C. Krause, C. Nägele, R. Schröder, M. Rosalska, S. Romero-Rodriguez (Eds.), Career Guidance in Schools from European and international perspectives: Designing Transfer in Career Guidance Between Science and Practice.

Tuchscherer-Schad, M., & Wiepcke, C. (2026). Empirical study on the systematization of digital career guidance measures. In C. Krause, C. Nägele, R. Schröder, M. Rosalska, & S. Romero-Rodriguez (Eds.), Career guidance in schools from European and international perspectives: Designing transfer in career guidance between science and practice (pp. 201–226). Career Lead/OAPublishing. https://doi.org/10.21240/cleg/2026/clc/106

Empirical Study on the Systematization of Digital Career Guidance Measures

Tuchscherer-Schad, Marie
marie.tuchscherer@ph-karlsruhe.de, University of Education Karlsruhe

Wiepcke, Claudia
claudia.wiepcke@ph-karlsruhe.de, University of Education Karlsruhe

Abstract

Context: The megatrend of digitalization has significantly impacted career guidance for young people, leading to an overwhelming number of digital educational tools, which create uncertainty among both teachers and students. Current research lacks a systematic overview of digital career guidance tools, making it unclear which tools are best for developing specific competencies. This article investigates the state of digital career guidance tools and explores how they can be categorized and systematized based on competencies.
Approach: A systematic search was conducted using the PRISMA procedure, followed by qualitative interviews with practitioners to assess which digital tools they use. The search yielded over 600 million online results for "digital career guidance measures" in Google, with more than 20,000 relevant entries identified through a tailored search grid. The tools were categorized by form (e.g., apps, platforms), cognitive levels according to Bloom's Taxonomy, and functional value within the SAMR model.
Findings: Findings suggest that most digital tools operate at the first two SAMR levels, which are easier for providers to implement. Tools at higher SAMR levels foster deeper competence development, aligning with higher cognitive learning levels in Bloom's framework.
Conclusions: The study provides insights into the value of these tools in enhancing teaching but does not evaluate their didactic quality, which will be explored in future research.

Keywords

digital career guidance, digital measures in career guidance, systematic research, systematization and classification, educational technology

1 Introduction - On the need for systematization of digital educational measures in career guidance

The megatrend of digitalization has brought far-reaching changes to life, work, and the educational processes of young people. Career guidance is especially affected because many

CC BY
Co-funded by the European Union
movetia

digital offerings have emerged and work has become increasingly digitalized. Technological tools offer advantages in career training such as rapid information processing in tests, positive interactions with multimedia, effective content absorption, wider dissemination of content, and increased motivation through digital media (De León Mendoza & Briones de León, 2012; Guerra Rubio et al., 2010). Digitalization is a global development increasingly integrated into career guidance practice. COVID-19 has accelerated the necessity for online services and expanded digital career guidance options (Albien, 2021, p. 181).

There is a growing number of digital teaching-learning formats in career guidance, including internet platforms, eGuidance (e.g., in Denmark, BOU, n.d.), career videos, interest tests, and career exploration apps. However, this abundance can lead to disorientation and overwhelm during career choice for both students and teachers (Brüggemann & Wiepcke, 2023). International research shows a lack of systematic overview and integration of digital measures into the didactics of career guidance (Seufert & Scheffler, 2016).

There is existing research on digital technologies in general and adult education (Gegenfurtner et al., 2020), career digital learning (Dobricki et al., 2020), soft skill development through technology (Lousã & Lousã, 2023), and the role of digital competence in entrepreneurship (Martín-Rojas et al., 2013; Mir et al., 2022; Singh & Dwivedi, 2022; Triyono et al., 2023). However, the systematic development of digital career guidance skills remains largely underdeveloped (Wiepcke & Tuchscherer, 2023).

A first approach is the DigiBOKom competence framework by Wiepcke (2023), combining career guidance competence requirements (Driesel-Lange et al., 2010, 2020; Jung, 2019) with digital education standards (Vuorikari et al., 2022). To effectively integrate digital offerings into career guidance, a concrete overview and systematic categorization of available tools is needed.

Building on the international research gap, this paper explores how current digital career guidance measures can be mapped, systematized, and analysed in terms of competence orientation.

The research presented is part of a BMBF-funded (Federal Ministry of Education and Research) project aiming to develop the didactic use of digital media for career guidance in German schools and universities. The study focuses on digital measures in the German education sector and career guidance models in German-speaking countries, while also considering international literature to ensure a comprehensive perspective. Its limited scope highlights the ongoing need for further research.

Guided by the research questions, the article discusses competence requirements for digital career guidance, models the use of digital tools based on a framework for technical integration in classrooms, and derives research objectives. It then presents the methodological approach and empirical findings on the current state and classification of digital measures. The article concludes with a discussion of limitations and implications for competence-oriented digital career guidance.

2 Learning Objectives and Competence Requirements for Digital Career Guidance

According to the newest Brüggemann and Wiepcke (2023) and the OECD (2023), a central quality criterion of digital education measures is the formulation of learning objectives and the promotion of competencies. The discussions about competence orientation in recent years show that, in addition to input orientation, the output orientation of school learning processes is significant in order to initiate an increase in competence among learners (Hamilton, 2008; Klieme

et al., 2003; Mittelstädt & Wiepcke, 2018). Furthermore, competencies should always be formulated in a domain-specific way (Wiepcke, 2013). In career guidance, the acquisition of competencies is characterized by a double challenge, which requires a match between the individual and the world of work and occupation (Butz, 2008, p. 27, Savickas, 2013). On the one hand, young people must be enabled to explore their inclinations, interests, abilities and skills and, based on this, to develop a suitable career perspective. On the other hand, they are also expected to behave strategically and adapt their career aspirations to the current demand on the training and labour market (Brüggemann & Rahn, 2020, p. 12). Both sides are strongly influenced by digitalization. For the development of career perspectives as well as career choice competencies, young people face countless digital career guidance measures, so their competencies to use these measures need to be trained. On the other hand, the current demand on the training and labour market is equally shaped by digitalization. Young people need to be prepared for technical and digital fields of work that may not yet exist today (Bakhshi et al., 2017; Wiepcke, 2023; World Economic Forum, 2023). At this point, the term 'digital career guidance' is defined as it will be used throughout the article. The term 'digital career guidance' encompasses the development and promotion of digital skills that young people need to find their way in the digital world on the one hand (CEDEFOP, 2023) and to prepare for fields of work that are increasingly characterized by technology and digitalization on the other (Bertelsmann Stiftung, 2023). This can be achieved by using and reflecting on digital educational measures, among other things.

Wiepcke (2022, 2023) provides a competence framework for digital career guidance, which combines both domains - career guidance skills and digital skills (Driesel-Lange et al., 2010, 2020; Jung, 2019; Vuorikari et al., 2022) and takes up the first two parts of the definition of digital career guidance. The career guidance model by Driesel-Lange et al., which Wiepcke integrated into her work, has been further developed several times since its first publication in 2010. These adaptations have taken into account current international theoretical approaches (e.g. Blustein, 2017) as well as new empirical research findings (Brüggemann et al., 2017) and practice-oriented findings (Kunz & Schreiber, 2017; Lipowski et al., 2015). In later publications (Driesel-Lange et al., 2013, 2020), these elements were continuously incorporated in order to adapt the model to the changing requirements of career guidance.

The starting point for the competence framework is formed by the digitalization-related competencies, to which the established competencies of career guidance are assigned. Digital competencies claim to enable people in a broad understanding to participate in a cultural, media, and technical world as well as in social communication and to actively shape their lives in a digitized world. In a narrower understanding and with reference to career guidance, digitalization-related competencies are 'individual skills of a person that enable him or her to use computers and new technologies to research, design, and communicate information and to evaluate it' (Eickelmann et al., 2019, p. 9) in order to design, plan, shape, and implement his or her educational and professional biography as well as to prepare him or her for the changes in the world of work 4.0 in the field of digitalization (Binkley et al., 2012; Jung, 2019; Wiepcke, 2023; van Laar et al., 2017).

The competence framework is not just a model that describes the acquisition of technical skills; it not only teaches the ability to use digital tools, but also takes these into account and links them based on the competence models for career choice developed by Driesel-Lange (2010) and Jung (2019 to procedural competencies such as aptitude reflection and decision-making in the career choice process (Wiepcke & Tuchscherer, 2023, p. 220-232). At the same

time, it is based on internationally recognized and scientifically sound competence frameworks such as DigComp and the corresponding strategies of the Standing Conference of the Ministers of Education and Cultural Affairs.

The European Reference Framework for Digital Competences DigComp 2.2 (Vuorikari et al., 2022) subdivides five competence areas:

1. Handling information and data
2. Problem solving and acting
3. Digital content creation (produce and present)
4. Communication and collaboration
5. Safety

The first three describe increasing levels of cognitive demand; areas 4 and 5 are considered cross-cutting and integral to the others (Wiepcke, 2023). DigComp 2.2 is based on Bloom's taxonomy (Anderson & Krathwohl, 2001; Bloom, 1956), linking 21 competences with eight levels and resulting in 168 operationalized learning objectives. These levels span knowledge, understanding, application, analysis, synthesis, evaluation, and design (Krathwohl, 2002). The taxonomy follows a cumulative logic: mastery of simpler skills is a prerequisite for more complex ones.

