‘Don’t fall into any fake news traps!’ What are the outcomes of a bespoke critical thinking skills programme on children and young people’s ability to identify fake news?

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Abstract

Fake news is a category of disinformation linked to behaviours which are harmful to society and individuals. There is some evidence that belief in fake news tends to be more prevalent amongst young people, making this group potentially more vulnerable to its negative effects. In this study, a systematic review of the literature was undertaken. Findings revealed that much of the previous research around mitigating approaches has involved self-selecting participants of an older age group. This embedded mixed methods study aimed to build on this research with primary school pupils aged 10-11, as a population identified as potentially vulnerable to some of the effects of fake news, but with little systemic support. Research based in inoculation theory, which is analogous to medical vaccination, indicates that pre-emptive debunking of fake news, by exposing individuals to disinformation techniques, can offer some protection.

Within this study, inoculation techniques were combined with critical thinking skills in a teaching programme which raised awareness of fake news techniques and the cognitive biases which can affect responses. This was also intended to mitigate the potential limitations of prebunking, which include taking a position of distrust of the source of inoculations. Measures included a quasi-experimental quantitative measure of participants' ability to identify fake news as well as a Thematic Analysis of teacher and pupil views about their participation in the programme and what mechanisms may have been involved in the outcomes.

The study findings suggest that the programme's approach seems to be appropriate to the aged 10-11 age group and was felt to be effective in developing relevant knowledge and skills by the child and adult participants. It is also suggested that enjoyment of the programme may be a factor in pupil motivation and engagement with the subject which could be incorporated into similar future interventions.

Despite some methodological limitations, the study results indicate that there may be benefits to this programme and for further exploration of combining inoculation techniques with critical thinking skills.

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Chapter 1. Introduction

The overall aim of the current study is to explore the effects of a bespoke critical thinking skills teaching programme for Year 6 pupils. The programme combines a gamified 'prebunking' approach with original classroom sessions incorporating additional teaching of critical thinking skills, including relevant cognitive biases. The research questions were formulated to measure any impact of the programme on the participants' ability to identify fake news. Additionally, further exploration of the possible mechanism underlying any programme outcomes were conducted through questionnaire responses from pupil and teacher participants supplemented by one teacher interview.

The first part of this paper (chapter 2) describes the review of the literature undertaken to contextualise the background to fake news and critical thinking, which are the components of the current study. The subsequent systematic literature search outlines key current research exploring what is known about developing children and young people's ability to identify fake news online, and outlines the potential for this research to make a contribution to the wider evidence base around attempts to mitigate the effects of fake news.

Chapter 3 outlines the mixed methods approach to investigating the research questions in this study, alongside the researcher's epistemological considerations and the position of the study. This chapter also reviews the trustworthiness, reliability of the chosen mixed methods approach as well as the ethical considerations of the study. This is followed in chapter 4 by a description of the analysis methods and results for the quantitative and qualitative data gathered for the research. Finally, a discussion of the results in chapter 5 also includes reflections on the trustworthiness and validity of the conclusions of the study, the implications for future practice and implications for possible future research.

1.1 Background, context and research questions

Fake news is part of a sub-set of disinformation which is created and disseminated with the intention of misleading others. This means that individuals who are exposed to fake

news are potentially vulnerable to organised, systematic and sometimes sophisticated campaigns to mislead or confuse (Vargo, Guo, & Amazeen, 2018). For example, the Policy Institute at King's College, London (Stoneman & May, 2022), conducted research in 2022 using the fake news examples of conspiracy beliefs around the authenticity of terror attacks in the UK, such as the 7/7 and Manchester Arena attacks. The highest levels of disbelief that these attacks took place were seen in the young adult (18-34 years) age-range, although it should be noted that children were not included in the sample. One contributing factor to this was thought to be that individuals who eschew traditional news sources in favour of social networks (such as TikTok, Instagram, Twitter and Whatsapp) for their information are more likely to believe these conspiracy theories. Although this finding is not sufficient to establish a causal link, one factor that the authors considered contributed to this is that this type of fake news is not covered in the same way by the mainstream media and therefore how individuals consume their news determines the types of stories they will be exposed to.

The spread of misinformation is considered to threaten the public's understanding of science (Lewandowsky & van der Linden, 2021). More specifically, fake news can affect the distribution of power in society (Brennen, 2017) and undermine trust, threatening democratic processes and contributing to social polarisation (Au, Ho & Chiu, 2021; Reglitz, 2022). It has also led to social actions and individual behaviours with harmful consequences (e.g. Independent Digital News and Media, 2020) and as such is of increasing concern (Lazer *et al*., 2019). More recently, popular fake news stories included claims that the war in Ukraine is fabricated (BBC, 2023). The Parliamentary Disinformation and 'fake news': Interim Report states that, '*our schools play a crucial role in helping students to differentiate between fact and fiction' (2017, p63).*

The present study seeks to address the following question:

What are the outcomes of a bespoke critical thinking skills programme on children and young people's ability to identify fake news?

And further sub-questions:

1. Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?

2. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?

1.2 Personal and professional interest

This researcher's interest in this area was influenced by a number of factors. Prior to commencement of professional training on the Doctorate in Applied Educational Psychology course, the researcher had experience as a Year 6 class teacher which allowed them to observe the impact of disinformation on children's views about science and world events. This raised the researcher's interest in developing greater knowledge around the external factors influencing primary school aged children's views and experiences of fake news.

These personal interests coincided with the author's professional interest after discussions with staff in a range of settings during placement with an Educational Psychology Service indicated that many teachers shared this view. The researcher felt that although concerns were expressed by schools in informal conversations, there was little support for both teachers and pupils around the issue of fake news on pupil views. Therefore, it was felt that research with this focus would be both relevant for the settings and the Educational Psychology Service supporting them, as well as being a route to further the author's personal and professional interest in the topic.

1.3 Definitions

This research makes reference to several terms which are defined for the purposes of this thesis within the domains of critical thinking and fake news.

Fake news

‘Fake news’ is a term which has gained recent popularity, originally referring to false information (Molina *et al*. 2021) and subsequently weaponised by some public figures and commentators as a way to discredit opponents and news organisations (Waisbord, 2018, Althuis & Haiden 2018) before entering the literature around digital media.

Edson *et al* (2018) have set out a typology of how previous studies have used and defined the term ‘fake news’ via an examination of 34 articles published over fifteen years. They categorised six different types of fake news (news satire, news parody, fabrication, manipulation, advertising, and propaganda) and considered these in relation to the dimensions of facticity and deception. Integrating these two continuums gives a typology of four general domains of fake news definitions based on level of facticity and level of immediate intention to deceive, displayed in a Carroll diagram to plot them against two key dimensions (see table 1).

		Author’s immediate intention to deceive	
		HIGH	**LOW**
Levels of facticity	**HIGH**	**Native advertising [sponsored content]** **Propaganda** **Manipulation**	**News satire**
	LOW	**Fabrication**	**News parody**

***Table 1: Edson* et al*., (2018)’s typology of six types of fake news*.**

Facticity, refers to the degree to which fake news relies on facts. For example, satire relies on facts but presents it in a diverting format. The second dimension, deception, takes account of the author’s immediate intention; referring to the degree to which the creator of the fake news intends to mislead. Parodies, for example, use some level of mutually understood suspension of reality in order to work, and therefore have a low level of deception.

Misinformation

A recent taxonomy of the terms around fake news has generated an operational definition for the purposes of fake news detection, including a decision-tree flowchart to determine whether the information is fake news (or 'false news') or a similar but distinct classification, such as misreporting, which could also be classed as a form of misinformation (Molina *et al*, 2021) (appendix A). In order to further distinguish fake news from misinformation, Southwell *et al* (2022, p.1), define misinformation as 'publicly available information that is misleading or deceptive relative to the best available scientific evidence,' a definition in which false information must be presented as though it were true. This creates an important distinction from fake news, as misinformation could be shared without intention to deceive.

Disinformation

In contrast, fake news sits within the larger context of disinformation, which can be defined as information which is known to be false and is disseminated with the purpose of misleading (Lewandowsky *et al*., 2020). Fake news is a sub-set of disinformation in which information is fabricated to mimic news media content in form (Brennen, 2017; Lazer *et al.,* 2018), and is often of a sensational nature (van der Linden, 2023). The subtle difference between fake news and disinformation is an important one for the purposes of this study, as manipulated and fabricated content has the potential to contribute to the development of false beliefs (van der Linden, 2023). The positioning of these concerns in the current national context is discussed below.

1.4 The impact of fake news on children and adolescents

The Education Policy Institute reported that half of nine to sixteen-year-olds use smartphones daily and that over a third of UK fifteen-year-olds can be classed as 'extreme internet users,' defined as over six hours of use a day (2017, p.5). This is a potential mechanism for exposure to fake news online. In addition young people seem to have a vulnerability to fake news when this exposure is combined with weaknesses

in their critical skills in being able to evaluate both the source of a news story and the validity of its content (Livingstone *et al.*, 2015).

Furthermore, an extensive survey of primary and secondary school teachers found that over half of the respondents were concerned that the national curriculum does not provide students with the skills to identify fake news (Commission on Fake News and Critical Literacy in Schools, 2018).

The Department for Digital, Media, Culture and Sport have subsequently developed an Online Media Literacy Strategy advising that pupils should be taught about how online content is generated, and be able to critically analyse the content they consume (2021, p.5). However, it should be noted that whilst this strategy document outlines general suggestions, this is not the same as a resourced teaching programme or a clear pedagogical direction for schools.

Chapter 2. Literature Review

2.1 Introduction to the Literature Review

This chapter begins by outlining the contemporary social and educational background to the research, as well as considering what is known about typical development in critical thinking skills and the range of approaches to tackling disinformation.

To provide a rationale for this study, the potential use of interventions and teaching programmes which aim to protect children and young people from some of the effects of fake news are examined. A mixed methods systematic literature review was conducted in order to examine the current evidence-base around what is known about the development of children and young people's ability to identify fake news online, incorporating both quantitative and qualitative data.

This review of the literature indicates that there have been no longitudinal studies on the impact of fake news on children and young people, however, there is some evidence to suggest that children and young people's immaturity makes them more susceptible to the harms presented by fake news. Because of their evolving emotional and cognitive capacities, children and adolescents may not be able to judge the difference between reliable and unreliable information, leading to an increased likelihood that they are vulnerable to disinformation and are more likely to spread it amongst their peers (Howard, Neudert & Prakash, 2021). Schurgin, O'Keeffe & Clarke-Pearson (2011) describe risks to young people online as including exposure to inappropriate content, a lack of understanding around the implications of online privacy issues, and being influenced by third-parties such as advertising groups.

2.1.1 Combatting the effects of fake news

Lewandowsky (2018) argued in evidence to the House of Commons Digital, Culture, Media and Sport Committee that training and educating people before they become immersed in a world of fake news online is one of two effective strategies (Digital, Culture, Media and Sport Committee, Oral Evidence, 2018) to prevent individuals from becoming unable to distinguish fake news from factual information and genuine news.

A range of interventions have been developed in recent years to attempt to counter the negative effects misinformation (van der Linden, 2022), with three established types of approaches to combatting the potential damaging impact of fake news: prebunking, accuracy primes and debunking (Roozenbeek & Van der Linden, 2019; Roozenbeek, Culloty & Suiter, 2022) which will be considered in turn.

2.1.1.1 Debunking

Debunking involves a post-hoc correction of misinformation (Lewandowsky *et al*. 2020), however it is subject to a number of limitations which are likely to reduce its effectiveness. The most significant limitations come from the likelihood that post-hoc corrections will not reach the same number of individuals as the original fake news (Chido-Amajuoyi *et al*, 2019) and may also have an 'illusory truth effect' (Hasher, Goldstein & Toppino, 1977; Ecker *et al,* 2020). This phenomenon is the experience of those repeatedly encountering fake news feeling more convinced that it is true than new information.

Other factors acting on individuals' responsiveness to debunking approach include the 'continued influence effect' which refers to a situation in which discredited and obsolete information may continue to affect the beliefs and therefore the behaviour of individuals (Lewandowsky *et al*, 2012). This has been explained in terms of new information being neurologically connected to a range of existing beliefs and facts, which are then easy to reinforce and strengthen, but difficult to extricate. Accessing memories about the subject may then lead to retrieval of the discredited information without either the associated knowledge that it has been discredited or the associated correction. Here repetition of fake news appears to generate fluency with the knowledge (Haring & Eaton, 1978) which the brain mistakes for truth (Johnson & Seifert, 1994; van der Linden, 2023).

Together these negative implications of debunking suggest that the use of a debunking approach should be carefully considered. However, despite the risks involved in debunking, in some situations, such as when misinformation is widespread and has the potential to cause harm, debunking can be both worthwhile and effective (Lewandowsky *et al*., 2020). The Debunking Handbook (Lewandowsky, *et al*.) sets out a series of steps

for debunkers to follow in order to maximise the effectiveness of this approach (2020, p.8).

A further, more indirect, debunking approach involves providing fact-checking skills to individuals, teaching the application of tested strategies such as lateral reading for people to verify information themselves (Breakstone *et al*, 2021). However, one of the disadvantages of focusing exclusively on fact-checking skills or source evaluation is that these are time-consuming processes and require motivation for individuals to spend their time implementing them. In real world conversations, individuals do not stop to question and verify every piece of information they are given, and instead, make use of heuristics (Kahneman and Tversky, 1972). Engaging with online information also employs these beneficial cognitive short cuts. One way to balance the disadvantages of these techniques and skills to accommodate this, may be to teach students to be aware of the heuristics they employ. This awareness and knowledge could be activated in any situation with any news story from any source and does not require time-consuming additional steps of action to be taken. Findings from research also indicate that building on the existing heuristics of young people can improve the accuracy of their credibility-related judgements whilst remaining compatible with their existing online interactions (Subramaniam *et al*, 2015).

2.1.1.2 Accuracy primes

Accuracy primes are designed to mitigate a possible lack of attention in busy and distracting social media environments, which are theorised to contribute to vulnerability to fake news (Pennycook *et al*, 2020). Providing 'accuracy nudges,' which indirectly focus users' attention on the issue of accuracy, such as through asking them to consider whether a news headline may be true or false, has had some success in supporting successful discrimination between real and fake news (Pennycook *et al*, 2021). However, these findings have been difficult to replicate and involve small effect sizes (Roozenbeek, Freeman & van der Linden, 2021). Moreover, there is evidence that the treatment effect from accuracy primes is time-limited and dissipates following exposure to around seven headlines (Roozenbeek, Freeman & van der Linden, 2021). Considering the biomedical analogy of inoculation, if individuals are potentially exposed

to fake news over extended periods, perhaps even over their lifetime, then a longer period of protection may be required.

2.1.1.3 Prebunking

Hovland (1959) originally posited the premise, reinforced by McGuire and Papageorgis (1962, p.24), that 'laboratory' studies of resistance to persuasion are of low ecological validity, leading to a discrepancy between these results and those from field studies.

The psychological approach of 'prebunking' (pre-emptive debunking) is based on McGuire's model of inoculation theory (McGuire, 1964), which considers misinformation to be analogous to the spread of a contagion. Prebunking seems to be the most promising approach for decreasing the perceived reliability of fake news, without inadvertently increasing scepticism toward evidence-based real news sources (Roozenbeek & van der Linden, 2019). In line with the inoculation analogy, prebunking involves participants being exposed to a weakened 'dose' of fake news.

Prebunking approaches have been further categorised as passive or active (McGuire & Papageorgis, 1961). With passive inoculation, individuals are provided in advance with counterarguments against the unwanted persuasion attempt, which has been found to generate psychological resistance against misinformation on specific issues, such as COVID-19 (Basol *et al.,* 2021) and also different manipulation techniques employed by creators of fake news (Roozenbeek, *et al*., 2022).

An important recent advance in inoculation research has been a shift in focus from 'passive' to active inoculations (Roozenbeek & van der Linden, 2018, 2019; Roozenbeek, Culloty & Suiter, 2022) in which individuals engage in an activity involving generation of their own counterarguments. Much of the recent research has achieved this via inoculation games, which are able to generate participant engagement to inoculate against a set of common manipulation techniques (Roozenbeek & Van der Linden, 2019; Cook *et al*., 2022). In this way, players are able to experience and learn about these fake news techniques in a conscious and low-risk way, before they are encountered during online activity. The approach posits that individuals then recognise the techniques, significantly diminishing their impact as they have developed a type of

cognitive immunity. In a series of studies, the use of gaming in active prebunking has been shown to significantly improve the ability of participants to recognise fake news techniques through the use of the online game Bad News (Roozenbeek & van der Linden, 2019; Roozenbeek, *et al*., 2020; Roozenbeek, *et al*., 2021).

The active prebunking approach has recently gained traction nationally and internationally as governments have partnered with academics working in the field to help mitigate the negative effects of Covid-19 fake news (University of Cambridge, 2020) and also countering Russian disinformation before the Ukraine invasion (The Economist, 2022).

One of the main limitations of prebunking and inoculation approaches is that, as with the biological vaccine analogy, they are non-mandatory and individuals can easily opt-out or disengage from them. Furthermore, their ability to reach all the relevant people may be countered by an 'echo chamber' effect (Villa, Pasi & Viviani, 2021) in which individuals tend toward interacting with types of information which reinforce their existing beliefs (Zollo *et al*, 2017). There is also evidence that the effects of prebunking can fade over time, from as early as two weeks following the inoculation (Banas & Rains, 2010) and 'boosters' are required to extend the effects, which may last for up to three months (Maertens *et al.,* 2021; Traberg, Roozenbeek & van der Linden, 2022).

In addition to these limitations, there is a risk that inoculations could becoming politicised, or the 'inoculator' be deemed untrustworthy (Traberg, Roozenbeek & van der Linden, 2022) which is not yet tackled in existing interventions. However, combining the prebunking approach with one which includes education around awareness of what may give rise to untrustworthiness could be a way to reduce this risk. Critical thinking skills, and the awareness of heuristics that this confers, may be one route to this and is discussed in the following section.

2.1.2 Introduction to the concept of critical thinking

Critical thinking has been defined as "reasonable, reflective thinking that is focused on deciding what to believe or do," (Ennis, 1985, p.45) and as "the ability to engage in purposeful, self-regulatory judgment" (Abrami *et al*., 2008, p.1102). Commonalities

across definitions include reference to skills which exert influence over a person's ability to question and evaluate the quality of the information they encounter. Critical thinking is considered to involve the engagement of rational and independent thinking for the purposes of this research, with skills incorporating: analysis, inference, reflection and evaluation (Alosaimi, 2013). It is broadly analogous with comparable terms such as 'civic reasoning' (McGrew, 2020), which is used more frequently in the USA and referred to here, as it is often linked to the development of the ability to identify fake news (Fazio, 2020).

There is disagreement about whether critical thinking is a skill that can be transferred and applied across domains, or whether it is a domain-specific skill (Moore, 2014; Axelsson *et al*., 2021). Moreover, across the historical literature there exists a dispositional dilemma which questions whether discussion of critical thinking is really about an individual's consistent internal motivation, or willingness, to apply critical thinking or an ability in the form of a set of specific cognitive skills (Ennis, 1985; Facione, 2000; Lantian *et al*, 2021). Whilst the purpose of this research is not to settle this debate, it is worth acknowledging both motivation and skills may be accommodated as components of critical thinking. An intervention intended to develop critical thinking skills may therefore need to provide teaching of cognitive skills whilst also fostering motivation to apply these.

Whilst there is evidence that equipping children with critical thinking skills can help them make independent judgements about information they encounter (Howard, Neudert & Prakash, 2021), the most effective way to do this must also be considered. Huber & Kuncel's meta-analysis (2016) explored factors which fostered critical thinking in adolescents and young adults. Amongst their key findings was the conclusion that whilst attendance at university appears to lead to a critical thinking disposition, the mechanisms for this were unclear. They also found that specific interventions to improve critical thinking might not produce long-term benefits. However, the evidence is not strong enough to be generalisable, as many of the studies included in the meta-analysis were of a small-scale or included methodological weaknesses.

