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The Current State of Digital Literacy, Disinformation, and Crisis Management in German Schools

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Abstract. A non-systematic scoping review analysed 145 documents addressing digital literacy, AI literacy, disinformation, and crisis management in schools, as well as their connections to vulnerable adolescent groups. Some documents covered multiple issues, such as both digital literacy and disinformation. The documents included policy reports from 2011–2024 and numerous research papers and identified a significant gap in addressing vulnerable[1] adolescents. Nonetheless, this paper primarily focuses on digital literacy, as it encompasses key aspects of both disinformation and crisis management. The review found Germany is committed to fostering a digitally competent and resilient society through initiatives promoting digital literacy, crisis management, and combating disinformation in schools. Despite progress, challenges persist, including a digital divide, particularly in eastern regions, alongside gaps in infrastructure, education, and policy execution. Addressing these requires targeted investments, better coordination between federal and state authorities, and stronger public-private partnerships to ensure inclusivity and fully realize Germany's digital transformation goals.

Keywords: *digital literacy, digital skills, disinformation, misinformation, crisis management, artificial intelligence.*

[1] Vulnerable adolescents are defined in the DRONE project as young people, young people with disabilities, minorities, Roma, immigrants, LGTBQIA+, etc.

Introduction

The term digital literacy can be an ambiguous one; there is little agreement among academics, policy makers, and software developers. However, there seems to be a consensus that digital literacy is a crucial attribute to possess in the Information Age. The European Commission defines a digitally competent person as one who 'can execute and accomplish tasks related to work, employability, learning, leisure, and/or participation in society'. The definition goes on to specify the key areas of skills, knowledge and understanding, and attitudes which are needed in order to attain this broad level of competence. This demonstrates that digital literacy is a multi-faceted skill set that goes beyond the basic ability to use computers. It requires a critical and discerning approach to technology, an ongoing interest in developing digital skills, and the ability to transfer skills and knowledge to different areas of application. This definition perhaps comes closest to the common ground agreed upon by most literacy scholars. It recognizes the multifaceted nature of digital literacy and stresses the active and creative use of technology, rather than just consumption.

Despite being a leading country in Europe, Germany still faces a digital divide, particularly in the eastern regions that are still recovering from the fall of communism.

Digital skills are essential for people of all ages if they are to continue to operate and participate successfully against the backdrop of these dynamic processes of change. The school closures of 2020–2022 have made it clear in various areas of education and work that Germany not only has a considerable backlog in terms of building a digital infrastructure, but also that neither pupils nor teachers have sufficient computer-related skills across the board. For example, Wößmann et al. (2021) and RWI (2021) describe continuing deficits for the second phase of school closures at the beginning of 2021 in the implementation of and participation in distance learning. In addition to a lack of supply with adequate digital devices, these are due to a lack of skills and affect children and young people from non-academic households more severely Bachmann, et. al. (2021).

However, assessments from international studies such as PISA and IALS have shown that average computer use in schools does not significantly impact students' performance in any subject across countries. This suggests that the digital divide in Germany is not necessarily based on social class but rather on the divide between eastern and western regions. Therefore, it is crucial for digital literacy policies to address technology usage and knowledge throughout Germany at all education levels.

Currently, there is no agreed consensus about the definition of digital literacy and the concept it holds. Digital literacy for German citizens is seen as important to maximize the potential of the information society to facilitate lifelong learning and self-development of individual competence. An information society itself is aimed at creating a social, political, and economic environment that enables citizens to access and apply information in every aspect of their life. From the education and professional

sectors, this demands active participation in the process of generating, distributing, and utilizing information (Dadaczynski et al., 2021; Rattay et al., 2021; Börnert-Ringleb et al., 2021; Albrecht et al., 2024; Okan et al., 2020; Impey & Formanek, 2021; Enssle & Kabisch, 2020).

