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EDITED BY
Niclas Schaper,
University of Paderborn, Germany

REVIEWED BY
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University of Paderborn, Germany
Olga Kunina-Habenicht,
Technical University Dortmund, Germany
Andreas Seifert,
University of Paderborn, Germany

*CORRESPONDENCE
Kristina Walz
✉ kristina.gruettemeier@uni-bielefeld.de

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The role of performance skills in German teacher education: empirical relations between general pedagogical knowledge, communication skills, and grades

Kristina Walz[1]*, Ulrike Schwabe[2] and Edith Braun[1]

[1]Department 03 Social and Cultural Sciences, Institute for Education, Justus Liebig University Giessen, Giessen, Germany, [2]Educational Careers and Graduate Employment, German Centre for Higher Education Research and Science Studies (DZHW), Hanover, Germany

This contribution explores empirical associations between general pedagogical knowledge (GPK), communication skills, and grades in initial teacher education. We assessed the GPK and communication skills of 105 student teachers in Germany, using a knowledge test and a performance-based assessment. Empirical results show a significant correlation between GPK and grades but not between communication skills and grades. GPK is associated with the number of semesters, while communication skills are associated with age. We discuss the learning objectives of initial teacher education in higher education in the light of our results.

KEYWORDS

communication skills, general pedagogical knowledge, performance assessment, preservice teacher education, teacher knowledge

1 Introduction

Teachers play a central role in learning processes, knowledge transfer, and in a student's acquisition of competence (Darling-Hammond, 2000; Loughran and Hamilton, 2016). Studies have shown convincingly that teacher's knowledge and competences are important determinants for the quality of classroom teaching (Hattie, 2010; Caena and Vuorikari, 2021). Inside and outside of the classroom, teachers face a variety of specific situations that require reflective action and complex decision-making (Kultusministerkonferenz, 2000; Griffith and Lacina, 2018; Makovec, 2018; Matsumoto-Royo and Ramírez-Montoya, 2021). To achieve a better understanding of the prerequisites for effective and successful teaching performance, the assessment of professional teaching competence has become an important research topic within empirical educational research (Blömeke and Kaiser, 2017; Ben-Peretz and Flores, 2018; Cramer et al., 2020).

In this article, we contribute to a better understanding of the role of performance skills of German students of teacher education. Due to the German federal system, teacher education is structured differently in each of the 16 federal states (Kultusministerkonferenz, 2022; Rackles, 2023, p. 230). For the sake of simplicity, we focus on core elements that these 16 structures have in common. First, teacher education in higher education covers courses in general pedagogy. That is why knowledge in general pedagogy is analyzed. Furthermore, there is an distinction between two phases: initial teacher education and extra-occupational

continuing education (Blömeke, 2019). The first, initial teacher education, is characterized by a separation between a phase of theoretical education in higher education and a phase of practical application afterwards at schools where student teachers gain classroom teaching experience (Cortina and Thames, 2013; Terhart, 2019). In this article, we refer to the first phase of initial teacher education as the 'education phase' and to the second phase as the 'training phase'. While this separation of theory and classroom practice follows a long tradition (Blömeke, 2019), they will also lead to a phenomenon of 'reality shock'. This shock is rooted in the lack of coherence between pedagogical theory and its practical application (Corcoran, 1981; Dicke et al., 2016; Cramer et al., 2020; Voss and Kunter, 2020). It can be linked to frustration and emotional exhaustion (Voss et al., 2017; Voss and Kunter, 2020) as well as high dropout rates (Stokking et al., 2003; Hong, 2010; Dupriez et al., 2016). Both phases of a student's initial teacher education, therefore, seek to align the student's knowledge acquisition more closely with their capacity to act (e.g. Rots et al., 2014; Terhart, 2019; Peltier et al., 2021).

Against this backdrop, we investigate the possible connections between student's knowledge and performance skills, respective capacity to act, to their attendance at institutions of higher education. Institutions of higher education offer a specific learning environment, where students may acquire vocational knowledge and performance skills. While there are studies that examine either a student's knowledge or performance skills, the relationship between both still remains a scarce and relatively recent field of research. Existing literature focusses on domain specific skills within classroom settings (e.g. Kulgemeyer et al., 2020; Junker et al., 2021). We contribute to existing literature by considering generic knowledge and performance skills instead of domain specific studies as well as by examining a performance skill that can be associated with a teacher's tasks inside and outside the classroom.

We start by introducing the core concepts of our article: General pedagogical knowledge (GPK), communication skills and grades. While GPK serves as meaningful example for the general knowledge and communication skills serves as meaningful example for performance skills, we regard grades as an evident and comparable indicator of a student's learning success at an institution of higher education (Magno, 2011; Mayhew et al., 2016; König, 2020). Our study builds on previous research that explores the relationship between knowledge and performance (e.g. König and Pflanzl, 2016; Zaragoza et al., 2021). However, we add to such research by exploring the potential effectiveness of using performance-based assessments to measure a student's communication skills. Performance-based assessments and simulations are an effective method for teaching and assessing complex skills like communication (Chernikova et al., 2020). By using a performance-based test to assess communication skills, we increase the validity of our data compared to self-reports. Further, our study is based in teacher education, therefore all involved students are enrolled in teacher education.