Critical thinking may be impeded by psychological factors including prior beliefs and confirmation biases (Aston, 2023). For example, consumers of online news may rely

on social heuristics when making judgements about believability (Traberg, Roozenbeek & van der Linden, 2022). Therefore, whether critical thinking is viewed as an ability or as a disposition, consideration must not only be given to facilitating these, but also to understanding and mitigating the potentially confounding factors involved.

2.1.3 Cognitive biases

There are several decades of literature which have identified many different types of heuristics that have been observed as useful in efficient decision-making, linking these with cognitive biases (Kahneman & Tversky, 1972; Gigerenzer & Todd, 1999; Kahneman, 2011). Although there is no definitive list detailing every known cognitive bias, one recent codex captures over 180 distinct types (Gholipour, 2016) and Britt *et al* (2019, p.95) discuss a range of cognitive biases which are categorised in terms of 'memory' and 'prior belief.' A review of the literature has yielded a range of potentially relevant cognitive biases, such as Truth Bias (McCormack & Parks, 1986) which describes how people's general disposition is to believe others, enabling society to run efficiently, without the delays that would be caused by continual checking of information and a position of suspicion. This bias is what must be suspended when adopting increasing scepticism towards potential sources of fake news, bringing awareness to a generally unconscious process.

However, identifying cognitive biases that are pertinent does not necessarily equate to identifying biases that individuals need to be aware of when encountering disinformation. Early work by Wason (1960) described Confirmation Bias, which refers to a cognitive error of preference for new information when it confirms individuals' existing beliefs and values. Subsequently this has been considered to be a broad category, with further and more specific Confirmation Biases operating within it. Sub-types of Confirmation Bias have also been identified, which are relevant to disinformation research, including Research Bias, Interpretation Bias and Memory Bias.

2.1.4 Combining critical thinking skills and prebunking

A further review of the evidence for interventions addressing the spectrum of misinformation (Roozenbeek, Culloty & Suiter, 2022) assesses the evidence and seeks

to identify key gaps in knowledge in relation to each of the identified individual and system-level categories of misinformation interventions (see Fig. 1). Whilst system-level interventions are important, they are outside of the scope of this research project, which is concerned with exploration of what is effective in educational settings and will focus on factors operating at the individual level.

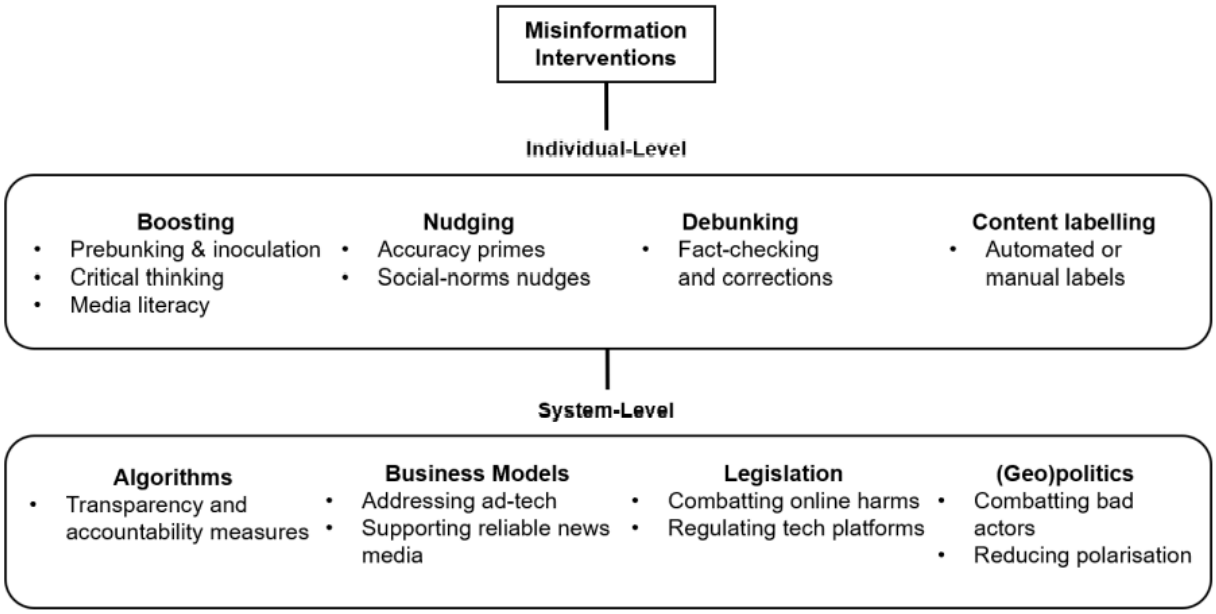


Figure 1: The range of system-level and individual-level misinformation interventions. (Roozenbeek, Culloty & Suiter, 2022)

Although there is a substantial body of evidence in relation to the effectiveness of prebunking and inoculation approaches (Banas & Rains, 2010; Roozenbeek & van der Linden, 2019; van der Linden, Roozenbeek & Compton, 2020; Basol, Roozenbeek & van der Linden, 2020; Roozenbeek, Culloty & Suiter, 2022; Roozenbeek, Traberg, & van der Linden, 2022), the literature does not include interventions which combine this with approaches which might extend or embed the effects, other than through 'boosters shots' (Maertens *et al.,* 2021) which are essentially repeating or revisiting the original inoculation activity. Although 'boosters' have been shown to confer some extended protection from susceptibility to fake news, of weeks or months (Maertens *et al*., 2021; van der Linden 2023), evidence currently relates to short-term benefits and effectiveness and relies on individuals engaging with the booster activity on several occasions. Scope therefore exists for an approach which combines the benefits of active

inoculation with critical thinking skills, two hitherto separate areas of individual-level interventions.

2.1.5 Maximising the effects of teaching on students

The importance of critical thinking in education is underpinned by decades of theoretical and practical work (Lai, 2011). There is a body of evidence across the literature indicating that primary education is the best time to teach critical thinking (Ennis, 1989; Bailin *et al*., 1999; Macedo-Rouet, *et al*, 2013). Kuhn (1999) is one of the few authors who has attempted to create a progression framework to describe the stages of critical thinking development across the lifetime. In this, a stage is described as typically being achieved at around aged six, and lasting until adolescence, in which the child becomes aware of sources of knowledge and is also able to distinguish between evidence and theory. Research conducted with primary school students has found that they were able to develop skills in evaluating information sources following an intervention programme (Macedo-Rouet, *et al*, 2013; Commission on Fake News and Critical Literacy in Schools, 2018), indicating that this age group can be responsive to this type of intervention. Findings from studies in other European countries have shown that when teenage participants claim to be good at finding information online, this is associated with the opposite result, and most pupils are not able to correctly identify fake news. Young people are often less skilled than they think they are when it comes to applying critical thinking skills to judging the reliability of information online (Enochsson, 2019). An openness to considering their own biases has also been linked with students who are most able to identify fake news (Nygren & Guath, 2019).

Finally, it is also worth revisiting the dispositional dilemma of applying critical thinking mentioned earlier, as there is evidence that affective factors are involved in successful outcomes, in addition to the development of knowledge and skills. These have been defined as the "consistent internal motivation to engage problems and make decisions by using critical thinking" (Facione, 2000, p. 65). Student motivation can therefore be viewed as a necessary partner to critical thinking abilities. Furthermore, Hui *et al* (2019) indicate that the extent to which students perceive their learning as useful is positively related to their motivation, indicating that perceived relevance is a key part of student

motivation and engagement. Moreover, Renninger & Hidi (2016) explored student engagement in learning and concluded that there is an essential role for educators in developing pupils' interest in a subject in order to achieve this. However, Halonen (1995) described an individual's pre-existing disposition toward demonstrating critical thinking skills as determining their motivation. Moreover, some research (Turner, 1995) suggests that it is more challenging tasks, which activate critical thinking skills, which in turn lead to increased motivation in contrasted with easier, lower-demand tasks.

2.1.6 Summary

Whilst a range of strategies can be beneficial in tackling the spectrum of misinformation (Lewandowsky *et al*., 2020; van der Linden 2023), there is gap in the evidence from the literature around attempts to combine the benefits of specific techniques, such as prebunking and critical thinking skills. In addition, it has been demonstrated that young people in the upper primary age range can be considered a group potentially vulnerable to the negative effects of fake news, as they are exposed to disinformation, and the evidence suggests they may not have developed the protective critical thinking skills or have been inoculated via a prebunking approach.

Furthermore, as children and young people are a group are vulnerable to the potential harms of fake news, it is important to explore in detail what is known about ways to develop their ability to identify fake news. The following section aims to review the evidence base for this, which will form the basis for the author's current study. The findings of a synthesis of the literature around what develops the ability to identify fake news online will be reported including conclusions regarding key areas of the existing research and the implications for future research and practice.

2.2 A Systematic Literature Review of what is known about developing children and young people's ability to identify 'fake news' online.

2.2.1 Research question for the Literature Review

The primary question for the following review was: 'what is known about developing children and young people's ability to identify 'fake news' online?'

2.2.2 Objectives

This review will examine previous explorations of what develops children and young people's ability to identify fake news online and will also generate an argument for focus on specific areas of theory and intervention, taken from the evidence reviewed. Areas for further research will be identified and the research question for this will then be presented.

2.2.3 Methods employed in the Literature Review

2.2.3.1 Quality Assessment

This review adhered to guidance provided by the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI, 2007). In this review identified studies were evaluated using the Mixed Methods Appraisal Tool (Hong *et al*, 2018) (appendix E) prior to the research synthesis. It should be noted that the process was biased as the analysis was conducted by a single researcher.

2.2.3.2 Critical review of the evidence base

Peer reviewed English language journals or research articles were searched across databases Ovid, Nusearch, ERIC (Education Resources Information Centre) and ProQuest, with search terms in the title or abstract. Publication dates were considered within the last five years as the rapid pace of change in the online world to which these relate renders pre-2017 articles out-of-date. Dates searches were undertaken were

31/07/22 – 02/08/22 with the search updated in April 2023, at which time 136 additional papers were found, of which 134 were eliminated following review of the titles and abstracts. Inclusion and exclusion criteria are detailed at appendix B. database search terms are found in table 2.

Database	((fake news or misinformation or disinformation) and (child* or adolescen*) and program* and identify). Omitted terms such as: teaching school skills online critical	(((online fake news) or (online misinformation) or (online disinformation)) and (child* or adolescen*) and program* and identify). Omitted terms such as: teaching school skills critical	(((online fake news) or (online misinformation) or (online disinformation)) and (child* or adolescen*) and program* and identify and skills and critical). Omitted terms such as: teaching school
Nusearch	2 545	357	282
Education Resources Information Centre (ERIC)	6 635	306	81
ProQuest	1 985	104	26
Ovid	1 302	360	31
TOTAL	12 467	1127	420

Table 2: Database search terms

Note: [1]The asterisk (*) enables the inclusion of terms with varied suffixes, for example 'adolescen' would include adolescent, adolescence, adolescents.

2.2.3.3 Details of final search terms by database:

ProQuest 26

0 duplicates were removed, leaving 26 titles remaining. A review of titles and abstract eliminated further papers (5 included a focus on machine learning algorithms related to identifying fake news, 4 focused on the emotional responses to encountering fake news, 2 focused on the characteristics of individuals who share fake news, 3 included a population outside the age-range of this review, 2 focused on disinformation found in teacher resources, 1 explored sources of fake news, 1 was a critical analysis of the findings of a high level expert group examining fake news public policies for the European Commission, 1 focused on ways to tackle fake news on Twitter, 1 focused on the prevalence of disinformation,). 6 titles remained for full-text analysis.

ERIC 81

0 papers were duplicates, however for 27 the full text was not available. Of the 54 remaining, a review of titles and abstract eliminated 50; 18 of which included participants from a population outside of the scope of the review, 17 focused on behaviours extraneous to the focus of this review, such as communication about or sharing of fake news, 8 were focused on students of technological solutions to fake news or involved focus on algorithms to detect/prevent the spread of fake news, 5 focused on teacher resources and 2 focused on analysing the content of fake news. 4 titles remained for full-text analysis.

OVID 31

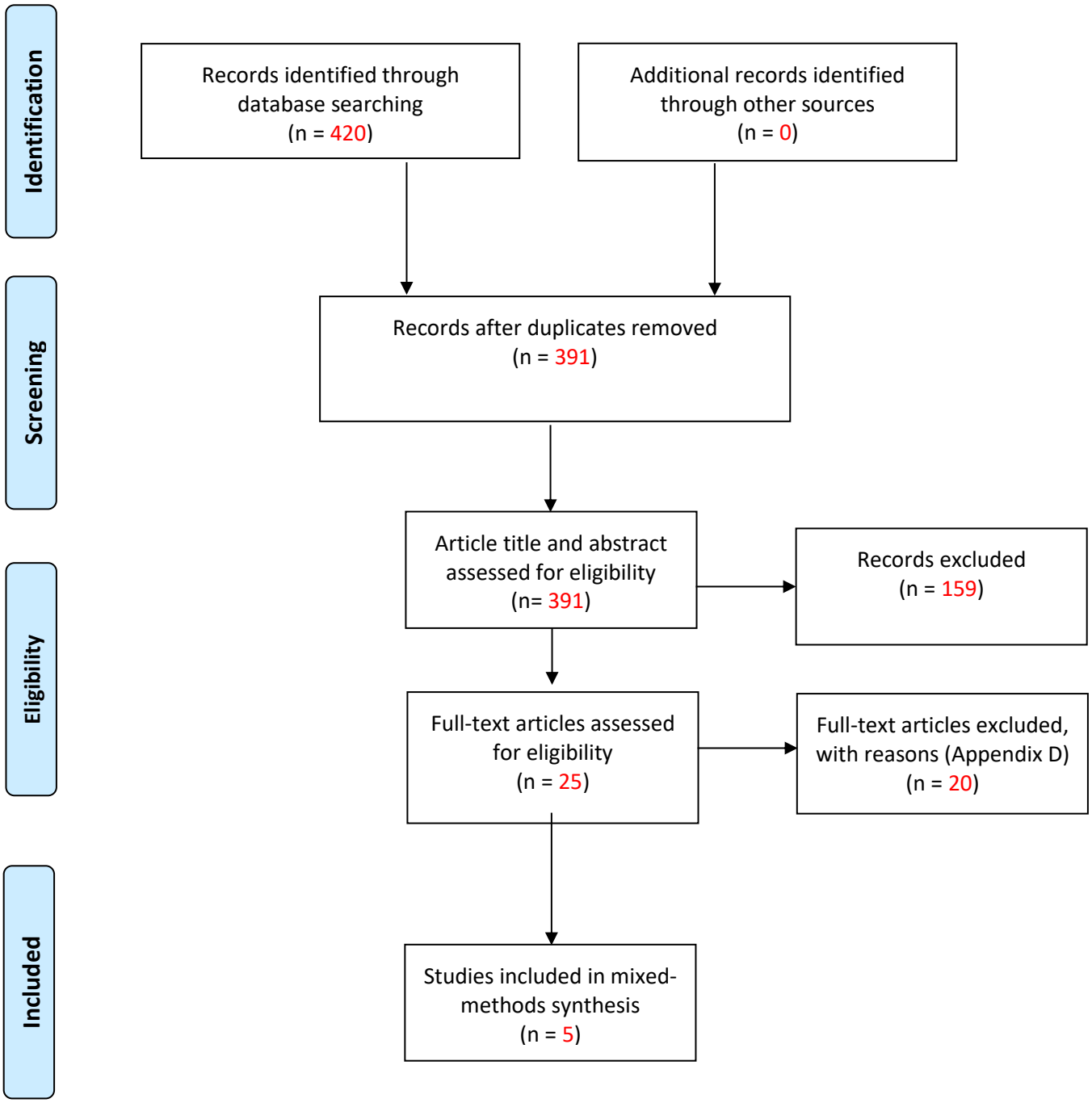
Of the 31 papers identified, 11 were duplicates and therefore eliminated. Of the remaining 20, a review of titles and abstract eliminated 7 papers which focused on behaviours relating to specific health conditions or behaviours, 8 papers were focused on measuring the impact of fake news, 2 papers focused on tackling the effects of misinformation, 1 paper focused on policy-making. 2 titles remained for full-text analysis.

Nusearch 282

Of the 282 papers identified, 18 were duplicates. A review of the titles and abstract eliminated 53 papers which included a participant ages outside the focus population, 45 papers which analysed misinformation networks, 24 papers which included a focus on machine learning algorithms related to identifying fake news, 18 papers which analysed misinformation patterns, 33 papers which focused on analysis of the nature of misinformation shared on social media sites, 8 papers focused on the impact of fake news, 24 papers focused on policy-making, 7 papers focused on behaviours relating to specific health conditions, 31 papers focused on factors affecting sharing of fake news, 1 paper focused on characteristics of the affected populations, 2 focused on the participants ability to cope with the effects of disinformation, 1 was focused on public communication around pseudoscience, 1 focused on critical thinking skills in relation to specific curriculum subjects (e.g. Geography) and 3 were systematic reviews. 13 titles remained for full-text analysis.

A total of 25 articles were assessed for eligibility, with those excluded detailed in table 4 (appendix C). Table 3 (appendix B) details inclusion and exclusion criteria at full-text screening. The screening process overall is detailed in the Prisma diagram below.

PRISMA Flow Diagram



Full references of the five included studies can be seen in table 5:

Study number	Final Chosen Papers
1	Katsaounidou, A., Vrysis, L. Kotsakis, R., Dimoulas, C. & Veglis, A. (2019) MAthE the Game: A Serious Game for Education and Training in News Verification, *Education Sciences, 9*(155)
2	Roozenbeek, J., Maertens, R., McClanahan, W. & van der Linden, S. (2021) Disentangling Item and Testing Effects in Inoculation Research on Online Misinformation: Solomon Revisited, *Educational and Psychological Measurement, 81*(2) 340–362
3	McGrew, S. & Chinoy, I. (2021) Fighting misinformation in college: students learn to search and evaluate online information through flexible modules, *Information and Learning Sciences, 123(*1/2), 45-64
4	Axelsson, C-A.W., Guath, M. & Nygren, T. (2021) Learning How to Separate Fake from Real News: Scalable Digital Tutorials Promoting Students' Civic Online Reasoning. *Future Internet 13*(60)
5	Dumitru. (2020). Testing children and adolescents' ability to identify fake news: A combined design of quasi-experiment and group discussions. *Societies 10*(3), 71

Table 5: list of included studies

2.2.4 Philosophical position

The reviewer has taken a Realist position in approaching this subject area for review, as this is a way to examine both quantitative and qualitative research in order to explore

what theories might underly interventions and supports examination of what contextual factors and programme mechanisms affect the success of interventions.

Pawson *et al* (2005) described realist reviews as a way to move from a 'what works?' question to asking about what the factors are which make an intervention work as well as for whom it works. The qualitative data obtained from research enables the reviewer to explore the processes and context underlying an intervention and the quantitative data enables the reviewer to examine the outcome of interventions. The development of an argument, or position, is also the purpose of a realist synthesis of evidence (Robson & McCartan, 2016) and therefore the reviewer is not searching for examples in the literature of the same intervention being replicated or refined, but for examples of an area of theory that is evident in different situations. This enables the reviewer to construct their own theoretical perspective.

Robson & McCartan (p. 96, 2016) describe mixed methods systematic reviews as a way to answer questions about the effects of interventions as well as their effectiveness without needing to convert qualitative findings into numbers, as would be required with the Campbell systematic review (Robson & McCartan, 2016). The authors, following the position of Howe (1988), endorse the realist position that as knowledge (as the basis of science) is at least in part socially constructed, and the role of science is to provide explanations of the observable world, then a pragmatic philosophy can bring qualitative and quantitative approaches together. This is what Harden & Thomas (2010) described as taking an 'a-paradigmatic' stance.

2.2.5 Critical Evaluation

Following this scientific realist approach, in the tradition of the mixed methods 'third research paradigm' (Johnson, Onwuegbuzie & Turner, 2007), a Mixed Methods Appraisal Tool (MMAT) (appendix E) was employed to reflect the value and contribution to the topic of both quantitative and qualitative data.