Methodology

The non-systematic literature review presented here covers the main policies and research published over the past 20 years on the topic. It is based on meta-analyses and review papers found in scholarly, peer-reviewed content databases and other key studies and policy reports related to the concepts studied (e.g., digital literacy, disinformation, crisis management) from governmental, EU and EU bodies. We searched the Scopus database, which indexes various online journals in the education sector with a European scope, to collect peer-reviewed academic papers. Furthermore, we used an all-inclusive Google search to include relevant key terms or studies found in the reference list of the peer-reviewed papers, and other key studies and policy reports related to the concepts studied.

Regarding search terms, we first searched resources on the impact of digital technologies on education, digital literacy, crisis management and disinformation by performing the following search queries: "impact" OR "effects" AND "digital literacy" AND "education", "impact" OR "effects" AND "misinformation" AND "education", "impact" OR "effects" AND "crisis management" AND "school". We further refined our results by adding the terms "meta-analysis" and "review" or by adjusting the search options based on the features of each database to avoid collecting individual studies that would provide limited contributions to a particular domain. We relied on meta-analyses and review studies as these consider the findings of multiple studies to offer a more comprehensive view of the research in each area.

Table 1

Corpus of Scoping Review

Domains/Issues	Numbers of Documents	% Total Number of documents
Digital Literacy	105	72,41%
Literacy in AI	8	5,5%
Disinformation	15	10,34%
Crisis management at school	15	10,34%
Vulnerable groups of adolescents	2	1,3%

The non-systematic scoping review was based on 145 documents in total related to the issues of digital literacy, literacy in AI, disinformation, crisis management at school, as well as to the interrelation of these issues with vulnerable groups of adolescents. As

it is showed in the table above. There are cases where the same document is related both to issues of digital literacy and disinformation. Many of the listed documents are policy reports, published between 2014–2024, while there is also an extended number of research papers published. Although the number of documents is extended, it is important to note that only 2 of them refer to vulnerable groups of adolescents.

Digital Literacy in Germany

Often digital literacy promotion in Germany overlaps with computer science education or efforts in information society. In December 2016, the German federal government announced "National Decade for Literacy and Basic Education" commencing in 2016. The programme that focuses on education at different hierarchies aims to foster literacy capabilities of population. Basic literacy and digital literacy are deeply interrelated and there must be special consideration to the influence on digital literacy throughout this program and similar general education programmes. Such impact analysis may present opportunities for future activities to synchronize digital literacy promotion in Germany.

State of the art findings were collected, and they are summarised focusing on the digital literacy levels and the digital literacy promotion activities. Here, it is observed that a comprehensive approach to the problem domain had not been present in Germany. Most of the studies that focus on digital literacy levels consider limited age groups, specific computer applications or information society in general. There is no clear data about the digital literacy levels in Germany as a whole. Comparing the results obtained from different studies may result in contradictory conclusions about the digital literacy situation (Antonazzo et al., 2022; Antonazzo et al., 2020; Melović, 2020; Dagienė et al.2023; Folea & Folcut, 2024; Marin & Popovici, 2022; Bejaković & Mrnjavac, 2020; Ratiu et al., 2023; Robert & Thomas, 2022).

Germany has existing national level policy for digital literacy which comes under the national strategy for lifelong learning through a new digital world. This strategy focuses on the development of digital competence among the population, so that all can participate in a knowledge society. The German government and the Federal Ministry for Economic Affairs and Energy has introduced a Digital Strategy 2025 program that focuses on enhancing Germany's digitalization processes (Digitalisierung gestalten) (BPA, 2021).

The Digital Strategy 2025 programme encourages the use of new tools and developing digital capabilities to improve Germany's digitalization efforts. The plan is built around ten key pillars that are essential to digitalization, one of which is providing digital education at every stage of a person's life. The following are the main goals of the pillar on digital education:

- By 2025, all students in schools will possess a foundational understanding of programming, algorithms, and information science. To do this, relevant courses need to be included in elementary and secondary school lesson plans, as well as in teacher education and ongoing professional development.
- The workplace should be the best place to learn the newest information technology (IT) skills by 2025. All publicly funded educational institutions must to provide critical instructional materials online by the year 2025. We must advocate for education in and for the digital world by 2025 at all levels, beginning in schools and extending to the dual system of vocational training, in order to accomplish these aims.