2 Conceptual background

The vocation of teaching requires not only knowledge about a specific subject, but also performance skills (Kunter et al., 2013; König et al., 2020). Teaching in classrooms demands teachers to observe and interpret situations, and then make decisions about how to act. This interplay between knowledge, personal characteristics, and situation-specific abilities constitutes teacher's performance skills (Blömeke, 2019; Stender et al., 2021).

Higher education institutions as well as schools are important learning environments to gain knowledge and performance skills. In Germany, different aspects of knowledge acquisition are generally well integrated within the education phase. However, most study programs do not include training of performance skills within their curriculum; some literature even says, students in education programs do not begin to build such skills until the practical, training phase that takes place at schools (Jenset et al., 2018). This may result in a division between the acquisition of theoretical knowledge and the application of practical skills and excludes opportunities for reflective learning and competence development for prospective teachers. Studies indicate that students perceive this division as an incoherent and even shocking experience that has a negative impact on their skill acquisition (Dicke et al., 2015; Alles et al., 2019).

2.1 General pedagogical knowledge

A substantial part of teacher's professional knowledge is general pedagogical knowledge (GPK). In a meta-analysis, Ulferts (2019). was able to highlight the importance of GPK. In her study, she included 20 quantitative and 31 qualitative international studies in ten different languages so that global statements can be made. The main findings of the study are that teachers who have more general pedagogical knowledge demonstrate a significantly higher quality of teaching with a clear effect of d = .64. In addition, a mean effect of d = .26 on higher learning gains among pupils was also demonstrated. The analysis of the qualitative studies confirms the results on the importance of general pedagogical knowledge for the teaching profession. It is part of the curriculum regardless of the subjects or the school type in which prospective teachers will specialize. Therefore, it can be considered to be a generic teaching skill.

Following the definition by König et al. (2011) GPK consists of specific core dimensions that are relevant in everyday professional life: structuring lessons, motivating and classroom management, dealing with heterogeneity in the classroom, and students' performance assessment. Each dimension is deeply explained in the original literature (König et al., 2011, p. 190), and only a short insight will be provided here. Teachers have good knowledge in *structuring* if they know how to prepare, structure, and evaluate lessons. Teachers are skilled in *motivating* and *classroom management* if they know how to strengthen achievement motivation and to prevent and counteract interferences. Teachers that are skilled in *adaptivity* recognize a wide range of teaching methods and know how to use them intentionally. And finally, one aspect of GPK is to know different types of *assessment* and their function. In Germany, the acquisition of GPK is part of the curriculum in the education phase of teacher education and structured by education science and other core disciplines (such as sociology or psychology). We consider GPK to be a distinctive part of higher education that applies to all students of teacher

education – even if the specific focus differs slightly between higher education institutions (Nehls et al., 2020). Therefore, we use GPK as part of our analysis to operationalize the knowledge aspect of professional teaching competence. In addition to pedagogical knowledge, teachers are also expected to be able to act within pedagogical and other situations in their professional life. This is discussed below.

2.2 Communication skills

One important performance skill for teachers is communication competence. Performance skills are understood as the ability to act in a specific situation, which constitutes in the interplay of knowledge, personal characteristics, and situation-specific abilities (Blömeke, 2019). Performance skills are characterized by the fact that they are observable, as they manifest themselves in the ability to act in specific situations (Schaper, 2021; Stender et al., 2021; Kleemola et al., 2022)[1]. Performance skills are subject to several research in the area of teacher education, such as lesson-planning-competence (König and Rothland, 2022), meta-reflexivity (Cramer et al., 2019) or similar reflection (von Aufschnaiter et al., 2019). Communication skills are considered as one central performance skill, since teachers are faced with multiple settings in their professional life where interaction becomes necessary for teaching and organization (Kultusministerkonferenz, 2004/2022; Struyven and Meyst, 2010; Gartmeier et al., 2016). Teachers interact not only with pupils but also with colleagues, supervisors, and parents. Each communicative situation requires more than mere knowledge. It requires performance skills (Falkenstern et al., 2020). The training and assessment of teachers' communication skills have received considerable attention recently. However, the majority of scholars focuses on specific scenarios related to teachers' communication, such as parent-teacher interaction (Bruïne et al., 2014; Gartmeier et al., 2016); classroom instruction (Tomei and Gilchrist-Petty, 2018; Kulgemeyer et al., 2020; Findeisen et al., 2021); or peer-interaction (Sjoer and Meirink, 2016; Spillane et al., 2018). These distinct communication scenarios are integral for effective teaching. Therefore, they can be considered as important tasks. However, in order to assess communication skills in the sense of a generic performance skill that is applied in all of the above mentioned situations, we need to understand a teacher's communicative skills in a more complex and holistic way (Falkenstern et al., 2020). Rather than on a specific situation in teacher communication, we explore the underlying competence that teachers need for successful communication across various situations and contexts. For this purpose, we use a theoretical conceptualization of communicative skills, formulated by Braun et al. (2018). This concept is based on the differentiation between two types of communication, which are applicable to all kind of situations: understanding-oriented and strategic communication. These types have been first established by Habermas (1984) as part of his theory of communicative action (see Figure 1). The first type 'understanding-oriented communication' refers to a type of communication in which the communication partners aim to reach an agreement by acting in ways that are — according to Grice (1975) maxims of communication — transparent, understandable, true, and honest within the scope of socially acceptable behavior. This type of communication is connected to the goal of mutual agreement (Braun et al., 2018). The second type 'strategic communication' describes a type of communication in which the communication partners do not necessarily aim at a common goal. Instead, they aim at goals defined by a particular purpose. In strategic communication, the communication partners hope to elicit a certain reaction from the other interlocutor that goes beyond the situation itself and affects the future relationship. This type of communication is connected to situations of negotiation (Braun et al., 2018).