Career guidance encompasses long-term development processes that include cognitive as well as motivational, emotional, and volitional dimensions. According to Driesel-Lange et al. (2010, 2020) and Jung (2019), career development requires both cognitive-action-related competencies (e.g., knowledge, reflection, decision-making) and affective-volitional competencies (e.g., motivation, self-efficacy). In this context, Bloom's taxonomy can serve as a structuring basis for competence development. This aligns with the logic of established digital competence frameworks such as the European DigComp, which likewise differentiate progression levels according to cognitive complexity and explicitly call for the development of procedural competences beyond mere technical use. It should be noted that a comprehensive description and promotion of competencies requires the systematic consideration and integration of affective and volitional aspects in career guidance.

In career guidance, handling information and data is fundamental. Learners must develop ability to critically reflect on and effectively use online research tools. In relation to career guidance, learners should be able to develop and refine search strategies to find digital information about job profiles, work environments, qualifications, earnings, and career prospects. They should also learn to identify, analyze, critically evaluate, organize, and securely store relevant digital data and sources. This aligns with Bloom's levels of knowledge and understanding. Exemplary goal**:** Learners can digitally research and explore career requirements, including job profiles, work environments, income, and career prospects and use this information for self-exploration and informed career decision-making. *Problem solving and action* involves applying digital tools to identify needs and solutions (Pettersson, 2018). In the context of digital transformation in education and the labour market, learners are required to analyse information, use self-assessment tools, and navigate online applications (Wiepcke, 2023), corresponding to Bloom's levels of application, analysis, and evaluation. These processes illustrate how problem-solving increasingly takes place in digital environments. In this context, Online-Self-Assessments (OSAs) serve as digital self-exploration instruments that enable learners to identify their interests, strengths, and values, thereby linking digital problem-solving with reflection and

decision-making processes in career guidance (Oeljeklaus & Höft, 2024, p. 22). Exemplary goal: Learners can use digital tools (e.g., self-tests, competence assessments) to identify their career interests and narrow down suitable careers, thus linking digital problem-solving skills to career decision and action phases of career guidance. *Digital content creation* emphasizes producing content such as LinkedIn profiles, videos, or e-portfolios (Wiepcke, 2023), thereby fostering digital identity management and strategic communication competencies required in modern workplaces (Kamsker & Slepcevic-Zach, 2021). Exemplary goal**:** Learners can plan, create, and publish digital content related to their educational and career paths using appropriate tools and platforms, thereby actively shaping their digital professional identity and preparing for the implementation phase of career guidance. These three areas rely on the cross-cutting competencies *communication and collaboration* and *safety*. The former supports digitally mediated interaction interactions with peers, teachers, and companies e.g., in applications or online communication (KMK, 2016; Wiepcke, 2022). Exemplary goal: Learners can use digital platforms to contact companies, conduct online counselling interviews, and find internships. To do this, they use appropriate digital tools and channels, thus developing social and communicative competencies essential for career exploration and professional networking. *Safety* addresses data privacy and secure digital behavior key for online applications, digital communication, and career research in an increasingly digitalised society (KMK, 2016). As digital platforms become central to education and career guidance, learners must be able to navigate and evaluate digital environments responsibly. Exemplary goal**:** Learners understand and apply data protection standards when using digital tools for career guidance, demonstrating responsible and informed participation in digital learning and working environments, which supports reflective and ethically grounded career development processes. The full competence framework can be found in Wiepcke (2023). What remains open is how these competencies can be effectively fostered through digital measures.

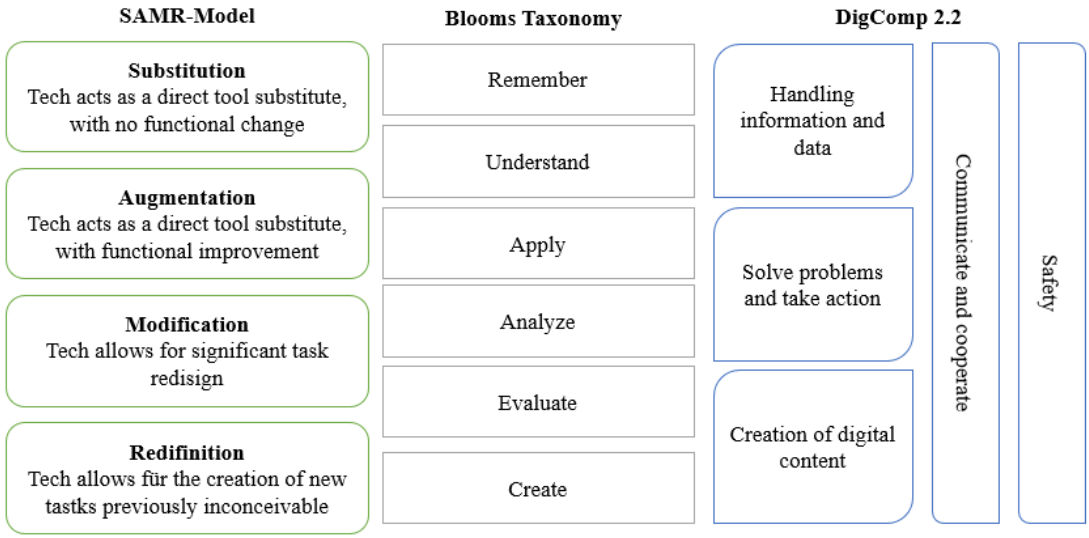
The inclusion of Wiepcke's (2023) competence model in this article was a deliberate choice, as it represents the first conceptual framework that links digital competence areas with the dimensions of career guidance competence. This integration enables an analysis of how digital tools support learning processes related to information handling, reflection, and decision-making in the context of career guidance. Although specific theories of career guidance are not discussed in detail, the applied competence model (Wiepcke, 2023) builds on established theoretical foundations in the field, particularly the developmental and constructivist approaches of Driesel-Lange et al. (2010) and Jung (2019). These form the conceptual basis for the integration of digital competence dimensions into career guidance competence. The selected competence frameworks by Jung (2019) and Driesel-Lange et al. (2010) are deliberately used as the theoretical basis for our model, as they already incorporate the broader discourse on competencies and are themselves based on validated theories of career development and guidance. Against this background, the present framework does not aim to reestablish these foundations from scratch but builds on their longitudinally developed and empirically supported conceptualization of competence development in career guidance. The development of the model is documented in detail in Wiepcke (2023).

3 Modelling the Use of Digital Measures in Career Guidance

Guided by the research question of how digital measures can be systematized and analysed with regard to a competence-oriented classification and in order to be able to take up the second

part of the definition - the use and reflection of digital educational measures - and pursue the research question, the chapter refers to the modelling of the use of digital measures in career guidance. With regard to the systematization of digital education measures, in addition to learning and competence objectives, the SAMR model can be used to analyse the integration of digital media in the classroom. The Substitution Augmentation Modification Redefinition (SAMR) model by Puentedura (2006) refers to the analysis of educational measures by teachers. Using the SAMR model, teachers can analyse and evaluate their educational interventions in a four-stage process (Hamilton et al., 2016, p. 434). The four stages are substitution, augmentation, modification, and redefinition. At the lowest level, substitution, analog materials are merely replaced by digital media without any functional change or improvement. At the augmentation level, the use of digital media brings about a functional improvement, e.g. by methodically extending the teaching and learning material through technical possibilities. At the modification stage, the transformative use of digital media begins. Digital media allow a significant redesign and modification of tasks through their technical possibilities. In the context of redefinition, digital media can be used to create novel task formats that are not possible in analog and were previously unimaginable (Hamilton et al., 2016, p. 434). Puentedura (2014) establishes a direct connection between the levels of the SAMR model and Bloom's levels and infers that the use of digital media in teaching at the higher levels of the SAMR model simultaneously corresponds to a higher cognitive level according to Bloom's taxonomy (Lorenz, 2019, p. 20). Scheiter (2021, p. 1046) also emphasizes that the transformative use of digital media in the classroom is attributed to better student performance than when digital media merely replace traditional classroom practices. As stated in the previous chapter, Bloom's levels correlate with digital literacy competence levels (Carretero et al., 2017, p. 13), so a connection with SMAR model can be made here as well (Figure 1). Overall, it is pointed out that the SAMR model is a pragmatic taxonomy, but not an empirically validated model (Scheiter, 2021, p. 1046).