Germany faces a digital divide, particularly in the eastern regions. Digital skills are essential for people of all ages, but assessments show average computer use in schools does not significantly impact student performance. There is a lack of consensus on the definition of digital literacy, but it is seen as crucial for participating in the information society. Surveys show many Germans feel unprepared for the demands of the digital world, and there is a need to better integrate digital competencies into school curricula.

Overall, the research reveals a growing appreciation for digital technologies and increased self-sufficiency in their usage compared to pre-pandemic levels, especially concerning interactions with public authorities and financial matters.

An analysis of data from 2019 and 2021 uncovers a digital divide across age, education, and income levels. Younger individuals and women generally attribute more significance to internet usage compared to older individuals and men. Additionally, respondents with higher education levels emphasize the importance of internet usage more strongly. This discrepancy is particularly pronounced among 14- to 29-year-olds, who heavily rely on online resources for education, exacerbating existing educational disparities and digital skill gaps among students and teachers.

The review underscores the importance of social networks in facilitating digital learning, especially for seniors who can seek assistance from family and friends. However, there's a growing trend towards independent problem-solving through internet searches, particularly among younger age groups. Despite this trend, a significant portion of respondents express a desire for support services to improve their digital skills, including instructional videos, online courses, offline learning options, telephone support, and in-home assistance from trained experts.

The pandemic has underscored the necessity of digital skills for societal participation, necessitating the development of targeted support services tailored to different age groups. Regarding the educational system, integrating digital skills more comprehensively into the school curriculum can ensure that young people are adequately equipped for the digital challenges of the future. Overall, addressing the digital divide requires a multifaceted approach involving collaboration between government, edu-

cational institutions, and community organizations to ensure digital inclusion for all segments of society.

Another study (IU, 2022) showed that nearly all surveyed teachers and senior leadership team members, totalling 99.5%, express confidence in their ability to navigate the internet. Regarding digital infrastructure, an overwhelming majority of school staff, 98.5%, report that their school is connected to the internet. However, a significant proportion note that internet access is not universally available in all necessary areas.

When it comes to the utilization of digital media like videos within schools, 57.0% of respondents indicate regular usage, with an additional 35.1% reporting sporadic use. Despite this, over half of parents, at 51.6%, believe that digital media is underutilized in their child's school and advocate for more extensive integration. Many parents also express a desire for improved access to tablets and laptops, with only 32.2% reporting the availability of class sets of tablets (IU, 2022).

In terms of equipment availability, 65.8% of surveyed school staff report possessing tablets for classroom use. Notably, a significant majority of senior leadership team members, totalling 65.7%, identify the adequate provisioning of digital devices to students as the primary barrier to digitalization, followed closely by concerns about teachers' digital skills, at 63.7%.

Given these challenges, state funding emerges as a critical factor. Approximately 41.5% of senior leadership team members disclose that their schools are already benefiting from funding under the government's DigitalPakt scheme. Moreover, an additional 40.0% have either applied for or received approval for funding, underscoring the significance of state support in advancing digitalization efforts within schools.57.0% of school staff say that digital media are regularly or predominantly used in lessons, 2.2% of those work with flipped classrooms. Conversely, this means according to 43.0% of school staff surveyed, their schools never or very infrequently have digital lessons.

Internet coverage in schools is not a given. Admittedly, 98.5% of school staff say that their school is connected to the internet – but only around two thirds of those say that internet is available in all necessary areas. However, the surveyed parents observe a larger deficit: 93.7% say that their children's schools have internet, but only 40.6% of those say that it is available in all necessary areas. In their experience, 6.3% of schools have no internet at all. Additionally, 51.6% of parents think that digital media is used too rarely in their child's school while 47.3% of parents call for more sets of tablets in school classes. Furthermore, parents say that only 37.9% of their children's schools have digital and multimedia lessons. 31.4% of those occur regularly, 4.4% predominantly, and 2.1% in flipped classrooms. 42.6% of surveyed parents think that digital media is used to an ideal extent in their child's school. However, more than half (51.6%) find that digital media is not used enough. Parents who think that digital lessons in their child's school are insufficient have a range of reasons: They especially often name the limited use and promotion of digital media and a lack of expertise and engagement amongst

teaching staff. But the confident use of digital media is important to their children's future. This was stressed by 12.5% of surveyed parents who think that digital media is not used enough (IU, 2022).