We consider these types of communication as one generic performance skills. Both types are applicable to and observable across different situations. With regard to the communication skills of students of teacher education, these types of communication are applicable to parent-teacher-interaction as well as to classroom instruction, peer-interaction and other communicational settings that teachers may encounter.

2.3 Grades

Continuous performance assessments and attaining higher education degrees are relevant for later professional career (König, 2020). Before, during and after study program of teacher education, grades are an evident and comparable quantitative indicator of general (professional) ability in the respective education phase (Magno, 2011). They indicate how far the defined learning objectives have been achieved. In addition to higher education certificates, grades indicate differences in individual achievement and competence at the same level of education (Lynch and Hennessy, 2017), which is a core criterion for recruitment into teaching profession in Germany (Terhart, 2007). Grades do not, however, only indicate specific knowledge; they also indicate different aspects of a student's motivation, attentiveness, conscientiousness, time management, and applying learning strategies (Magno, 2011; Kuhl and Hannover, 2012). Thus, student's grades, a summative evaluation, is predictive for a variety of professional and personal competences. Grades are the primary means by which institutions of higher education evaluate and provide feedback on a student's performance (Mayhew et al., 2016). Grades are a meaningful indicator of the level of professional teaching competence that a student has attained during their study program (König, 2020). While research on the empirical relation between grades as the common practice and performance-based learning outcomes is generally sparse, existing evidence shows the expected correlation between test scores in knowledge of German didactics and grades in the subject of German (König and Bremerich-Vos, 2020). The low correlations between grades and test scores, however, indicates that other determinants seem to be relevant. It remains an open empirical question whether performance skills — like communication skills — are reflected in grades. Our study seeks to address this gap in the research, and uses the overall grades of the current study program (see also method section below).

1 Schaper uses the expression competence-based assessment, which can be understood as a synonym.

Context: Reason to talk, Situation		
Communicative intention:	Understanding-oriented	Strategic
Content level:	Adherence to clarity, quantity, relevance and quality	Violation of clarity, quantity, relevance and quality
Relationship level:	Authentic self-disclosure	Future-oriented self-disclosure

FIGURE 1
Concept of communication competence (based on Braun et al., 2018, p. 44).

3 Hypotheses

In Germany, the development of professional teaching competence is an important part of the education phase of teacher education. Knowledge and performance skills, we assert, are both important outcomes of the education phase. In our study, we therefore consider these two factors but with a more refined focus on GPK and communication skills, both of which can be compared amongst students with different prospective subjects and teaching tracks. During the education phase, students of teacher education achieve grades that provide empirical evidence of their professional teaching competence, as related to their knowledge. Still, it remains open if grades are also related to performance skills. Based on these observations, we formulate our first hypothesis:

(1) GPK and communication skills are linked to a student's grades.

We consider GPK as knowledge that students learn specifically during their education phase. We consider communication skills as generic skills that are important not only for teaching but are also relevant outside higher education and in classroom settings. Students may acquire communication skills both inside and outside institutions of higher education. In this study, we used the number of semesters spent at an institution of higher education as an indicator for experience acquired in higher education. In addition, we also used the participant's age as an indicator for general life experience, acquired inside and outside an institution of higher education. Accordingly, our second hypothesis is:

(2) Different learning and experiential environments promote GPK and communication skills.

a. Number of semesters spent at an institution of higher education is associated with GPK and communication skills, equally, since both concepts are defined as learning outcomes of higher education.
b. Age is associated more strongly with communication skills than with GPK as communication is learnt inside and outside higher education, whereas GPK is only learnt in higher education.

Our hypotheses focus on exploring empirical associations between GPK, communication skills and grades based on theoretical arguments. Figure 2 illustrates the hypothesized associations between the different concepts.

4 Materials and method

4.1 Sample

We used a sample of 105 students of teacher education from five German institutions of higher education that was collected from October to December 2016 as part of the project 'Performance-Based Assessment of Students' Communication Skills' (Braun, 2021; for more information also see Supplementary Appendix 1) .