The MMAT (Hong *et al*, 2018) was developed as a checklist for the appraisal of qualitative, quantitative and/or mixed methods studies which are included in mixed

methods systematic reviews. It incorporates a checklist appraisal tool (Part I) and an explanation of terms involved in each question (Part II) (see appendix E). Table 7 is populated with study numbers (1-5) in the appropriate fields following appraisal. Each study passed the initial screening questions, enabling further analysis to take place.

Hong *et al* (2018) explicitly discourage the use of the MMAT as a 'scoring' tool whereby the 'yes' or 'no/can't tell' values are totalled for comparison, instead encouraging a more in-depth consideration of the ratings, as performed here. The findings in relation to each study are discussed in detail in turn, following the completed MMAT (table 7). Study 2 emerges as demonstrating particularly strong methodological quality and Study 4 as demonstrating some gaps in evidence for some of the MMAT criteria for randomised control trial designs. As Study 3 takes a mixed methods approach and demonstrates some weaknesses in integrating the qualitative and quantitative data, this also provides key points for consideration in the design of future mixed methods studies in this area.

A brief outline of each of the selected studies is shown in table 6 for ease of reference in relation to the MMAT appraisal tool which follows.

Study number	Name of study	Summary of study
1	MAthE the Game: A Serious Game for Education and Training in News Verification (Katsaounidou, Vrysis, Kotsakis, Dimoulas, & Veglis, 2019)	This study involves participants (*n*=111) learning techniques for identifying fake news via an online game, with a subset (*n*=35) providing qualitative information about the process. The findings indicate that this approach led to a greater awareness of fake news and the game approach increased the motivation of the participants.
2	Disentangling Item and Testing Effects in Inoculation Research on Online Misinformation: Solomon Revisited (Roozenbeek, J., Maertens, R.,	This study investigates item and testing effects on the online fake news inoculation game 'Bad News' in a large sample of *n*=2159. The findings indicate that there is some influence of item effects in this form of inoculation intervention, but not from testing effects. The study demonstrates that

	McClanahan, W. & van der Linden, S., 2021)	participants' ability to identify fake news techniques is improved by the intervention.
3	Fighting misinformation in college: students learn to search and evaluate online information through flexible modules (McGrew & Chinoy, 2021)	This small-scale (*n*=29), exploratory study investigates an intervention for teaching university students about online searching and evaluation techniques for recognising disinformation. The findings indicate that the students went on to use the evaluation strategies.
4	Learning How to Separate Fake from Real News: Scalable Digital Tutorials Promoting Students' Civic Online Reasoning (Axelsson, Guath & Nygren, 2021)	This study investigates the effects of an online intervention combined with feedback, for teaching secondary school students (*n*=209) strategies to determine the trustworthiness of text, videos and images. The findings indicate that the process improve the participants' performance in determining the credibility of online information.
5	Testing children and adolescents' ability to identify fake news: A combined design of quasi-experiment and group discussions (Dumitru, 2020)	This small-scale (*n*=54), exploratory study of children aged 10-11 and adolescents aged 18-19 investigated participants' responses to fake news in an experimental situation (using a hoax website). The findings indicate that children and adolescents are likely to act on fake information, even when they might not trust the source.

Table 6: outline of chosen studies for the systematic literature review

Category of study designs	Methodological quality criteria	Responses			
		Yes	**No**	**Can't tell**	**Comments**
Screening questions (for all types)	S1. Are there clear research questions?	1, 2, 3, 4, 5			
	S2. Do the collected data allow to address the research questions?	1, 2, 3, 4, 5			
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions				
Qualitative	1.1 .Is the qualitative approach appropriate to answer the research question?	5			
	1.2 Are the qualitative data collection methods adequate to address the research question?			5	
	1.3 Are the findings adequately derived from the data?			5	
	1.4 Is the interpretation of results sufficiently substantiated by data?			5	
	1.5 Is there coherence between qualitative data sources, collection, analysis and interpretation?	5			
2. Quantitative randomized controlled trials	2.1 Is randomization appropriately performed?		4		
	2.2 Are the groups comparable at baseline?			4	
	2.3 Are there complete outcome data?			4	
	2.4 Are outcome assessors blinded to the intervention provided?			4	
	2.5 Did the participants adhere to the assigned intervention?			4	
3. Quantitative non-randomized	3.1 Are the participants representative of the target population?		2		
	3.2 Are measurements appropriate regarding both the outcome and intervention (or exposure)?	2			
	3.3 Are there complete outcome data?	2			
	3.4 Are the confounders accounted for in the design and analysis?	2			
	3.5 During the study period, is the intervention administered (or exposure occurred) as intended?	2			
4. Quantitative descriptive	4.1 Is the sampling strategy relevant to address the research question?			1	
	4.2 Is the sample representative of the target population?	1			
	4.3 Are the measurements appropriate?		1		
	4.4 Is the risk of nonresponse bias low?		1		
	4.5 Is the statistical analysis appropriate to answer the research question?	1			
5. Mixed methods	5.1 Is there an adequate rationale for using a mixed methods design to address the research question?		3		

	5.2 Are the different components of the study effectively integrated to answer the research question?	3			
	5.3 Are the outputs of the integration of qualitative and quantitative components adequately interpreted?			3	
	5.4 Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?			3	
	5.5 Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?			3	

Table 7: Mixed Methods Appraisal Tool (Hong et al, 2018)

Details of the mixed methods appraisal for each study is set out below:

Study 1

Katsaounidou *et al* describe the study as 'a randomised online field study' (2019, p.1), however there does not appear to be a control group included. The online survey format suggests it is a non-probability sample of the target population although a clear description and justification of the sample frame and population is not provided. For criteria 4.1 it is therefore not possible to state whether the sampling strategy addresses the research question adequately.

Criteria 4.2 is achieved as the study states that the target population is identified via an initial screening questionnaire to ensure that participants online activities expose them to fake news. However, the age of the participants was only captured within a subset of basic demographic information. Of the 111 participants in Study 1, 41 are identified as being between the ages of 18 and 28 and additionally 56 participants are described as students. Therefore, it has been inferred and is considered likely for the purposes of this review, that some of these individuals are under the age of 24 and hence meets the inclusion criteria. Unfortunately, it is not possible to determine to what degree the participants are representative of the target population, as these demographic groups are not cross-referenced in the study and the detail is insufficient (i.e. only age-ranges are given).

For criteria 4.3 the measures included an evaluation sub-set of data, based on self-reported Likert scales across two 17-item questionnaires incorporating experience metrics (set 1) such as how much the intervention was enjoyed, and measures of perceived skills around identifying fake news (set 2), such as how much the game helped them to identify fake news images. There is no indication that the outcomes were pre-tested as per the 'gold-standard approach' (Hong *et al*, 2018).

Discussion of non-response is absent in Study 1, and therefore criteria 4.4 cannot be met. Although the statistical analyses applied and described in the Results section are appropriate to answer the four research questions (p.5, Katsaounidou, *et al*, 2019) analysis via the MMAT reveals the overall methodological weaknesses of Study 1.

Study 2

Considering representativeness firstly, Roozenbeek ***et al's*** (2020) study provides clear indicators of a range of demographic data for the 2182 participants, aged 18 and above. However no clear target population is identified and therefore these are broad and varied across age, gender, education level, social media use and political ideology. No clear inclusion and exclusion criteria is provided in the study (other than providing informed consent and participating in the study) which may have been a conscious decision on the part of the researchers to be as unrestricted and broadly inclusive as possible (extending, potentially, to all internet users). However, a case is not clearly made about why this is a representative or indeed a valuable approach. This approach has conferred the advantage of obtaining a large dataset and therefore more reliable results, but it cannot be concluded from the information reported that this was the motive of the Study 2 researchers. The threshold for criteria 3.1 is therefore not met in the MMAT analysis.

As can be seen in the analysis of criteria 3.2 and 3.3, appropriate and detailed measures are used and complete outcome data reported for each of the three conditions in the study (p.347, Roozenbeek *et al*, 2020). Confounding variables are discussed in detail and informed the study design and therefore criteria 3.4 is attained. Criteria 3.5 also provides the basis for successfully examining the fidelity of the administered intervention. The researchers in Study 2 adhered to the planned intervention and

reported repeating one data collection attempt when a technical error meant that an item was missing in the presented dataset (p.246, Roozenbeek *et al*, 2020).

Study 3

Although McGrew & Chinoy's (2021) study is described as 'exploratory' it follows a convergent mixed methods design and no rationale is provided for the use of a mixed methods approach; therefore within criteria 5.1 there is a negative indicator of study quality. Within criteria 5.2, the guidance from Hong *et al* (2018) directs reviewers to consideration of how qualitative and quantitative data are integrated, and although there is no visual display of both sets of results, the authors describe integrating the data during the interpretation stage. The qualitative findings both illuminate the thinking of participants behind some of the binary responses required in the quantitative assessments, and also begin to reveal some themes in relation to other factors related to evaluation skills, such as beliefs and emotions.

Although 'correct' and 'incorrect' responses were recorded and captured as percentages, reflecting whether students were applying the strategies taught during the intervention, analysis comprised a thematic coding of their written responses in the pre and post assessments. The measures further included a 'thinking aloud' condition as a sub-set of the 29 total participants**,** in which oral responses were captured by the researchers and coded for thematic analysis. Here, although quantitative data is utilised to draw basic empirical conclusions about the effectiveness of the intervention (e.g. that the number of students successfully applying lateral reading strategies increased from 19% to 78% as pre and post measures), the questions of why and how the intervention worked is further explored through richer qualitative data.

Unfortunately, however, as only examples of the student's oral and written responses and the emergent themes are included in the analysis and results sections of this study, it is not possible to make a reliable judgment on criteria 5.3, 5.4 or 5.5. Inclusion of a complete map of the codes used and themes generated by the data would have enabled readers to have a clearer view of the basis for exemplifier statements of an identified theme, such as, 'many students moved from offering definitive judgements about why they would or would not trust the information, to arguing that they would have to check'

(McGrew & Chinoy, 2021, p.58). It appears that the rich data set of qualitative information is subjected to a superficial level of coding and interpretation within this study, which may reflect a paradigmatic tension between a quantitative, empirical, approach and the departure from this required by analysing and evaluating qualitative data for more than frequencies of themes. Providing transcripts of the raw data used in the study would also have enabled other researchers to extract further insights from this, such as during this literature review.

Study 4

Hong *et al's* (2018) guidance around evaluation of the quality of randomisation procedures in randomised controlled trials indicates that simply stating that participants were randomly assigned to conditions (in this case the control or intervention groups) is not sufficient for readers to evaluate adequacy. Although Axelsson, Guath & Nygren's (2021) study describes two versions of an experiment, with a total of 209 participants described as 'randomly assigned' to conditions, no further information is given around how the randomisation is achieved or how many participants were assigned to each condition.

When considering criteria 2.3, there is no reference made within the results of whether any participants dropped out or withdrew from the study and this cannot be inferred from statistical analysis of results being compared with the initial participant numbers as the analysis of results for each condition does not include any *n*=. It is not known whether outcome assessors were blinded to the conditions in the trials or what level of involvement the assessors had with the administration of the intervention. The study reports that the trials took place in a secondary school and therefore it is possible that teachers in the setting were involved in administering the programme and measures, but unfortunately this information is not shared. Therefore, for criteria 2.1, 2.2, 2.3 and 2.4, Study 4 has not demonstrated the methodological quality required. Criteria 2.5 relates to whether participants adhered to the intervention, which is not explicitly discussed in the paper. Although no reference is made in the results section to a requirement to exclude any participant data or to treatment fidelity, it cannot be assumed that this means there was full adherence and therefore this criteria is given a 'don't know' rating.

The researchers in Study 4 have included an element of feedback in the intervention, based on the social learning described by Bandura *et al* (1963) and Collins *et al* (1988). In their review of the literature the authors make extensive reference to the type of observational learning outlined in these models and relate it to the real-world classroom learning environment. However, the feedback component of the intervention design involves digital feedback provided within an online tutorial programme which the reader infers is automatically generated and therefore of a limited and generic range. It does not make use of social learning or observational learning and is likely to be limited to feedback on accuracy of performance.

Study 5

In Dumitru's study, two research questions are included, the second of which ('what are the mechanisms underlying the fake news identifying process?' (Dumitru, 2020, p.7)) is of interest in this review. Researchers employed a qualitative 'debriefing' approach, following an experimental investigation (which is not evaluated in this MMAT). Criteria 1.1 has been met in this study, as it is inferred to follow a narrative approach from the description of the 'open group discussions' format to answer the research question referred to above. The explanations of this, however, are missing, and although the method of data collection (criteria 1.2) appears adequate, the form of the data is not described, nor evidenced via artefacts such as transcripts. Instead, the authors offer selected quotes from the qualitative data in combination with their own interpretation. Therefore, examination of criteria 1.3 and 1.4 yield a 'don't know' rating.

Criteria 1.5 evaluates coherence between data sources, collection, analysis and interpretation, which was not achieved by the authors in Study 5. Some elements were executed well, such as the attempts to ensure that the participants represent a sample of the target population of children and adolescents exposed to online fake news. The researchers achieved this by including a range of students in two age categories (10-11 years and 18-19 years) to ensure that both children and adolescents are included. The qualitative research question offers the potential for responses to illuminate a broad area of understanding for the reader. However overall insufficient information is shared to

demonstrate the thread from the research question through data sources, collection, analysis and conclusion.

2.2.5.1 Summary of implications

Prior to synthesising the findings of the five papers involved in this review, a visual analysis of the MMAT results indicates that studies 1, 3, 4 and 5 have a minority of (or no) ratings in the ‘yes’ column. Study 2 is the only example to demonstrate methodological rigour. Although studies with weaker methodological quality will not be excluded, this must be acknowledged when considering their weight of evidence in the interpretation stage of the synthesis.

2.2.6 Mixed-methods Synthesis

Mixed-method syntheses or reviews are a relatively recent ‘third paradigm’ in research and although these are not yet used with the same frequency as well-established quantitative and qualitative syntheses, it ‘has the potential to enhance both the significance and utility for practice of the many qualitative and quantitative studies constituting shared domains of research.’ (Sandelowski, *et al*, 2006, p.1).

Mixed-method reviews are informed by both positivist and constructivist paradigms. Positivism is generally associated with quantitative studies focusing on data around prevalence or frequency of a phenomenon, or on the nature of links between variables such as association or cause-and-effect (Robson & McCartan, 2016). Constructivism is an alternative, generally associated with qualitative studies that explore a phenomenon through language, using a myriad of potential approaches (Robson & McCartan, 2016). The unique advantage of the mixed-method review is to combine the objective data of the positivist paradigm with the subjective perspectives presented of the constructivist paradigm in order to generate a fuller picture of an inherently complex area (Stern *et al., 2021*). The Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI, 2007) advises using mixed-methods models when seeking to integrate

quantitative information with qualitative reports across research, as with the research question of this review.

This review will follow the core concepts related to mixed methods reviews to fully inform this approach, as provided by the Joanna Briggs Institute (JBI) (JBI, 2014), see table 8, (appendix D). The JBI define their role as supporting the translation of research evidence into practice (Aromataris & Munn, 2020), which is highly relevant to this study which is rooted firmly in the potential application of findings from real-world research. According to guidance from the JBI, the purpose of a review is to assess the methodological quality of a study, determining how it has addressed the possibility of any bias across the stages of design, implementation and analysis. It should be noted that the papers included in this review have been examined by one critical appraiser, rather than two as the JBI advise (Aromataris & Munn, 2020). However, a quality check was conducted by the researcher's Academic Supervisor to provide a source of inter-rater reliability.

In attempting to synthesise results from different types of studies, Pawson's guidance on conducting realist reviews (2005) must also be considered: that the purpose of the evaluation is to provide useful information about what might be implemented or modified in different settings. Here, the researcher is concerned with the real-world settings of schools.

2.2.6.1 Segregated or integrated mixed method design

Segregated mixed method design

A segregated design can be used to synthesise qualitative and quantitative findings when they are viewed as complementing each other, which necessarily means that they do not address the same questions (Sandelowski, Voils & Baroso, 2006), making this approach unsuitable for exploring this research question. Instead, an integrated design is more suitable, as this approach can seek confirmation across all types of studies.

Integrated mixed method design

In integrated designs, the studies are grouped for synthesis of findings viewed as answering the same research questions, or addressing the same aspects of a target phenomenon. Whether the methods sit within a qualitative or quantitative method is of secondary importance and findings from an integrated design approach can confirm each other by extension of an area of data. An integrated design was chosen for this synthesis of data, to enable the qualitative and quantitative information to triangulate findings around the same phenomena (Sandelowski, Voils & Baroso, 2006). Research findings in this review will therefore be assimilated to create a picture of the field of knowledge.

2.2.6.2 Bayesian approaches to mixed-methods reviews

Mixed research synthesis requires mixed methods analysis and therefore the analytic emphasis is on 'translating' findings (Noblit & Hare, 1988) into one data language so that they can be combined for analysis (Onwuegbuzie & Teddlie, 2003). Bayesian methods can be used to produce statements of evidence through the meta-aggregation of data in this way (Pearson *et al*, 2015). In order for quantitative and qualitative data to be given equal treatment in informing the topic, following an integrated synthesis approach, the data must be transformed into a consistent format. For example, if there are qualitative and quantitative findings, all must ultimately be in either a quantitative or qualitative form.

Converting qualitative data to quantitative data ('quantifying') involves assigning a numerical value to qualitative data in a form which is compatible to that of the quantitative data, enabling the author to calculate the proportion of participants associated with a particular finding. (Pearson *et al*, 2015). However, the studies which emerged from the literature search in this review are not all measuring equivalent or comparable dependent variables.

Some of the studies' research questions attempt to answer, 'what works?' questions, such as whether participants will recognise misleading content that make use of misinformation techniques learned in the game *Bad News Junior* (Roozenbeek *et al*, 2020) and whether users will learn to recognise bogus content according to fact-checking procedures, by playing MAthE (Katsaounidou *et al*, 2019). Additionally, some

ask ‘how?’ such as what search and evaluation strategies participants used to identify misinformation (McGrew & Chinoy, 2021) or ‘why?’ such as exploring what the mechanisms are that underly the fake news identifying process (Dumitru, 2020). The research question of this review is intentionally broad in order to avoid paradigmatic restrictions of what areas of the field are explored, taking an epistemologically pragmatic approach. ‘Quantifying’ the qualitative data would be a reductionist action. Furthermore, this would, at best, yield comparable quantitative data which enables statistical analysis of different phenomena, erroneously creating the impression that the studies are measuring the same thing. JBI guidance states that codifying quantitative data for qualitative analysis is ‘less error-prone’ (JBI, 2014) than the reverse approach and therefore this method will be employed in this review with the goal of maximising parity between the two datatypes.

Quantitative data treatment

Qualitizing involves the reviewer applying a narrative interpretation to quantitative results, for example based on word categories of supplementary descriptive statistics such as averages or percentage scores (JBI, 2014). The qualitized data from quantitative studies can then be combined with the qualitative data from mixed-method or qualitative studies enabling the reviewer to undertake rigorous, detailed examination of the combined data to identify emergent categories on the basis of similarity in meaning.

Qualitative data treatment

Harden & Thomas (2008) outline an approach to ‘qualitizing’ quantitative data by carrying out a line-by-line coding of all the text from included studies under the headings of ‘findings’ or ‘results’. At the second stage, from this coding emerged descriptive themes and finally, analytical themes were generated via a thematic synthesis across all the included studies with reference to the review question. This approach was replicated here (see table 9).

A thematic analysis was undertaken, a well-established approach to extracting meaning from qualitative data (Braun & Clarke, 2006; 2017; 2022). An inductive approach was taken to the data, equating to a data-led, rather than a theory-led, examination.