Digital Literacy needs of teachers, school leaders, and students at the national level

At the national level of education in Germany, digital literacy in the context of knowledge relating to recognizing disinformation is not strongly represented in any formal educational policy, and there is no comprehensive approach to teacher training in this area. Although awareness of the importance of these issues is growing, progress is slow and varies between the federal states (Länder). An initiative of the Kultusministerkonferenz (KMK), federal conference of state ministers of education, aimed at seing digital media included as a cross-curricular theme in all types of schools in all Länder, with its own set of educational standards, by 2006. This should have been beneficial for the development of teacher training and student instruction in these issues, but evaluation of the implementation of this initiative and its impact on learning of digital literacy and skills relating to disinformation was not possible at this stage.

According to the Das Deutsche Schulbarometer (2023) (Robert Bosch Stiftung, 2023) the current status of digitalization in Germany, in financially disadvantaged municipalities, the equipment is inadequate. A basic technical infrastructure is essential for digital teaching. A strong Internet connection within school buildings is available to 59% of teachers at general education schools (an increase from 36% in 2020). Half of all teachers recognize a significant need for improvement in both school technical equipment (50%; 61% in socially difficult situations) and technical equipment for students at home (50%; 70% in socially difficult situations). The investment backlog is notably higher at special schools, and schools in socially challenging circumstances, often located in financially weak municipalities, are also significantly less equipped.

As far as the digitally supported learning concerns, there is still great potential for utilizing digital media. Over three-quarters (79%) of teachers have access to a learning and working platform. At general education schools, teachers use digital media in the classroom for acquiring new learning content, such as explanatory videos (69%; up from 66% in 2021), independent practice with learning apps (68%; up from 65% in 2021), and cooperative learning methods (30%; up from 26% in 2021). However, digital tools are still underutilized for performance assessments (18%; up from 16% in 2021), designing differentiated lessons (39%; no comparative value from 2021), identifying learning gaps (16%; no comparative figure from 2021), or determining special educational needs (12%; no comparative value from 2021) (Robert Bosch Stiftung, 2023).

Crisis Management in Schools

In Germany the crisis management at schools lies with the federal states. Among the federal states, the majority have adopted plans or guidelines for managing crises on school premises or have developed them on a regional level. The types of crises contemplated can vary from accidents in science laboratories through hostage-taking to diseases like pandemic influenza. Generally, the requirements are that schools (or school authorities) should establish their own crisis response plans which address prevention/mitigation, preparedness, response, and recovery. These can be developed separately or integrated into an all-hazards plan. It should also detail the roles and responsibilities of various staff members and ensure that the plan is known to all members of the school community. To ensure that plans are of good quality, German states have been urged to carry out regular crisis management exercises. These can take the form of tabletop exercises and, for larger crises, simulations involving emergency services. These might be done on a single school or joint school/regional basis and aim to identify strengths and weaknesses in existing plans and provide training for crisis management teams.

Schools are encouraged to develop crisis response plan strategies as part of their school program activities. These strategies commonly follow a five-phase emergency management plan which covers identification, prevention, preparation, acute response, and recovery. The plan is designed to cover all disasters, natural (floods, storms) and man-made (shootings, terrorism), and has a clear set of achievable goals for each. However, these plans are non-binding and there are no clear policies or information about the status of development and effectiveness of crisis response plans in schools across Germany (Haider & Sundin, 2022; Posetti & Bontcheva, 2021; Neidhardt, 2021).

Unfortunately, there is little detailed information regarding methodologies used and it is unclear to what extent this advice has been followed. In general, it is likely that the greater the risks faced, the more developed the plans will be. Crisis management is particularly important for schools that have boarding facilities. A 2003 inquest into a fire that killed 10 boys at a boarding school in Schleswig-Holstein concluded that the school had failed to undertake adequate planning and preparation (Anke et al., 2021; Haslam et al., 2021; Wodak, 2021; Thielsch et al., 2021).