The sample we drew on consisted of students from all tracks of subjects and school types (see Table 1). The average age of the sample was 23 years old (sd 3.65). The sample consisted of 72 female and 30 male participants. The remaining three either did not identify their gender according to a male/female binary or did not respond to the question at all. Compared to official statistics, our sample mirrors the general distribution for students of teacher education by gender and educational tracks for the winter term 2016/2017 in Germany (Statistisches Bundesamt, 2017). The average number of semesters spent at an institution of higher education was 6.61 (sd 4.44).

4.2 Instruments

We used two different tests to assess the student teacher's GPK and communication skills. Furthermore, we used self-reported information about grades, number of semesters spent at an institution of higher education and age to operationalize the remaining constructs of our hypotheses.

4.2.1 Assessment test for general pedagogical knowledge

We assessed GPK with a validated shortened version of the instrument developed by König and Blömeke (2009), which assesses GPK as an unidimensional construct (König and Blömeke, 2010). This shortened version of the test consists of two test-booklets, each containing 15 open-and-closed questions from a pool of 18 questions. Responses were regarded as either right or wrong, according to a prepared coding scheme (König and Blömeke, 2010). Each test is evaluated and provides one score for the student's GPK. The areas of general pedagocial knowledge, which are demanded in this written test, are *structuring,*

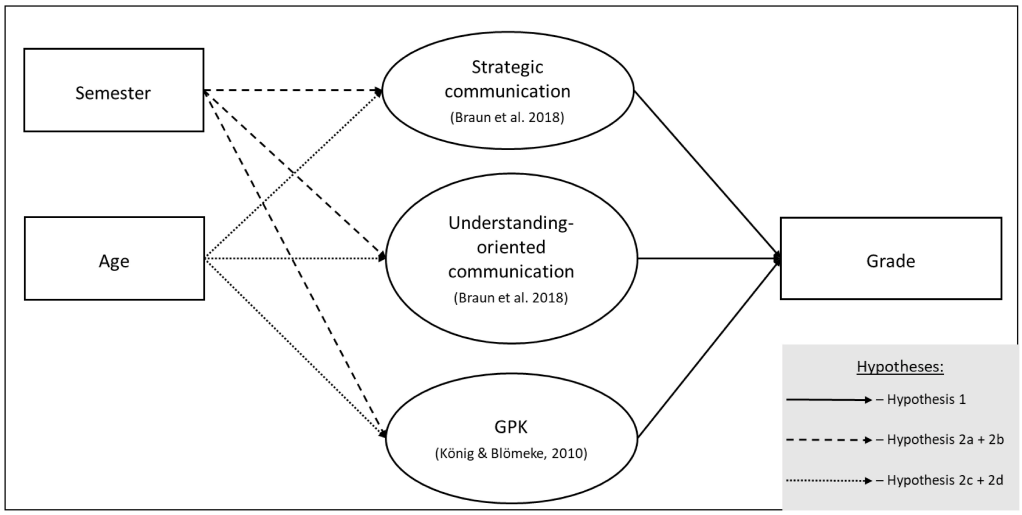

FIGURE 2
Graphical representation of the assumed and empirically tested hypotheses.

TABLE 1 Descriptives of the sample.

	N	M	SD
Age	103	23.03	3.65
Semester	104	6.5	4.48
Grade	73*	2.02	0.55
Educational Track	105		
Elementary school	6		
Elementary & Secondary school I	4		
Secondary school I	18		
Secondary school II	52		
Vocational school	5		
Other	20		
Gender	105		
Female	72		
Male	30		
Other	3		

*For the following analysis we used multiple imputations and estimated the grade for $N = 100$; N, Number of Observations; M, Mean Value; SD, Standard Deviation.

motivating and *classroom management, adaptivity* and *assessment*. For example, students have to specifically answer how to structure a lesson or what different types of assessment they know. The GPK-assessment for this sample has a reliability of $\rho = 0.86$.

4.2.2 Role-play-assessment for communication competence

To assess the communication competence, we used role-play scenarios. A role-play can be characterized as a simulation that takes place in an environment approximated to the real world, entailing a task or goal that motivates the participants to interact solution-oriented with this environment (Crow and Nelson, 2015; Chernikova et al., 2020). Role-plays can be used to assess performance skills like communication (Gartmeier et al., 2015; Levin and Paryente, 2021). Based on the concept of two generic types of communication, Braun et al. (2018) developed a role-play instrument to make the two types of communication observable and therefore measurable. They applied a literature review and a nationwide survey among experts to identify situations that could serve as an environment for the role-plays (Braun et al., 2016). For a first selection of ten environments they added a content goal and a relationship goal to each environment to motivate the students to apply either understanding-oriented or strategic communication. Five of the developed role-plays require understanding-oriented communication and five role-plays require strategic communication. This crucial distinction between the two types as well as the instruments reliability has been empirically confirmed (Braun, 2021). In this sense, each single role-play can be considered as a single task that assesses communication skills. At the end, there is one assessment each for strategic and understanding-oriented communication skills.

