Beyond truth: Teaching digital competences in secondary schools to counteract disinformation. Experts' views on practical teaching frameworks for basic digital education in Austria

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Increasing disinformation makes it necessary for schools to sensitise students from an early age. Various recent developments around the globe underline the need to teach and learn about disinformation in classrooms. Moreover, digital literacy in

Austria will be revised in 2022. This paper therefore discusses the circumstances and requirements for teaching and learning against disinformation. The paper draws on the concepts of phenomenon-based learning, multiliteralism, immunisation theory and civic online thinking to propose practical teaching interventions for Austrian secondary schools focusing on two target groups: Lower Secondary students aged 10–14 years and Upper Secondary students aged 15–18 years. Based on qualitative semi-structured interviews with teachers and practitioners (n=19), the above theoretical approaches are applied to Austrian secondary schools. Experts suggest that phenomenon-based learning trains younger students (10–14 years) in basic multiliteracy, while vaccination theory and online civic thinking deepen resistance to disinformation in older students (15–18 years). Our findings indicate that digital literacy training needs to be made a compulsory part of digital literacy education, with a holistic, cross-curricular approach, so that skills can be addressed in all school subjects from the age of 10 in regular lessons.

Die zunehmende Desinformation macht es notwendig, dass die Schulen die Schüler:innen von klein auf sensibilisieren. Verschiedene aktuelle Entwicklungen rund um den Globus unterstreichen die Notwendigkeit, in den Klassenzimmern über Desinformation zu lehren und zu lernen. Außerdem wird die digitale Grundbildung in Österreich im Jahr 2022 überarbeitet. Dieses Papier diskutiert daher die Umstände und Anforderungen an das Lehren und Lernen gegen Desinformation. Der Beitrag stützt sich auf die Konzepte des phänomenbasierten Lernens, der Multiliteralität, der Impftheorie und des bürgerlichen Onlinedenkens, um praktische Unterrichtsinterventionen für österreichische Sekundarschulen vorzuschlagen, die sich auf zwei Zielgruppen konzentrieren: SchülerInnen der Sekundarstufe I im Alter von 10–14 Jahren und Schüler:innen der Sekundarstufe II im Al-

ter von 15–18 Jahren. Auf der Grundlage qualitativer halbstrukturierter Expert:inneninterviews mit Lehrer:innen und Praktiker:innen (n=19) werden die oben genannten theoretischen Ansätze auf österreichische Sekundarschulen angewendet. Expert:innen schlagen vor, dass phänomenbasiertes Lernen jüngere Schüler:innen (10–14 Jahre) in grundlegender Multiliterarität schult, während Impftheorie und zivilgesellschaftliches Onlinedenken die Resistenz gegen Desinformation bei älteren Schüler:innen (15–18 Jahre) vertieft. Unsere Ergebnisse zeigen, dass die Schulung digitaler Kompetenzen zu einem obligatorischen Bestandteil der digitalen Grundbildung gemacht werden muss, wobei ein ganzheitlicher, fächerübergreifender Ansatz verfolgt werden sollte, damit die Kompetenzen in allen Schulfächern ab dem Alter von 10 Jahren im regulären Unterricht behandelt werden können.

1. Introduction

Increasing levels of disinformation through digitalised media means pupils' awareness needs to be raised at a young age in school classrooms (Loveless/Williamson 2013). Recent developments around the globe (e. g. the Covid-19 pandemic, the climate crisis) clearly show how harmful the impact of fake news on society can be (Lewandowsky et al. 2017). This highlights the need to teach and learn about disinformation in classrooms (Burnett/Merchant 2011). The importance of age group-specific teaching in school is thus the subject of vibrant discussion (Wardle 2017). In Austria, basic digital education ("Digitale Grundbildung") is currently being revised and made a compulsory component of edu-

cation – so this is a good time to rethink the subject and discuss how this could be done.

Having a deeper understanding of the possible (in)visible factors that may be involved with disinformation can prevent the dissemination or creation of disinformation (Starbird 2021) and help pupils to develop healthy digital identities and safe online practices. In this paper, we investigate teachers' and practitioners' ideas on how to develop pupils' digital competencies. Based on their feedback and on selected approaches, we discuss practical approaches to teaching and how to address the topic in educational settings.

We will identify the educational consequences of teaching and learning to counteract disinformation, and the associated pedagogical approaches and requirements. We analyse the perspectives of selected experts from Austria (n=19), including 6 interviews with teachers from different types of schools and 13 interviews with practitioners covering multiple viewpoints including social work, the Ministry of Education, law, journalism, fact checking, conspiracy myths, teacher education, extremism prevention, the Chancellor's Office and the probation service. Based on these findings, we draw on the concepts of phenomenon-based learning (Kangas/Rasi 2021), inoculation theory (Compton 2013) and civic online reasoning (McGrew 2020) to formulate guidelines for a teaching framework for lower secondary (10–14 year-olds) and upper secondary school pupils (15–18 years) in Austria.

A growing body of literature suggests that preventive measures are needed to counteract disinformation at a general level; these typically include ways to identify fake news through inoculation measures such as media literacy, artificial intelligence technology, fact-checking and correction (Ha/Perez/Ray 2021). In addition to stronger regulation, the strengthening of technological mechanisms and the expansion of qualitative news media, Wardle (2017) describes educational initiatives to counteract disinformation, calling for a greater number of news literacy programs. The curriculum, she contends, should include strategies to (1) build traditional news literacy skills; (2) fact checking skills with regard to social media; (3) improve understanding of algorithms and how they shape what is presented to us; (4) promote learning about the ethical implications of artificial intelligence; (5) develop scepticism so that pupils are less vulnerable to provocative content and emotional reactions; and (6) promote a basic understanding of statistics. Recent programs focusing on critical thinking, source evaluation and emotional manipulation have been successful (Wardle 2017). Experts largely agree that censorship and/or blocking of content is not recommended (Ha/Perez/Ray 2021). This paper therefore focuses on how experts envision the development of digital competencies in secondary schools, including source criticism, fact-checking and media literacy.

2. Spotting fake news: Competences and digital teaching

Ha, Perez and Ray (2021) present an analysis of 142 journal articles published in the last 10 years on misinformation and fake news and found that communication (n= 30) and psychology (n= 35) were the two major disciplines addressing these issues, while education (n= 2) was underrepresented (Ha/Perez/Ray 2021). This underlines the need for more research on education and fake news.

2.1 Facts about fakes

The interest in fake news has grown since the rise of social media in 2008; and fake news became the word of the year in 2017 (BBC 2017). Fake news is currently defined as information "that is intentionally and verifiably false, and could mislead readers" (Allcott/Gentzkow 2017: 213) or as "fabricated information that mimics news media content in form but not in organisational process or intent" (Lazer et al. 2018: 1094). Scholars distinguish between two motives for providing fake news: Financial motivation drives content that spreads virally with high click-rates, thus generating income for advertisers; and ideological motivation spreads content to promote certain "themes or ideas" (Allcott/ Gentzkow 2017: 213).

The development of artificial intelligence and social media bots has aggravated this problem (Ferrara et al. 2016). The polarisation of ideologies provides fertile ground for fake news. People on both sides of the political spectrum are more likely to believe fake

news when they are surrounded by negative emotions. This effect is intensified when news reinforces recipients' opinions. The use of information provided by algorithms also increases the impact of fake news (Brisola/Doyle 2019, Tandoc et al. 2018). Since people have phones with them most of the time from a young age, it is easy for them to receive and share content in an instant, making it equally easy for disinformation to be disseminated (Ha/Perez/Ray 2021). However, as Monsees (2021) argues, 'sharing' does not necessarily mean 'believing'. People also share fakes in the knowledge that they are fakes, with a view to debunking it or to making fun of it. Fake news works because it is addictive and grabs our attention. Venturini thus calls it "junk news" or "viral news" (Venturini 2019: 126). Pariser (2011) addresses the phenomenon of filter bubbles and echo chambers, in which users only see personalised information that reinforces their own opinions, giving them a distorted view of reality. There is no transparency for recipients about what they are seeing and what is being filtered out (Pariser 2011).