Disinformation

The terms misinformation and disinformation are often mistakenly used interchangeably. However, the terms are distinct and the difference matters. "Misinformation" is simply false or inaccurate information – nothing more, nothing less while "Disinformation" is false or misleading information promoted deliberately to deceive, often in pursuit of an objective and very often with the prime objective to affect the well-being of an individual or a group. Disinformation thrives in environments where

critical thinking skills are underdeveloped, making individuals more susceptible to accepting false or misleading information. Strengthening critical thinking is essential to empower people to analyse, question, and verify the credibility of information in general and online in particular, thereby reducing the spread and impact of disinformation and prevent crises.

The first-time disinformation was taken into consideration at a national level was in 2018 with the commissioning of a European security study by Angela Merkel. However, it was in 2019 when the Federal government released the first strategy that would cater to combating disinformation. This strategy aims to "protect open democratic opinion and will-formation from disinformation and influence operations," as well as developing alliances with various information platforms and networks to increase awareness and counteract disinformation.

The German government has endeavoured to curb digital disinformation through a number of different initiatives, the most important being the Interministerielle Arbeitsgruppe zur Gesamtstrategie gegen Desinformation (Interministerial working group for an overall strategy against disinformation) set up in 2016 under the auspices of the Federal Press Office in accordance with the EU's 'Action Plan against Disinformation'. The working group has been made responsible for coordinating Germany's response to disinformation and for developing a wider strategy. Its initial focuses were on improving domestic transparency of political processes for the general public and sharpening media and information literacy to erect prophylactic barriers to disinformation. To this end, it placed particular importance on identifying and protecting 'Digital Opinion Makers' and sought to form partnerships with social media outlets to improve abilities to self-regulate and co-regulate content, combat fake accounts and bots, and develop early detection systems for coordinated attempts at disinformation. The second phase of development was intended to construct a comprehensive manner of crisis management and a system of 'inoculation' to increase societal resilience to potential effects of disinformation both in times of relative calm and in the lead up to federal elections in autumn 2017. This led to the creation of the 'Widerstandsfähig Gegen Desinformation' (Resilient Against Disinformation) (Humprecht, et al., 2020) project and the 'Abwehrzentrum Gegen Desinformation' (Centre for Defence against Disinformation) that was established in 2017 and modelled on the concept of the 'Zentrum für Informationsarbeit der Bundesregierung' created in 1963 to act as a means of communication between the government and the public during the Cold War.

The NetzDG requires social media platforms with over two million users to promptly remove illegal content, including hate speech and disinformation, or face hefty fines. The NetzDG is a significant legislative effort aimed at combating the spread of illegal content, including hate speech and disinformation, on social media platforms. It mandates that platforms with over two million users must promptly remove such content or

face substantial fines. This act represents Germany's proactive approach to regulating online platforms to curb the dissemination of harmful content.

Additionally, Germany has signed onto the EU Code of Conduct on Disinformation (EC, 2022), which aims to combat the spread of disinformation online through measures such as transparency in political advertising and cooperation with fact-checking organizations. Germany is a signatory to the European Union's Code of Conduct on Disinformation, which seeks to address the proliferation of false information online.

Finally, another important policy initiative is the Federal Government's Strategy on Civic Education (Bundeszentrale für politische Bildung/bpb, 2024). The German government has developed a strategy to strengthen civic education, including media literacy initiatives to empower citizens to critically assess information they encounter online. The developed strategy bolsters civic education, recognizing the pivotal role of media literacy in empowering citizens to navigate the digital landscape effectively. As part of this strategy, initiatives are undertaken to promote critical thinking skills, foster digital literacy, and encourage active citizenship. These efforts aim to equip individuals with the tools necessary to discern credible information from misinformation and disinformation.