Figure 1
Connection SAMR Model, Bloom's taxonomy and DigComp 2.2

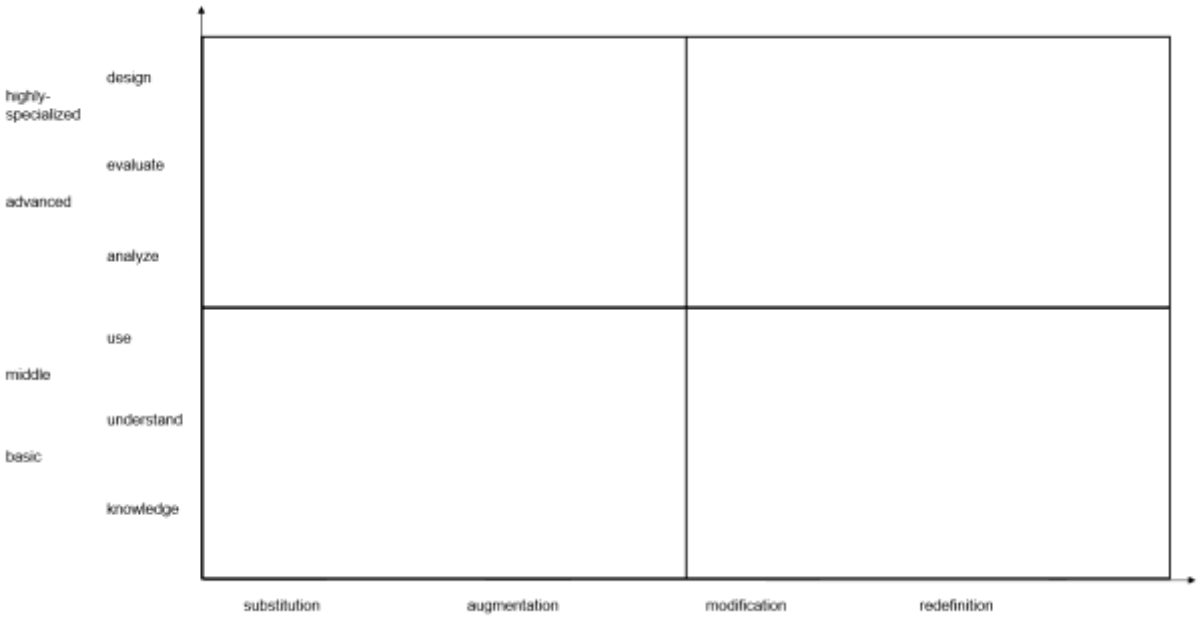


In the following, the SAMR model is used to categorize digital educational measures in career guidance. It is intended to provide information on whether the digital learning offering contributes to an improvement or even, at a higher level, to a transformation of tasks. The learning and competence objectives (based on Bloom's taxonomy) presented and the SAMR model for analysing and integrating digital education measures in teaching-learning processes result in the taxonomy designed (Figure 2), according to which digital education measures can be classified. On the vertical axis, the digital measures are assigned to the cognitive level (Anderson & Krathwohl, 2001; Bloom, 1956) from basic to highly specialized, in which a corresponding promotion of competencies is expected. On the horizontal axis, the level of use of the digital measure is assessed according to the SAMR model (Puentedura, 2006).

As this question remains theoretically open how the currently existing career guidance measures can be classified using this taxonomy, this remains to be investigated in the further course.

Figure 2

Taxonomy Matrix for Structuring Digital Measures



4 Research Question and Research Objectives

As already explained in the introduction, the question arises as to what a concrete current state of digital measures in career guidance looks like and how these can be systematized and classified in a competence-oriented manner. The goal of this project is to conduct an empirical survey of the abundance and diversity of digital measures in career guidance and to structure and classify them on the basis of the developed taxonomy (Figure 2).

4.1 Empirical Design of the Study

To ascertain the abundance and diversity of digital measures in career guidance, the first step was a quantitative procedure of systematic research according to the PRISMA Statement procedure (Moher et al., 2009; Page et al., 2021). This is due to the fact that this methodological form, based on a search grid, enables a large-scale, structured survey with the inclusion of several databases (Newman & Gough, 2020). This is followed by a qualitative survey form of a guided interview to capture the digital measures of the practice contacts of career guidance

(Döring & Bortz, 2016, p. 358; Eid et al., 2017). The interviews are analysed using qualitative content analysis according to Mayring (Mayring, 2015).

4.2 Description of the Sample

For the intervention, professional databases on career guidance served as the sample for systematic research. Relevant German- and English-language journals were selected based on journal rankings. Library databases of the [anonymized], the [anonymized], and the [anonymized] Library were consulted, as well as internet searches to broadly cover the topic. The online search was conducted via predefined platforms for career guidance and subsequently via Google.

Practical contacts in career guidance from the district of [anonymized] formed the interview sample. A cross-section of stakeholders in career guidance was selected as an [anonymized], comprising the following representatives (i.e., adult employees):

1. Chamber of Industry and Commerce
2. Federal Employment Agency (interview covering both lower and upper secondary school)
3. [anonymized] skilled trades
4. [anonymized]
5. Center for School Quality and Teacher Education

In relation to the intervention, professional databases on career guidance serve as a sample for the systematic research. For this purpose, relevant German and English-language journals were identified and selected with reference to the journal ranking. The library databases of the [anonymized] were also consulted, as well as a search on the internet, in order to cover the topic on a large scale. The search was done on predetermined career guidance platforms for career guidance and subsequently on the search engine Google. The practical contacts of the career guidance in the district of [anonymized] functioned as a sample for the interview implementation. For the project, a cross section in the area of career guidance was selected as an example for [anonymized], consisting of the following practical contacts, which are representatives and therefore adult employees of the: 1. Chamber of Industry and Commerce, 2. Federal Employment Agency (conducting one interview with a focus on lower secondary school and upper secondary school), 3. [anonymized] skilled trades, 4. Baden-Württemberg Chamber of Skilled Trades, 5. Center for School Quality and Teacher Education. The selection of practice partners is justified in particular by the fact that they have extensive experience in the development and implementation of digital offerings and career guidance measures. The selection of interview partners was made specifically because these actors have both a systemic overview and in-depth knowledge of the conceptual and practical management of such measures. In addition, through their close cooperation and regular exchange with schools, the practice partners provide valuable insights into the actual use of digital offerings in a school context. Universities, on the other hand, were not included because the use of digital formats in the field of career guidance has been very limited to date.

After initial contact with the above-mentioned practice institutions and a presentation of the project, the most suitable contact person for the interview was selected in each case.

4.3 Description of the Survey Methods and the Survey Instruments

The inventory of existing digital career guidance measures on the internet was conducted using a systematic search following the PRISMA statement (Moher et al., 2009; Page et al., 2021). The structured method and transparent selection and search procedures provide a verifiable, internally valid basis for results and subsequent steps, satisfying scientific criteria (Chander et al., 2020).

The first step was to create a search grid defining databases, relevant criteria, and search terms. Its design followed the PICOC model (Booth et al., 2012; Petticrew & Roberts, 2006,), shown in Table 1. It should be noted that the PICOC model served as a guideline and was adapted, as it was originally developed for studies, whereas this project targets digital offers and measures not necessarily based on scientific studies.

Table 1
PICOC Model for Creating a Search Grid of Digital Offers and Measures in Career Guidance

Population	Central terms of career guidance are established and incorporated into the search grid. These are combined with terms such as 'digital' or 'e-learning'.
Intervention	Systematic research in central databases on career guidance
Comparison	Not relevant for this project.
Outcomes	Inventory of digital offers and measures in career guidance according to specific criteria.
Context	German and English language, schools, universities, career guidance institutions, etc

Note. The criteria for including results can also be derived from this model. Booth et al., 2012; Petticrew & Roberts, 2006.

Relevant terms from career guidance and digital education were compiled, categorized into central and secondary terms, and then used to form search terms (Table 2).

Table 2
Search term used in the systematic search (Moher et al., 2009)

Career guidance	('vocational orientation' OR 'professional orientation' OR 'vocational guidance' OR 'vocational training' OR 'vocational education' OR 'vocational behaviour' OR 'career guidance' OR 'career orientation' OR 'study orientation' OR 'career choice' OR 'career advice' OR 'potential analysis' OR 'competence analysis' OR 'interest test' OR 'suitability test')
AND	
digitalization	(Digital OR digitally OR online OR digitalization OR E- OR 'digital media' OR electronically OR 'computer-based' OR network-based OR 'digital competencies' OR 'digital applications' OR 'digital services' OR App OR WebQuest OR E-learning OR 'digital teaching' OR 'digital education' OR 'blended learning' OR 'E-teaching learning formats' OR 'E-teaching- learning arrangements')
Berufsorientierung	Berufsorientierung ODER 'Berufliche Orientierung' ODER Berufsbildung ODER Berufserziehung ODER Studienorientierung ODER Berufliche Bildung ODER Berufswahl ODER Berufsberatung ODER Berufswahlpass ODER Potenzialanalyse ODER Kompetenzanalyse ODER Interessenstest ODER Eignungstest
AND	

Digitalisierung	Digital ODER digitale ODER digitaler ODER online ODER Digitalisierung ODER E- ODER 'Digitale Medien' ODER elektronisch ODER elektronische ODER elektronischer ODER computergestützt ODER computergestützte ODER computergestützter ODER netzbasiert ODER netzbasierte ODER netzbasierter ODER 'Digitale Kompetenzen' ODER 'Digitale Maßnahmen' ODER 'Digitale Angebote' ODER App ODER WebQuest ODER E- Learning ODER 'Digitale Lehre' ODER 'Digitale Bildung' ODER 'Blended Learning' ODER 'E- Lehr Lern Formate' ODER 'E- Lehr Lern Arrangements'

Subsequently, criteria for applying the search were defined (Table 3). The search was international; therefore, English terms were used in databases and libraries. Due to the overwhelming number of results on Google Scholar, only German search terms were used there. The search focused primarily on titles to ensure a narrower selection.

A revision of the search grid followed, reflecting questions such as: "Did additional relevant terms emerge?" and "Are key databases or journals missing?" A standardized results table was then created, and the inventory was carried out.

The qualitative oral survey was conducted as a guided interview (Döring & Bortz, 2016). The guideline, aligned with research objectives, explored digital measures in career guidance used by practice partners. It comprised two sections: one on existing digital offers, and another on conditions for their successful use. Around eight questions were developed for the first section and three to five for the second. A pretest was conducted to check completeness, clarity, and scope. The interviewer also rehearsed via role-play (Döring & Bortz, 2016). After the pretest, the guide was finalized.