Each role-play includes instruction sheets for a student (test person) and a trained conversation partner (confederate), as well as an observation sheet for a trained rater (for information on confederate and rater training see Supplementary Appendix 1). The instruction sheets introduce the communicative environment to students and confederates and contain either a communication goal (students) or further instructions for the situation (confederates) (see Supplementary Appendix 2 for an example).

The observation sheets for the rating person contain items, which were derived from the theoretical concept of communication skills by Braun et al. (2018) and associated with specific observable behavior. After the student teacher's performance, one observer rated the student's behavior for each item on a 4-point rating scale.

In our sample, each student performed four of the ten role-plays, two strategic and two understanding-oriented (for details on testing procedure see Supplementary Appendix 3). An example of a strategic communication situation is when a teacher must admonish a pupil who has been late to class several times. An example of understanding-oriented communication is the

collaboration between two teachers who are asked to produce a summary of a difficult topic.

The student interacted with the same confederate and was rated by the same observer during all four role-plays. Reliability for the assessment of communication competence has been reported by Braun (2021) resulting in coefficients of $\rho_{strategic}$ = 0.8 and $\rho_{understanding-oriented}$ = 0.84.

4.2.3 Questionnaire for grades, number of semesters and age

After the role-plays, students filled out a questionnaire. Besides other information, they were asked about their current grade point average based on their completed and graded study courses ("What is the average grade of your academic achievements to date"), the number of semesters attended thus far ("For how many semesters (including the current winter semester) have you been enrolled at a university in Germany?"), and socio-demographic information including their age ("When were you born?"[2]).

We considered the students' grades as a comparable indicator that in sum reflects the general achievements they had attained thus far at an institution of higher education. Students know their overall grade from the Transcript of Records. The mean of the grades was 2.02 (sd 0.55; N = 73). German grades are ranked from '1' being the highest to '4' being the lowest grade with which it is possible to pass an exam. Most of the participants who did not report any grades were in their first year of higher education (N = 21; 67.7%) and had not yet have any exams.

As general but valuable indicators, we considered the number of semesters a student had attended so far for their experience at an institution of higher education on the one hand, and students' age for their overall life experience on the other hand.

4.3 Multi-matrix test design

We assigned one test-booklet of the GPK test as well as two strategic and two understanding-oriented role-plays randomly to each participant (for details on randomization see Supplementary Appendix 3). Using this procedure, we observed 83 percent data of the GPK assessment with 17 percent data missing completely at random and 40 percent data of the role-plays with 60 percent data missing completely at random. Table 2 provides a summary of the distribution of booklets and role-play combinations for strategic communication and understanding-oriented communication. Regarding the distribution of the test-booklets, we observed an equal share of roughly 50 percent per test booklet. Regarding the distribution of the role-plays, all 10 role-plays appeared with an equal share of roughly 20 percent per role-play (16.7 percent for role-play 10 to 24.3 percent for role-play 9) within different combinations. Therefore, we did not expect an influence of the outlier combinations. The marginal distributions of Table 2 display the frequency of each single role-play. These marginal distributions added up to 210 role-plays per communication type for our sample of 105 students as each student performed two strategic and two understanding-oriented role-plays.

4.4 Data preparation

In a first step, we applied item response theory (IRT) and multiple imputation to prepare the data. We used different IRT models to estimate competence values for GPK and both types of communication to gain precise competence estimations for further analysis (Embretson and Reise, 2013; Boone, 2016). The mean of the estimated competence values is 0 and the standard deviation is 1 (Raykov and Marcoulides, 2018). Additionally, because IRT models are capable to work with missing data (as long as the data is missing completely at random), they are useful for analysis of data from multi-matrix design (Hartig and Frey, 2013; Raykov and Marcoulides, 2018). The performance assessment as well as GPK have a multi-matrix design. Therefore, an IRT analysis allowed an estimation of competence for each participant.

4.4.1 General pedagogical knowledge

In the case of GPK, we used a dichotomous Rasch model as suggested in the original work by König et al. (2011). As described in the instruments section, answers in this test are binary, because they are either right or wrong. The estimated competence values range from −2.51 to 1.75.

4.4.2 Communication skills

In the case of the communication-performance assessment, we used a polytomous-graded response model (GRM), which fits ordered categorical answers (Samejima, 2010; Raykov and Marcoulides, 2018; Walz and Braun, 2022). To compare different IRT models, we use the Aikakes and Bayesian information criterion (AIC and BIC) (Raykov and Marcoulides, 2018). Accordingly, the model associated with the smallest values is considered to fit the data best. Compared with the partial credit model and the general partial credit model, two other polytomous IRT models, the GRM was associated with the smallest values (strategic: AIC = 2986.741, BIC = 3329.102; understanding-oriented communication: AIC = 3657.732; BIC = 4082.366). We applied one GRM for each type of communication competence. The estimated competence values for strategic communication range from −3.11 to 1.71. The estimated competence values for understanding-oriented communication range from −2.53 to 2.14.