Some researchers are already cautioning against using the term *fake news*, as this buzzword is often misused in other contexts, or used to denounce political opponents or criticise media reporting. The term has been applied to a large variety of phenomena since 2016. It has been investigated in the context of disinformation, media criticism and increasing insecurity about societal truth (Egelhofer et al. 2020). We therefore distinguish between *fake news, misinformation, malinformation* and *disinformation*. Fake

news is defined as intentionally and verifiably false articles created to manipulate (Allcott/Gentzkow 2017). Misinformation is the sharing of false information with no intent to harm (Wardle/Derakhshan 2017), whereas disinformation is a wider mixture of techniques aiming to manipulate public opinion, shared knowingly and with political intent in order to cause harm (Brisola/Doyle 2019; Wardle/Derakhshan 2017). Malinformation is the dissemination of real information in order to cause harm, for instance by leaking information to the public sphere that was intended to be kept private (Wardle/Derakhshan 2017). In this paper we focus on the concept of *disinformation*, because it involves more than the question of whether it is true or false: "Disinformation goes through an 'informing machine' that also uses the truth and parts of the truth to disinform" (Brisola/Doyle 2019: 277). Since 2020, the Covid-19 pandemic and the associated spread of disinformation have led to the coining of the term *infodemic* (Eberl/Lebernegg 2022).

Wardle and Derakhshan (2017) distinguish between *agent, message and interpreter*. The agent, as the creator of a fabricated message, might be different from its producer or distributor. We therefore need to understand agents and their motivations. Different types of messages can appear depending on the agents that distribute them. Recent debate has focused overwhelmingly on fabricated texts, whereas fabricated visual content is just as widespread and harder to identify and debunk. Interpreters of disinformation also influence how it is processed: messages can

be shared in line with their original intention, re-shared with controversial information attached or distributed offline in personal conversations (Wardle/Derakhshan 2017).

Huber et al. (2021) highlight the distinction between *victims and perpetrators*. Perpetrators are private individuals, people belonging to political or religious groups, or working for companies or states, regardless of whether they are aware that they are participating in disinformation. Victims can be classified as parties through whom disinformation is spread or who are deceived by disinformation (Huber et al. 2021). Interestingly, targets of disinformation are often to be found in the centre and to the right of the political spectrum (Arendt et al 2019). Therefore, people with more right-wing political tendencies are thought to be more likely to be the recipients of disinformation, fake news and conspiracy theories (Huber et al. 2021).

2.2 From digital competences to multiliteracy

Digitisation and emerging technologies have made it increasingly difficult to identify reliable information (Auberry 2018). Therefore, the teaching of *digital competences* in schools needs to bring together different types of knowledge, abilities and skills. A number of studies have explored different approaches to the development of digital competences, focusing amongst other things on *information literacy, digital literacy, computer literacy and media literacy*.

Although literacy in general is often a primary goal of education, the increasingly complex nature of digital landscapes requires new skills and competences, which can be summarised with the overarching term "digital literacy". Gilster describes *digital literacy* as "the ability to both understand and use digitized information" (Gilster 1997: 2). *Digital literacy* is the "confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society" (Ala-Mutka 2011: 1), while *computer literacy* is typically, a functional definition, specifying "the basic skills that are required to undertake particular operations" (Buckingham 2015: 23). "*Media literacy* sees media as a lens through which to view the world and express oneself while *information literacy* sees information as a tool with which to act upon the world" (Livingstone et al. 2008: 106). The concept of *media literacy* is closely linked to digital literacy, but media literacy refers to the skills to manage media, reduce their influence, filter information, orientate oneself with regard to content and assess the truthfulness of content. Media literacy competences are therefore also interest-oriented and shape one's identity within a society (Fukuyama 2006). Hobbs and Jensen (2009) have a wider understanding of *media literacy* involving the "important life skills" of analysing

> news and advertising, examining the social functions of music, distinguishing between propaganda, opinion and information, examining the representation of gender, race and class in entertainment and information media, understanding media economics

and ownership, and exploring the ways in which violence and sexuality are depicted in media messages. (Hobbs/Jensen 2009: 8)

Brisola and Doyle (2019) conclude that *critical information literacy* is a key component of resistance to fake news as it enables recipients to deal with the flood of information and to actively build "a more ethical society [with regard to] the use of information" (Brisola/Doyle 2019: 274). Other studies have investigated whether people with media, information, news and digital literacy skills are better at recognising disinformation, and which of these skills are most important. The results indicate that information literacy – but no other skills – is most likely to increase individuals' ability to detect fake news (Jones-Jang et al. 2021).

Although all these approaches address important aspects, *multiliteracy* represents a broader perspective and has had a strong impact on work in this field. *Multiliteracy* is defined as

the competence to interpret, produce, and make a value judgement across a range of different texts, helping pupils to understand different modes of cultural communication and to build their personal identity. (Rasi et al. 2019: 98)

This understanding includes the strengthening of basic literacy through links to other types of literacy, e. g. media literacy and visual literacy (Rasi et al. 2019). Multiliteracy sets digital competences in a wider context and includes the ability to combine, obtain, understand, modify, present, produce and evaluate different information in different contexts, modes and situations using a range of different tools. Kangas and Rasi (2021) argue that multi-

literacy is one of the central civic skills education should focus on in order to enable pupils to interpret, produce and judge the value of a variety of texts in visual, auditory, verbal, kinaesthetic and numeric systems and in combinations of such systems. The prefix multi underlines the variety of different texts in multiple contexts (Kangas/Rasi 2021).

Because of its breadth of scope, multiliteracy can be fuzzy or problematic: some researchers understand it as referring to abilities or competences, whereas others see it as a pedagogical approach (Palsa/Ruokamo 2015). In this paper we use multiliteracy as an umbrella term for a variety of concepts relating to digital competence, including digital literacy (Ala-Mutka 2011), information literacy (Jones-Jang et al. 2019), visual literacy (Felten 2008), media literacy (Hobbs/Jensen 2009), computer literacy (Buckingham 2015) and advertising literacy (Rozendaal et al. 2011).

2.3 Teaching digital competences

Digital pedagogy refers to the use of electronic elements to improve or modify the experience of education (Croxal 2012), and the skill to deploy digital technology to enhance teaching, learning, assessment and curricula (Kivunja 2013). The concept is seen as constructivist and pupil-centred compared with more traditional teacher-centred approaches (Väätäjä/Ruokamo 2021). Traditional approaches to digital skills development in teacher education have focused on fostering the digital literacy of pupils (Borthwick/Hansen 2017). However, these have increasingly been questioned as new digital formats and new uses for technology

have emerged. Teaching digital competences now means prioritising technical skills and using the most appropriate digital tools for the learning goals in question (Admiraal et al. 2016).

The frequently cited European Union DigComp 2.0 and DigCompEdu frameworks set out key digital competences within policy instruments for educational institutions (Vuorikari et al. 2016; Redecker 2017). Their Austrian counterparts, digi.komp and digi.kompP, include a competence matrix listing the required digital competences for pupils and teachers (BMBWF 2016). However, these frameworks confine themselves to listing competences and skills; they do not include specific, practical suggestions for teaching in classrooms. The aim of this article is to address this shortcoming.

Recent studies have called for teacher education programmes to be re-conceptualised, suggesting that the current focus on digital competences be broadened into models that recognise the diverse knowledge, skills and dispositions of future teachers (Falloon 2020). This new understanding sees digital competences both as specific knowledge and as familiarity with other issues concerning technology, for example legal and ethical aspects, privacy and security, and an understanding of the role of ICT in society. While this acknowledges the relevance and importance of technical knowledge and skills, it also takes a broader socio-cultural view, underlining the need to understand and consider the broader implications of digital technologies for individuals and society (Janssen et al. 2013). Further, it focuses on attitudinal issues,

including the development of a "positive mindset" to improve teachers' understanding and critical evaluation of technological innovations and the role and influence of technology in the formation of new practices (Janssen et al. 2013: 474). The absence of a positive mindset might be the answer to the question raised by Väätäjä and Ruokamo (2021), namely why some teachers do not integrate digital technologies into their teaching despite having all necessary competences to do so.

