M., & Mishra, P., & Akcaoglu, M., & Rosenberg, J. (2013). The Technological Pedagogical Content Knowledge Framework for Teachers and Teacher Educators. ICT integrated teacher education.

Shulman, L.S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review,* 57(1), 1–22.

Starkey, L. (2010) Teachers' pedagogical reasoning and action in the digital age. *Teachers and Teaching: theory and practice*, 16 (2), 233-244, DOI: 10.1080/13540600903478433

New Directions in Studying Classroom Talk: A Mixed-Method Case Study on Silent Students

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Keywords: Case studies, Mixed-method research, Student-teacher interactions, Teaching/instruction

Theory

There is considerable evidence that engaging students in classroom talk is linked to positive learning outcomes (Howe et al., 2019). However, studies also show that the effects of classroom talk vary for individual students depending on the way how they are encouraged to talk (Kovalainen and Kumpulainen, 2007). For this reason, it is important to investigate individual students' verbal engagement in classroom discourse in more detail. In this study, we focus on the verbal engagement of silent high-achieving (SHA) students, a group which has not often been studied yet. Recently, this group is considered as cognitively well-performing but also as reserved in plenary situations of classroom talk (Sedova and Navratilova, 2020). Due to SHA students are seldom internally triggered to engage in classroom talk, teachers invite them more directly (Sedova and Navratilova, 2020). However, there are only a few studies which have shown how effective this communication strategy is in fostering SHA students' verbal engagement in classroom talk. Hence, the present study addresses the following research questions:

1. How do teachers directly invite SHA students to contribute to classroom talk?

2. How do SHA students contribute in response to teacher's direct invitations?

3. How do SHA students perceive the quality of teacher's communication behavior?

Methods

To get a comprehensive insight into students' behavior and thinking, we conducted a mixed-method case study and examined two classes (class A and B; 42 students) over nine months by use of questionnaires, video observations, and interviews with the students and class teachers. We used all data sources to identify focal students that matched the profile of a SHA student (six students: Cassandra, Mariah, Frank, Sandra, Michelle and Ann). Videos were analyzed regarding quality aspects of teacher and student talk (Howe et al., 2019).

Results and Discussion

Results show, first, a higher quality of teacher invitations of the teacher in class A (see Tab. 1). Second, in response to teachers' direct invitations, the responses of SHA students in class A show more reasoning (see Tab. 2). Third, SHA students in both classes are very aware of the quality of teacher's communication behavior. Teachers' talk moves such as direct-call on are seen very critically by the students. In the interview Laura, for example, said: "*That's also the case when you really don't know what the answer is. Then it doesn't help if the teacher says you have to say something now. That doesn't help.*"In the paper presentation, we will examine and discuss these results in more detail by illustrating additional findings from the interviews and provide further implications for research and teaching practice.

References:

Howe, C. et al. (2019). Teacher–Student Dialogue During Classroom Teaching: Does It Really Impact on Student Outcomes? *Journal of the Learning Sciences,* 1–51.

Kovalainen, M., & Kumpulainen, K. (2007). The social construction of participation in an elementary classroom community. *International Journal of Educational Research,* 46(3–4), 141–158. https://doi.org/10.1016/j.ijer.2007.09.011

Sedova, K., & Navratilova, J. (2020). Silent students and the patterns of their participation in classroom talk. *Journal of the Learning Sciences*, 29(1), 1-36.