Table 3
Inclusion and exclusion criteria for the systematic search (Liberati et al., 2009)

Included	Excluded
Focus on educational technology	No focus on educational technology
Focus on the target group of students	Focus is not on students (e.g. in the field of adult education)
Education-related with regard to career guidance (e.g. meta-analyses of experimental studies related to teaching and learning)	Education-related but not with regard to career guidance (e.g. advanced labour market and employment research)
Journal articles, book chapters, reports, conference papers (both long and short contributions), Internet content of educational offers	Workshop contributions, poster presentations, editorials

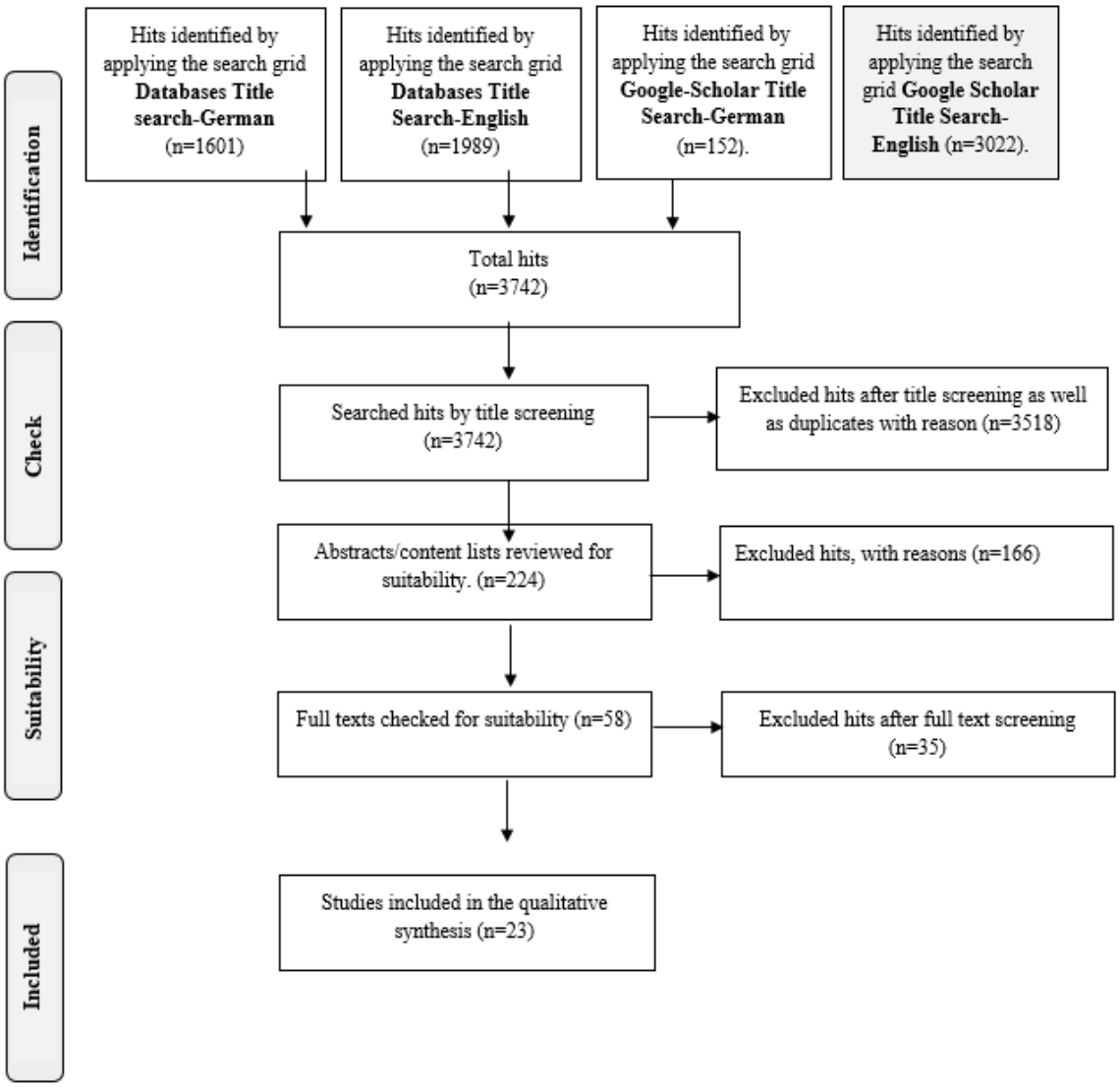
4.4 Description of the Evaluation Instruments and Evaluation Steps

For the evaluation of the results, a step-by-step filtering was applied based on the PRISMA statement. First, titles were checked for suitability, followed by abstracts or short descriptions, and finally the full texts. This yielded the results selected for further qualitative analysis in each database category. The PRISMA flow diagram in Figure 3 (Moher et al., 2009, Page et al., 2021, p. 5) illustrates the evaluation process and number of hits per step (same for the Internet and library samples).

The interviews conducted alongside the systematic search were analyzed using qualitative content analysis according to Mayring (Döring & Bortz, 2016; Mayring, 2015; Mayring, 2016). Six fully transcribed interviews were included. Inductive category formation was performed

and revised through an intercoder reliability check (Mayring, 2015). The transcripts were then analyzed using the category system with MAXQDA software.

Figure 3
Prisma Flow Diagram for the Database and Journal Search



Note. Moher et al., 2009.

5 Results of the Evaluation

In the identification phase of the databases and journals, the search was limited to titles due to the high number of hits when first entering the search grid. This yielded n = 1601 (German) and n = 1989 (English) hits. The grid was also applied to Google Scholar: n = 152 (German) and n = 3022 (English), totaling n = 6764. As noted in Chapter 4.3, the English Google Scholar hits were excluded, reducing the number for further analysis to n = 3742.

In the review phase, title and duplicate screening excluded n = 3518 hits. The second screening, assessing abstracts and tables of contents, included n = 224 hits, of which n = 166 were excluded. Full-text screening was then conducted with n = 58 hits; n = 35 were excluded, resulting in n = 23 included in the qualitative synthesis.

Due to the low number of title hits in library searches, the BOSS function was used in 'all fields' and title search was broadened. This yielded n = 2737 (German) and n = 2579 (English), totaling n = 5316. Title screening excluded n = 5269 due to duplicates or non-matching content. The remaining n = 47 were screened by abstract or table of contents, resulting in n = 29 exclusions and n = 18 remaining. After full-text screening, n = 11 were excluded, leaving n = 7 for qualitative synthesis.

The search grid was also applied to internet sites for career guidance and to Google (German only due to high volume). The identification phase yielded n = 121 hits from predefined platforms and n = 18,207 from Google, totaling n = 18,328. Title and duplicate screening excluded n = 17,996 hits. Abstract or content screening of n = 332 resulted in n = 151 exclusions. Of the remaining n = 181, n = 112 were excluded in the full-text screening, leaving n = 69 for qualitative synthesis.

In the next step, the N = 99 total included hits were categorized according to Table 4, with some hits containing multiple measures. This yielded N = 127 categorized and n = 4 unpublished measures.

Table 4
Table of results of the systematic research on digital measures of career guidance

Form of the measure	Number (N = 127)	Of which not yet published in progress (n=4)
Internet platform	66	1
Tests/ competence analyses	16	-
Apps	14	2
Communication via Whats App	4	-
Videos	7	-
YouTube channel	3	-
Digital career fair	3	-
Digital games	2	-
Explore jobs in 3D	3	-
WebQuest	1	-
Quiz	1	-
Digital portfolios	1	1
Online webinar	2	-
Telefonic consultancy	1	-
Makerspace	2	-
Learningsnacks on the subject profession	1	-

A central part of the interviews was the survey of digital career guidance measures used by practice partners. This complemented the systematic search and incorporated practical insights. To provide an overview, measures were sorted by target group (Table 5).

For the future design of digital offerings and measures, prior experience with practical applications regarding design criteria is essential. Therefore, the question of specific criteria relevant to the creation of digital offerings was well received in the interviews. Figure 4 shows the mentioned criteria.

Most frequently cited were "appealing in terms of design" and "appealing in terms of content." These were followed by "accessibility", meaning ease of technical use. Also mentioned were "adaptation to the target group's language," "presentation of the tool" (e.g., advertising),

and "obtaining feedback." Further relevant aspects included "clarity," "practicability," "comprehensibility," "compatibility," "accuracy of fit," and "added value." Other development needs included:

- Digitizing accompanying materials (e.g., writable PDFs)
- Networking platforms
- A digital curriculum with a support platform (e.g., Moodle)
- Bundling, categorizing, and providing offers with application notes

These aspects were linked to the question of tips and criteria for successful integration of digital measures in teacher training. Table 6 summarizes the answers.

Table 5
Results and Categorization of the Digital Measures Mentioned in the Interviews

Category	**School students** Sek. I (n = 28)	**School students** Sek. II (n = 12)	**Teachers** (n = 17)	**Parents** (n = 17)	**Others** (n = 15)
Internet platform	10	5	8	10	5
Tests/ Competence analyses	4	1	1	1	3
Apps	4	2	3	2	2
Videos	1	1	1	1	1
Digital career fair	1	1	1	1	-
Digital games	1	-	-	-	1
Explore jobs in 3D	2	-	-	-	-
Digital portfolios	1	-	-	-	-
Online Webinar	1	-	1	-	1
Telefonic consultancy	1	-	-	-	-
Social media	2	-	-	-	2
Online magazines	-	2	2	2	-

Note. Some of the digital measures mentioned are listed several times in the various target groups. Others are e.g., career school and FSJ students.