Thus, teacher education institutions should not only prepare preservice teachers to use digital resources in their teaching, but also to understand, conduct research into, and develop further reflections on, the use of technology and its impact. Their understanding will need to be constantly revised and developed in order to keep up with the speed of technological change (Janssen et al. 2013). This requires educational institutions to constantly reflect on current needs in order to respond to technological innovation and the new opportunities it presents for educational environments (Falloon 2020).

2.4 Basic digital education in Austria: Digitale Grundbildung

Basic digital education (Digitale Grundbildung) was initially introduced in 2018 as a compulsory addition to the existing curriculum for lower secondary schools in Austria (BMBWF 2018). In late 2021, the Austrian National Council decided that the subject should be given the status of a compulsory subject, which it is planned to introduce in schools with effect from autumn 2022: at lower secondary level (age groups 10–14) with at least 4 weekly

lessons per year. In order to meet the demand for teachers, 150 new jobs are being created (Parlamentsdirektion 2021). Alongside this measure, around 150.000 pupils in the first two years of lower secondary school were given low-cost laptops and tablets in autumn 2021 (BMBWF 2020). To prepare and qualify teachers to teach the new compulsory subject, the Ministry of Education is planning a three-stage training initiative: in the short term, a Massive Open Online Course (MOOC) for teachers; in the medium term, university courses at teacher training colleges for in-service teachers; and in the long term, a new teacher training curriculum (BMBWF 2022).

The goal of the Austrian basic digital education agenda is to build media, application and information technology competences in order to enable learners to orient themselves in the context of digital technology and take a responsible approach to it. The new curriculum is based on the *Frankfurt Triangle*, which considers three perspectives: (1) how digital technologies work, (2) the socio-cultural interactions that arise from their use and (3) the options for pupils to interact and take action. The focus is on five areas of competence: orientation, information, communication, production and action (Brinda et al. 2020).

The Ministry of Education has not specified in further detail how basic digital education should be delivered. Sections 3 and 4 below describe educators' existing approaches to disinformation.

## 3. Phenomenon-based Learning: Multiliteracy for 10- to 14-year-olds

In the context of multiliteracy teaching, phenomenon-based learning provides fertile ground, since it focuses on real-life topics and pupils' areas of special interest (Rasi et al. 2019). Despite the existence of research on multiliteracy (e. g. FNBE 2016) and phenomenon-based learning (e. g. Lonka et al. 2018), there have been no studies of the practical aspects of phenomenon-based learning and multiliteracy in secondary schools in Austria.

3.1 Phenomenon-based learning and project teaching

Phenomenon-based teaching and learning invites educators to reposition the boundaries of traditional subject teaching to include interdisciplinary explorations of phenomena (Lonka et al. 2018). It links school knowledge to real-life topics, enabling pupils can create new solutions, individually or collaboratively. Pupils acquire knowledge through the exploration of their experiences and lifeworlds and of societal issues (Lonka et al. 2018). According to Silander (2015a) a phenomenon is an authentic object of observation, a systematic model for the things to be learned, a metaphorical model for the things to be learned or a motivating fundament for attaching the things to be learned (Silander 2015a). Teaching requires a problem-solving environment, where teachers raise a topic and pupils "build answers together to questions or problems posed concerning a phenomenon that interests them" (Silander 2015a: 17). Learning goals are negotiated and evaluation is used as a tool for self-analysis. Teaching processes

are learner-centred and the content to be learned by pupils is connected to practical situations. Team teaching and cross-curricular lessons are crucial aspects of the process. Teachers are seen as facilitators of learning, encouraging and guiding pupils as they deal with the question they themselves have identified (Silander 2015b). Phenomenon-based learning has a lot in common with problem-based learning, design-based learning and inquiry-based learning (Puente et al. 2013) but has a stronger focus on team teaching, multidisciplinary, authentic, cross-curricular and contextualised projects (Lonka et al. 2018).

When it comes to the practical implementation of phenomenon-based learning with regard to multiliteracy, Kangas and Rasi (2021) suggest the following eight steps, as shown in Figure 1.

Figure 1: Phenomenon-based teaching and learning for multili-
teracy in secondary school (Kangas/Rasi 2021: 13)
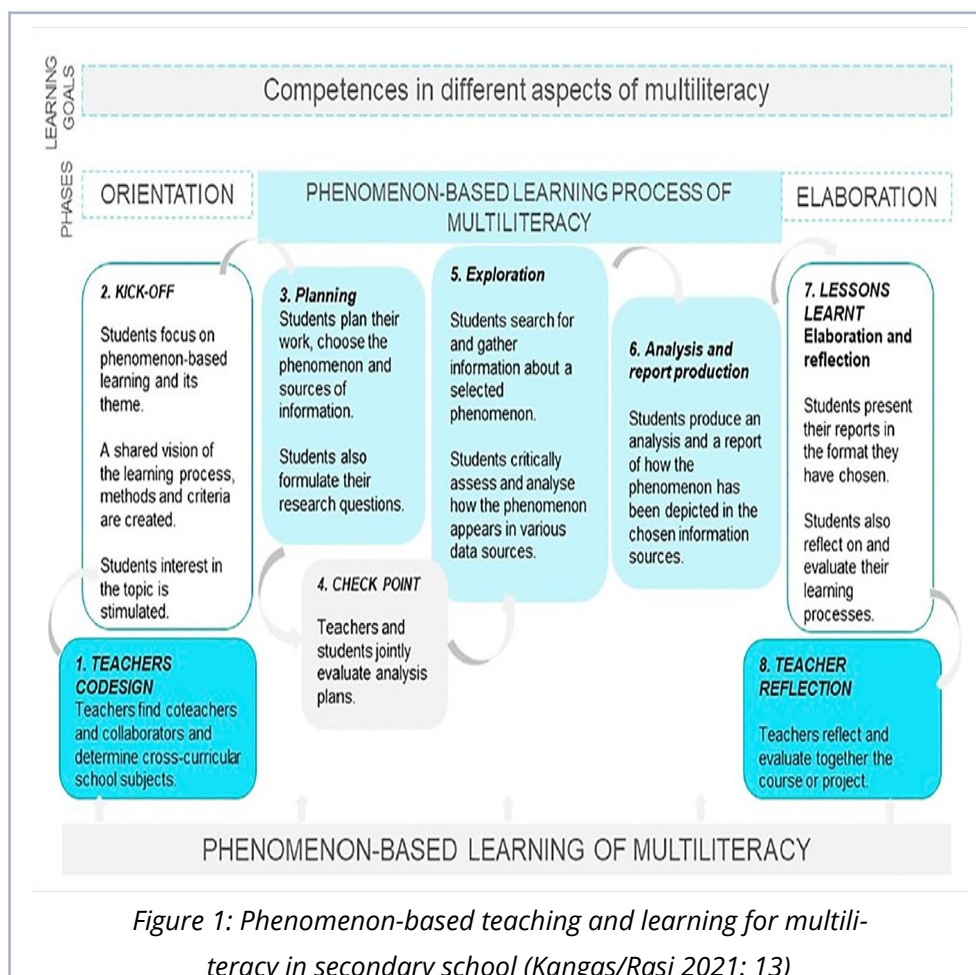
A specific practical example of delivery based on this approach (Kangas/Rasi 2021) in a secondary school might be as follows: (1) Teachers Co-Design: Two teachers (of English and Biology respectively) get together and define learning goals, teaching/learning methodologies and evaluation criteria as well as setting a duration of (e. g.) two weeks. The chosen topic (in this instance climate change) is linked to the curriculum and to pupils' lives by allowing them to choose a problem that is connected to their lives.