4.4.3 Grades

We computed a multiple imputation to estimate missing values for grades in our sample. Most missing values were related to students who were in their first semester and could not, therefore, report a grade when the test was conducted. Apart from that, first-semester students did not show any significant characteristics that separated them from the rest of the sample. For imputation, we included all variables of our analysis model (GPK and both types of communication), as well as gender, track, self-rated success of course-completion, number of semesters, and the institution of higher education as auxiliary variables for the imputation process. During the regression-based imputation routine we drew 40 new data sets.

2 The students were asked about the year and month of their birth. We calculated the age based on the start of data collection.

TABLE 2 Distribution of booklets and role-play combinations.

GPK test booklet		SC	UOC	7	8	9	10	Total
A	51 (48.57%)		6 / 1	6 (5.71%)	12 (11.43%)	8 (7.62%)	10 (9.52%)	36 (17.1%)
B	54 (51.43%)	*2*	14 (13.33%)	7 / 2	16 (15.24%)	19 (19.09%)	3 (2.86%)	44 (20.9%)
		3	5 (4.76%)	11 (10.48%)	8 / 3	9 (8.57%)	7 (6.67%)	44 (20.9%)
		4	14 (13.33%)	11 (10.48%)	11 (10.48%)	9 / 4	15 (14.29%)	51 (24.3%)
		5	10 (9.52%)	12 (11.43%)	9 (8.57%)	8 (7.62%)	10 / 5	35 (16.7%)
		Total	43 (20.5%)	48 (22.9%)	36 (17.1%)	44 (20.9%)	39 (18.6%)	210

SC, strategic communication; UOC, understanding-oriented communication; numbers 1–5 refer to five strategic role-plays; numbers 6–10 refer to five understanding-oriented role-plays; 'Total' refers to the total number of the single role-plays.

All steps of data preparation and all subsequent analyses have been performed with Stata 15.

4.5 Analysis

In line with our exploratory approach, we have conducted several multiple linear regression analyses. Depending on the variables included in the regression, the sample size has varied between 100 and 103 students, as some observations still contain missing values in some of the analyzed variables. For the purpose of analyzing the association of communication skills and GPK with grades (Hypothesis 1), grades are used as the dependent variable, and the scores of communication skills and GPK as independent variables. We have examined the strength of the associations using the beta-coefficients from the regression analysis. Furthermore, we have interpreted the adjusted R^2 as an indicator of the shared variance, hence the evidence of communication skills and GPK in the grades. For the purpose of analyzing the association between different learning and experiential environments and communication skills and GPK, we have conducted three multiple linear regressions and have compared the results with the assumptions regarding the relation as stated in the Hypotheses 2a and 2b. The regression analysis used the competence estimations of communication skills and GPK as dependent variables. The indicators used were semester for the learning environment and age for general life experience, and both were used as independent variables in the regression models that we computed separately. We examined the strength of the associations using the beta-coefficients of the regression analysis.

5 Results

Before we present the results of the formulated hypotheses, we report the correlations of the independent variables: An examination of intercorrelation between all variables resulted in a significant correlation between both types of communication ($r = 0.49$, $p < 0.01$). There was no significant correlation between either type of communication and GPK (strategic communication: $r = 0.16$, $p > 0.5$; understanding-oriented communication: $r = 0.14$, $p > 0.5$). Age and number of semesters correlate significantly ($r = 0.57$, $p < 0.01$). Details regarding all possible intercorrelations are presented in Supplementary Appendix 4. Following, we are testing our Hypotheses.

TABLE 3 Associations between grades, strategic communication, understanding-oriented communication (standardized regression coefficients).

	Grade
SC	0.13
UOC	−0.09
GPK	−0.29***
Adjusted R^2	0.07
N	100

SC, strategic communication; UOC, understanding-oriented communication; GPK, general pedagogical knowledge; N, total number of observations; ***$p < 0.01$.

5.1 Are GPK as well as communication skills evident within a student's overall grades?

We observed a significant association between GPK and grades (beta = −0.29, $p < 0.01$, $N = 100$). German grades are ranked from '1' being the highest to '4' being the lowest grade with which it is possible to pass an exam. Higher test scores for GPK were associated with better grades. There was, however, no significant relation between grades and the two types of communication (strategic communication: beta = 0.13, $p > 0.1$, $N = 100$; understanding-oriented communication: beta = −0.09, $p > 0.1$, $N = 100$).

Altogether, the explanatory power of the variance in grades is very small ($R^2 = 0.07$ (all reported R^2 values are adjusted)). This seems plausible, as GPK shows a significant impact but is only one among other aspects formally defined in the curricula and professional teaching competence. Table 3 summarizes the results of the regression analysis between a teacher student's grades and their competence scores for strategic communication, understanding-oriented communication, and GPK.

The results confirmed Hypothesis 1 only in parts. We observed that GPK was correlated with higher education grades, while communication skills were not.