Figure 4
Criteria for the Creation of Digital Offers

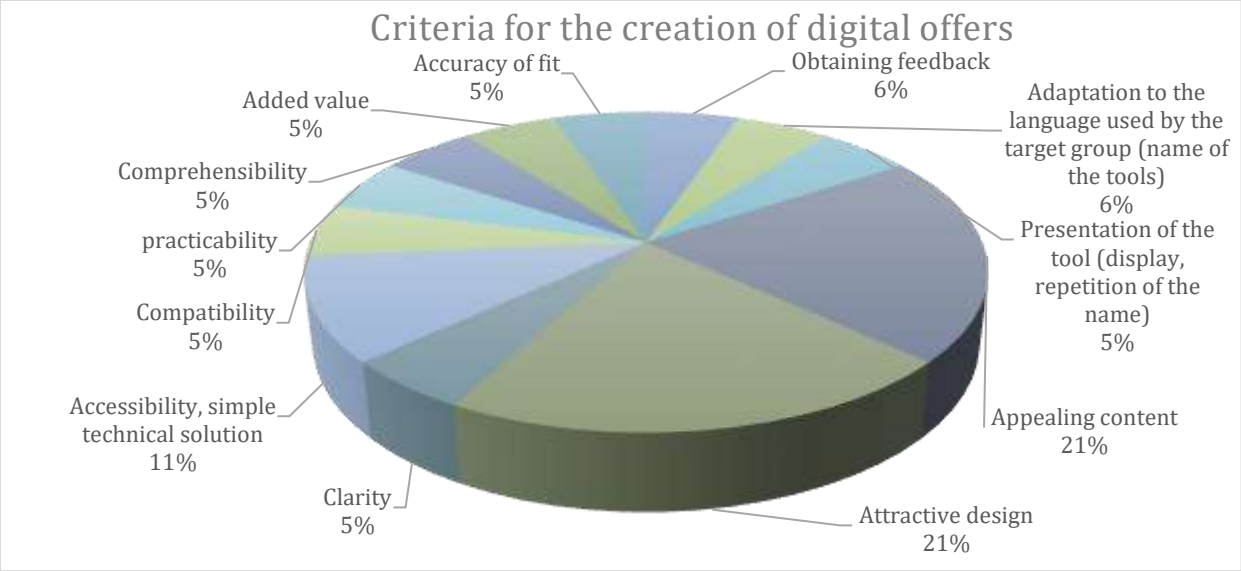


Table 6
Integration of digital offerings in higher education

Criteria for successful integration in teacher training	Tips for integration into teacher training
Knowledge of the prospective teachers about the offers and the actors/partners	Don't be afraid of using digital devices
Encourage students to engage with the digital offerings Generate a point of contact (students and actors) Feedback on the app and the website Manifest pedagogically	Experience: Classroom teaching can take place well in digital form Relevance of communication and exchange with each other (contact persons, involvement of students → valuable tips on how to address young people) Always set small accents (permanent partners who can be asked and who can be directly involved in teacher training) Include Monday's events or teacher network meetings (meet experienced career guidance professionals and encourage exchange) meet and encourage exchange → how is careers guidance actually taking place at schools?) Incorporate digital offers at suitable points again and again Offer a module on trades and digital career opportunities Teach as paperless as possible

Digital measures identified from research and interviews were categorized by three examiners using taxonomy axes derived from the theory section. Results are shown in Figures 5 and 6. Most of the 61 internet platforms, 14 apps, and all 16 tests fall into Category 1 (basic to

medium cognitive level, SAMR level: substitution/augmentation). Also in this category: 10 digital videos, 1 webinar, 3 digital fairs, 3 3D job exploration tools, 1 WebQuest, 1 quiz, 1 maker space, and 1 LearningSnack.

Category 2 (intermediate to advanced, substitution/augmentation) includes 2 apps, 4 websites, and 1 webinar. Category 3 (basic to intermediate, modification/redefinition) includes 1 app, 2 digital games, and 1 maker space. Category 4 (intermediate to advanced, modification/redefinition) includes 1 platform and 1 app.

The evaluation shows that most digital measures in career guidance align with lower levels of Bloom's taxonomy (knowledge, understanding, application; Anderson & Krathwohl, 2001; Bloom, 1956) and the SAMR levels substitution and augmentation. This matches the competence areas "handling information and data" and "solving problems and taking action" (see Fig. 1). For instance, platforms like Azubiwelt replace analog materials by helping learners retrieve and structure occupational information.

CheckU is an example of SAMR Level 2 (augmentation): it offers tests on competencies and interests with immediate psychological feedback. These features support competencies in problem solving and action by helping students identify suitable occupations based on their preferences.

Fewer digital measures exist at the modification level. One is the Berufswahlapp (Brüggemann et al., 2020), which supports portfolio-based teaching and digital storytelling. Learners can reflect on test results, share them with teachers, and collaboratively create content like career profiles. This promotes deeper learning, communication, and collaboration, supporting life and career planning.

No digital measures were found in the redefinition area. This is likely because learners would have to produce content themselves (e.g., wikis, VR rooms, explanatory videos). Such scenarios are rarely implemented due to lacking hardware or teacher training (Greiten et al., 2021). Most digital measures for career guidance are situated at the lower SAMR levels due to ease of implementation (Lorenz, 2022). Puentedura's (2014) hypothesis that higher SAMR levels require and promote higher cognitive learning levels is supported. Higher levels involve deeper engagement and greater competence development (e.g., using simulations like Meister POWER to analyze business processes and make informed decisions). However, the competence area "creating digital content with editing tools" is not yet covered.

The systematic research provides a structured inventory of current digital measures in German-speaking countries, which should be expanded internationally. While the inventory helps assess the digitalization level and associated cognitive competencies, it does not evaluate didactic quality. Teachers must review the provider, legal frameworks (e.g., data protection), target group fit, costs, and technical feasibility (Brüggemann & Wiepcke, 2023) (Figure 5 and Figure 6).

Figure 5

Taxonomy Assignment of the Surveyed Digital Measures of Career Guidance (1)