(2) Kick-Off: In the first lesson(s), the teachers share the vision and the goals of the project and arouse interest through subject-specific stimuli, for example a film about Greta Thunberg. The teachers encourage pupils to ask questions. (3) Planning: Pupils choose their own research question based on their specific interests. They form groups or work individually on questions such as: What effects of the climate crisis do I notice in my hometown? What can I myself do to combat the climate crisis? How can we make everyday life in school sustainable? What can my family do? The aim is to find the most relevant sources for their projects. (4) Teachers and pupils jointly analyse and evaluate work plans and project ideas. (5) Exploration: The pupils undertake research, looking at news articles, YouTube videos, blogs, Twitter, TikTok, advertisements, etc. They consider how their phenomenon is presented in different sources. (6) Analysis and report production: Pupils try to answer the questions using the available sources and discuss them in the group or in a plenary session. Depending on pupils' ages and the prior knowledge, an additional checkpoint with teachers and pupils could be included here, to evaluate the findings. Pupils produce reports and presentations and are encouraged to make creative use of various digital tools and formats as appropriate to their research question, creating comics, short videos or podcasts in German and English language, for example. (7) Lessons learnt: The results are presented in class and published in a shared folder on the school's learning platform. The multimedia reports are also displayed in the school building for other pupils and parents to see. Finally, the pupils discuss the

learning process and the results with their teachers in English and Biology. Teachers assess the reports and pupils evaluate themselves and/or their classmates (8) Teacher reflection: At the end of the project, the two teachers discuss the learning process and compare the results with the desired outcomes, taking pupil feedback into account.

3.2. Criticism of phenomenon-based learning and constructivism

Phenomenon-based teaching and learning have their roots in constructivism and aspects of socio-cultural learning (e. g. Vygotsky 1987), progressive inquiry learning (e.g. Hakkarainen 2003) and problem-based learning (e. g. Hmelo-Silver 2004). Some researchers criticise the central constructivist premise of phenomenon-based learning, raising concerns that it avoids pupils' responsibility for any failure to learn (Symeonidis/Schwarz 2016). Critics highlight the need to exercise care with regard to "educational reform and policy making that tends to shift the responsibility for learning outcomes onto the pupils and reduces the teaching job to facilitating, mediating and organizing multidisciplinary learning modules" (Symeonidis/Schwarz 2016: 41). This critique argues that a constructivist approach disconnects teachers from their responsibilities through the creation of phenomena in pupils' minds. The idea of pupils as self-regulated learners might become an unintended consequence, releasing teachers from the responsibility if educational goals fail (Symeonidis/Schwarz 2016).

In this paper, we take a look at phenomenon-based learning in the form of time-limited interventions rather than as a wholesale

replacement for traditional teaching methods. The above mentioned criticism of phenomenon-based learning is less applicable in the context of periodic, short-term projects.

This chapter has shown that phenomenon-based learning provides pupils aged 10-14 years with training in basic digital skills. The following chapter describes teaching and learning methods for addressing disinformation issues with older students.

4. Ways to deepen understanding of disinformation – for 15 to 18 year-olds

As outlined in the previous sections, digital competences in the context of disinformation need to be developed from an early age and extended at upper secondary level. While basic digital education in Austria is intended to foster basic digital competences, the core aspects at upper secondary level are techniques for spotting, addressing and countering disinformation. We therefore outline two established approaches for 15–18-year-olds: Inoculation theory (Compton 2013) and evaluation of online information sources (McGrew et al. 2018).

4.1 Inoculating pupils against disinformation

The technique known as prebunking has generally seemed to be a fruitful way of neutralising the effects of false experts and/or disinformation (Cook et al. 2017). Prebunking is based on inoculation theory, which was first introduced by McGuire in the 1960s

(McGuire 1964; McGuire/Papageorgis 1962). The main idea is that individuals can be inoculated against misinformation attacks that can impact on their attitudes, in the same way as individuals can be immunised against a virus (Banas/Rains 2010; Compton 2013). Attitudinal inoculation consists of several steps: First, a "threat" is introduced by forewarning people that they may encounter (mis-)information that could challenge their pre-existing beliefs. Then one or more (weakened) examples of such (mis-)information are presented and directly refuted in a process called "refutational pre-emption" or "prebunking" (Van der Linden et al. 2017), which uses established debunking techniques. It is worth noting, however, that the deepening of debunking skills could also be seen as a meaningful approach in its own (Ha/Perez/Ray 2021).

Studies found that inoculating people with facts against misinformation was effective in the context of 9/11 conspiracy theories (Banas/Miller 2013), but also in the context of global warming (Cook et al. 2017; van der Linden et al. 2017). Recent studies even found that actively inoculating adults during online gaming phases significantly reduced the perceived reliability of tweets in which common online misinformation strategies were embedded (Roozenbeek/van der Linden 2019).

To our knowledge, there has been no investigation of whether inoculation theory can also be used in educational settings with pupils aged between 15 and 18. But we see clear merit in this approach and there are some initial hints of its effectiveness in educational settings. Schubatzky and Haagen-Schützenhöfer (2022)

investigated the effect of inoculation of Austrian adolescents (15–18 years) with regard to the perceived scientific consensus on climate change; this was shown to have a significant impact on beliefs about whether climate change was happening and whether it was caused by humans (Cook et al. 2016) and the researchers concluded that the approach was useful for pupils in this age group.

4.2 Evaluating Online Resources

The internet may be an empowering and enriching platform for knowledge sharing if citizens can use it effectively (Kahne et al. 2012). However, it is critical for pupils to understand how the internet changes the information they get (e. g. Lynch 2016; Mason/Metzger 2012; Pariser 2011) and to know how to identify trustworthy information (Kahne et al. 2016; Metzger 2007; Metzger et al. 2010). Young individuals are easy misled if they consume information without first determining who is behind it and what the source's objective is.

Students' assessment internet material has been extensively researched. Pupils used the order of search results as a signal of a website's trustworthiness when conducting open searches. They frequently clicked on the first or second result, believing that the higher a site's listing in the search results, the more trustworthy it was (Gwizdka/Bilal 2017; Hargittai et al. 2010; Pan et al. 2007). When looking for information about online news sources, college students had misconceptions about the curating of Google's Knowledge Panels, and frequently concluded that sources were

trustworthy if they had a strong social media presence in the search engine results page. Pupils' evaluation of the webpages they accessed was similarly inappropriate, and they rarely made decisions based on content (Lurie/Mustafaraj 2018).

When conducting searches on relatively straightforward questions, pupils ignored sources and evaluated websites based on superficial features (Hargittai et al. 2010). They fared worse when content was more contentious (Brand-Gruwel et al. 2005). Analyses of thousands of responses to tasks assessing pupils' ability to evaluate social and political information online showed that pupils did not distinguish between traditional news and sponsored content and rarely based their evaluation on the reliability of a source (McGrew et al. 2018). Instead, they were swayed by what appeared to be strong evidence and evaluated websites on the basis of their design or how authoritative their logo or references made them appear (McGrew et al. 2018; Wineburg et al. 2016). Studies have also shown, however, that it is possible to foster evaluation skills through interventions involving civic online reasoning (McGrew 2020).

We believe that inoculation theory and civic online reasoning might represent useful approaches for teaching digital competence, including in the context of Digitale Grundbildung. To evaluate our hypothesis, we shared these ideas with experts on teaching, education, law, social work, media and journalism and sought their views.

5. Methods and methodology

We followed up on two research questions:

RQ1: How do experts from different disciplines envision the teaching of digital competences to counteract disinformation in (lower and upper) secondary schools in Austria?

RQ2: How do experts rate the proposed educational approaches of phenomenon-based learning, inoculation theory and civic online reasoning for practical use in (lower and upper) secondary schools in Austria?

In addressing these questions, we follow Guba and Lincoln's methodological principles (1994) for qualitative social research.

5.1 Methods

Since we were interested in how experts envision teaching and learning of digital competencies, we used semi-structured interviews with experts in disinformation in professional environments to find out their views on what teaching and learning to counteract disinformation should entail. Expert interviews are undertaken with individuals who are ascribed expert status (Helfferich 2014). Our goal with the interviews was to reconstruct the expert knowledge embedded in a specific social context. Teachers and practitioners are identified as experts in this context as a result of their experience with disinformation and/or teaching. However, it is vital to note that being an expert in one field does not make an individual expert in another or associated field or fields. Hence, we are not seeking to claim that individuals' expertise in

disinformation in particular areas also makes them experts in the teaching of digital competencies to counteract disinformation. However, when taken in combination, expert views can deliver new insights that may help with the development of teaching frameworks. To ensure the results from the expert interviews were comparable, we used interview guidelines consisting of 24 questions, which is set out in the appendix (Gläser/Laudel 2009).