TABLE 4 Associations between strategic communication, understanding-oriented communication, GPK, term, and age (standardized regression coefficients).

	SC	UOC	GPK
Semester	0.01	0.09	0.52***
Age	0.26**	0.27**	−0.14
Adjusted R^2	0.05	0.08	0.19
N	103	103	103

SC, strategic communication; UOC, understanding-oriented communication; GPK, general pedagogical knowledge; N, total number of observations; Significance: $^{**}p < 0.05$; $^{***}p < 0.01$.

5.2 Do different learning and experiential environments promote GPK and communication skills?

Table 4 summarizes the results of three regression-analysis between strategic communication, understanding-oriented communication, and GPK respectively as independent variables and the number of semesters in attendance and age. First, we present the results concerning the following hypothesis:

2a) Number of semesters spent at an institution of higher education is associated with GPK and communication skills, equally, since both concepts are as defined learning outcomes of higher education.

The number of semesters spent attending an institution of higher education is associated significantly with GPK (beta = 0.52, $p < 0.01$, N = 101). The number of semesters spent attending an institution of higher education is not, however, associated with either of the communication skills (strategic: beta = 0.01, $p > 0.1$, N = 103; understanding-oriented: beta = 0.09, $p > 0.1$, N = 103). Therefore, we could only partly confirm Hypothesis 2a), since duration in higher education is only correlated with GPK, but not with communication skills.

Second, we present the results concerning the following hypothesis:

2b) Age is associated more strongly with communication skills than with GPK as communication is learnt inside and outside higher education, whereas GPK is only learnt in higher education.

A student's age showed a significant and comparably strong association with both types of communication (strategic: beta = 0.26, $p < 0.05$, N = 103; understanding-oriented: beta = 0.27, $p < 0.05$, N = 103). This connection is weaker and non-significant for age and GPK (beta = −0.14, $p > 0.1$, N = 103), therefore the results confirm Hypothesis 2b).

Overall, these associations do not explain much variance in communication skills (strategic: $R^2 = 0.05$; understanding-oriented: $R^2 = 0.08$) but for GPK ($R^2 = 0.19$). Again, these findings emphasize the strong embedding of GPK within the curricula and the relatively weak embedding of communication skills at institutions of higher education.

6 Discussion

6.1 Summary of the study

In teacher education in higher education, the acquisition of performance skills is essential as addressed by political actors (Kultusministerkonferenz, 2004/2022). Existing literature suggests that the teacher education phase not only promotes professional knowledge but also more generic performance skills as outcomes of higher education (König and Pflanzl, 2016; Cramer et al., 2020). However, studies focusing on the relation of these learning outcomes and grades are sparse. Our study, therefore, examined their promotion within current teacher education programs in Germany exploratory. According to our hypotheses, grades should thus reflect these performance skills as well as professional knowledge. For our empirical investigation, we operationalized professional knowledge as GPK (König and Blömeke, 2010), and performance skills as communication skills (Braun et al., 2018). However, empirical results did not confirm all of our assumptions: While we found a clear correlation between GPK and grades, we did not find evidence that there is a meaningful association between communication skills and grades.

In addition, we also examined the impact of learning opportunities in higher education, operationalized with the number of semesters participants had attended at an institution of higher education, versus a learning experience acquired outside of such an institution, operationalized with the participant's age, on both facets of professional teaching competence. Consequently, we assumed that students would improve in both areas during their education phase. According to the presented results, however, an association between enhanced performance skills and the number of semesters a student had attended an institution of higher education, was found for GPK, but not for communication skills. Nevertheless, there is a significant correlation between a student's age and communication competence that implies that these skills are trainable. These findings go along with the fact that knowledge is reflected in a student's grade point average, while communication skills are not.

6.2 Implications

Based on our findings, it might be claimed that performance skills are not acquired during study programs but rather in the training phase after higher education. We argue, however, that this claim is problematic: new teachers regularly report a 'reality shock' when starting their training phase (Dicke et al., 2015; Voss and Kunter, 2020). This 'reality shock' leads to a significant dropout rate from teacher education programs (Stokking et al., 2003; Dicke et al., 2016) and results in high levels of frustration among this group of new teachers. To prevent such a 'reality-shock' university-based teacher education programs should therefore seek to integrate more thoroughly and effectively theoretical knowledge and it's practical application (Flores, 2016; Blömeke, 2019). To do so, such programs could support relevant learning opportunities, such as creating more performance-based settings, by using role plays, which allows students to bring their knowledge into action. This would help close the gap between theory and practice in the sense of supporting

transfer of knowledge, establishing coherence and better prepare students to become effective teachers (Cramer, 2020).

This is closely related to our study's second aim. We seek to make performance skills measurable. Role-plays, we suggest, can be used as a method for initiating and evaluating complex performance skills in a way that goes beyond testing 'pure' knowledge (Blömeke et al., 2015; Braun and Mishra, 2016). In doing so, we are also joining existing performance-based assessments, such as those currently being developed for critical thinking (Kleemola et al., 2022) or for reflection skills (Stender et al., 2021).