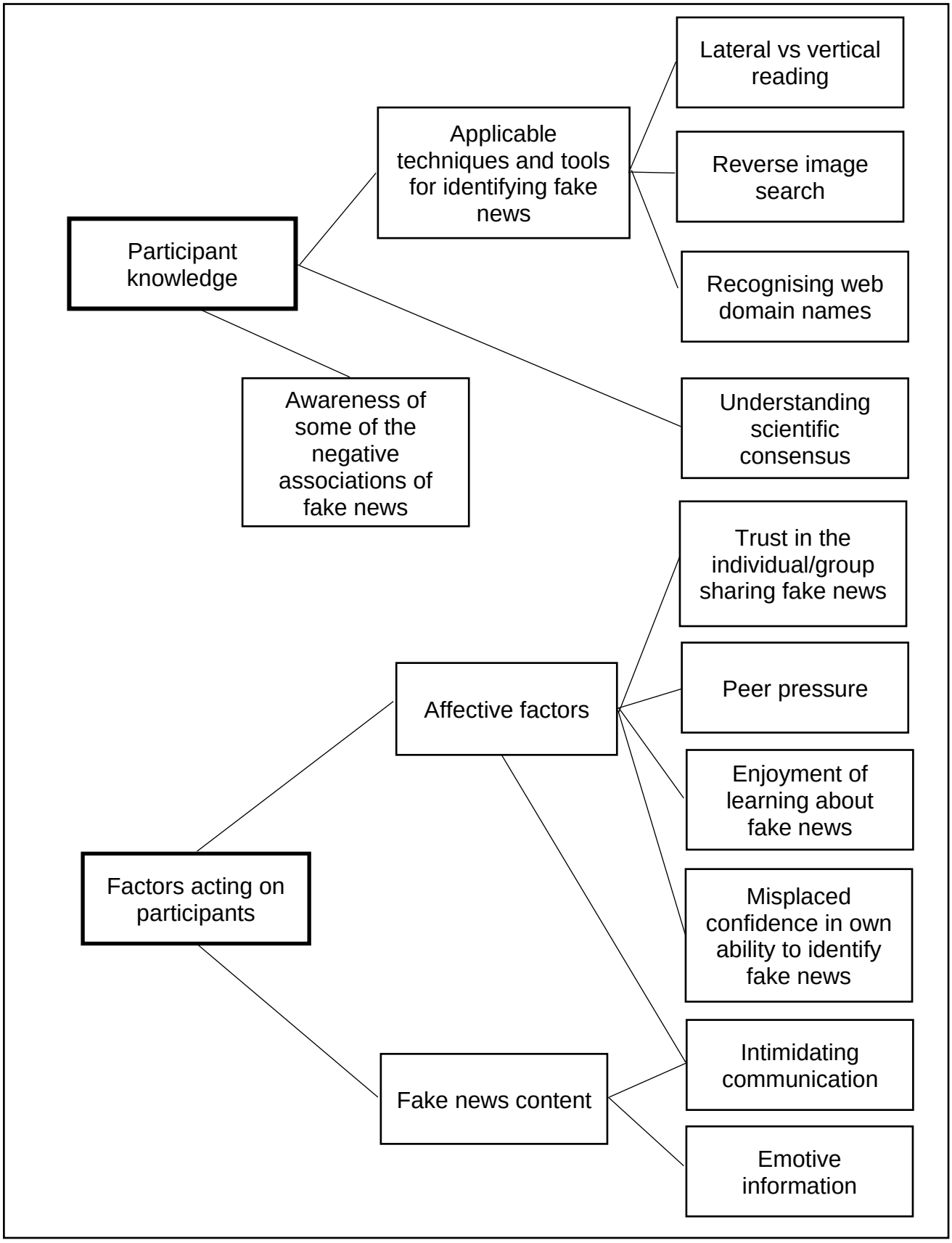
2.2.7 Coding the text

The reviewer coded each line of text according to meaning and content and captured these mainly as non-hierarchical, independent codes. At this early stage some connections were observed when generating the codes, based on the relationships which seemed to recur across codes, and which made sense to the researcher in the light of the broader context provided by the literature. These connections were additionally recorded in a structured ‘tree’ form. Twenty-eight initial codes were generated (appendix F), which described the essential meaning of the theme, e.g., ‘influencing factors on participants,’ ‘lateral reading vs vertical reading techniques’ and ‘user engagement with intervention materials’).

2.2.7.1 Descriptive themes

Following the complete coding of the texts across all five studies, similarities and differences between the codes were considered in order to identify emergent themes. At this stage new codes were also created if required, to succinctly describe groups of initial codes. This stage generated a hierarchical tree structure with a total of 10 descriptive themes, which was then split into two layers. These layers stratified the themes into those factors which influenced participant knowledge and those which acted on participants (see table 9).

Table 9*: *Descriptive themes from analysis of all five studies.



2.2.7.2 Analytical themes

The third and final stage of the synthesis involved revisiting the descriptive themes and relevant data with the overarching review question in mind ('What is known about developing children and young people's ability to identify 'fake news' online?'). This involved an interpretive approach to the data, comparable with the stage in meta-ethnography where third-order explanations are constructed (Harden & Thomas, 2010). This takes the data from being a summary of the findings of the primary studies to generating new understandings and hypotheses to inform future research and practice, in line with the realist approach to synthesis and evaluation (Pawson *et al*, 2005).

A total of five analytical themes emerged from this process, which are shown in table 10 in the five distinct areas identified by the researcher. As the goal of this review is to provide useful information, the implications for future interventions that these themes generated were also considered. This was done by considering the analytical themes in the context of real-world educational settings and how this knowledge could be incorporated into the design and implementation of future interventions around the identification of fake news.

Theme number	Analytical themes	Implications for interventions
1	External and internal factors impact on children/adolescents' ability to recognise fake news in a way which is out of their control (e.g. peer pressure, emotive content, following the decisions of other parties).	Interventions relating to any aspect of teaching around fake news should incorporate components which relate to these impact factors (i.e. psychological factors which influence thinking and behaviour)
2	Children/adolescents lack the skills and knowledge required to identify fake news, but do not recognise this deficit.	Interventions for teaching children and/or adolescents to identify fake news are needed and should include a component related to raising awareness of any deficit.

3	Children/adolescents know that fake news is a real and potentially problematic factor in their online life.	Interventions relating to any aspect of teaching around fake news should be planned around existing educational motivators for the participants.
4	Children/adolescents are receptive to learning about fake news, especially when they find the process fun and engaging (e.g. though games).	
5	When children/adolescents think they recognise fake news, they do not have the knowledge and skills to verify this.	Interventions focused on providing children/adolescents with practical tools for verifying whether suspected fake news is fake or real are needed.

Table 10: Analytical themes and implications for interventions

2.2.8 Discussion

Analytical Theme 1

Six of the initial descriptive themes related to internal and external factors as impacting on participants when engaged with fake news in the range of studies analysed in the review:

1. Trust in the individual/group sharing fake news
2. Peer pressure
3. Enjoyment of learning about fake news
4. Misplaced confidence in own ability to identify fake news
5. Intimidating communication
6. Emotive information

From these, a key finding emerged, which was felt to have significance for future research. The reviewer inferred a potential barrier to intervention engagement (participants not finding the materials sufficiently enjoyable) and potential barriers to accurate recognition of fake news (such as the belief that participants had a high

accuracy which proved to be an incorrect belief, and the influence of emotive content, such as endangered animals, which seemed to eclipse their logical reasoning about the content). The reviewer captured this line of argument in the analytical theme entitled, 'external and internal factors impact on children/adolescents' ability to recognise fake news in a way which is out of their control.' This is a key finding, which would indicate that any teaching programme aimed at identifying fake news should also take these into consideration, incorporating teaching elements which relate to these impact factors (i.e. psychological factors which influence thinking and behaviour). This, along with the findings from the other analytical themes, will be central to the design of this study.

Analytical Theme 2

The second analytical theme was created by coalescing descriptive themes around students demonstrating a misplaced confidence in their own ability to identify fake news which had arisen from specific examples in the original codes, such as:

1. Student searches (to verify information) which yielded no relevant results were still treated as is the fake information was real.
   and
2. Discrepancies between actual and reported ability to identify fake news.

These were summarised in the analytical theme as 'children/adolescents lack the skills and knowledge required to identify fake news, but do not recognise this deficit.' Therefore, the design of interventions for teaching children and adolescents to identify fake news are needed, as these analytical themes highlight a risk to these groups. Furthermore, it was concluded that teaching interventions should include a component related to raising awareness of any deficit, such as through an established measure.

Analytical Themes 3 and 4

These analytical themes are summarised as 'children/adolescents know that fake news is a real and potentially problematic factor in their online life' and 'children/adolescents are receptive to learning about fake news, especially when they find the process fun and

engaging (e.g. though games).' These emerged from codes around enablers of success in programmes and games, such as one descriptive theme around visual information having a positive impact along with similar findings, coded separately, around motivation and engagement. These were captured in across descriptive themes as 'Factors acting on participants' and also 'participant knowledge.'

Although they may seem disparate at the descriptive themes level, these two analytical themes have been combined in relation to implications for future intervention, as together they point to a way to maximise the chances of a programme achieving its outcomes. These themes indicate that any aspect of teaching around fake news should be planned around existing educational motivators for the participants. The individuals in the best position to understand and implement this are their current educators.

Analytical Theme 5

The final analytical theme created to summarise the findings from the coding and descriptive themes is described as, 'when children/adolescents think they recognise fake news, they do not have the knowledge and skills to verify this.' This is a component of the descriptive theme around 'participant knowledge' which revealed that students need and may lack, 'applicable techniques and tools for identifying fake news.'

Therefore, interventions focused on providing children/adolescents with practical tools for verifying whether suspected fake news is fake or real are needed, alongside the other key elements identified across the other analytical themes.

2.2.9 Conclusions and recommendations

Consideration of the breadth of literature in this relatively recently emerging area of research, and the strength of evidence around the effectiveness of inoculation theory, combined with the findings of this literature review, suggests that there is a need for educating school-age young people on the potential effects of fake news. The review suggests that the most potentially effective area to focus on is that of pre-bunking

(Roozenbeek & van der Linden, 2019) and seeking to prevent or minimise the potential harmful effects, as opposed to allowing young people to be exposed to a mixture of both real and fake news, and teaching skills in fact-checking and verification (one of the four areas of intervention recommendation highlighted by the literature review, see table 10) as a primary mitigation strategy.

Key findings are that, as well as providing the tools for accurately identifying fake news, interventions should incorporate teaching around psychological factors which influence thinking and behaviour, young people would benefit from awareness of deficits in their knowledge about identifying fake news, and teaching programmes should be built around student motivators in order to maximise the positive effects of engagement.

This study therefore proposes to address the concern around young people's vulnerabilities to fake news by creating and evaluating a bespoke teaching programme. This will incorporate three of the four areas for intervention derived from the review of the literature described previously: the teaching programme will include raising awareness of the participants' vulnerability to fake news, their own psychological responses to it and be equipped with the critical thinking skills required to support this. This will be achieved using enjoyable, engaging activities and will be designed to attempt the development of cognitive inoculation of participants to pre-emptively protect them, analogous with a medical vaccine (van der Linden *et al*, 2017). The proposed study poses the following research question: 'What are the outcomes of a bespoke critical thinking whole-class teaching programme on students' skills in identifying fake news?'

As review of the literature indicates that applying critical thinking skills to information encountered online can be impeded by confirmation biases (Aston, 2023), the proposed intervention's learning objectives should be focused on developing the students' understanding of cognitive biases (Kahneman & Tversky, 1972), combined with a prebunking approach to how to recognise fake news online. The prebunking, rather than accuracy priming or debunking approaches, will be adopted as research suggests this has been shown to successfully 'train' individuals to be more sensitive to specific deception strategies, analogous with activating specific resistance antibodies (Roozenbeek & van der Linden, 2019, p.7).

The aim of this research study is to contribute to the evidence base around tackling the harmful effects of fake news online. It aims to explore whether elements which are known to work separately can be combined in a single teaching programme, and aims to target this at children who are both vulnerable to fake news but are likely to be receptive to an intervention to mitigate these potential effects. The research question which this has generated is outlined below, with a description of the design and methodology of the study to address this detailed in the following chapter.

Research Question

The present study seeks to address the following question:

What are the outcomes of a bespoke critical thinking skills programme on children and young people's ability to identify fake news?

Chapter 3

Methodology

3.1 Introduction

This chapter outlines the methodology and design of the present study, including the mixed method approaches related to the chosen research design, participant details and selection procedures, measures used, methods of data analyses and also a consideration of the ethical implications of the study. However, the author first gives consideration to the epistemological and ontological issues that are the foundation of all research and discusses the paradigm they are situated within.

3.1.1 Philosophical traditions within research: ontology, epistemology and methodology

Cohen, Manion and Morrison (2011) advised that prior to commencing any project, the researcher must begin with a consideration of the differing views of reality (ontology) and of how we acquire knowledge (epistemology) which exist in research traditions and literature. This must then guide the researcher's methodology: their ways of finding out about reality, which informs their instruments of data collection and approaches to their data analysis (Guba & Lincoln, 1994). This project aims to be a scientific piece of research, carried out 'systematically, sceptically and ethically,' (Robson & McCartan, 2016, p.15). This means that primacy is given to using systematic thought processes, considering alternative interpretations and ensuring that the research includes consideration of ethical implications. A further priority when planning and implementing this research project was to seek findings which are both reflective of, and relevant to, the real-world practice of educational psychologists.

3.1.2 Applied Research Paradigms

3.1.2.1 What is a paradigm?

One common way of understanding the philosophical underpinnings of differing approaches within educational research, is that of competing ‘paradigms’. Originating with the writing of Kuhn (1970), this was initially a description of the way in which scientific progress was understood; as a series of dominant frameworks of understanding, widely adopted, which are then eclipsed by a new paradigm, following a ‘scientific revolution.’ Kuhn emphasised the social character of research in the natural sciences, arguing that scientific work, is not a sequence of empirical gains which accumulate knowledge. Kuhn saw mature sciences as typically being dominated by one single paradigm at a time, until a ‘scientific revolution’ eventually leads to the adoption of a new paradigm, which offers a different conception of the world. Kuhn described social sciences as displaying a range of competing approaches simultaneously and his work can be seen as opening the way for new approaches in social sciences research, including the influence of qualitative methods (Hammersley, 2012).

Positivism

The positivist approach emerged from the dominant traditions of the physical, empirical sciences and takes the position that an external objective reality exists and moreover that this exists separately to the individual. The way to discover this reality is through scientific observation and testing causal hypotheses (Robson & McCartan, 2016). The paradigm is widely used in establishing cause and effect, ‘what works,’ relationships in education (Mertens, 2015). However, it can be argued that the paradigm is reductionist, with limited application in the real world. It can be further argued that a purely positivist approach is dehumanising, as it reduces individuals solely to numerical or aggregate terms (Hammersley, 2012).This does not mean that the scientific method must be rejected, but rather it can be built upon with a clear acknowledgement of where its limits lie and that a different approach is needed to extend knowledge when working in social sciences and answer questions beyond ‘does this work?’.

Post-positivism

Although this emerged as a response to the criticisms of positivism and the empirical approaches of the natural sciences, post-positivism is not simply an anti-positivist

position (Robson and McCartan, 2016, p.23). Rather it can be seen as a way to better adapt the epistemology of the natural sciences to social science research, continuing to use mainly quantitative methods but with the further acknowledgement that the researcher themselves can influence what is observed and therefore what can be known (Robson & McCartan, 2016).

Post-positivism allows for the idea that research evidence may be fallible and/or subject to biases whilst attempting to describe causal relationships (Robson & McCartan, 2016). The post-positivist epistemological stance infers a scientific approach, high in reliability and based on quantitative data-gathering. Researchers adopting a post-positivist epistemology believe that reality is something measurable, but that researchers have limited access to a perfect understanding of this.

Post-positivism recognises the criticisms of positivism but still retains key elements of its epistemological position. These include retaining the commitment to the value of a scientific approach in research, emphasis on the value of some form of measurement, and on the importance of controlled comparison (Shavelson, Phillips, Towne & Feuer, 2003). Although in the postpositivist tradition, evidence must be empirically given, working with and between people involves some unique factors. Abstract notions of motivations, emotions, biases or the unconscious represent potentially confounding factors in taking direct measurements in line with the positivist tradition (Mertens, 2015).

Constructivism

In contrast with the ontology of the positivist paradigm, the constructivist approach poses that reality does not exist externally but is constructed through interaction with the surrounding world (Bogna, Raineri & Dell, 2020). This means that different individuals can perceive reality in ways which conflict with each other and their perceptions of reality may also change over time. The constructivist epistemology tells us that researchers and participants can exert mutual influence which can shape the course of a study and socially construct it (Mertens, 2015). The task of a constructivist researcher is therefore to attempt to understand other's constructions in order to gain insight into multiple perspectives (Fien, 2002; Robson & McCartan, 2016). However, working with a

framework of multiple realities means that this approach does not confer advantages of scientific validity, such as generalisability of findings (Robson & McCartan, 2016).

Pragmatism

The pragmatic paradigm provides the researcher with a model of scientific research that avoids the extremes of purely positivist or relativist world-views (Robson & McCartan, 2016). Pragmatism has been viewed as occupying a philosophical position that seeks to achieve a moderate position between positivists and constructivists by combining features of both as needed (Morgan, 2014; Mertens, 2015). Reichardt & Rallis (1994) listed the set of fundamental beliefs which can be seen to underpin the pragmatic approach and are compatible with both the post-positivist and constructivist approaches:

1. Enquiry is value laden.

2. Facts are theory laden.

3. Reality is multiple, complex and constructed.

4. Any particular set of data can be explained by more than a single theory.

Pragmatism involves research designs that incorporate bespoke approaches and decisions based on 'what will work best' in finding answers for the questions under investigation, enabling pragmatic researchers to conduct research in innovative ways to solve research problems. A pragmatic study defines terms by their application to human experience (Mertens, 2015), emerging as a method of inquiry for more practical-minded researchers (Creswell & Clark 2011).

The primary goal of pragmatism is to create knowledge that has utility for practice (Goldkuhl, 2012), which is aligned with this study's concerns with real-world research in educational settings. There is a danger that the flexibility of the approach is mistaken for an 'anything goes' philosophy (Robson & McCartan, 2016, p.183) with weak rationale and validity. The researcher will here attempt to mitigate this risk, via the use of a reflexive approach as part of the analysis (see chapter 5).

3.1.3 Stance of the current research design

In this study, the phenomena under investigation require the quantitative measurement of variables, enabling detection of any changes in outcome produced by the independent variables. However, for the real-world application of this to be considered, illuminating the 'why' and the 'how' are also required. Therefore, a pragmatic research design has been chosen, which can incorporate both the confirmability of the constructivist paradigm (Lincoln & Guba, 2000), using qualitative data collection methods, and the epistemological goal of attaining useful knowledge via quantitative data collection methods. Epistemologically, this does not preclude drawing on the post-positivist paradigm, as the researcher will attempt to employ objectivity in relation to collecting quantitative data. Ontologically, the pragmatic position of this research allows the researcher to attempt to measure a specific reality, to focus on what difference this measurement might make (Morgan, 2007) and also to incorporate the understanding that individual participants have their own interpretation of what their reality is (Mertens, 2015).

3.2 Methodological considerations

Within applied research, the range of experimental designs for the investigation of phenomena has been organised via a taxonomy which assigns a position in a hierarchy, based on the study's relative quality (see figure 2).

Fig. 2: A hierarchy of applied research (from Murad, Asi, Alsawas & Alahdab, 2016)

This provides an instant, visual method for comparing study designs and judging the likelihood that their findings are reliable.

3.2.1 Alternative designs considered

Systematic Reviews

Within this hierarchy, systematic reviews are traditionally located at the top, indicating that these are the highest quality, as these evaluate the consistency of results and risk of bias across all studies investigating a particular topic. However, these synthesise existing research data rather than conducting original research.

Randomised Control Trials (RCTs)

Within this framework, the randomised control trial (RCT) is the next-highest level of evidence. As a 'true' experimental design these are often considered the design of choice for high-quality research (Robson & McCartan, 2016). Because participants are allocated randomly to groups, it is argued that RCTs provide the best evidence for the effectiveness of a treatment as it may establish causality and generalisability (Cohen, Manion & Morrison, 2011).