5.2 Research Design

In general, it is assumed that expert knowledge can be detached from individuals in a generalisable manner. However, both the historical interchangeability of expert knowledge and the differences in opinions within the group of the experts mean that such generalisability cannot be equated with objective opinion. Subjective interpretation is hence also required when conducting expert interviews (Helfferich 2014). In the interdisciplinary context of teaching and learning about disinformation, we tried to give a voice to experts who are otherwise not heard. The interviewees were experts in their own subjective reality and approached the topic through their individual professional lenses (Gläser/Laudel 2009). In our analysis, we drew on the expertise that could be attributed to the respective experience of the experts in question and tried to put it into perspective from a pedagogical point of view. To provide comparability, all practitioners were asked the same set of questions. The teachers were not asked precisely the same questions, but all the key aspects for answering the research questions above were addressed.

5.3 Analysis

Based on the 24 questions in the interview guidelines (see appendix), we inductively created 8 categories with a reliability check (general circumstances, understanding of digital competences, basic digital education in Austria, the concept of digital competences teaching, age of pupils, lesson content, phenomenon-based learning, inoculation & civic online reasoning theory) and 35 subcategories for content analysis (Kuckartz 2012). Three categories were excluded.

5.4 Sample and data collection

To address the myriad and complex approaches in the field of disinformation, we chose publications that combined a range of perspectives from pedagogy (e. g. Loveless/Williamson, 2013), communication (e. g. Ha/Perez/Ray 2021), economics (Allcott/Gentzkow 2017), sociology (Buckingham 2015), media (e. g. Kangas/Rasi 2021) and science education (e. g. Falloon 2020), technology-enhanced teaching and learning (e. g. Admiraal et al. 2016) and technology (e. g. Starbird 2021). Where possible, these perspectives have been incorporated into our analysis. All other disciplines – outside of scientific publications – were taken into account via interviews with experts. These included the perspective of teachers, head teachers, high school teacher educators, social workers, journalists, fact checkers, conspiracy theory and extremism prevention workers, media lawyers, civil servants from the Federal Chancellery and the Ministry of Education, employees of

criminal justice programmes working against hate speech and so-cio-psychological counselling consultants for victims.

The empirical data is based on 19 semi-structured expert inter-views (6 teachers and 13 practitioners) lasting between 45 and 80 minutes. Table 1 and Table 2 provide an overview of the individu-als interviewed and their field of expertise. The interviews were conducted and recorded online. All ethical and data protection regulations, including anonymity, were considered. The interviews with 6 teachers were conducted as part of the Digital? Safe! pro-ject at the University of Graz (Otrel-Cass et al. 2022).

Participant	Subject(s)	School type
Teacher 1	Computer science	secondary school (BRG)
Teacher 2	German, History	vocational secondary school (HTL, HAK, NMS)
Teacher 3	Accounting, Business Informatics	vocational secondary school (HAK)
Teacher 4	Maths, Arts	secondary school (NMS)
Teacher 5	English, Italian	vocational secondary school (HLW)
Teacher 6	English, Sports	secondary school (NMS)

Table 1: Informations about the 6 teachers
who participated in the study.

Participant	Occupation / Employer	Field of expertise
Practitioner 1	NGO youth worker	social work, fake news
Practitioner 2	head teacher	secondary school
Practitioner 3	journalist, fact checker	media company
Practitioner 4	content and social media manager	fact checking
Practitioner 5	CEO	conspiracy theory education
Practitioner 6	chief editor	media company
Practitioner 7	university of education	didactic and digital teaching & learning
Practitioner 8	lawyer/law firm	media law
Practitioner 9	NGO youth worker	social work, extremism prevention
Practitioner 10	Chancellor's office	youth competence
Practitioner 11	Ministry of Education	media education
Practitioner 12	social institution	criminal justice, probation assistance
Practitioner 13	NGO counselling service	civil courage and anti-racism work

Table 2: Informations about the 13 practitioners
who participated in the study.

6. Results and findings

This section describes the main findings resulting from the qualitative expert interviews (n=19). It begins by outlining the experts' views on the main ideas underlying teaching against disinformation. We organised the results into two major categories, further dividing them into eight subcategories. Section 6.1 sets out the factors that shape education on disinformation and form the

framework in accordance with which the experts believed education against disinformation should be structured. Section 6.2 describes the experts' proposals for educational interventions and their evaluation of the practical teaching frameworks described in section 3 and 4 above. The experts' various views are then consolidated and used to outline what teaching of digital competences could look like in the age of disinformation.

6.1 Current circumstances and requirements for education against disinformation

Contextual factors stemming from the school system, pupil prerequisites and the understanding of digital competences all shaped the experts' vision for the teaching of digital competences against disinformation. The headings of the next sections represent the categories we analysed. The content of the sections is drawn from our analysis of the expert interviews. The next section concludes with clarification of these statements (Figure 2).

6.1.1 General circumstances

The experts stressed that most disinformation arises in non-public online environments (e. g. Telegram) in closed groups and spreads further via other social media. Adults are more likely to be misled in the course of this process. Hence, the experts stressed that teachers should see their pupils as experts on this issue. As one expert from our sample puts it (translated from the German):

> The question is which target group education is aimed at. I think teachers and pupils should be taught equally, maybe even together. So that teachers realise that they have major problems when it comes to dealing with digital media, just as we all do. […] We are all sitting in highly engineered machines in an editorial society and have only just learned to drive carts. (Practitioner 6)

According to the experts, young people are more likely to have the courage to experiment with new tools on the internet, even if they make mistakes. Experts observe that older teachers are often more afraid of digital teaching tools than younger teachers because they have a less positive mindset (Janssen et al. 2013) towards digital trends. Teachers should therefore be open to digital innovations and introduce them and critically reflect on them in the classroom.

On the social and political side, the experts pled for more funding and investment in resources, more precisely the production and dissemination of quality information to increase participation in democratic political processes. On the one hand, they argued, state institutions should provide tailor-made information for target groups, and on the other hand, they should promote quality journalism. A greater range of high-quality formats should be created to appeal to younger people, for example on social media.

6.1.2 Experts' understanding of digital competences

The following overview brings together the experts' understanding of the digital competences pupils require, and is based on the three lenses structure of the Frankfurt Triangle (Brinda et al.

2020) to highlight the connections with basic digital education (Digitale Grundbildung) in Austria (BMBWF 2020): (1) *Technological and media structures and functions*: understanding of traditional media and media consumption, understanding of journalism, communication flows, basic knowledge of social media, media law (and criminal law), checking and classification of information (sources, website legal details, opinions, satire, fact-checks), ability to put content into context, political education, source criticism; (2) *Social and cultural interactions*: societal, social and political competence, understanding of offline/online effects on oneself and others, background knowledge of overall context, critical faculties, formulation of discussion, recognising emotionality in content, potential dangers, awareness of plausibility, potential of digital tools and opportunities they present, environmental issues and consequences; (3) *Interaction: use, action, subjectification*: operating programmes, devices and search engines, 10-finger system, awareness, consciousness, critical thinking, capacity for reflection and self-reflection, direct, indirect, long-term and short-term effects (data traces, legal claim, privacy), interpretation of facts, tracing sources of pictures and videos, capacity for self-learning. One expert summarised the issue as follows (translated from the German):

> There are simply rules for dealing with the Internet: I call them the digital traffic regulations […] We have to teach primary school kids the rules – just as we do with cycling proficiency, we could introduce media 'driving licences' for kids. (Practitioner 5)

This understanding of digital competences reflects the ideas that are integral to the 'Frankfurt Triangle'. Although we did not show the experts the triangle, they highlighted the relevance of the same aspects for inclusion in teaching of digital competences. The digital competences to address disinformation can thus be divided into three categories, or perspectives: "socio-cultural", "interaction" and "technology and media". Some of the experts highlighted that up to now, the process of fostering digital competences has focused heavily on the technology and media perspective; in the future, therefore, the other two perspectives should be given particular attention.