6.3 Strengths and limitations

Our study makes an empirical contribution to research on the assessment of a teacher's professional competence. It shows how knowledge and performance skills are reflected in a student teacher's grades. Specifically, we go beyond previous research by using a performance-based test for assessing a student's general communication skills. The assessed communication skill refers to a theoretical concept of an underlying communication competence that influences not only specific situations of a teacher's work but all communicative interaction within and outside classroom.

Despite its strengths, this study has at least three limitations. First, the test setting itself required a great deal of planning and time because the role-plays could not be conducted as a group test (Braun, 2021). In addition, different learning environments inside and outside institutions of higher education were operationalized with two rough proxy variables using the number of semesters spent at an institution of higher education and the age of the participant. Learning opportunities could instead be operationalized based on the extent to which they were anchored in the curriculum or specific courses. Such questions, however, go beyond the scope of this article.

Second, our analytic sample was with N = 105 cases quite small for a regression framework. It might be that some coefficients did not become significant, because they lacked statistical power (known as Alpha-error in regression diagnostics, see Wooldridge, 2015). Yet, the significant correlation between GPK and grades can be trusted as being robust, because it also showed up in the small sample. More advanced statistical analyses, like structural equation models, were not applicable because of the small sample size.

A third limitation is connected to the general assumption that higher education programs help students to acquire additional knowledge and skills which can therefore be systematically improved with learning opportunities in higher education environments. Since we only had a cross-sectional data set, we could not empirically test this assumption. We would, therefore, need to measure a student's knowledge and performance skills at least at two points in time: first when the students start attending a higher education program and second when they are close to the end of their studies. This would allow us to separate the effect of learning at an institution of higher education from other learning phases as well as to account for individual differences in competence levels when entering higher education.

6.4 Directions for future research

Additional research shows promise for helping us better understand current learning opportunities in teacher education programs and their impact on learning outcomes. As such, we have identified three directions for future empirical investigation. First, little is known about the forms of learning opportunities through which communicative skills are acquired: Do students who attend institutions of higher education have better communication skills if some courses offer training in such skills or if such skills are anchored in the curriculum? To answer these questions, systematic evaluations of courses addressing communication skills or other generic skills could provide valid empirical answers. By extension, repeated measures of performance, based on longitudinal data, could also shed light on the development of communication skills in higher education study programs.

A second direction of future research could deal with the question what the potential of utilizing simulations is in performance-based testing? Are performance-based test settings a suitable way to initiate communicative action and therefore a way to integrate communication training into teacher education? A recent meta-study shows that simulation methods, such as performance-based, role-play assessments, have become more popular within higher education programs and are effective (Chernikova et al., 2020). Research projects using quasi-experimental designs could provide further insights. The quasi-experimental design could, for example, compare courses in which different methods of communication training are used.

And a third direction of future research could deal with the following questions: What other learning environments are suitable to train and thus promote performance skills? How do learning opportunities outside the education phase shape communication skills and contribute to the development of professional competence? What general situations enhance experience and therefore communication skills? To answer these questions, it is worth focusing on extracurricular experiences in a more intense and systematic way, for example by following the approach of a recent model for measuring informal learning in higher education (Decius et al., 2024).

The aim of our paper was to examine the promotion of performance skills at institutions of higher education. Based on the empirical evidence obtained thus far, our findings suggest that within current teacher education programs in Germany there is no evident, conscious promotion of communication skills. The debate about the 'reality shock' that graduates of teacher education programs experience after the completion of their studies is a global one. Thus, although our study was restricted to Germany, we believe that these empirical findings have potential application to other national contexts. To strengthen coherence within teacher education programs, in different phases of a student's studies and their professional development afterwards, it is worth thinking more intensively about performance-based teaching within education programs undertaken at institutions of higher education to assist students in transferring their theoretical knowledge and performance skills into the classroom. We believe, therefore, that measuring and training performance skills as early as possible during a student's education phase is crucial to their future

professional success (Cramer, 2020; Rothland, 2020). However, as the used model, the performance-based test for measuring a student's communication skills is flexible; it can be easily adapted to other communication situations and to the training phase of teacher education as well.

Data availability statement

The datasets presented in this study can be found online via the following link: http://dx.doi.org/10.22029/jlupub-1133.

Ethics statement

Ethical approval was not required for the studies involving humans because this study was conducted in the academic term 2016/2017 at five German universities providing teacher education. The institutions were randomly assigned. For data collection, no institutional approval was necessary. All test persons participated voluntarily and received a small monetary compensation. After comprehensive information on the objectives and contents of the study, the participants consented their participation. No single participants are identifiable in the data set. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KW: Conceptualization, Data curation, Formal analysis, Methodology, Writing—original draft, Writing—review and editing. US: Conceptualization, Data curation, Investigation, Writing—original draft, Writing—review and editing. EB: Conceptualization, Funding acquisition, Investigation, Project administration, Supervision, Writing—review and editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2024.1327827/full#supplementary-material

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