Conclusions

Digital literacy in Germany has been closely linked to computer science education and efforts to build an information society, with initiatives like the "National Decade for Literacy and Basic Education" highlighting its importance. Despite these efforts, comprehensive data on digital literacy levels across different demographics remains scarce, and existing studies often yield contradictory conclusions. Programs like the Digital Strategy 2025 aim to integrate digital skills into education and vocational training, with goals to provide all students a foundational understanding of programming, algorithms, and information science by 2025. However, challenges such as inadequate infrastructure, limited access to digital devices, and insufficient teacher training hinder progress, particularly in underrepresented regions like the eastern states. These issues underline the need for more robust implementation, monitoring, and funding to bridge the digital divide.

Crisis management in German schools is largely decentralized, with individual states responsible for planning and preparedness. While most states have established guidelines, their non-binding nature results in varying levels of preparedness. Schools are encouraged to adopt comprehensive crisis response strategies covering identification, prevention, and recovery phases, but inconsistent adoption and execution remain significant barriers. Regular training exercises and standardized national guidelines could improve the overall effectiveness of crisis management in schools.

Germany has also made strides in combating disinformation, leveraging initiatives like the NetzDG to hold social media platforms accountable for removing harmful content and promoting media literacy through programs like the Federal Government's Strategy on Civic Education. Collaborative efforts with social media platforms and fact-checking organizations, coupled with public awareness campaigns, aim to strengthen resilience against disinformation. However, these efforts must be sustained and adapted to the evolving digital landscape.

In conclusion, Germany's approach to digital literacy, crisis management, and combating disinformation reflects a commitment to fostering a digitally competent and resilient society. Nevertheless, gaps in infrastructure, education, and policy execution must be addressed to ensure inclusivity and effectiveness. Targeted investments, better coordination between federal and state authorities, and stronger public-private partnerships are essential to overcome these challenges and fully realize the potential of Germany's digital transformation initiatives.

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Skaitmeninio raštingumo, dezinformacijos ir krizių valdymo padėtis Vokietijos mokyklose

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Autoriai reiškia padėką Eszterai Salamon už jos indėlį rengiant šį straipsnį.

Santrauka

Nesistemingo pobūdžio apžvalginėje studijoje pateikiama 145 dokumentų, susijusių su skaitmeniniu raštingumu, dirbtinio intelekto raštingumu, dezinformacija ir krizių valdymu mokyklose, taip pat su jų sąsajomis su pažeidžiamomis paauglių grupėmis, analizė. Kai kuriuose dokumentuose nagrinėjami keli klausimai vienu metu, pavyzdžiui, skaitmeninis raštingumas ir dezinformacija. Apžvelgti dokumentai – tai politikos ataskaitos (nuo 2011 iki 2024 m.) ir gausūs moksliniai straipsniai – atskleidė didelę spragą, susijusią su pažeidžiamų paauglių poreikių atliepimu. Neatsižvelgiant į tai, šiame straipsnyje daugiausia dėmesio skiriama skaitmeniniam raštingumui, nes jis apima svarbius dezinformacijos ir krizių valdymo aspektus. Apžvalga parodė, kad Vokietija siekia ugdyti skaitmeniškai kompetentingą ir atsparią visuomenę,

vykdydama iniciatyvas, skatinančias skaitmeninį raštingumą, krizių valdymo gebėjimus ir kovą su dezinformacija mokyklose.

Nepaisant pažangos, vis dar išlieka iššūkių, tokių kaip skaitmeninė atskirtis (ypač rytiniuose regionuose), infrastruktūros, švietimo ir politikos įgyvendinimo spragos. Šiems iššūkiams įveikti reikia tikslingų investicijų, geresnio federalinių ir regioninių institucijų koordinavimo bei stipresnio viešojo ir privataus sektoriaus bendradarbiavimo, siekiant užtikrinti įtrauktį ir visiškai įgyvendinti Vokietijos skaitmeninę transformaciją.

Esminiai žodžiai: *skaitmeninis raštingumas, skaitmeniniai įgūdžiai, dezinformacija, melaginga informacija, krizių valdymas, dirbtinis intelektas.*

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