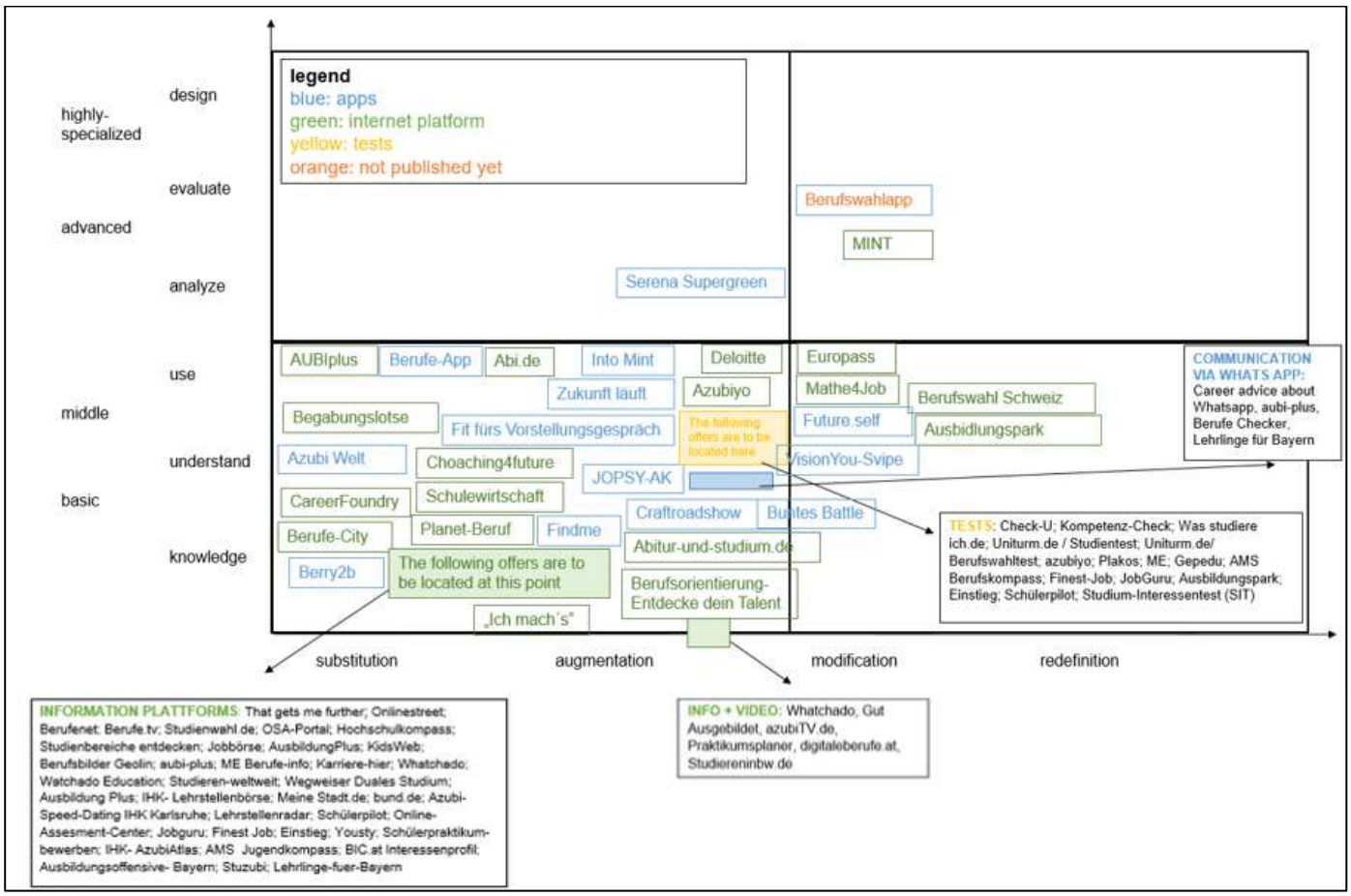
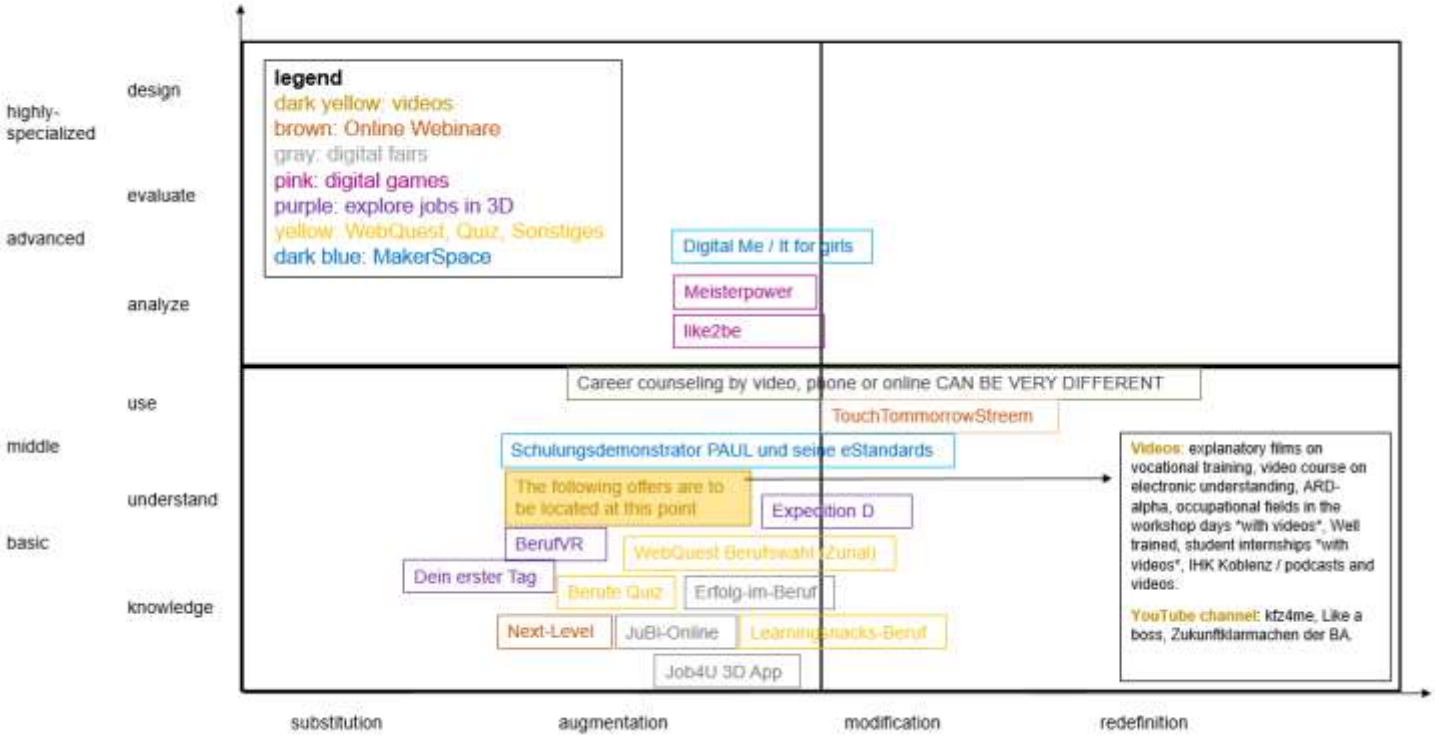


Figure 6
Taxonomy Assignment of the Surveyed Digital Measures of Career Guidance (2)



6 Limitations and outlook: Implications for a competence-oriented digital career guidance

The main contribution of this study lies in providing the first structured inventory and theoretical classification of digital career guidance measures with focus on German-speaking countries. More importantly, it identifies a systemic gap between the availability of digital tools and their didactic use for competence development. The study thus contributes to bridging the gap between empirical data collection and skills development and highlights the need to find ways to design future skills-oriented digital career guidance. Guided by the research question, the success of the study can be attributed to the extensive inventory, which covers a considerable part of the databases of career guidance. A large number of digital measures of career guidance could be collected and categorized. The current state of digital career guidance measures shows that a search for them on the Internet in particular produces countless hits. In the present systematic research, the use of a previously created and thus already tailored search grid yielded more than 20,000 results. An unfiltered entry of ‘digital measures in career guidance’ in Google yields more than 2,000,000 (german). It can be stated that a systematic limitation, concretization and filtering must take place in the research on digital measures of career guidance. In addition, the current state of digital measures in career guidance provides a wide variety of measures, with the largest number of Internet sites, followed by tests and apps. It was possible to classify and systematize the digital measures of career guidance with the help of models for analysing the integration of digital media in the classroom and Bloom's taxonomy.

The structure and linking of the steps should be emphasized, which made it possible to structure and classify the digital measures for the first time and also drew on Wiepcke's competence model for digital career guidance in combination with the SAMR model (2023).

With regard to the systematic research, it should be noted that the internet research did not include the labour, economic, education and youth ministries of the federal states, the media centers of the federal states or the schools in Germany. Since the research was already very extensive, these areas were not included. The study was based on interviews with representatives of key career guidance institutions. This decision was made deliberately, as these stakeholders have a comprehensive overview of the design, implementation, and effectiveness of digital measures. They work at the interface between educational practice, educational policy management, and organisational implementation and are therefore in a position to provide assessments that go beyond the individual school context. Although teachers and students are the immediate target group of digital measures, they were not included in this phase of the study, as the initial focus was on recording structural and conceptual framework conditions. Including the school perspective (teachers, students) would be particularly useful in a further, practice-oriented survey cycle in order to supplement and verify the user perspective.

In addition, future surveys should address the extent to which and which digital skills the career guidance measures promote. Another limitation of this study is that the interviewees come exclusively from the [anonymized] area. To gain a more comprehensive perspective, it would be useful to take an international approach to the study design and expand it to include international contacts. The interview results therefore relate primarily to the German federal state of Baden-Württemberg and are only transferable to other regions to a limited extent.

The PRISMA model was used as a procedure for the systematic research. Since the model is primarily aimed at the context of scientific studies, it was adapted to the research project described. The question therefore arises as to a more suitable model for conducting a systematic search of digital measures.

With regard to the included SAMR model, it should be noted that individual digital technologies (e.g., PowerPoint, etc.) cannot be comprehensively assessed using the model. A fuller assessment is mainly possible through practical use, which is why it is a self-assessment tool. For research-related use, observations and interviews with teachers are also required for a solid evaluation.

Furthermore, it should be noted that a clear classification of some measures based on the descriptions of the SAMR categories could not always be given, since these category descriptions do not address all facets of some measures, some measures could not be tested in their full complexity and a bias could be distorted due to the consideration of 2 investigators.

In addition, it should be added that some digital measures have changed in their form of offering since the beginning of the study, such as a workshop that was digital during the COVID-19 pandemic, but is now analog again, and that some measures no longer exist.

The results of the article provide an overview and systematization of existing digital career guidance measures. On the one hand, it would be important to carry out a criteria-based analysis of the quality assurance of the digital measures examined and, on the other hand, to build on the results of the article to find out how well an offer promotes the respective competence of digital career guidance (Brüggemann & Wiepcke, 2023; Wiepcke, 2023). The research revealed that most digital career guidance measures are not subject to any quality assurance or scientifically sound justification. Further steps of the research project and the authors therefore include the review of digital measures on the basis of quality criteria from educational theory and international research as well as the systematic and well-founded integration of the results of the as-is analysis into the competence model of digital career guidance (Wiepcke, 2023).

The results of the study not only provide an overview of digital career guidance measures but also offer relevant implications for schools and teacher training. The analysis reveals a clear trend: most of the digital career guidance tools currently available focus on information delivery and self-assessment rather than on interactive, reflective, or collaborative learning processes. This indicates that the potential of digitalization for fostering higher-order competencies such as self-reflection, problem solving, and informed decision-making is not yet fully realized. Schools in particular need to integrate digital offerings into school career guidance in a targeted manner and view them not as additional aids, but as didactically embedded tools. The findings therefore suggest a shift from tool accumulation ("many tools exist") toward didactic integration, where digital instruments are purposefully aligned with learning objectives, competence frameworks, and school curricula. The analysis showed that many of the digital measures currently available are primarily located at the lower levels of Bloom's taxonomy and at the SAMR levels of "substitution" and "augmentation." This means that digital technologies often replicate analogue practices instead of transforming learning and guidance processes. For instance, most platforms offer information access and self-tests, but only few support co-creation, peer exchange, or project-based reflection. For teaching practice, this means that teachers should select digital tools more consciously and expand them didactically in order to promote skills such as self-reflection, problem solving, and collaborative work. In concrete terms, digital career guidance should be linked to portfolio work, digital storytelling, or simulation-based scenarios that enable learners to explore vocational pathways actively rather than passively consuming information. This is linked to the need to embed the use of digital career guidance measures in existing school concepts (e.g., career guidance curricula or skills portfolios) and to link them to school development processes (KMK, 2021).