However, it has been argued that the use of RCTs to investigate complex social issues or interventions by emphasising outcomes does nothing to explain why the intervention is a success or failure and does not account for complex patterns of motivation and autonomy (Pawson & Tilley, 1997; Robson & McCartan, 2016). In addition, their performance in social research is 'very poor' (Robson & McCartan, 2016, p.119). Moreover, it can be argued that the use of RCTs to investigate complex social interventions by concentrating on outcomes does not help to explain why the intervention is (or is not) effective (Robson & McCartan, 2016).

Fixed designs

Experimental research designs are an approach involving a design that is pre-determined before the collection of data. In fixed designs of this nature, it is key that the researcher controls and manipulates one (or more) dependent variables, determining the events with which the study is concerned. The researcher then introduces an intervention in order to measure its impact on the dependent variable (Cohen, Manion & Morrison, 2011). Typically, fixed designs of this nature are quantitative and aligned with a post-positivist epistemology (Robson & McCartan, 2016).

Quasi Experimental Designs

There are several ways in which the robustness of quasi-experimental designs can be maximised. For example, the utilisation of a control group and pre-test would provide some protection against such potential threats as maturation, attrition and testing (Mertens, 2015). By testing multiple dependent variables the researcher can also explore predicted patterns of effects which may be able to strengthen the conclusions drawn (Shadish, Cook & Campbell, 2002).

Mixed methods designs

Sale, Lohfeld & Brazil (2002) have argued that because quantitative and qualitative methods are concerned with studying different and mutually exclusive phenomena, they cannot be combined for the purpose of triangulation. However, although this 'incompatibility thesis' (Howe, 1988) would seem to preclude any mixed research methods, Sale, Lohfeld & Brazil also state that they can be combined where the purpose is complementary, or 'additive'. Therefore, employing different methods in different epistemological elements of this study is considered to be a way to gain a broader range of knowledge than confining research to the one paradigm. Furthermore, Howe (1988) argues that focusing on the differences between quantitative and qualitative methods can lead to missing their similarities, such as shared goals about understanding the world. Robson & McCartan (2016) warn against privileging philosophical concerns over

other, more practical, issues, and advise that researchers should ‘use the appropriate methodology to answer your question,’ (p.26). In this study, mixed research methods are used additively, taking a pragmatic position (Robson & McCartan, 2016). The post-positivist component of the current research is reflected in the quasi-experimental design, providing quantitative data which will be subject to statistical analysis. These findings will then be built upon with illuminating qualitative data.

Qualitative data cannot be objectively measured, but instead can be seen as expressing the subjective and interpretive qualities of an item or process. A central concept of this is its private, and thus incomparable, nature. One individual’s experience of participation in this research is subjective. Whilst outward, quantitative measures may be comparable between participants, as they are measuring the same phenomena, qualitative measures are not measures in the same way at all. These instead are an attempt to communicate a unique experience, mediated through language, and as such the researcher can never be sure that commonalities in the language of this qualitative data represents true commonalities in data. The qualitative data serves the purpose of attempting to answer the questions of why and how the findings of the quantitative data were observed, enriching the findings, described by Bryman (2006) as putting the ‘meat on the bones’ of the quantitative data.

3.2.2 Choice of design for the current study

In this study, the researcher has employed an embedded mixed methods design (see table 11) which is not only in keeping with the pragmatic philosophical stance of the researcher but also meant that the findings to emerge could be considered in relation to previous research.

Qualitative data can provide an insight into the behaviour observed in the quantitative data, thus enhancing the applicability of findings (Lincoln & Guba, 1994). In this study, the qualitative data gathering is utilised to explore the component of the research question which asks about the nature of the effects, and is measured by interventionists and participants’ views. This aims to provide insight into the views of those involved in this initial implementation of the programme, with a focus on factors that were perceived

to particularly help or hinder the process, to inform future practice, in an embedded sequential mixed methods design.

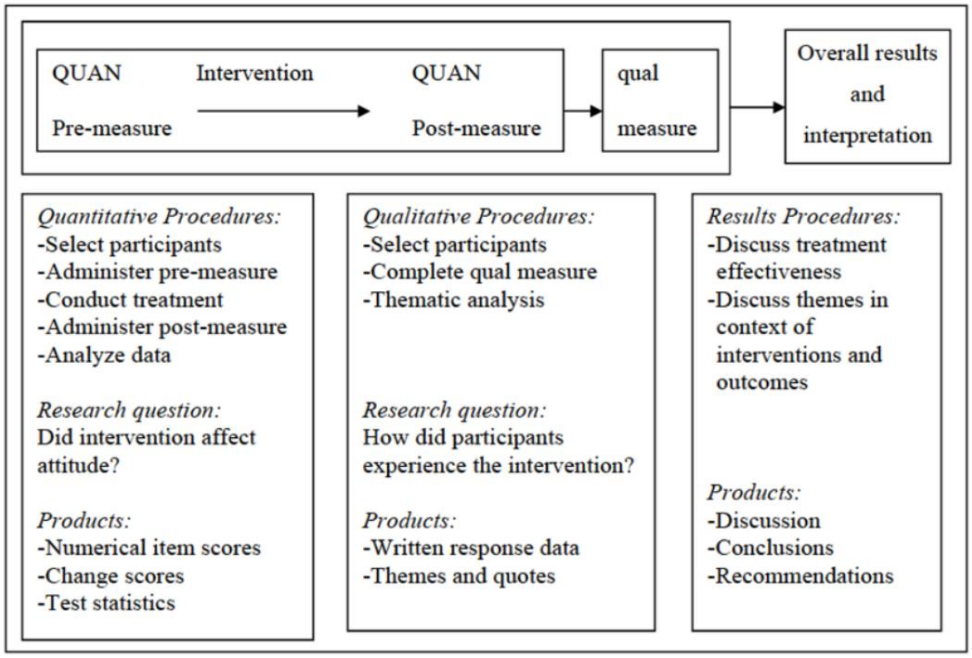


Table 11: Embedded sequential mixed methods design model, adapted from Cresswell & Plano Clark, (2017)

3.2.2.1 Quantitative methodology and design

A quasi-experiment in a real-world setting is a way to develop the evidence-based practice via research which will be most useful in the future (Mertens, 2015). Therefore, the researcher has employed a quasi-experimental design to maintain a basic experimental stance in a real-world setting, whilst also exploring the contextual effects via a qualitative analysis.

3.2.2.2 Qualitative methodology and design

Qualitative research offers the advantage of being able to examine and posit theories around contextual effects. Qualitative studies are able to show sensitivity to context by considering the perspectives of the participants, the study setting, the sociocultural

context and by considering how these may influence both the participants' narrative and how this is interpreted by the researcher (Yardley, 2015).

3.2.2.3 Overall mixed methods study design

By adopting a mixed methods approach, this study implements two different methodological approaches as part of an embedded sequential mixed methods design (Creswell & Plano Clarke, 2017), gathering qualitative data within a predominantly quantitative method. Individual analyses from both types of data will be integrated during a final stage so that inferences can be based on these findings. Whilst the quantitative data is considered the predominant method, each method will be considered separately, with regard to their individual designs.

3.3 Method

Methodological details of the procedures, data collection and data analysis for both the quantitative and qualitative research methods used in this study are outlined below.

3.3.1 Stakeholder engagement

Discussion with schools supported in the researcher's role as a Trainee Educational Psychologist during 2021 highlighted that pupils were viewed as vulnerable to believing and sharing disinformation, such as widespread fake news about Covid-19. Schools reflected a lack of confidence in ways to mitigate this or support the relevant student skills, and were keen to explore ways these might be improved. Staff indicated that they would feel more confident in addressing this if their knowledge and skills were improved.

This research was completed as part of professional training in Applied Educational Psychology at The University of Nottingham. This was an exploratory mixed method study with the aim of gaining insight into the effects of a bespoke critical thinking skills teaching programme on the pupils' ability to identify fake news.

Stakeholders for this study include:

- The participating primary schools
- Participants
- Participants' parents/carers
- The University of Nottingham

3.3.1.1 The schools participating in the research:

Two primary schools dedicated significant time and resources to the implementation of the teaching programme and measures in order to support the research at a time when schools are under extreme pressures in the form of industrial action, recruitment crises, Covid 'catch-up' efforts and the impact of the cost-of-living crisis. Their hope was that both pupils and trained staff would improve their understanding of fake news, ways to identify it and mitigate its effects. The schools also hoped to embed this within their curriculum.

3.3.1.2 The children involved in the research:

It was hoped that pupil's interests related to the potential improvements in their knowledge and understanding of the techniques used to spread fake news, ways to identify it and their own responses to encountering it. The study aimed to confer potential benefits arising from their inoculation against the effects of fake news. In addition, critical thinking skills generally may have a broader impact on their communication and learning, although this was not measured in this research.

3.3.1.3 The University of Nottingham:

The importance of evidence-based practice was highlighted as part of the training for a Doctorate in Applied Educational Psychology. The University of Nottingham provided support and supervision to the Researcher throughout this project.

3.4 Procedure

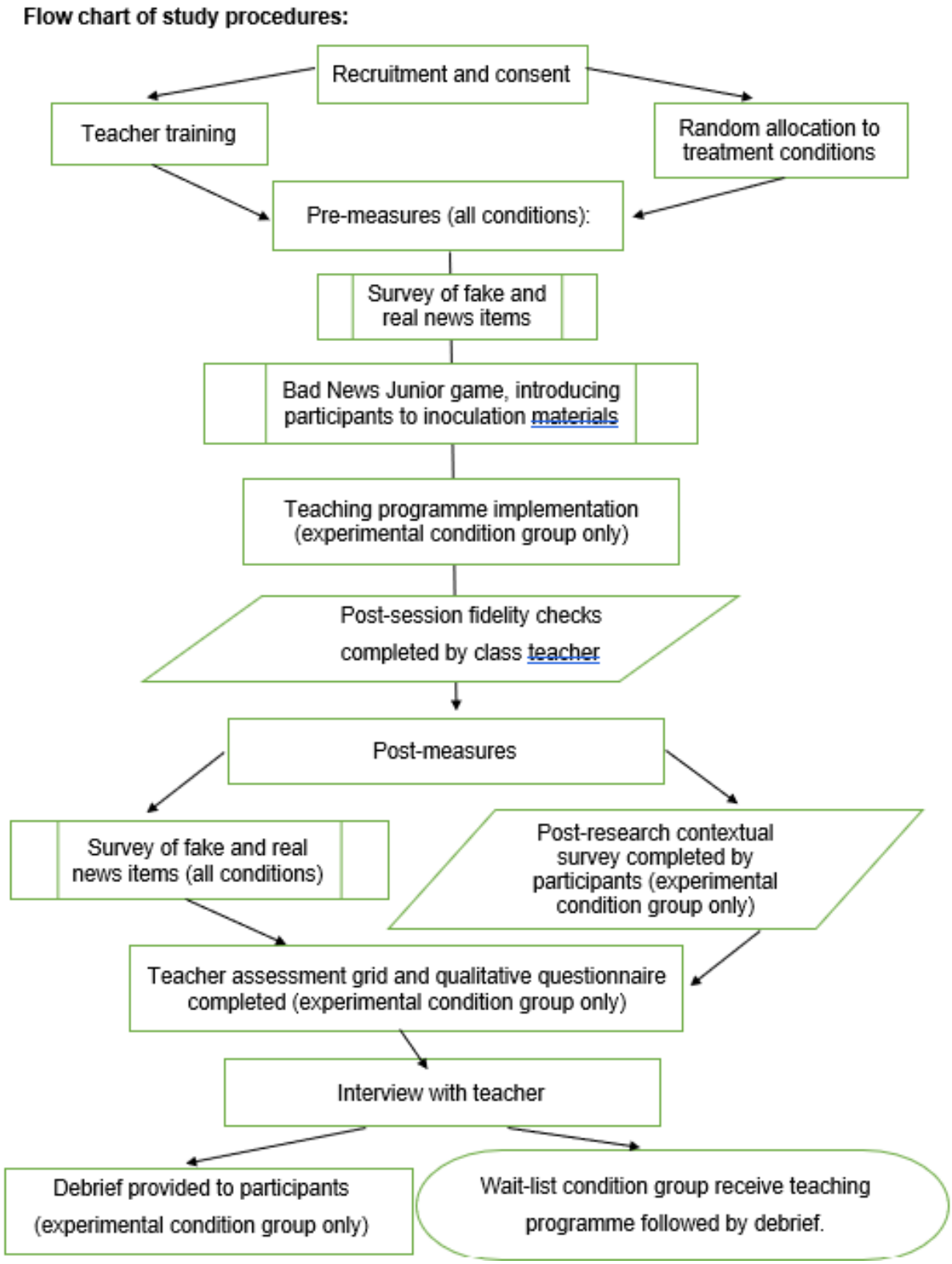


Figure 3: flowchart detailing the procedures for the study.

3.4.1 Participants and sampling

15 participants aged 10-11 formed the experimental group receiving the teaching programme treatment and were included for this aspect of the study. 10 pupils from School 1 and 5 pupils from School 2 completed all the sessions. 9 pupils across both schools completed the post-intervention questionnaires. Each of these participants was asked to complete a post-treatment questionnaire. In addition, both interventionists were invited to share their views in a post-treatment questionnaire (appendix G). Both were also invited for a further interview, which one was available to attend.

This sample was chosen to represent a population of young people in full-time education, who engage with digital media on a daily basis but have experienced limited exposure to disinformation techniques, making them eligible candidates for prebunking (Roozenbeek & van der Linden, 2019). The researcher sent an 'expression of interest' letter to all the primary schools they support.

Four schools initially expressed interest in participating in the research during November 2022 and two decided not to proceed following initial discussions around the time commitment required, with one more dropping out at a late stage due to staffing challenges in the setting. During a second round of recruitment (December 2022/January 2023) three further schools expressed and interest with two deciding not to proceed on receipt of further details about the study requirements. Therefore, two primary schools were included in the study. In total, 22 children participated in the research across both conditions. To reduce the impact of the school setting on the outcomes, experimental and control groups were included in each setting.

Head teachers and Year 6 teachers in these schools were provided with an information and consent form detailing the responsibilities of the school and the researcher (appendices H and I). Once key stakeholders' consent was gained, meetings were then held with Year 6 staff to discuss their involvement.

Information sheets, risk assessments and consent forms (see appendices J, K, L and M) were distributed to parents/carers via the school and written consent was required from parents/carers in order for pupils to be included in the study. Children did not have to provide further written consent, in line with attendance at other timetabled teaching

sessions. Teachers included the programme as part of the routine timetable within school's Personal Social Health Economic (PSHE) curriculum.

Facilitators were asked to monitor the children's response to the programme and to give opportunity for the children to withdraw if they showed distress of any kind, enabling them to participate in an alternative activity during the programme teaching sessions, in line with the ethical principles governing the study (see appendix N).

3.4.2 Population and inclusion criteria

Inclusion criteria was intentionally broad in order to be as representative of the national population, and therefore for results to be as generalisable, as possible. Variables such as gender, additional needs and academic ability were therefore likely to reflect the general population and randomisation was used to further help to control for these.

3.4.3 School Characteristics

The two schools involved in the research were mainstream urban primary schools from different areas of the same city in the North of England. Each school was a member of a different Multi-Academy Trust.

3.4.4 Pilot study

A pilot phase was included to test and refine the teaching materials for sessions 1 and 2 and testing materials, as this is a bespoke programme design. This was on a small-scale, implemented with one teacher and two pupils, with teacher feedback captured leading to minor amendments to the programme and the bespoke version of the Bad News Junior game, prior to the full-scale implementation.

3.4.5 Staff training

The class teachers involved in the research were provided with training on the teaching resources and materials to be used in the three sessions. They were also given access to the bespoke version of the Bad News Junior game in order to become familiar with this in order to provide any support to participants if needed when the game was in use in the study. During (and following) the training the interventionists were encouraged to explore the issues raised and ask questions to develop confidence with the subject and materials.

3.4.6 Fidelity checks

Durlak & Dupre described the completion of fidelity checks an ‘essential feature of programme evaluations.’ (2008, p.327). As the intervention in this study was implemented in different settings by different facilitators, the integrity of its implementation was considered a potential threat to internal validity (see chapter 3). In order to mitigate this potential threat, teachers were asked to complete fidelity checks after each session.

3.5 Measures

3.5.1 Quantitative measures

This section considers the quantitative methods included within this mixed methods study. This phase of the study involved a quasi-experimental design. Considering the aims of this study this design was considered the best way to measure the aspect of the research question concerned with the presence and size of the treatment effect. Research questions are considered in terms of the relevant element of the research design and measures in table 12.

Research question	Research design	Measures
1. Does the teaching programme make a difference to children's ability to identify fake news?	Pre and post intervention data	Accuracy of Likert scale assessment (1-7) of real and fake news stories within the Bad News Junior game. Teacher assessment using 1-7 Likert scale (post-intervention) of participant ability to identify fake news.
2. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?	Post-intervention data	Participant self-rating of enjoyment of the teaching programme and confidence in identifying fake news.

Table 12: details of the research sub-questions in relation to the research design and measures used

3.5.1.1 Rationale

Employing an experimental design was not only in keeping with the philosophical stance of the researcher but also meant that the current findings could be combined with the established body of research into the effectiveness of inoculation-based approaches (Banas & Rains, 2010), which have typically involved large-scale trials of experimental design.

3.5.1.2 Teaching programme content

The teaching programme's learning objectives are focused on developing and applying the students' critical thinking skills in key relevant areas, which is an identified factor in

influencing young people's thinking and responses to news material they encounter, not included in existing pre-bunking research. These are focused tightly on cognitive biases (Kahneman & Tversky, 1972) and supplemented by specific critical thinking skills application in relation to identifying fake news, adapted from the Newswise materials (Newswise Programme, The Guardian Foundation, 2020). Here, materials from session 5 of the Newswise programme (see appendix O) comprise session 3 of the study's teaching programme. These materials have already received extensive evaluation (Education Policy Institute, 2021).

The three teaching programme sessions include the following foci:

Session 1: Introduction to cognitive biases with learning objectives:

- To understand what a cognitive bias means.
- To understand confirmation bias (appendix O)

Session 2: development of critical thinking skills with learning objectives:

- To understand what The Bandwagon Effect
- To understand Availability Bias (appendix O)

Session 3: learning objective:

- To identify fake news and its consequences (appendix O)

3.5.1.3 Intervention

Participant response data was gathered by implementing a survey involving a series of eight news stories (presented within the Bad News Junior game). These comprised six fake news stories presented alongside two genuine news stories (see appendices P and Q). The six fake news stories were created by the researcher to reflect each of the six disinformation techniques covered: trolling, discrediting, emotion, impersonation, polarisation and conspiracy (Roozenbeek & Van der Linden, 2019; van der Linden & Roozenbeek, 2020). No feedback was provided to participants about the accuracy of their responses and therefore the same stimulus materials were presented in the post measure version. Participants were asked to rate the reliability of each story on a Likert

scale from 1-7 (appendix R). These eight test items are not the same news stories presented within the game itself.

The survey was included at the outset of the game, prior to any materials being presented, in order to accurately represent participants' ability to identify the fake news materials.

3.5.1.3.1 Independent variable (IV)

The study incorporates one independent variable (IV):

Participation in a bespoke version of the online game Bad News Junior which involves active engagement with the techniques used in fake news in line with the inoculation model discussed in chapter 1. This is combined with a critical thinking skills teaching programme which focuses on understanding and applying heuristics in encountering information online.

A bespoke variation of the comprehensively evaluated Bad News Junior game (Roozenbeek *et al*., 2020) followed the survey within the pre activity. This comprises the 'inoculation' element of the intervention, to be developed further with the critical thinking skills included in the teaching programme. Amendments to the original version of the game included omissions and alterations in language and stimulus materials to adapt the game to a Year 6 audience of a range of literacy levels, by ensuring language and news stories were accessible and child-friendly.