Teacher characteristics as predictors of their responses to bullying incidents among students

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Keywords: Peer interaction, Primary education, Social interaction, Student-teacher interactions

Given the dramatic impact of school bullying and the key role of teachers in tackling bullying, it is crucial to get more insight into teachers' responses to bullying. Research has shown that these responses vary extensively between different teachers (e.g., Burger et al., 2015). We aim to explain this variation by investigating characteristics that predict teachers' responses from a socio-ecological perspective. We assume that next to student factors and the interaction between teacher and student, also teacher factors may play a role in bullying processes. More specifically, individual teacher characteristics may predict their responses to bullying (Strohmeier & Gradinger, 2021). Based on Ajzen's (1991) theory of planned behavior and the expectancy-value theory (Wigfield & Eccles, 2000), we examine teachers' bullying-related cognitions and emotions as predictors of their responses to bullying and take into account background characteristics of teachers. Specifically, the investigated bullying-related cognitions and emotions are perceived seriousness of bullying, empathy towards the victim, normative bullying attitudes, self-efficacy, and internal and external attributions of the bullying. The included background

characteristics are teachers' gender, experience, and personal bullying history. Some cross-sectional studies have found (partial) evidence for these predictors (e.g., Strohmeier & Gradinger, 2021; Yoon et al., 2016). However, these studies investigated hypothetical responses to bullying vignettes reported by teachers. To contribute to the scarce existing research, this study longitudinally examined predictors of teachers' responses to actual bullying as perceived by students. We used data from the three-wave longitudinal Teachers4Victims project, including 911 fourth to sixth grade students (M_{age} = 10.56 years, 53% girls) and their 53 teachers (M_{age} = 39.09 years, 85% female) from Flanders (Belgium). Student perceptions of teachers' actual responses to bullying were measured with the validated Teachers' Responses to Bullying questionnaire (Campaert et al., 2017; Nappa et al., 2021), distinguishing Non-Intervention, Disciplinary Methods, Group Discussion, Mediation, and Victim Support. Predictors as well as background characteristics were assessed by teacher reports. Instruments show adequate internal consistency. Longitudinal multiple multivariate regression analysis was conducted in Mplus to investigate the temporal links. To account for the nested structure of the data, student perceptions were aggregated at the class level resulting in class mean teachers' responses. Preliminary results (see Figure 1), when controlling the analysis for initial teachers' responses, show that perceived seriousness of bullying positively predicted the teachers' responses Mediation and Victim Support at a later time. Further, self-efficacy negatively predicted Victim Support. The other predictors remained non-significant. The background characteristic sex positively predicted Group Discussion, implying that male teachers apply more of these responses. These preliminary results provide some evidence for promoting teachers' bullying-related cognitions and emotions, such as perceived seriousness of bullying, in teacher training to influence and improve teachers' responses to bullying.

References:

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. https://doi.org/10.1016/0749-5978(91)90020-t

Burger, C., Strohmeier, D., Spröber, N., Bauman, S., & Rigby, K. (2015). How teachers respond to school bullying: An examination of self-reported intervention strategy use, moderator effects, and concurrent use of multiple strategies. *Teaching and Teacher Education*, 51, 191-202. https://doi.org/10.1016/j.tate.2015.07.004

Campaert, K., Nocentini, A., & Menesini, E. (2017). The efficacy of teachers' responses to incidents of bullying and victimization: The mediational role of moral disengagement for bullying. *Aggressive Behavior,* 43(5), 483-492. https://doi.org/10.1002/ab.21706

Nappa, M. R., Palladino, B. E., Nocentini, A., & Menesini, E. (2021). Do the face-to-face actions of adults have an online impact? The effects of parent and teacher responses on cyberbullying among students. *European Journal of Developmental Psychology,* 18(6), 798-813. https://doi.org/10.1080/17405629.2020.1860746

Strohmeier, D., & Gradinger, P. (2021). Teachers' knowledge and intervention strategies to handle hate-postings. *European Journal of Developmental Psychology,* 18(6), 865-879. https://doi.org/10.1080/17405629.2021.1877130

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology,* 25(1), 68-81. https://doi.org/10.1006/ceps.1999.1015

Yoon, J. S., Sulkowski, M. L., & Bauman, S. (2016). Teachers' responses to bullying incidents: Effects of teacher characteristics and contexts. *Journal of School Violence,* 15(1), 91-113. https://doi.org/10.1080/15388220.2014.963592