Furthermore, when formulating and promoting competencies, it is important to bear in mind that comprehensive career guidance does not only take cognitive learning objectives into account. It also encompasses development processes that include motivational, emotional, and volitional dimensions (Driesel-Lange et al., 2010; Jung, 2019). A holistic description and promotion of competencies therefore requires the systematic consideration of these affective and volitional aspects. The question of how dimensions such as motivation, value orientation, and self-efficacy can be specifically integrated into the use of digital tools appears particularly relevant. Future development should therefore focus on digital formats that include reflective prompts, feedback mechanisms, and peer interaction, allowing learners to link self-knowledge with decision-making processes. This would lead to a more comprehensive understanding of digital career development processes that goes beyond pure knowledge or application dimensions. In this regard, structuring process-related competence requirements based on Bloom and as operationalized in frameworks such as DigComp appears particularly productive for digital career guidance.

For educational institutions such as schools and universities, the results thus offer concrete starting points for practical implementation: digital career guidance offerings can be identified, critically examined, and selected for their suitability for specific skill areas (Brüggemann & Wiepcke, 2023, p. 10). In addition, teaching staff can be made aware of the importance of competence-based career guidance and supported in integrating such tools into teaching and learning processes in a meaningful way. The practical implication is that digital career guidance should be seen not as a separate digital add-on but as an integral component of competence-oriented education that combines cognitive, motivational, and reflective learning. This not only

ensures higher quality digital offerings, but also the targeted promotion of students' digital career choice skills (Eickelmann & Gerick, 2020; Vuorikari et al., 2022).

Important conclusions can also be drawn for teacher training. The results underscore that prospective teachers should be familiarized with digital offerings and career guidance platforms at an early stage. This applies both to technical handling and to the pedagogical evaluation of the quality and suitability of such offerings (Redecker, 2017). In addition, teacher training should emphasize how digital career guidance can contribute to holistic competence development, including motivational and reflective aspects, and how teachers can facilitate these processes through guided reflection and collaborative learning tasks. It is particularly important to promote reflection and analysis skills in training so that teachers can critically question digital measures and use them in a targeted manner. This competence-oriented approach positions teachers as mediators who connect digital tools with individual learning needs and career development processes, rather than as mere users of ready-made digital resources.

Furthermore, future research and development work should examine the extent to which motivational, emotional, and value-related dimensions have been taken into account in digital career guidance measures to date and how they can be embedded more systematically. Such a perspective could help to structure the affective-volitional area in digital career guidance more effectively and thus contribute to a more holistic understanding of career development processes in the digital space.

In addition, interviews with practice partners make it clear that successful digital career guidance does not depend solely on technical implementation, but is largely supported by cooperation between schools, external partners (e.g., BA, ZSL), and parents. For teacher training, this means that prospective teachers should be better prepared for networked, cross-institutional work for example, through practice-oriented modules in which digital career guidance services are tested and reflected upon. In addition, prospective teachers should be trained in the didactically meaningful and comprehensive use of digital measures (KMK, 2016; Redecker, 2017).

From this paper, readers can learn (1) what types of digital career guidance measures currently exist, (2) how they align with theoretical models such as SAMR and Bloom's taxonomy, and (3) what gaps and potentials emerge for competence-oriented and holistic career guidance. The findings thus inform both research and practice by showing where current digitalization stands and what steps are needed for quality-oriented, competence-based development.

References

Albien, A. J. (2021). International perspectives. In T. Grüneberg, I. Blaich, J. Egener, B. Knickrehm, M. Liebchen, L. Lutz, U. Nachtigäller, & R. Thiel (Eds.), *Handbuch Studienberatung* (pp. 147–198). UTB.

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.

Bakhshi, H., Downing, J. M., Osborne, M. A., & Schneider, P. (2017). *The future of skills: Employment in 2030*. Pearson & Nesta.

Bertelsmann Stiftung. (2023). *Vocational training: Opportunities for everyone*. Bertelsmann Stiftung.

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17–66). Springer. https://doi.org/10.1007/978-94-007-2324-5_2

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals*. Longmans.

Blustein, D. L. (2017). *The importance of work in an age of uncertainty: The eroding work experience in America*. Oxford University Press.

Borne- og Undervisningsministeriet. (n.d.). *Studievalg*. https://www.ug.dk/studievalg

Brüggemann, T., Driesel-Lange, K., Eisenbraun, K., Epker, M., Gehrau, V., Howe, F., Klein, I., Schall, M., Staden, C., Weyer, C., & Zaynel, N. (2020). *Vom Berufswahlpass zur Berufswahlapp. Institut Technik und Bildung*. https://media.suub.uni-bremen.de/handle/elib/4588

Brüggemann, T., Driesel-Lange, K., & Weyer, R. (2017). *Maßnahmen der Berufsorientierung*. Waxmann.

Brüggemann, T., & Rahn, S. (2020). *Berufsorientierung: Ein Lehr- und Arbeitsbuch*. Waxmann. https://doi.org/10.36198/9783838552491

Brüggemann, T., & Wiepcke, C. (2023). Der EdTech-Index (ETX) – Beurteilungskriterien digitaler Bildungsmaßnahmen am Beispiel der beruflichen Orientierung. In C. Wiepcke (Ed.), *Karlsruher Beiträge zur ökonomischen Bildung*. https://phka.bsz-bw.de/frontdoor/index/index/docId/457

Butz, B. (2008). Von der Berufsorientierung zum Übergangsmanagement. In E. Jung (Ed.), *Basiswissen Berufsorientierung: Zwischen Qualifikationswandel und Marktenge. Konzepte und Strategien einer zeitgemäßen Berufsorientierung* (pp. 156–169). Schneider Verlag Hohengehren.

Cedefop. (2023). *Integrating digital skills and competences in VET curricula and programs*. European Centre for the Development of Vocational Training. https://www.cedefop.europa.eu/en

Chandler, J., Cumpston, M., Thomas, J., Higgins, J. P. T., Deeks, J. J., & Clarke, M. J. (2020). Kapitel I: Einführung. In J. P. T. Higgins, J. Thomas, J. Chandler, M. Cumpston, T. Li, M. J. Page, & V. A. Welch (Eds.), *Cochrane-Handbuch für systematische Überprüfungen von Interventionen (Version 6.1)*. Cochrane. https://training.cochrane.org/handbook

De León Mendoza, T., & Briones de León, R. (2012). La correlación entre los intereses, aptitudes y preferencias vocacionales con la carrera que eligen al egresar los alumnos del Centro de Bachillerato Tecnológico Agropecuario, México. *Revista Didasc@lia: Didáctica y Educación, 3*(2), 55–70.

Dobricki, M., Evi-Colombo, A., & Cattaneo, A. (2020). Situating vocational learning and teaching using digital technologies: A mapping review of current research literature. *International Journal for Research in Vocational Education and Training, 7*(3), 344–360. https://doi.org/10.13152/IJRVET.7.3.5

Döring, N., & Bortz, J. (2016). *Forschungsmethoden und Evaluation in den Sozial- und Humanwissenschaften.* Springer. https://doi.org/10.1007/978-3-642-41089-5

Driesel-Lange, K., Kracke, B., Hany, E., & Schindler, N. (2010). *Berufs- und Studienorientierung: Erfolgreich zur Berufswahl. Ein Orientierungs- und Handlungsmodell für Thüringer Schulen (Materialien 165).* Thüringer Institut für Lehrerfortbildung, Lehrplanentwicklung und Medien.

Driesel-Lange, K., Kracke, B., Hany, E. A., & Schindler, A. (2013). Berufliche Orientierung von Jugendlichen. *Zeitschrift für Berufs- und Wirtschaftspädagogik, 109*, 29–50.

Driesel-Lange, K., Schindler, A., Hany, E. A., & Kracke, B. (2020). Evidenzbasierte Berufsorientierung: Modelle, Methoden und Erfahrungen. In B. Maier & T. Schröder (Eds.), *Handbuch Berufsorientierung* (pp. 295–310). Springer.

Eickelmann, B., Bos, W., & Labusch, A. (2019). Die Studie ICILS 2018 im Überblick – Zentrale Ergebnisse und mögliche Entwicklungsperspektiven. In B. Eickelmann, W. Bos, J. Gerick, F. Goldhammer, H. Schaumburg, K. Schwippert, M. Senkbeil, & J. Vahrenhold (Eds.), *ICILS 2018 #Deutschland: Computer- und informationsbezogene Kompetenzen von Schülerinnen und Schülern im zweiten internationalen Vergleich und Kompetenzen im Bereich Computational Thinking* (pp. 7–33). Waxmann. https://doi.org/10.25656/01:18319

Eickelmann, B., & Gerick, J. (2020). Lernen mit digitalen Medien: Zielsetzungen in Zeiten von Corona und unter besonderer Berücksichtigung von sozialen Ungleichheiten. In D. Fickermann & B. Edelstein (Eds.), *„Langsam vermisse ich die Schule …". Schule während und nach der Corona-Pandemie* (pp. 153–162). Waxmann. https://doi.org/10.25656/01:20235

Eid, M., Gollwitzer, M., & Schmitt, M. (2017). *Statistik und Forschungsmethoden*. Beltz.