The game shows players a news story to which they can react in a number of ways with progress measured through a "followers" and "credibility" meter which provides instant visual within-game feedback (appendix S). Participants are encouraged to behave in a way that is consistent with being a producer of fake news in order to gain more followers and credibility and secure each of the six badges (levels). If the participants utilise a strategy which is 'too obvious or too much in line with journalistic best practice' (Lewandowsky & van der Linden, 2021), the game will lower players' credibility score or reduce the number of followers they have gained. The bespoke version of the game

was adapted and developed in collaboration with the University of Cambridge's Social Decision-Making Lab.

3.5.1.3.2 Dependent variables (DV)

The dependent variable measured in the study is the participants' ability to recognise fake news stories, presented online and assessed via pre and post Likert scale measures embedded within a bespoke version of the game Bad News (Junior version) https://www.getbadnewsjunior.com/#intro. The assessment measure was administered separately, before and after the teaching programme and was supplemented by a post-session fidelity check (see appendix T) with the interventionist. Participants in the treatment groups were required to attend a minimum of two out of three sessions in order to be included in the study.

The dependent variables measured in the study are:

1. Participants' ability to recognise fake and real news stories presented online, assessed via accuracy of responses in identifying stories embedded in a bespoke version of the game Bad News Junior.
2. Participants' ability to recognise fake news stories, measured via teacher assessment.
3. Participants' critical thinking skills, measured via teacher assessment.

3.5.1.3.3 Likert scale ratings

Likert scales were used as a measure for teacher assessment and in pupil self-assessment ratings in the post-treatment questionnaires (appendix G). These provided comparable data and mirrored the seven-point format of the ratings within the Bad News Junior game in the study. Between five and ten items is considered appropriate to suggest that the construct can be reasonably analysed (Kline 2005).

3.5.2 Qualitative Measures

Methods of data collection are set out below:

3.5.2.1 Questionnaires

The aim of this element of the study was to explore and understand the perceptions of both interventionists and participants regarding what may have supported and hindered the pupils' ability to identify fake news, within the study's teaching programme. Both questionnaires also created the opportunity for respondents to share additional views and insights via open-ended questions, from which themes could then be extracted. Open-ended questions provide the maximum opportunity for discovery of participants' views (Gillham, 2008), and to express views spontaneously and without being restricted to a pre-determined response (Rosnow & Rosenthal, 2002).

There were several considerations that guided the decision to use questionnaires. Focus groups were considered, however, it was not possible to bring the adult interventionists together for a focus group due to practical issues such as geographical location and time available. When asked to express a preference they preferred the flexibility of the opportunity to make written contributions. Therefore, self-completion questionnaires presented an approach which allowed participants and interventionists to create responses in their own time and also generate data which was free of the risk of interviewer bias (Gillham, 2008). Questions in the facilitator questionnaires are found in appendix G.

Whilst questionnaires have benefits, there are also some risks to consider with this method. The key consideration is that question wording may have an effect on answers, and therefore extensive time was taken with the design of these two questionnaires, ensuring that they asked for information which relates to the research question of this study. The motivation of respondents in completing questionnaires and potential problems around accuracy and completeness are also possible disadvantages to consider (Gillham, 2008). To ensure as high a response rate as possible along with the purpose of eliciting accurate information, the researcher followed the questionnaire preparation checklist set out by Robson & McCartan (2016, p.264).

Although there is some disagreement about precisely what percentage of responses can be considered adequate (Robson & McCartan, 2016), the highest standards refer to mean response rates of 75%, with some considerably lower. The authors refer to a review of 175 surveys which had a mean overall response rate of 55% (Baruch, 1999) and further note that lower response rates can be found in published research. The possible confounding effect on participant data of non-response bias (Robson & McCartan, 2016) was mitigated by a response rate of 8 from the treatment condition total of 15 pupils. 7 pupils were non-respondents, partly as a result of participant absence, constituting a response rate of 54%. There were no interventionists who declined to complete the questionnaires, which ensured that the sample responding was representative of the views and experiences of the adult facilitators.

3.5.2.2 Interview

A further approach was used to collect data from the interventionists: in addition to the questionnaires, one interventionist was available for a more in-depth semi-structured interview around the same focus areas. The same questions were used as prompts to gather information relevant to the research question, and a further question was also explored around whether the interviewee would consider implementing the programme again. Responses were then transcribed for analysis. Asking open-ended questions of different participants in the research, both pupils and adults, meant that the concepts around the understanding of fake news and the effects of the programme were explored in many different ways and therefore with different meanings, providing one rich dataset.

3.5.2.3 Thematic Analysis

To analyse the qualitative data provided in the participant and interventionist questionnaires, thematic analysis was used. This has the benefit of being independent of theory and epistemology, enabling its application across a range of approaches (Braun & Clarke, 2006; 2017; 2022) and comprising a widely-used method for both identifying and describing the themes within data.

Proudfoot (2022) outlines a case for combining inductive and deductive reasoning in a hybrid approach to thematic analysis, building on the discussion of Hatta *et al*, (2020) which describes an approach, sitting within a mixed methods analysis in which the researcher can move between inductive and deductive analysis. These were analysed in one large, combined dataset in order to both triangulate perspectives and treat all sources of data inclusively and equally. Braun & Clarke (2006) outline the following key steps in the approach:

1. Familiarisation with the data – transcribing, reading and re-reading the data, capturing initial ideas.

2. Generating initial codes – capturing emerging features in the data in a systematic manner via coding and collating the data relevant to each code.

3. Searching for themes – collating the codes identified in step 2 into potential themes.

4. Reviewing the themes – creating a thematic pattern across the whole data set. Braun & Clarke advise that, 'data within themes should cohere together meaningfully, while there should be clear and identifiable distinctions between themes.' (2006, p.20).

5. Defining and naming themes – continuing to analyse the data set and refining the specifics and naming each theme.

6. Producing a report – selection and analysis of examples, relating them back to the research question and literature.

There are several potential risks identified by Braun & Clarke (2006; 2022) that researchers need to take into consideration when conducting this method of analysis. For example, there is the risk that the data will not be truly analysed but instead, simply listed as a collection of extracts with little or no analytic narrative. Alternatively, there may be inconsistency or overlap between the identified themes. Additional risks relate to the claims that are made based upon the analyses, for example if the data extracts

contradict the claims that are made. The interpretations made within a good thematic analysis need to be consistent with the theoretical framework of the study (Braun & Clarke, 2006; 2017). To protect against these risks the researcher will follow the guidance set out by Braun & Clarke (2006; 2022).

Thematic analysis also requires researchers to take decisions regarding the form of analysis selected. The first consideration is whether the analysis should be inductive or deductive in approach. Inductive analysis is strongly linked to the data with themes emerging from this and therefore not necessarily having any relationship to the specific questions asked in the questionnaires (Braun & Clarke, 2006; 2022). With this approach, analysis is not guided by a theoretical interest in the topic. By contrast, deductive analysis is more closely guided by the specific research question and whilst this approach may provide a less rich picture of the data overall, it may instead provide a more detailed picture of one aspect of the data (Braun & Clarke, 2006; 2022). It has been argued that a thematic analysis can be both inductive and deductive (Fereday & Muir-Cochrane, 2006; Braun & Clarke, 2017), however in this study, the researcher has posited a specific research question with which to approach the data and as such the initial analytical approach will be deductive in nature.

A further consideration is whether the approach is undertaken at the semantic or at the latent level. Themes identified at the semantic level are those which have been identified at a spoken, surface level without searching for a deeper meaning in the data (Braun & Clarke, 2006; 2022). Latent approaches, often associated with a constructionist paradigm, go beyond this semantic level in order to attempt to examine the underlying ideas and assumptions within the data via researcher interpretation (Braun & Clarke, 2006; 2022). In the present study the researcher's analysis will consider and examine these latent assumptions within the data with the aim of revealing the sociocultural and structural contexts which give rise to the individual accounts, rather than speculating about individual motivations.

3.5.3 Mixed Methods

As this research uses mixed research methods, consideration must be given to the analysis and integration of the different types of data for final interpretations. The procedures included in this study comprise an embedded sequential mixed methods

design model within which quantitative and qualitative methods are concurrently analysed to provide the researcher with a broader perspective of the phenomenon being investigated (Cresswell & Plano Clark, (2017). Quantitative (quasi-experimental design) measures are collected first, with qualitative data collected in a second phase (questionnaires and interview) to attempt to balance the limitations of each kind against the strengths of the other (Creswell, 2003).

3.5.3.1 Establishing trustworthiness

3.5.3.1.1 Trustworthiness of the quantitative methods

There are three key standards for judging the quality of the measurements used in quantitative research: reliability, validity and objectivity (Mertens, 2015, p.394). Each of these is considered in turn below.

Validity

Internal validity

The aim of the quantitative aspect of this research design is to explore the effects and outcomes of the intervention. It is essential for the researcher to be able to demonstrate that the treatment, and not extraneous variables, is the cause of the outcome. Asking the question of whether any changes in the dependent variable may be caused by any unintended factors is central to establishing internal validity (Mertens, 2015; p130).

Robson & McCartan (2016, p.109) describe two key strategies for addressing threats to internal validity: anticipating these in order to address them before the research, or by using randomisation, which is a key component of true experiments.

Campbell & Stanley (1963) identified potential threats to the internal validity of experimental research designs which need to be considered. This list was later extended (Cook & Campbell, 1979) to include twelve possible threats and this more comprehensive list is presented in the following table with corresponding steps taken in

the study to control for their effects. Taking steps to minimise these threats helps to demonstrate that the treatment in the research is likely to be the cause of the outcome.

Threat to internal validity	Definition	Actions taken to reduce impact
History	Factors in participants' environments which may have changed during the study, e.g. exposure to information about fake news techniques.	The teaching programme sessions and measures took place within a maximum of a two-week period. Class discussions during the teaching programme provided the opportunity for facilitators to ascertain any external influences on participant knowledge.
Testing	Testing at the 'pre' stage may stimulate thinking or create opportunities for practise, prior to the implementation of the intervention.	The pre-testing was combined with initial education in fake news techniques as part of the Bad News Junior game and therefore is integral to the intervention. Both the experimental and control groups participated in the pre-testing.
Instrumentation	Aspects of the measurement itself change between pre and post-test, e.g. revising the definition of a dependent variable between pre and post-test.	The pre and post measurements in this study were developed in advance and were not revised during the study. Pre and post measures were the same.
Regression	Participants who have unusual or outlier qualities may demonstrate performance results which regress to the mean if retested.	The sample population included a range of abilities and views relating to the issues relevant to the study. Interventionists confirmed that there were no known relevant unusual or atypical qualities observed in the participants prior to inclusion in the study.
Mortality	Attrition of participants due to a factor of the treatment.	There was no attrition in any of the study settings and all participants in the experimental groups completed the teaching programme. However, a technical failure meant that Bad News Junior game data from 14 participants across both experimental and control groups was not supplied.
Maturation	Change and development of participants which may impact on the measures	The teaching programme sessions and measures took place within a maximum of a two-week period to

		minimise the possibility of maturation effects.
Selection	Differences between the treatment groups at the point of selection	Ensuring randomisation in group selection
Selection by maturation interaction	The predisposition of the treatment groups to converge or diverge (e.g. if the groups are divided by gender)	Ensuring randomisation in group selection
Ambiguity about causal direction	Confusion between causality and correlation at the point of analysis of results	The study design followed a strictly controlled chronology of pre-test/intervention/post-test
Diffusion of treatments	One group in the same setting may inadvertently be influenced by the other such as a treatment group sharing information with a control group.	Interventionists discouraged explicit diffusion of information however it was not possible to eliminate this threat entirely in this study. Participants may have engaged in discussions about programme materials, for example, during unsupervised time.
Compensatory equalisation of treatments	Pressures from within the wider system for the control group to receive the benefits conferred on the treatment group.	The 'waitlist' study design ensured that all participants were able to experience any benefits after the research was completed.
Compensatory rivalry	This describes the risk that participants in a control group may consider itself under threat from the planned changes affecting the treatment group.	The teaching sessions took part as part of timetable PSHE sessions and therefore participants were unlikely to view session content as planned changes. Typical teaching sessions contain new information and content. Interventionists also ensured that pupils in the control group understood they would also experience the teaching programme at a later date.

Table 13: Threats to the internal validity of experimental research designs (adapted from Robson & McCartan, 2011 after Cook & Campbell, 1979) and mitigating actions taken by the researcher in this study.

External validity

In real world experimental research, the challenge for the researcher is to be able to mitigate internal threats to validity whilst also balancing this with controlling those that may threaten the potential generalisability of the findings. External validity, or generalisability, is the extent to which the findings from one study can be considered applicable to another situation (Gall, Gall & Borg, 2007 in Mertens, 2015). Within the

scope of external validity there are two main sub-types to consider: the extent to which the findings can reliably be generalised to other contexts (ecological validity) or populations (population validity; Mertens, 2015). Internal and external validity can be considered inversely related (Robson & McCartan, 2016), as the laboratory, rather than the field, is the optimal environment for maximising internal validity however the control that this allows is precisely what is least ecologically valid.

Population validity

Population validity describes the extent to which the sampling strategies used to select a sample from the identified population confer generalisability to the entirety of it.

One sample size 'rule of thumb' is 15 observations per group for experimental or quasi-experimental designs which involve group comparisons (Mertens, 2005; Robson & McCartan, 2011, p.144). In an updated version of her sampling guidance, however, Mertens (2015, p.343) recommends 21 participants per group for experimental or quasi-experimental types of research, based on Onwuegbuzie, Jiao & Bostick (2004). This study includes a total sample size of 15 participants in the treatment groups and therefore may be susceptible to this threat to external validity. It was not possible in this real-world context to completely overcome the limitations in the participant sampling methods used, as there were relatively small participant numbers within each group. Therefore, it is essential to acknowledge that external validity is limited within this study and findings cannot be directly generalised to wider populations.

Ecological validity

This describes the extent to which the outcome of research can be generalised from the environmental conditions of the experiment to those of another environment, such as those present in the real world (Mertens, 2015). In this study, the participants were taken from two different primary school settings in different areas and in different Multi-Academy Trusts. This sample selection (engaging with participants 'in the field' rather than in a laboratory setting) and the randomisation procedure maximises the likelihood

that the characteristics and responses of the participants resemble those of the overall Year 6 UK population. Research took place in naturalistic setting as part of the timetabled activity of the school. Robson & McCartan (2011, p.111) argue that replicability is one of the key methods to assess the generalisability of research findings.

In addition, the fake news materials used in both the game and the teaching materials were modelled after real-life examples of fake news stories and techniques.

Additional threats to validity

Intervention fidelity

In order to monitor the fidelity of the intervention, facilitators recorded faithfulness to the materials and contents of the teaching programme, details of any additional materials introduced, numbers of participants who did not meet the learning objectives and numbers in attendance at each session (appendix T). Intervention fidelity was typically high with interventionists reporting 100% adherence to session plans and materials (see Appendix U).

Reliability

Reliability refers to the consistency of the data collection instrument with which something is measured, in order to obtain an accurate measurement (Mertens, 2015). This is achieved by both minimising potential sources of error and gaining an understanding of how much error then remains. The measures used in this research project were selected by the researcher as they are commonly used in research and intervention evaluation (Robson & McCartan, 2016; Jebb, Ng, & Tay, 2021). The literature review (see chapter 2) explored the measurement of the constructs under investigation.

Threat	Definition	Actions taken to reduce impact
Participant error	Individual differences in participant performance, such as tiredness or illness which may affect the outcome of the measure differently on different days.	Whilst an adequate sample size was included in the study to reduce the impact of individual differences, not all of the quantitative data was captured and therefore this threat may remain present in the data.
Participant bias	The risk of participants responding to measures by trying to align responses with the desired result of the researcher or facilitator.	The use of closed response options as part of the Likert scale accuracy measure. The measures do not involve interaction with the facilitator or any feedback from the facilitator about participant responses.
Observer bias	The researcher or facilitator's bias toward or against individual participants may influence their ratings or assessment.	A measure is included which does not rely on facilitator assessment.
Observer error	The researcher or facilitator may make inadvertent errors in their ratings or assessment.	

Table 14: summary of common threats to the internal reliability of experimental research designs (adapted from Robson & McCartan, 2011) and mitigating actions taken by the researcher in this study.

3.5.1.3.2 Trustworthiness of the qualitative methods

In qualitative research, emphasis is placed on strength of internal validity, as it does not seek to demonstrate generalising or triangulation but to explain a phenomenon as it occurs (Mertens, 2015). The three main threats to validity identified by Lincoln & Guba (1985) are researcher bias, reactivity and respondent bias which aligns with their focus on confirmability as a substitute for the objectivity found within quantitative methods (Lewis, 2009)**.** More recently, a much more extensive range of threats to the validity of qualitative research has been outlined by Mertens (2016, p.268) with pertinent criteria found in table 15, along with details of the steps taken by the researcher to minimise their effects.

Quality indicator	Definition	Actions planned to reduce impact
Credibility	*Prolonged and persistent engagement* This requires researchers to ensure that they spend enough time with the data and making observations to avoid premature conclusions.	Whilst no direct observations of participants were made, involvement with the participating schools took place over several months and involved frequent communication and a range of sources of information (e.g. questionnaires, interview, conversation).
	Member checks and peer debriefing This suggests that researchers check in with participants and peers to verify the constructions arising from the data.	Drafts were shared with the researcher's Academic Supervisor and a peer with experience of Thematic Analysis at several stages from initial coding of the data to summary of the data sets. Following the participant interview, an informal check took place to summarise the position of the interviewee.
	Progressive subjectivity Best practice is for researchers to monitor their own changing constructions throughout the process and engage in critical discussions with an experienced or appropriately positioned peer.	The researcher used a reflexive approach which involved recording reflections throughout the process. The researcher also engaged critical discussion via regular supervision. A discussion of researcher reflexivity is also detailed in chapter 6.
Transferability	*Thick description* The researcher should provide an extensive, detailed contextual and factual description to enable readers to judge similarities and differences to their own situation.	This detail has been captured so that readers of the study are able to understand the complexity of the research setting and make their own judgements about the transferability of the research to their own setting or situation.

	Multiple cases This can strengthen external validity of results and may support decisions about generalisation.	This study design does not aim to create generalisable data which lies within the post-positivist paradigm, whilst a significant aspect of this mixed methods study does not. However multiple cases have been included and contributions from both participants and interventionists included.
Dependability	This is comparable with reliability in quantitative research and requires changes over time to be expected and tracked.	Each step of the research process has been recorded and included as part of this study in a fully transparent manner.
Confirmability	This is comparable with objectivity in quantitative research and requires researchers to demonstrate that data are traceable to their source and the process of interpretation is explicit.	The reflexive approach to analysis provides a clear description of the stages and processes of the Thematic Analysis. A process audit trail is included via appendices.

Table 15: summary of threats to the validity of qualitative research with actions planned to reduce their impact

Each of the actions taken, detailed in table 15, are employed as a method of guarding against possible threats to validity and will be considered during the integration of the data in this study.

3.6 Ethical considerations

As the researcher was working as a Trainee Educational Psychologist in a local Educational Psychology practice in the region in which this study took place, the Professional Practice Guidelines of the Division of Educational and Child Psychology (DECP; British Psychological Society, 2002) were followed. In addition, the ethical principles adhered to in this study included those set out by the British Psychological Society's Guidelines for minimum standards of ethical approval in psychological research (BPS, 2004), Code of Ethics and Conduct (BPS, 2021), Code of Human Research Ethics (BPS, 2010) and the University of Nottingham (UoN) Code of Research Conduct and Research Ethics (UoN, 2009). Obtaining ethical approval is an essential

requirement of doctoral psychological research (BPS, 2004 & UoN, 2009), and the researcher's study proposal was submitted in December 2021 in accordance with UoN procedures to enable Academic Tutors to scrutinise the design and ethical safeguards within the research. In addition, the researcher was in receipt of academic supervision throughout the duration of the research study, in accordance with the BPS (2010) guidelines regarding supervision of Trainee Educational Psychologists and student investigators.