6.1.3   Basic digital education in Austria

The Ministry of Education's targets for the introduction of basic digital education represent a major challenge for teachers and headteachers: they have indicated that this is an ambitious goal and will take several years to achieve. The quality of implementation is heavily reliant on teachers: whether they are young or older, teachers need extensive digital education and regular in-service training and in some cases persuasion in order to implement the curricula. The experts saw the greatest weaknesses of the current regulations as being the strongly informatics- and ICT-oriented curricula and the danger of shifting the responsibility for digital teaching onto the shoulders of basic digital education teachers, despite the identification of digital competences teaching as a cross-curricular subject/activity.

6.1.4 The concept of digital competences teaching

The experts agreed that digital competences must be taught on a cross-curricular basis. Computer science lessons are strongly application-oriented and are not sufficient. On the one hand, it was suggested that ideally digital competence training should be delivered via mandatory project days or weeks; on the other, all the experts emphasised the importance of regularity, as otherwise the content can quickly be forgotten. It was also pointed out that lessons needed to be interactive and entertaining. Most experts placed particular emphasis on deconstructing real-world examples of disinformation in classrooms; this corresponds with the idea of active inoculation as outlined in section 4.1. It was felt that pupils should even be given the chance to construct their own fake news to help them understand how disinformation techniques work. Here, competence took precedence over subject matter. As one expert puts it (translated from the German):

> Don't just take any fake news and investigate it – maybe write some fake news yourself in a protected environment. Let the kids select photos of political events or whatever, for example, and then generate news that is simply not true. Doing something yourself provides a huge amount of insight. Then the class could rate the fake news items, for example. Ideally the items should be in the right kind of layout to make the activity as serious as possible. (Practitioner 5)

This should be the responsibility of trained teachers, but also of external practitioners.

6.1.5 Age of pupils

Experts in digital education mentioned different pupil ages as the appropriate time to begin training digital competences. While many thought this should start at lower secondary level (10–14), others thought primary school (6–9), or even kindergarten (3–5) was the right time. It was emphasised that digital literacy training should start at the latest when children first encounter digital devices. In upper secondary school (15–18), it was felt, content should be further deepened and reflected upon. Interestingly, legal regulations in Austria allow young people to create their own social media accounts from the age of 14. Nevertheless, many digital stakeholders (influencers, advertising, opinion formers, …) deliberately target younger children. It is important to stress here that the experts we interviewed did not all declare themselves experts in digital education. Nevertheless, there seemed to be consensus among them that the training of digital competencies should start at the latest with young people's first encounters with digital devices.

6.1.6 Lesson content

When it came to content, the experts highlighted the importance of focusing on the required competences. All the experts agreed that the best way to deliver content was through engagement with case studies.

Firstly, young people should create and reflect on fake news themselves in a safe environment, use digital tools, identify ma-

nipulation of images and videos or manipulate material themselves and try out tools for research and fact-checking.

Secondly, young people should practise classifying information, comparing (political) viewpoints in the media, recognising text forms (satire, news, agency reports, …) and deconstructing radical or propagandistic narratives and conspiracy theories. Such deconstruction could focus on agenda-setting or mass-media framing as an analytical lens. The classification of information should include an overview of social media platforms, their economic goals and functions (algorithms, filter bubbles, social bots).

Thirdly, pupils should study what constitutes a healthy digital identity. Topics such as resilience, addiction, personal coping strategies, digital ethics, diarising personal experiences, exclusion and intersectionality, bullying and building a personal shield against hate and trolls all play a crucial role.

The Codiv-19 pandemic in particular has shown that science education, and in particular basic scientific methods and the interpretation of statistics, are essential here. But a basic understanding of media law, especially as regards the publication of content, but also in connection with dangers such as blackmail, nude photos, contact with strangers, radical or extremist content, is vital too. In this context, it is important not to place any blame on pupils, but rather to provide practical examples.

6.2 Practical teaching frameworks for Austria

Having analysed the current circumstances and requirements as regards digital teaching in Austria, we will discuss how the experts viewed phenomenon-based learning, civic online reasoning and inoculation theory (described in section 3 and 4) as means for addressing disinformation through education.

6.2.1 Phenomenon-based learning

The experts' suggestions with regard to introducing phenomenon-based learning in the Austrian context ranged from clarification of the overall concept to the curriculum, the role of teachers, teaching techniques, defined responsibilities, legal issues, the choice of topics and the conclusion of the project (see Figure 2). The next section sets out the main arguments made in the interviews.

Clarifying the concept in advance: The experts interviewed took the view that the first step was for school management to provide support for any new teaching and learning environments being introduced. This was based on their own experiences, e. g. when conducting workshops or teaching in schools. The second step identified was for teachers to be given the appropriate competencies to ensure phenomenon-based learning. The third step was to discuss planning, implementation and learning goals with pupils and the fourth was to inform parents about the new learning framework. The experts suggested it was advisable not to think in terms of individual, 50-minute lessons, but rather in terms of project days or project weeks. It would be beneficial to avoid the

phases of the school year that typically involve a large number of tests and to take time to deepen pupils' understanding of the topic. Teachers estimated that delivery would realistically require between 8 and 15 teaching hours once or twice per year. Teachers said they would also need to consider school infrastructure (computer rooms, WiFi, library, …) and where necessary switch projects to alternative locations (e. g. city library, university, …). They also felt different learning areas might be useful for different project phases (e. g. quiet work, creative work, discussion).

Curriculum: Practitioners recommended that phenomenon-based learning approaches be a mandatory aspect of the school curriculum. Conversely, they also emphasised that no teacher should be forced to teach in a particular way, because this could lead teachers to become defensive. The teachers interviewed contended that each educator should determine their own pedagogical style. Further criticisms included the risks of increased overtime, the need to adapt to the specific school type (morning and afternoon teaching), and organisational and workload challenges as well as less obvious factors such as the need for teachers to rethink their approach to education.

Role of teachers: The experts frequently mentioned the concern that teachers' ages and years of service could have an impact on their ability/willingness to use phenomenon-based learning to deliver qualitative teaching. Teachers themselves highlighted that older and more experienced teachers were often less eager to try out new formats. On the other hand, it was emphasised that

young teachers and older teachers could learn from each other when working together. While not arguing that team teaching should be mandatory, practitioners felt it was highly recommended.

Teaching and pedagogy: One of the most important aspects highlighted was the need for teachers to have a positive mindset towards digital technologies and not to fear stepping out of their comfort zone when teaching. The experts interviewed felt it that some rethinking of teacher training was necessary in order to address new pedagogical approaches such as phenomenon-based learning. Practitioners highlighted the pedagogical importance of teachers in the orientation phase, stressing that teachers should be responsible for initiating the learning process in such a way as to capture pupils' interest. Almost all experts said that a greater number of checkpoints with pupils should be available to enable their learning processes to be assessed – depending on age, year group and prior knowledge. Teachers themselves underlined that they knew their pupils and, depending on the setting, they were able to assess how much guidance or freedom different groups needed. In contrast to traditional teaching methods, teachers needed to step back more often and allow pupils to learn through trial and error. Sufficient time needed to be planned in for discussion and reflection.