Gegenfurtner, A., Schmidt-Hertha, B., & Lewis, P. (2020). Digital technologies in training and adult education. International Journal of Training and Development, 24(1), 1–4. https://doi.org/10.1111/ijtd.12172

Guerra Rubio, L. M., Simón Brito, O., & Hidalgo Abellé, A. (2010). La orientación profesional hacia las carreras de educación superior: Alternativas metodológicas. *Centro Azúcar, 37*(1), 64–98.

Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use. *TechTrends, 60*, 433–441. https://doi.org/10.1007/s11528-016-0091-y

Hamilton, M. (2008). Competency frameworks and the shift towards output-oriented education in Europe. *European Journal of Education, 43*(3), 325–339. https://doi.org/10.1111/j.1465-3435.2008.00358.x

Jung, E. (2019). Förderung der Berufswahlkompetenz im Wirtschaftsunterricht. In R. Schröder (Ed.), *Berufliche Orientierung in der Schule: Gegenstand der ökonomischen Bildung* (pp. 51–74). Springer. https://doi.org/10.1007/978-3-658-24197-1_4

Kamsker, S., & Slepcevic-Zach, P. (2021). The digital change of vocational training and business education: What it takes to prepare students for the future challenges of the job market. *International Journal for Business Education, 161*(1), Article 6. https://doi.org/10.30707/IJBE161.1.1648090824.269195

Klieme, E., Avenarius, H., Blum, W., Döbrich, P., Gruber, H., Prenzel, M., Reiss, K., Riquarts, K., Rost, J., Tenorth, H.-E., & Vollmer, H. J. (2003). *Zur Entwicklung nationaler Bildungsstandards: Eine Expertise*. https://doi.org/10.25656/01:20901

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice, 41*(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

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

Kultusministerkonferenz. (2021). Lehren und Lernen in der digitalen Welt: Ergänzung zur Strategie „Bildung in der digitalen Welt" (Beschluss vom 09.12.2021). https://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2021/2021_12_09-Lehren-und-Lernen-Digi.pdf

Kunz, A., & Schreiber, H. (2017). Praxisorientierte Ansätze in der Berufsorientierung. In S. Tippelt & B. Schmidt (Eds.), *Handbuch der Berufsorientierung* (pp. 233–248). Springer.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Medicine, 6*(7), e1000100. https://doi.org/10.1371/journal.pmed.1000100

Lipowski, M., Kretschmer, S., Voss, S., & Rauner, F. (2015). Berufsorientierung und Praxisbezug: Erfahrungen aus dem Projekt Paten für Azubis. In T. Prenzel, J. Kramer, & H. J. Tschiesner (Eds.), *Berufsbildung und Arbeit* (pp. 161–175). Springer.

Lorenz, T. (2022). *Entwicklung eines Konzepts zur Umsetzung des SAMR-Modells im Geographieunterricht* [Master's thesis, Universität Potsdam].

Lousã, E. P., & Lousã, M. D. (2023). Effect of technological and digital learning resources on students' soft skills within remote learning: The mediating role of perceived efficacy. *International Journal of Training and Development, 27(1), 1–17. https://doi.org/10.1111/ijtd.12280*

Martín-Rojas, R., García-Morales, V. J., & Bolívar-Ramos, M. T. (2013). Influence of technological support, skills and competencies, and learning on corporate entrepreneurship in European technology firms. *Technovation, 33*(12), 1–12.

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

Mayring, P. (2016). *Einführung in die qualitative Sozialforschung: Eine Anleitung zu qualitativem Denken*. Beltz.

Mir, A. A., Hassan, S., & Khan, S. J. (2022). *Understanding digital entrepreneurial intentions: A capital theory perspective. International Journal of Emerging Markets*. Advance online publication.

Mittelstädt, E., & Wiepcke, C. (2018). Kompetenzorientiert lehren und erfahrungsbasiert lernen mit Hilfe didaktischer Werkzeuge. In B. Weber (Ed.), *Wirksamer Wirtschaftsunterricht* (pp. 164–177). Schneider Verlag Hohengehren.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine, 6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Newman, M., & Gough, D. (2020). Systematic reviews in educational research: Methodology, perspectives and application. In O. Zawacki-Richter, M. Kerres, S. Bedenlier, M. Bond, & K. Buntins (Eds.), *Systematic reviews in educational research* (pp. 3–23). Springer.

https://doi.org/10.1007/978-3-658-27602-7
OECD. (2023). *OECD digital education outlook 2023: Towards an effective digital education ecosystem.* OECD Publishing. https://doi.org/10.1787/digital-edu-outlook-2023
Oeljeklaus, L., & Höft, S. (2024). Die Qualität von Online-Self-Assessments zur Studienorientierung: Ein Überblick zur bestehenden empirischen Befundlage. In H. Steiner (Ed.), *Online-assessment* (pp. 21–41). Springer. https://doi.org/10.1007/978-3-662-68684-3_2
Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, Article n71. https://doi.org/10.1136/bmj.n71
Pettersson, F. (2018). On the issues of digital competence in educational contexts – A review of literature. *Education and Information Technologies, 23*(3), 1005–1021. https://doi.org/10.1007/s10639-017-9649-3
Puentedura, R. R. (2006). *Transformation, technology, and education*. http://www.hippasus.com/resources/tte/
Puentedura, R. R. (2014). *SAMR and Bloom's taxonomy*. https://www.commonsense.org/education/articles/samr-and-blooms-taxonomy-assembling-the-puzzle
Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union. https://doi.org/10.2760/159770
Savickas, M. L. (2013). Career construction theory and practice. In S. D. Brown & R. W. Lent (Eds.), *Career development and counselling: Putting theory and research to work* (2nd ed., pp. 147–183). John Wiley & Sons.
Scheiter, K. (2021). Lernen und Lehren mit digitalen Medien: Eine Standortbestimmung. *Zeitschrift für Erziehungswissenschaft, 24*, 1039–1060. https://doi.org/10.1007/s11618-021-01047-y
Seufert, S., & Scheffler, N. (2016). Developing digital competences of vocational teachers. International *Journal of Digital Literacy and Digital Competence, 7*(1), 50–65. https://doi.org/10.4018/IJDLDC.2016010104
Singh, R., & Dwivedi, A. (2022). Digital entrepreneurship competency and digital entrepreneurial intention: Role of entrepreneurial motivation. *Journal of Positive School Psychology, 6*(6), 2310–2322.
Triyono, M. B., Mutohhari, F., Kholifah, N., Nurtanto, M., Subakti, H., & Prasetya, K. H. (2023). Examining the mediating-moderating role of entrepreneurial orientation and digital competence on entrepreneurial intention in vocational education. *Journal of Technical Education and Training, 15*(1), 116–127.
van Laar, E., van Deursen, J. A., van Dijk, J. A., & de Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior, 72*, 577–588. https://doi.org/10.1016/j.chb.2017.03.010
Vuorikari, R., Kluzer, S., & Punie, Y. (2022). *DigComp 2.2: The digital competence framework for citizens – With new examples of knowledge, skills and attitudes*. Publications Office of the European Union. https://doi.org/10.2760/490274
Wiepcke, C. (2013). Qualitätssicherung ökonomischer Bildungsmaßnahmen – Eine Analyse. In T. Retzmann (Ed.), *Ökonomische Allgemeinbildung in der Sekundarstufe II* (pp. 318–330). Schneider Verlag Hohengehren.
Wiepcke, C. (2022). *Berufliche Orientierung in einer digitalen Welt (BOdigi).* Dialog.
Wiepcke, C. (2023). Kompetenzrahmen einer digitalen beruflichen Orientierung (DigiBOKom). In C. Wiepcke (Ed.), *Karlsruher Beiträge zur ökonomischen Bildung* (No. 2, pp. 1–19). https://phka.bsz-bw.de/frontdoor/index/index/docId/371
Wiepcke, C., & Tuchscherer, M. (2023). Kompetenzmodell einer digitalen beruflichen Orientierung. In B. Knickrehm, T. Fletemeyer, & B. J. Ertelt (Eds.), *Berufliche Orientierung und Beratung: Aktuelle Herausforderungen und digitale Unterstützungsmöglichkeiten* (pp. 217–237). Springer. https://doi.org/10.1007/978-3-658-40601-1
World Economic Forum. (2023). *The future of jobs report 2023. World* Economic Forum. https://www.weforum.org/reports/the-future-of-jobs-report-2023

Biographical notes

Marie Tuchscherer-Schad completed her master's degree in educational science in fall 2019. Since May 2020, she has been researching, teaching, and completing her doctorate as an academic assistant at the Institute of Economics and its Didactics at the Karlsruhe University of Education. The focus of her work is digital vocational orientation.

Dr Claudia Wiepcke is Professor of Business and Economic Education at the University of Education Karlsruhe. Her research focuses on vocational orientation, particularly in gender-equitable and intersectional STEM education, digital vocational orientation, and social entrepreneurship education.

This page is intentionally left blank.