3.6.1 Informed consent

Individual consent was obtained for participants via written agreement from their parents/carers once they were allocated a place in the study via stakeholder consent from the school's head teacher and Year 6 class teacher/s (appendices H, I and J). Parents/carers were also provided with a summary of the study, risk assessment and information on GDPR to inform their decision (appendices K, L and M).

3.6.2 Risk and mitigations

Key identified areas for detailed ethical consideration, referring to procedures which were likely to carry minimal risk, included the following:

Prolonged testing or multiple sessions with the same participant.

This was mitigated via the implementation of the teaching programme using the participants existing teaching arrangements. Testing via pre- and post- measures comprised only two short assessments which were administered by their class teacher.

Procedures likely to change participants' mood, be aversive or stressful.

Whilst it is possible that exposure to some of the fake news stories and materials within the sessions could have the potential to be aversive or stressful, this was be mitigated by ensuring that participants were provided with the right to withdraw (temporarily or

permanently) from a session and would then be provided with further support from their teacher following the session. The teaching and testing materials were created or amended by the Researcher to ensure that examples of both fake and real news items did not include current affairs topics that would be likely to be controversial or distressing.

Additionally, the game forewarns participants that playing the game will expose them to potentially challenging content.

3.6.3 Duty of care

The researcher provided all participants (via their parents/carers) and stakeholders with contact details for the researcher, their Academic Supervisor and the University of Nottingham Ethics Committee prior to commencing the study. This enabled any questions to be raised and addressed directly in advance of or during the study. The class teachers, as interventionists, were encouraged to monitor participants' wellbeing throughout the research and ways to provide support were discussed. The class teacher also delivered a debrief script (appendix V) following the post-measures, to ensure that participants understood that the study was over and that they could raise any questions or concerns.

3.6.4 Right to withdraw

In addition to the standard considerations around consent, all participants (both schools and individuals) had the right to withdraw (British Psychological Society, Code of Ethics and Conduct, 2021). Additionally, participant consent to for completion of the game and survey was obtained via the pre and post measures in the game, which involved an option to withdraw from the testing procedure (appendix W) by selecting the appropriate option from the options menu.

3.6.5 Debriefing

Provision was made for debriefing at the end of the study, with the opportunity for participants to share any difficulties or distress, so that additional support could be provided (appendix V). No participants or parents/carers reported a need for additional support.

3.6.6 Anonymity and confidentiality

BPS (2021) guidance requires all information obtained during research to be treated with confidentiality unless participants have agreed otherwise in advance. Identities of all participants and individuals involved in the study, including staff and parents/carers, have been protected at all times in line with GDPR requirements. Consent forms have been securely stored to safeguard the confidentiality of those involved in the study.

No individual participant identifying information was collected. The participants and their parents/carers were also provided with a statement outlining the study, the data collection and storage procedure and assurances around confidentiality, anonymity and the participants' right to withdraw.

3.7 Summary

The results and findings of this mixed methods study are presented in the following chapter.

4. Results

4.1 Introduction

This chapter presents both the quantitative and qualitative data gathered during the current mixed methods study. Firstly, exploratory quantitative data around the impact of the critical thinking skills teaching programme on pupils' ability to identify fake news will be presented. This will consist of descriptive statistical analysis of pupil responses to the teaching programme and the Bad News Junior (BNJ) online game. The overall research question asks:

What are the outcomes of a bespoke critical thinking skills programme on children and young people's ability to identify 'fake news'?

Further sub-questions are asked in this research, which will be explored in the second part of this chapter:

1. Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?

2. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?

The second part of this chapter will comprise a reflexive thematic analysis of the qualitative transcript data from both pupil and teacher questionnaires and one class teacher interview. The qualitative data explores factors that participants felt to be influential to the implementation and outcomes of the programme. The findings from both qualitative and quantitative analyses are then triangulated in order to strengthen conclusions, which will be discussed in more depth in chapter 5.

4.2 Quantitative data and analysis

To support the reader in the interpretation of the following quantitative analyses, table 16 provides an overview of the dependent variables measured in this study, as well as the direction of change anticipated, where applicable.

Measure	Respondents	Hypothesised direction of change
Ability to identify fake news stories correctly (as measured via the Bad News Junior game)	Pupils	Decrease scores from pre to post assessment
Ability to identify true news stories correctly (as measured via the Bad News Junior game)	Pupils	Increase scores from pre to post assessment
Ability to correctly identify news stories overall (as measured via the Bad News Junior game)	Pupils	Decrease scores from pre to post assessment

Table 16: The dependent variables employed in the study and the hypothesised directions of change

This section considers the following research question, testing the subsequent experimental hypotheses:

What are the outcomes of a bespoke critical thinking skills programme on children and young people's ability to identify 'fake news'?

4.2.1 Experimental Hypothesis

Pupil ability to correctly identify fake news and true news will increase from pre to post-test.

A range of dependant variables were measured in the exploration of these hypotheses. In order to determine the impact of the critical thinking skills programme, it is necessary to undertake preliminary data analyses using descriptive statistics. This will establish

whether any of the variables violate the assumptions underlying the range of statistical techniques that may be employed in addressing the research question (Pallant, 2020).

Whilst the design of this study included an expectation of performing inferential statistical analyses, this was affected by an initial lower sample size than expected in each school, due to difficulties with obtaining the anticipated number of parental consents for study participants. This resulted in an overall sample size, across both settings, of *n*=22 including both experimental and control groups. This reduction was further compounded by a substantial loss of the data at both pre and post stages in the Bad News Junior online measure. Whilst all participants played the game in full and completed the assessment of their ability to identify fake and real news stories, technical factors meant that not all of this was captured, with recorded results for only *n*=6 participants across both schools. Repeating these measures would have risked possible practice effects and therefore had a consequent impact on the ability to perform inferential statistics, meaning that it was only possible to undertake a descriptive statistical analysis.

4.2.2 Descriptive statistics

4.2.2.1 Measures of normality

4.2.2.1.1 Distribution of the data

Before considering any inferential statistics, it must be established whether the data is normally distributed, as parametric statistics assume a normal distribution of data (Mertens, 2010) which must be demonstrated rather than assumed. Statistical tests and conclusions are based around the principle that if the data comes from a sample which can be seen to be representative of the population it comes from (in this study: year 6 school pupils), inferences can be made about the population. Although this is one of the bases on which the research question is being answered in this study, it must be noted that caution is required throughout: ‘Inferences regarding the population are always a little risky’ (Tabachnik & Fidell, 2013, p.65).

Shapiro-Wilk test

The Shapiro–Wilk test can be utilised, as a ‘goodness-of-fit’ test preferable to the standard Kolmogorov-Smirnov test when working with small sample sizes of n=>2 (Steinskog, Tjostheim & Kvamsto, 2007). A non-significant result using the Shapiro-Wilk test (>0.05) would indicate normally distributed data (Pallant, 2020).

Skewness

Whilst the Shapiro-Wilk test is used to determine normality of the data, the skewness of the distribution is also measured (see table 17). A skewness value of 0 indicates that the distribution is not skewed, whereas negative values indicate a negatively skewed distribution and positive values indicate a positively skewed distribution (Dancey & Reidy, 2020). A general rule is that skewness values of over 1 or below -1 indicate that the data is not sufficiently normally distributed to meet the assumptions of parametric tests (Dancey & Reidy, 2020).

As skewness can affect analysis (Pallant, 2020, p.57) advises reporting non-parametric descriptive statistics, as these do not assume that the data has a normal distribution. If the sample size is large enough, the likelihood that skewness will have a large impact on the analysis is reduced (Pallant, 2020), however in this study, the sample size is small and skewness is observed for some dependent variables (highlighted in table 17).

Kurtosis

Kurtosis provides information about the presence of outliers in the data, which would preclude the assumption that the population of the study is normal. As with skewness, kurtosis can also have an impact on the analysis of the distribution of the data, and as with skewness, a sufficiently large sample of over 200 participants (Tabachnik & Fidell, 2013, quoted in Pallant, 2020) could mitigate the risk of underestimation of variance. As the participant numbers are not sufficiently close to the relevant sample size, the shape of the distribution can instead be inspected visually.

Variance of the Data

In order to establish which form of inferential statistical tests should be used, it was necessary to analyse the distribution of the data. Histograms and Q-Q plots were created and analysed visually, then statistical analyses were carried out in the form of skewness, kurtosis and Shapiro-Wilk analyses, in order to establish the significance of the distribution.

Tests of Normality						
Dependent variable	**Group**	**Shapiro-Wilk**			**Skewness**	
		Statistic	**df**	**Sig.**	**Statistic**	**Std. error**
Ability to identify fake news stories correctly (pre-test)	Experimental	.981	4	.906	-.456	1.014
	Control	Sample size too small				
Ability to identify true news stories correctly (pre-test)	Experimental	.849	2	.224	-.370	1.014
	Control	Sample size too small				
Total score* for identifying true and false news stories correctly (pre-test)	Experimental	.878	4	.332	-.130	1.014
	Control	Sample size too small				
Ability to identify fake news stories correctly (post-test)	Experimental	Sample size too small				
	Control	.729	4	.024	0	1.014
Ability to identify true news stories correctly (post-test)	Experimental	Sample size too small				
	Control	.729	4	.024	0	1.014
Total score* for identifying true and false news stories correctly (post-test)	Experimental	Sample size too small				
	Control	.729	4	.024	0	1.014
Pupil critical thinking skills as a result of the teaching programme (teacher assessed using 0-7 scale)	Experimental	.819	15	.007	**-1.283**	.580
	Control	-	-	-	**-**	-
Pupil ability to identify fake news as a result of the teaching programme (teacher assessed using 0-7 scale)	Experimental	.841	15	.013	**-1.658**	.580
	Control	-	-	-	-	-
Pupil confidence toward identifying fake news (self-rated scale of 0-10)	Experimental	.921	9	.399	-.717	.717
	Control	-	-	-	-	-
Pupil enjoyment of the teaching programme (self-rated scale of 0-5)	Experimental	.655	9	**<0.001**	.271	.717
	Control	**-**	**-**	**-**	**-**	**-**

*Includes ‘true’ items reversed

Table 17: tests of the distribution of the data across groups for each variable with non-normal results highlighted in bold.

4.2.2.1.2 Visual analysis

Visual inspection of the histograms did not yield valuable data due to the small sample size. When sample sizes are low, each bar on the histogram does not contain enough data points to accurately show the distribution of the data. 5-8 is considered the approximate minimum number of data points (Nuzzo, 2019). The minimum is not met here and therefore this visual analysis is not included in the study findings.

Quantile-quantile plots (Q-Q plots) for each measure were also visually analysed. Pallant (2020, p.64) states that a 'reasonably straight line' suggests normal distribution and the analysis identified no data points which appear extreme and could therefore be described as outliers (see appendix X).

Overall, visual analyses indicate that the data appears to be normally distributed, although it should be noted that is view tentatively as small sample sizes limit the strength of this observation.

4.2.2.2.2 Tests of normality

The results of the preliminary analyses show that much of the data is normally distributed. The sig. values (see table 17) all have a value higher than .05, other than the pupil ratings of enjoyment of the teaching programme, indicating significance for the measures of identifying true and fake news stories, pupil confidence, teacher ratings of pupil ability to identify fake news and of critical thinking skills) and therefore that an assumption of normality can be made.

Skewness values fall within the range of +1 or -1 of the normal distribution's skewness and therefore can also be considered to indicate normality with the exception of both of the pupil ratings, which therefore cannot be assumed to be normally distributed.

However, whilst these indications of normality are positive outcomes, they must be met with caution, as several of the assumptions that apply to the use of parametric tests

have not been robustly met. It is not clear that the sample is normally distributed (Pallant, 2020). Although the Shapiro-Wilk test is suitable for small sample sizes, the control group (n=2) was too small to generate a valid score and therefore it was not possible to determine normal distribution for this group. Taking into consideration the very low sample size the researcher has chosen to employ descriptive statistics over inferential statistics in order to avoid inferences which are too speculative.

4.2.2.2.3 Measures of central tendency

Central tendency is the aim of generating a single figure to represent a typical value for the level of the distribution. In psychological research, the arithmetic mean is typically the most commonly used measure of central tendency (Robson & McCartan, 2016). There are also other measures of central tendency: the median average and mode, which are also included in table 18.

Measures of central tendency and variability					
Dependent variable	**Group**	**Mean**	**Median**	**Standard deviation**	**Range**
Ability to identify fake news stories correctly (pre-test)	Experimental	24	25	10.392	24
	Control	17.5	17.5	.707	1
Ability to identify true news stories correctly (pre-test)	Experimental	11.5	12	3	6
	Control	9	9	2.828	4
Total score* for identifying true and false news stories correctly (pre-test)	Experimental	28.5	29	8.851	18
	Control	24.5	24.5	3.536	5
Ability to identify fake news stories correctly (post-test)	Experimental	13.5	13.5	3.536	5
	Control	11	11	6.928	12
Ability to identify true news stories correctly (post-test)	Experimental	13.5	13.5	.707	1
	Control	11	11	3.464	6
Total score* for identifying true and false news stories correctly (post-test)	Experimental	16	16	4.243	6
	Control	16	16	10.392	18
Pupil critical thinking skills as a result of the teaching programme (teacher assessed using 0-7 scale)	Experimental	5.3	5	1.279	5
	Control	-	-	-	-
Pupil ability to identify fake news as a result of the teaching programme (teacher assessed using 0-7 scale)	Experimental	4.9	6	1.698	7
	Control	-	-	-	-
Pupil confidence toward identifying fake news (self-rated scale 0-10)	Experimental	7.3	7.5	2.22	7
	Control	-	-	-	-
Pupil enjoyment of the teaching programme (self-rated scale of 0-5)	Experimental	4.4	4	0.53	1
	Control	-	-	-	-

*Includes 'true' items reversed

Table 18: Mean, Median, Standard Deviation and Range scores across groups for each variable.

Across normally distributed data, without the effects of skewness, the mean and median averages can give an indication of the central tendency of a dataset. If skewness is low, the mean and median scores would be expected to be the same or similar to one another. Lower overall scores would be expected in the experimental group at post-test, compared with the control group, if the data follows the hypothesised direction of change, as the score reflects a 'believability' rating.

Comparisons of the differences between pre and post mean average scores for the experimental and control groups are shown in table 19:

Dependent variable	Mean average score at pre-test	Mean average score at post-test	Difference	Group
Ability to identify fake news stories correctly	24	13.5	-10.5	Experimental
	17.5	11	-6.5	Control
Ability to identify true news stories correctly	11.5	13.5	+2	Experimental
	9	11	+2	Control

Table 19: Differences in Mean Average scores from pre to post test across both conditions.

The experimental group data shows that from pre to post-test, the total mean score for the experimental group reduces from a mean of 28.5 to 16, which follows the hypothesised direction of change. In the control group this score also decreased from a mean average of 24.5 to 16 indicating that the direction of change is the same as the experimental group, but that the difference between the pre and post test scores is less for the control group. For the measure of identifying true news stories correctly, both conditions saw an increase of 2 in their mean average score, in the hypothesised direction of change.

Supplementary information was also obtained to reflect teachers' assessment of the pupils' development of critical thinking skills and the ability to identify fake news. These indicate average scores in the higher range, with histograms also included in appendix Y for visual analysis.

Median scores

The median is often considered in research involving a small sample, as it is less likely to be influenced by extreme scores (Dancey & Reidy, 2020). The median scores for each condition (experimental and control conditions) are included in table 20, for each dependent variable:

Dependant variable	Median score			
	Experimental condition		Control group	
	Pre	Post	Pre	Post
Ability to identify fake news stories correctly	25	13.5	17.5	11
Ability to identify true news stories correctly	12	13.5	9	11
Total score* for identifying true and false news stories correctly	29	16	24.5	16

*Includes 'true' items reversed

Table 20: Median scores across groups for each variable.

4.2.3 Inferential statistics

4.2.3.1 Between-group Comparisons

Similarity at post-test

Mann-Whitney U tests were performed on post-test data to investigate any differences between the intervention and the control groups following the implementation of the programme. The Mann-Whitney U test is employed for comparison between two independent samples when the sample distributions are not normally distributed and the sample sizes are small. It is a non-parametric equivalent to the independent-samples t-test, but compares medians rather than means (Pallant, 2020). The finding suggests that the differences between the groups are not significant and therefore cannot be used to support the hypothesis that the programme makes a significant difference to pupils' ability to identify fake news. As findings from this analysis are not statistically significant, the researcher is not able to use these to support any conclusions about the research question.

Source	Dependent Variable	Intervention Group		Control group		U value	Z score	P
		Median Score	Group size (n)	Median Score	Group size (n)			
BNJ game	Ability to identify fake news	**13.5**	**4**	**11**	**2**	**2**	**0**	**1**

Table 21: comparison between variables for intervention and control groups, with scores that are not statistically significant highlighted in bold.

4.2.3 Summary of findings

Descriptive data was accessed and analysed visually (see table 21). Analysis of median scores indicated that the participants' ability to identify fake news stories decreased across both conditions (in line with the desired direction of change) however a greater difference was observed in the experimental group.

The ability of participants to identify true news stories correctly increased across both conditions (in line with the desired direction of change) however there was a greater difference observed in the control group. Changes in median scores were similar, with a shift of 1.5 in the experimental condition and 2 in the control group.

The overall total score for identifying true and false news stories correctly was observed to decrease across both conditions (in line with the desired direction of change) however a greater difference was observed in the experimental group. Supplementary assessments obtained from teachers also indicated that the children in experimental group were viewed as generally being able to recognise fake news and apply critical thinking skills, at the end of the programme.

An observed effect (along the hypothesised direction of change) was expected for both the control and experimental groups as both groups were exposed to the disinformation techniques presented in the BNJ game. However as only the experimental group was exposed to the main treatment of the teaching programme, a greater effect (either an increase or decrease, as relevant for each DV) was predicted for these participants. For two of the three measures there was an indication of improvement, as the change in score observed in the experimental group was slightly larger, although due to the small size of the sample it is not possible to determine if the difference observed is significant.

Interpretation of the findings from these analyses is limited by the small sample sizes and the assumptions that can be made about the data. The assumptions for the use of parametric tests were not met and the non-parametric analysis did not yield results of statistical significance. It was not therefore possible to determine whether the changes observed represent statistically significant differences between pre and post-test scores across groups, which would enable firmer conclusions to be drawn. The changes observed round the impact and effectiveness of the programme must therefore be treated cautiously with any interpretations being viewed as hypothetical.

4.3 Qualitative Data Coding and Analysis

4.3.1 Introduction

Five main themes and seventeen subthemes were identified within the data which will be discussed in relation to the research questions. During the introduction of these themes, quantitative language may be used to describe the approximate proportion of participants whose views are represented in that theme's development. Within reflexive thematic analysis, a theme's frequency in the dataset is not a measure of its relevance in answering the research questions. However, the purpose of utilising this language is to indicate patterns or consistencies of the theme across the dataset, enabling the reader to interpret findings with the full understanding of what may be minority and majority views across participants.

The overall research question asks:

What are the outcomes of a bespoke critical thinking skills programme on children and young people's ability to identify 'fake news'?

This is further differentiated into the following sub-questions which will be explored in more detail:

1. Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?

2. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?

As a pragmatic approach is taken in this study, there is an emphasis on actionable findings relevant to educational interventions. The dataset was considered in the light of the research questions and analysed by an initial search for factors which were felt to relate to these questions. As these were applied deductively to the dataset, these are

not captured as themes, however the data is organised and findings presented in relation to these two key areas (see fig. 4).

An initial deductive approach was brought to the data to inform analysis of the themes by providing areas of focus which arose from the review of the literature and the research question. Subsequently, within this framework, an inductive approach enabled the data to determine themes and for the researcher to construct a final overall thematic map combining the deductive and inductive analysis results (fig. 4).