Defined responsibilities: The teachers interviewed emphasised that everyone involved in the teaching process needed to be clear about their responsibilities in order to successfully implement the
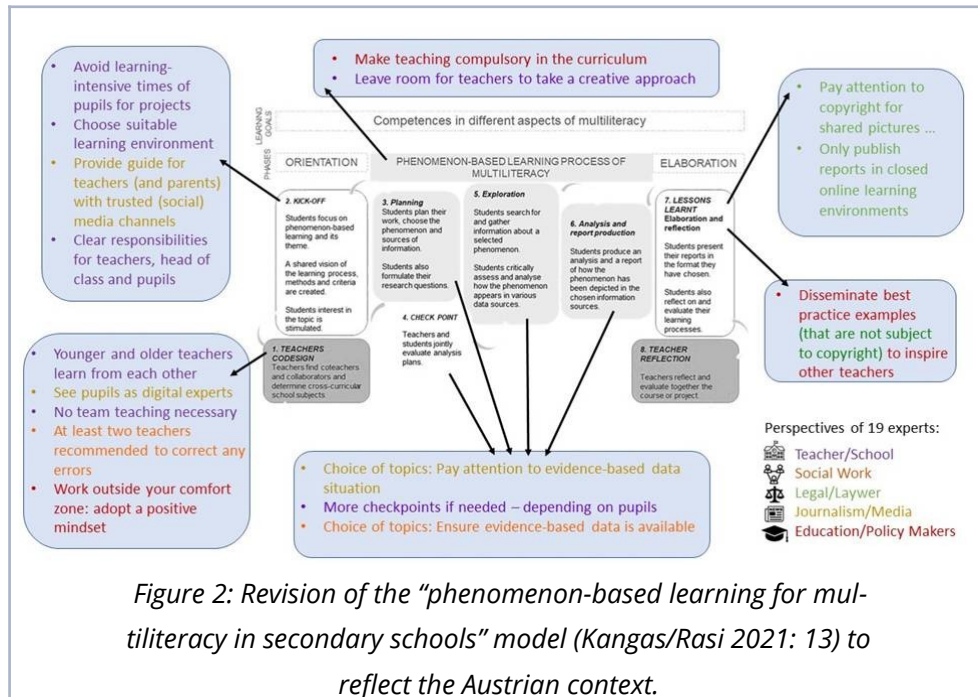
framework. Year group heads can offer help with coordination and organisation; teachers must agree who will take responsibility for which parts of the project, and take advantage of synergies; pupils should discuss the distribution of group tasks and distribute work fairly. During the implementation of the project, teachers should be kept aware of progress (e. g. through notes made in a shared document).

Legal aspects: When publishing the project report, pupils and teachers should be aware of copyright issues with regard to videos, images and music. Raising awareness of legal issues should be an integral part of the project. Digital tools, class presentations and publication in a contained/limited environment (e. g. through learning management software such as Moodle) address copyright concerns and are legally designated as free to use for the purpose of teaching. Publically published reports (e. g. on social media) must take copyright regulations into account. Here, legal experts recommended large, commercially active, reputable platforms with licence-free content.

Choice of topics: When teachers suggest topics, it is important they ensure in advance that reliable data is available. Neutral topics attracting less polarised ideological views (e. g. nuclear dumping, homelessness, nutrition, plastic pollution in the sea) are particularly suitable here. Less suitable topics include Covid-19, chemtrails or other issues that are the subject of conspiracy theories. Caution is needed with regard to topics where pupils might have had negative previous experiences (e. g. racism, bullying).

Teachers should use checkpoints to ensure that no negative group dynamics or re-traumatisation occurs during project phases. Teachers from our sample suggested considering in more detail topics that had already been covered in class. Dealing with topics that were on the curriculum would, they argued, reduce the risk of not covering certain areas due to lack of time.

Project conclusion: Pupils should be encouraged to also present their search methods in the final report, including search words, tools and sources. The experts recommended pupils undertake self-reflection including a psychosocial checkpoint (e. g. How did it make me feel? What did it trigger in me?). The phenomenon-based learning model recommends that project reports be presented and shared within the class. The experts recommen-ded that views should also be exchanged with teachers from one's own school and from other schools. Examples of best prac-tice should also be disseminated through various digital channels – taking account of copyright issues – to inspire other teachers to trial the framework.

Figure 2: Revision of the "phenomenon-based learning for mul-
tiliteracy in secondary schools" model (Kangas/Rasi 2021: 13) to
reflect the Austrian context.

6.2.2 Teaching of explicit strategies to counter disinformation

Three major approaches for dealing with disinformation emerged
from our interviews: (1) teach pupils how to identify accurate and
relevant information in the current media landscape, (2) address
how to identify sources' intentions and select accordingly, and
lastly, (3) teach pupils how to identify disinformation by "immun-
ising" them. Drawing on these topics, we propose a practical
teaching framework that includes all three aspects. First and fore-
most, all the experts highlighted that using real-life examples to
deepen pupils' understanding of disinformation was a particularly
fruitful approach.

Learn how to filter relevant information: The experts stressed that a
basic understanding of the media landscape is important to un-

derpin understanding of disinformation. Pupils should thus develop the appropriate skills during secondary education. The experts' vision was very much in line with ideas of scientific media literacy as proposed by Höttecke and Allchin (2020), who argue that pupils need to recognise the epistemic challenges of public science communication and the role played by mediators. Our experts also highlighted that this includes the initial realisation that there is a lot of disinformation and irrelevant information out there.

Learn how to identify relevant sources and critique sources: The experts agreed that it was important for pupils to learn how to identify relevant sources, but also to identify how information is framed and the intentions of information providers on social media and mass media in general. This is basically the idea of lateral reading, namely the act of searching for information about a source while you are reading it in order to understand where the information is coming from. Our experts saw this technique – which mimics a strategy commonly used by fact checkers – as an important part of deciding whether information is trustworthy. In practical teaching settings, therefore, pupils should learn how to contrast vertical reading with lateral reading using real world examples. Such examples should ideally use disinformation that has circulated in the past or examples of disinformation pupils have encountered in their own lives. Stanford University, for example, has developed extensive teaching materials addressing civic online reasoning.

Learn disinformation techniques in order to provide immunity against known disinformation mechanisms: As one expert put it (translated from the German):

> Yes, it's important to debunk or refute disinformation, but prebunking is much more important – to immunise pupils against disinformation. (Practitioner 8)

With regard to the third explicit strategy to counter disinformation, the experts talked about learning how "disinformation works". Six experts suggested that pupils should create their own disinformation products – for example social media posts, fake images, in order to understand how disinformation techniques work. This correlates closely with the idea of active inoculation (see section 4.1; Roozenbeek et al. 2019). Creating their own disinformation products will on the one hand acquaint pupils with the technological tools commonly used to produce disinformation (for example how to fake images or videos) and on the other hand give them experience of using tools to identify such fakes. In this context, the experts recommended pupils be familiarised with fact checking tools like:

- Reverse Image Search, online at: https://tineye.com/ (last access: 15 September 2022).

- Mimikama Austria, online at: https://www.mimikama.at/ (last access: 15 September 2022).

- Waybackmachine, online at: https://archive.org/web/

- (last access: 15 September 2022).

- Twitter Bot Indicator, online at: https://www.truthnest.com/ (last access: 15 September 2022).

- Weather/Data/Area Check online at: https://www.wolframal-pha.com/examples/science-and-technology/weather-and-met-eorology/ (last access: 15 September 2022).

- Verifying sunlight, online at: http://suncalc.net/#/51.508,-0.125,2/2022.09.17/10:12 (last access: 15 September 2022).

- Verifying Pictures/Videos) online at: https://www.invid-project.eu/tools-and-services/invid-verification-plugin/ (last access: 15 September 2022).

Once again, they stressed that it is also crucial for teachers to be competent in this field: Schubatzky and Haagen-Schützenhöfer (2022) provide a practical example of how to approach this.

7. Discussion and Conclusion

Before we discuss the main results of our study in the light of existing literature, we want to address several limitations associated with it.

7.1 Limitations

Although expert interviews are a suitable data collection method for gathering a range of information and ideas from experts with a multiplicity of backgrounds, there are some limitations associated with the expert interviews in this article. First and foremost, the validity of the information collected is highly dependent on the quality of the experts. Although we believe we approached highly respected experts in their fields, we cannot rule out the possibility that we omitted experts whose answers might have shifted the outcome of our analysis. Interviews with different experts might thus lead to different outcomes. However, we see the

coherence between our interviews as a strong argument for the reliability of our findings. Although a link between the reliability and validity of data cannot simply be assumed, it seems plausible that coherent views from experts are also more likely to represent valid information. Furthermore, our sampling was purposeful and we took individual experts' different backgrounds into account, anticipating that some experts would be more informed on certain issues than others.

Besides the selection of the experts, another aspect that needs to be considered is the fact that we did not incorporate the recipients of digital competencies teaching, namely school pupils. We acknowledge that the experts we interviewed may be experts in disinformation, but they may not be experts in pupils' actual needs when it comes to counteracting disinformation (see section 5.2). A similar argument could be made with regard to the evaluation of the educational approaches proposed in this article. A significant proportion of the experts interviewed were not experts in pedagogy, hence their evaluation needs to be interpreted with care. During our analysis, therefore, we took a critical stance with respect to statements from the experts on pedagogical issues, as already outlined in section 5.

Additionally, we want to stress that we only interviewed experts working in (or related to) Austria. We can therefore not make any claims about how their vision for the digital competencies teaching would be received in an international context, in particular

with regard to the perspectives of other cultures and educational systems.

The next section discusses our findings with regard to educational and societal consequences and the implications for digital education in schools in the future.

7.2   Conclusion

Our results show that experts think phenomenon-based learning for multiliteracy, inoculation theory and civic online reasoning are appropriate educational interventions for secondary schools in Austria with regard to countering disinformation. Nonetheless, they highlight potential barriers to implementation, including cumbersome bureaucracy, the need to redesign curricula and for teachers to adopt positive mindsets. The experts agreed that it should be mandatory to train pupils in digital competences, but stressed that this should not be left to separate, dedicated lessons; training should also be holistic, cross-curricular and recurring, ensuring that all subject-specific teaching addresses digital competence starting from the age of 10.

To ensure that the necessary skills are acquired, teaching and learning to counter disinformation must include the *perspective of pupils* themselves. Otrel-Cass and Fasching (2021) discuss the competences pupils believe they and their peers should have: Information management, opinion management and identity management. *Information management* describes critical analytical skills, *opinion management* suggests that pupils should under-

stand how filter bubbles, algorithms and echo chambers work, while *identity management* entails the construction of healthy online and offline identities in different environments. In an era of disinformation, "educators but also parents and caregivers will need to 'walk' with young people to learn together how different digital materials are produced and shaped and experienced" (Otrel-Cass/Fasching 2021: 105). According to the experts, awareness-building should begin at the time of pupils' first contact with digital devices, even though in Austria they are legally not allowed to create social media accounts until the age of 14. Such training should start at the latest in secondary school, at the age of 10. For older pupils, it would be helpful to continue deepening their understanding of disinformation throughout compulsory education. This should encompass basic science education and media law. The main point here is that the needs of pupils mentioned above are in line with the views of the experts we interviewed; this is a strong argument for taking up and further developing these ideas.

In order to address the use of digital technologies and rapidly changing media consumption behaviours, *teachers* could usefully be supported to move from an application-oriented approach towards digital competences, placing at least as much emphasis on social and cultural issues including digital wellbeing and healthy digital identities. We therefore propose a redesign of pre-service and in-service teacher education to support teachers to develop positive mindsets. Teachers should avoid shifting responsibility

for this area on to other subjects. Older and younger teachers, and pupils, can learn from each other by using, reflecting on and creating digital artefacts together on an equal footing. It should be mandatory to train pupils to develop digital competences, but as highlighted above, training should not only occur in specific, dedicated lessons; it should be offered as part of all subject teaching.

Teaching content should include interactive and entertaining elements with a focus on real-life scenarios. Meaningful activities include using tools, classifying information, trying out, creating, reflecting on, sharing and deconstructing digital artefacts. Following the experts' recommendation to use fact checking tools, we suggest educational or serious games that can be used to increase digital skills:

- Digital? Sicher!, online at: https://digital-sicher.at/digitalsicher/ (last access: 15 September 2022).

- Fake it till you make it, online at: https://fakeittomakeit.de/ (last access: 15 September 2022).

- Troll bunker escape game, online at: https://yle.fi/aihe/artikkeli/2021/03/26/troll-bunker-escape-game (last access: 15 September 2022).

- Cranky Uncle, online at: https://crankyuncle.com/ (last access: 15 September 2022).

- Factitious, online at: http://factitious-pandemic.augamestudio.com/#/ (last access: 15 September 2022).

- Bad News Game, online at: https://www.getbadnews.com/en (last access: 15 September 2022).

- goviral, online at: https://www.goviralgame.com/books/deutsch/ (last access: 15 September 2022).

The main argument here is that teachers need systematic support within the school system. However, there is no need to reinvent the wheel. Approaches already exist that are considered useful by experts and/or that have already been shown by empirical research to be effective (Lonka et al. 2018; Cook et al. 2017). Phenomenon-based learning for multiliteracy, inoculation theory and civic online reasoning need to be contextualised to make them suitable for secondary school teaching.

Further, *policymakers* need to invest the necessary resources to provide information tailored to young people to prevent them from getting trapped in fake news. This includes investment in qualitative journalistic digital products as well as the provision of public information by the state. In addition, policymakers should provide resources to support teacher education, schools and educational institutions to ensure that pupils' needs are met. Our main argument here is that disinformation must be countered with qualitative information. Communal responses are required to address the challenges associated with disinformation and this should involve expert groups going beyond education, including e. g. journalism, media law, science and policymakers. We need more suitable digital information tailored to young people.

Many initiatives on digital competences, including this paper, contend that education is a cure for fake news. News media and many other commentators consider fake news as a problem re-

lating to specific beliefs. This problematizes people who hold certain opinions. However, from a democratic viewpoint, the idea of making 'them' believe in the 'right' news is deeply concerning (Monsees 2021). This is a critical reminder that disinformation arises not only from the absence of digital competences education.

7.3 Outlook

What does this imply for the future? This article has outlined promising ways of developing digital education in secondary schools in Austria going forwards. As a next step, we aim to use our findings to put these frameworks into practice in secondary schools, broadening the perspectives of teachers and pupils and testing the interventions through a design-based research approach (Bell 2014).

Further, it is crucial to develop (educational) digital tools to assist with the detection of fake news (Huber et al. 2021). Educational institutions need to respond to these challenges by making the development of digital competences – by pupils and teachers – a mandatory part of curricula. Current research highlights the importance of making digital competences an integral aspect of education, along with reading, writing and mathematical skills (Huber et al. 2021), as soon as pupils start reading, texting and interacting online with others. What we have not covered in this work, but which has been highlighted by the experts, is the need to develop digital competences in other target groups, e. g. primary schools, older people and even kindergartens. Education

needs to take a holistic, cross-curricular, regular and transdisciplinary approach that tackles all aspects of disinformation, focusing on technology, creation, circulation and the target audience (Jahnel et al. 2021).

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Appendix

Interview guidelines

- Personal details:

  - Please briefly describe your activities in the context of digital literacy/fake news/disinformation?

  - What do you understand by 'digital competences' in general? What does it mean to be 'digitally competent'?

  - What do you understand by disinformation/fake news?

- Young people and teaching:

  - What might a regular digital literacy lesson against fake news in school look like? How often should it take place? Who should teach it? Where else can young people learn about it?

  - What is your view of "digital literacy" in current school practice? Strengths/weaknesses?

  - Which teachers should be responsible for teaching digital literacy? How do you see the passing on of responsibilities?

  - At what age should young people start exercising digital competences?

- Content: What do you think pupils should know/be able to do in relation to Fake News? What is particularly important?

    - Example nude photos: How can you encourage young people to take action? How can moral courage (e. g. intervening in cyberbullying) be increased? Example: Contact with strangers – how can pupils be made aware of this?

- With whom do young people talk about this?

    - Who do you think young people should talk to (dangers)?

    - What is the role of teachers?

    - How can parent-child dialogue be strengthened?

    - What advice do you give parents on media education?

- What is your opinion on the inclusion of smartphones in school lessons? What opportunities and risks do you see? How can they be used in a meaningful way?

- How can young people develop a healthy digital identity?

- Example – Influencers: How do you evaluate the influence of advertising and influencers on young people?

- Do you see differences between female and male pupils in terms of internet/cell phone use? Digital competences?

- Digital competences as a framework

    - What might a Fake News lesson look like?

    - Explanation of Phenomenon-based Learning and Multiliteracy

    - How do you evaluate this approach to digital literacy?

    - How practical do you think this approach is for schools?

    - What are the strengths/weaknesses of this approach?

    - Measures for older pupils to go deeper?

- Debunking

  - What strategies are there for dealing with false news?

  - How important is it to you to assess the trustworthiness of sources?

  - What strategies or tools are you aware of for learning to assess trustworthiness?

  - Difference: Passive recipients? Active – directly addressed?

  - Resistance – Is it worthwhile for education to address Fake News? If yes, how?

  - Approaches to journalism education for young people? Science Education?