1. *Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?*

In relation to factors which were felt to answer this research sub-question, the following three main themes were constructed from the participant and interventionist responses:

1. **Development of pupil knowledge and skills (in relation to fake news and critical thinking skills).**
2. **Real-world relevance and applicability to the lives of the participants.**
3. **General benefits within the school system.**

In relation to factors which were felt to answer the second research sub-question:

2. *What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?*

Two further main themes were constructed from the participant and interventionist responses:

4. **Identifying the practical and logistical challenges of implementation.**

5. **Future direction and implementation (elements to keep, enhance or change).**

4.3.3 Rationale for a single analysis

Questionnaires from participants and interventionists were collated and stored initially, with the in-depth interview with one teacher taking place at the final data-gathering stage, in order to adhere to the planned approach of treating all the responses as a combined dataset. The voices of the child participants were also given an equal status to those of the adults, as all of the data was treated inclusively. In addition, this recognised that a researcher must necessarily occupy a position and bring some assumptions when reading data (Braun, Clarke & Hayfield, 2019) and the researcher exercised a desire to avoid premature interpretation of some data which might subsequently colour the interpretation of others. Furthermore, the findings were compared and contrasted in stages 4-5 (see below) to support possible triangulation with results from the quantitative element of this study.

4.3.3 Constructing themes from the data

Two areas of focus were chosen by the researcher, led by the focus of the overall research question. Themes were then constructed from the data provided by the participants and facilitators. The dataset overall incorporated five main themes and seventeen sub-themes, displayed as thematic maps in fig. 4. Through exploring each of the themes relating to these two aspects of the research, insight was gained into the effects of the teaching programme in this study. Additionally, the data provides an understanding of the hidden factors, interpreted by the researcher, which show what the participants are viewing as influential to programme and its outcomes.

4.3.4 Stages of analysis

Qualitative data was gathered via questionnaires from both the class teachers and pupils involved in the intervention. A more in-depth interview was undertaken with one of the teachers in addition to their questionnaire responses. The interview data was recorded using a digital recording device and transcribed verbatim including fillers and

pauses as well as interviewer contributions. As the data collected from the survey was written this was not transcribed. The author conducted a Reflexive Thematic Analysis based on Braun & Clarke's (2006; 2022) model, the stages of which are set out below:

1. *Familiarisation with the data*

Transcriptions were checked for accuracy against the digital recording which also enabled the researcher to begin the process of immersion in the data, as this enabled exposure to the data in the form of printed words as well as information presented audibly. This was to create a rich and coherent picture of data for the researcher which reflected what participants shared. Whilst reading and listening, notes were made of any initial ideas or areas of interest from within the data.

2. *Generating the initial codes*

Once the author felt familiar with the dataset, the process of generating initial codes followed. At this stage of the analytical process, codes are not required to coalesce into any coherent framework of themes or meaning, but are intended to capture single concepts (Braun & Clarke, 2006; 2022). As this analysis takes an approach of analysis at the latent level of the data, which includes what is considered by the researcher to be examples of implicit meaning. Codes identified by the author were initially written out and listed alongside the relevant section of text (see appendix Z). These labels were then organised together into what seemed to be meaningful groups in the light of the research question. This was an iterative process, undertaken over three cycles, in which reflection on the data and codes was followed by revisiting the data to check the validity of the identified codes and make amendments.

3. *Generating initial themes*

Braun & Clarke (2022) emphasise that this is not a process of searching for themes, but constructing them, based around the data and research question as well as shaping this by the researcher's insights. Once all codes had been established and organised into initial groups, these were given early labels for this stage of analysis. This stage works at the level of broader, shared meaning, rather than individual codes (Braun & Clarke, 2022). The researcher created two different visual representations of these initial labels, as potential themes and sub-themes (see appendix AA). At this stage, themes and

subthemes (candidate themes) were acknowledged to be preliminary and treated as labels which could be revised and refined.

During this process, as the analysis included both deductive and inductive elements (Proudfoot, 2021), two dimensions of the overall research question were included in the questionnaires and interviews in order to elicit information relevant to the interests of the study. Within these two key areas, broad main themes, and then several subthemes were identified during the coding process. Each of these will later be discussed in order to demonstrate why the data are important (Braun, Clarke & Hayfield, 2019) and what this rendering tells us about the teaching programme in this research.

4. Developing and reviewing themes

This phase involved assessment of the initial fit of the candidate themes in relation to the entire data set. Here, Braun & Clarke note that 'radical revision' is common (2022, p.35) as themes may be combined, discarded or expanded. For example, the researcher removed a sub-theme around the difficulties of gaining consent for participation in the study, which was described by interventionists as a factor which had a negative impact on their implementation of the teaching programme as the researcher interpreted this as being related to the research process rather than the intervention.

During this phase the researcher also made some revisions to the candidate themes, noticing links between some which seemed to represent relationships between candidate themes across different main themes and sometimes relating to both research sub-questions. These connections indicated something significant about the story of the dataset as a whole: that it reflected some of the tensions and contradictions present in classrooms, such as some teacher perceptions.

5. Refining, defining and naming themes

This final process involved refining the specifics of each theme by generating names which both define and describe each theme. Braun & Clarke's guidance (2022, p.112) cautions against these being too much like a descriptive summary of the data, advising instead that the theme name should 'signal its meaning and analytic direction'. The aim

therefore is to provide a clear description of what each theme represents, illustrated by extracts from the data sets and a narrative as to the relevance of the theme.

6. Writing up

Braun & Clarke (2022) describe this as the phase of formalising the many types of writing which have taken place throughout the analysis, such as journals and notes. It allows the researcher to consider the overview of the dataset's narrative and requires them to communicate this in a cohesive narrative through the use of extracts from the data, which addresses the research question.

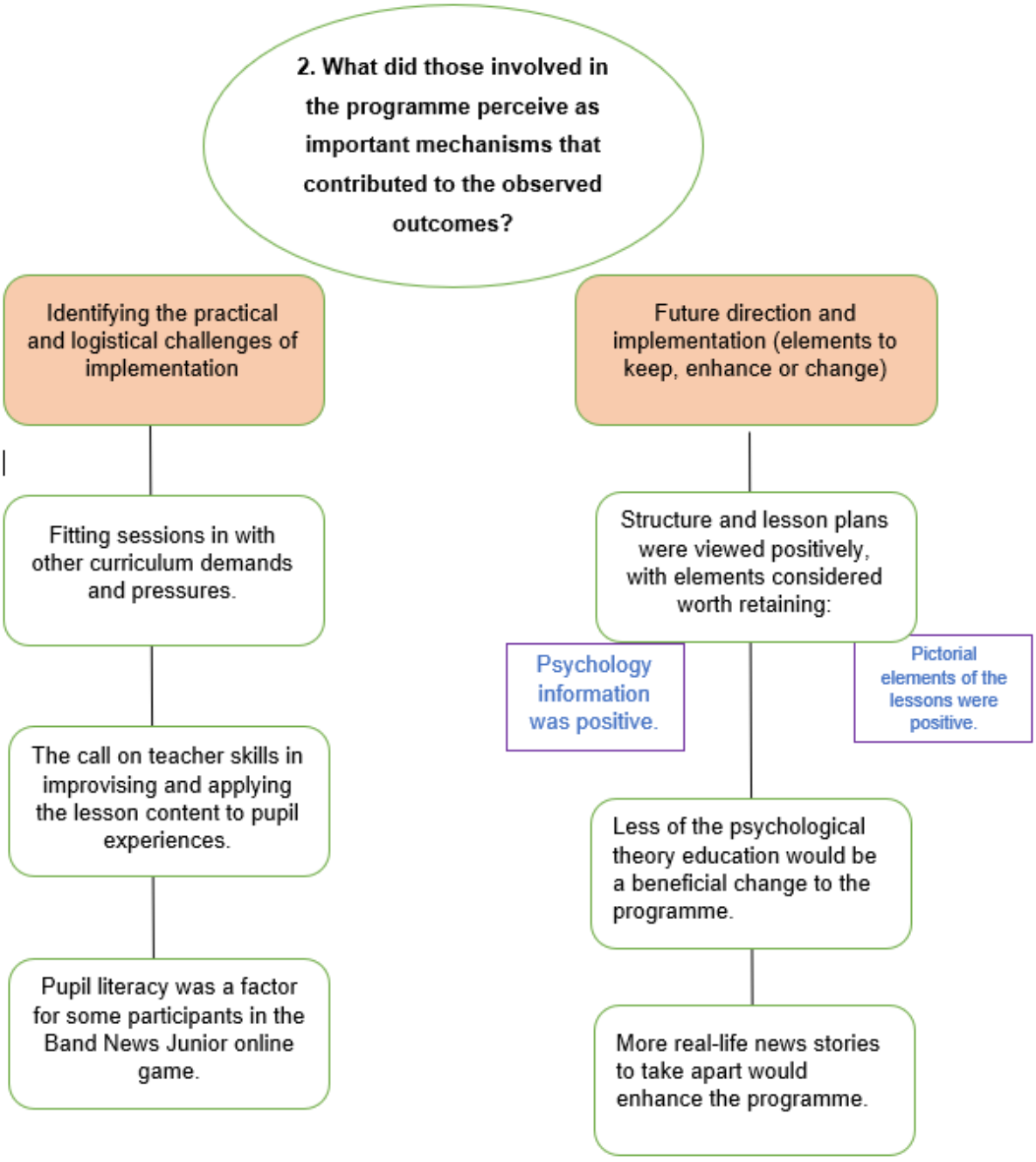
It is worth noting here that a common procedure for verifying the themes identified, by inviting a second rater to analyse the dataset and measuring areas of agreement, was not employed. Measuring inter-rater agreement and achieving a sufficiently high percentage is considered by some researchers to indicate that the themes are a reliable representation of the dataset (e.g. Joffe, 2012). However, as the approach in this study is a Reflexive Thematic Analysis, rather than the more positivist 'codebook' approach to Thematic Analysis (Wiltshire & Ronkainen, 2021; Braun & Clarke, 2022), minimising researcher subjectivity was not the main goal of the constructivist component of this mixed methods study. This approach embraces the values of qualitative research and therefore the subjective skills of the researcher are also embraced. Braun & Clarke (2020) have suggested that the use of a research team is both unnecessary and undesirable in relation to good quality analysis. As the researcher is positioned as active in shaping the 'output' of the analysis (p.236, Braun & Clarke, 2022) in this study, their position is not a threat to the quality of the analysis.

4.3.5 Themes from the dataset

The five main themes and seventeen subthemes identified within the data are displayed visually as thematic maps (fig. 4). In the following sections, the themes will be explicated in detail, alongside reflexive analysis from the researcher.

Figure 4: Map of themes constructed from the dataset in relation to the two research sub-questions.

KEY:
Research sub-questions = circled
Main themes = shaded boxes
Sub-themes = no colour
Third order themes = blue text



4.3.5.1 Research sub-question 1

In relation to factors which were felt to make a difference to children's ability to identify fake news, according to teacher and pupil participants, the following three main themes were constructed from the participant and interventionist responses:

1. **Development of pupil knowledge and skills (in relation to fake news and critical thinking skills).**
2. **Real-world relevance and applicability to the lives of the participants.**
3. **General benefits within the school system.**

Each of these encapsulated a number of sub-themes, which are set out beneath the main themes in the thematic maps (fig. 4) to visually represent the hierarchical relationship between these strata of information. Each sub-theme comes from the main theme it is recorded under. Using Braun & Clarke's (2022) six phase approach the researcher attempted to identify the latent meaning underpinning participants responses. Each theme will be discussed in turn, in the context of their more detailed sub-themes.

1. **Development of pupil knowledge and skills (in relation to fake news and critical thinking skills).**

This main theme describes the ways in which the programme has been viewed by the participants as influencing the outcomes. In particular, this theme relates to specific knowledge and skills that the pupils are reported to have developed, and what are the distinct areas of this discussed by the participants. Sub-themes providing a richer illustration of this theme are:

Development of critical thinking skills and concepts.

Increased awareness of key factors around news and information.

Pupils developed knowledge of cognitive biases.

These three sub-themes will be discussed in more detail in turn. The first sub-theme developed in relation to this key aspect of the research, is:

Development of critical thinking skills and concepts.

This subtheme focused on the skills demonstrated by the pupils and observed by the adults across the course of the programme. Pupils' views suggested that many were aware of this progress and viewed it as a positive development in their learning. Further details recorded in three specific related areas (third-order themes) are listed below.

Although this is not an essential step in Thematic Analysis (Braun & Clarke, 2006; 2022), and it has not been completed for every sub-theme, this level of detail was considered necessary by the researcher in order to capture the breadth and complexity of the data for this and some of the other sub-themes later in the analysis.

- Greater insight into the distinction between opinion vs fact when presented with information.
- Development of debate and discussion skills.
- Why fake news is 'bad.'

Each of these will be considered in turn, to further illustrate the sub-theme with the level of detail considered to be required at the analysis stage, as this sub-theme comprises distinct elements (third-order themes).

- Greater insight into the distinction between opinion vs fact when presented with information.

One teacher involved in the implementation of the intervention shared that this was observed when pupils actively engaged with the programme contents via a subject which they already had knowledge and opinions around:

> 'Some presented … facts on dogs and cats, and the discussion between opinions and facts and how that can change.' [Teacher 2]

> 'I've got 8/10 confidence now, like about the adverts on Youtube that flash up… that you have to be careful.' [Pupil 1]

Therefore, the greater insight described in this third-order theme rests in part on enabling pupils to link the programme knowledge to something they already had an understand of and an interest in.

- Development of debate and discussion skills.

Participant responses seemed to suggest that the development of discussion and debate was an important part of development of critical thinking and it appears to have emerged as a product of teacher skills and interpretation of the materials, as well as responsiveness in real time to what was successfully engaging their students. For example, teacher 2 noted that:

> ‘So by the end of the first session, what I did with them, I told them, right … for the next session I want you to be able to present your evidence … in the form of: you’re going to listen to each other and then we’re going to discuss the, kind of, validity of what you’ve said.’ [Teacher 2]

And later:

> ‘It was a kind of discussion behind that as well … I think it was after the Bandwagon Effect.’ [Teacher 1]

Here, these sub-themes are largely informed by adult contributions as they described their observations of pupils progress towards the programme’s learning objectives over the three sessions. The dataset reflected that teachers seemed to be more concerned with measuring progress than the children, possibly as a natural consequence of their role, however the children’s voices are captured where they appear in relation to further themes. Many pupils contributed to the following third-order theme, with several describing succinctly the importance of the knowledge they had gained as a result of the programme:

- Why fake news is ‘bad’

In one sense this area of the dataset speaks to the heart of the overall aim of the research project, which seeks to explore young people’s ability to identify fake news. Participants highlighted how the programme supported their exploration of the concept of fake news and to consider the motives behind, and consequences of, fake news. Participant knowledge of ‘why fake news is bad’ is captured here as a demonstration of how concepts around news and disinformation have been developed by the programme. As this pupil describes, their concepts do not just encompass ways to identify fake news, but an appreciation of the purpose of that:

> ‘I learnt *why* fake news is bad.’ [emphasis added] [Pupil 2]

And one teacher described the children’s conceptualisation of why fake news may not be what it appears:

> ‘I think the children were able to recognise … when somebody may have another motive for doing something.’ [Teacher 1]

The second sub-theme developed in relation to this key area of the research, is:

> *Increased awareness of key factors around news and information.*

The distinct components of these key factors are captured in three third-order themes. The identification of fake news and valid news were viewed by the participants as being separate, which may have arisen from separate treatment of these in the teaching materials. Pupils also shared an increased awareness of the common cognitive pitfalls which might lead to misidentifying fake or real news. The three third order themes are:

- How to identify fake news.
- How to identify valid news sources.
- Potential traps.

Participants felt that one of the outcomes of the programme was an increase in the awareness of these key factors around news and information. They also seemed to feel that it may support children to develop metacognitive skills and understanding of their own development. Children appeared to know what they could do and that their awareness had shifted.

- How to identify fake news.

> ‘They [the pupils] told me a step-by-step approach of how to question … a news story for believability purposes.’ [Teacher 1]

‘I learnt how to see if news is fake.’ [Pupil 3]

‘I learnt to be aware of what you accept online.’ [Pupil 4]

- How to identify valid news sources

This element of the programme is incorporated into both the game and the classroom sessions, aiming to elevate critical thinking above a generic cynicism toward all news, which would confer accuracy in measures of scepticism toward fake news, without requiring the desired underlying critical thinking skills. As well as being captured in a separate measure within the quantitative dataset (see table 22), views of the participants indicated that this separate skill emerged as an observable outcome in the classroom. One teacher discussed their view that the children had an increased awareness, as a result of the programme, that questioning validity is something that takes place as part of reading and evaluating news online.

‘To have the awareness of, you know, is that actually a valid source and where does it come from?’ [Teacher 2]

- Potential traps

The ‘traps’ referred to here relate to the thinking traps described in the teaching programme (see appendix O), representing mistakes in thinking put into action, which several pupils appeared to recollect and mention as a point of learning:

‘Don’t fall into any fake news traps.’ [Pupil 5]

‘Important learning – to not believe everything you see on the internet.’ [Pupil 6]

And

‘Whenever there is news, we need to stop, think, question, decide.’ [Pupil 2]

Caution must be exercised against taking interpretations beyond what the dataset allows. The measures used (both qualitative and quantitative) do not extend to establishing whether the relationship between the programme and these themes endures over time, however responses from pupils and teachers were interpreted as indicating that the programme seemed to help pupils to develop knowledge of identifying both fake and real news as well as their own cognitive biases. The final sub-theme is:

Pupils developed knowledge of cognitive biases.

One teacher shared their own insight, which indicates a degree of security in their views around cognitive bias, possibly engendering confidence in delivering sessions around cognitive bias:

‘You know, everything’s biased isn’t it? You can say that.’ [Teacher 2]

Whilst this is not a direct illustration of how pupil knowledge may have developed, this hints at a possible contributing factor. Within the relationship between teacher and pupil, this interventionist response indicates that there may also be a connection between the teacher’s subject knowledge and the facilitating of pupil knowledge. The *‘development of pupil knowledge and skills (in relation to fake news and critical thinking skills)’* is a key theme in relation to the overall research question of the study and the researcher felt that this theme reflects the heart of what the programme was designed to achieve. Therefore, the way that each of this main theme’s sub-themes relate to key findings from the literature review (chapter 2) was considered to be a key relationship to illustrate visually. These are charted together below in table 22:

Findings from the review of the literature	**Evidence from the dataset analysis**
Interventions for teaching children and/or adolescents to identify fake news are needed and should include a component related to raising awareness of any deficit in their ability to do so.	Sub-theme: *Development of critical thinking skills and concepts.* Greater insight into the distinction between opinion vs fact when presented with information Development of debate and discussion skills Appreciation of why fake news is 'bad'
Interventions relating to any aspect of teaching around fake news should incorporate components which relate to these impact factors (i.e. psychological factors which influence thinking and behaviour).	Sub-theme: *Pupils developed knowledge of cognitive biases.*
Interventions focused on providing children/adolescents with practical tools for verifying whether suspected fake news is fake or real are needed.	Sub-theme: *Increased awareness of key factors around news and information.* How to identify fake news How to identify valid news sources Potential traps

Table 22: the sub-themes of main theme 1 and how they relate to key findings from the literature review.

2. Real-world relevance and applicability to the lives of the participants.

This main theme describes adult and child views around the value the programme is seen to add to their lives. Participating in the programme is perceived as taking place at a pertinent time, with outcomes which are viewed as relevant to the pupils' lives. The extracts illustrate what respondents considered to be important and why, and also explore some of the underlying mechanisms which seem to be referred to in some of their contributions. The sub-themes providing a richer illustration of this theme are:

This area of knowledge has a high level of importance for children.

The contents of the programme are highly relevant for the participants and linked to their real-life experiences.

New and unexpected learning occurred.

Pupils gained a greater understanding of the interaction between their own biases and the agendas of other agents.

Each of these sub-themes will be explored in turn:

This area of knowledge has a high level of importance for children.

This theme was developed to reflect the high level of importance and relevance respondents felt the programme had to the development and application of pupil thinking skills. One interventionist felt strongly that this is an important area of learning for the pupils and went further by saying that this seems to fill a gap in the teaching that children currently receive. Valuing the aims of this teaching programme, seemed to be viewed as a factor in participating in the research and furthermore in communicating this enthusiasm to the children.

> 'This study was a pleasure to be a part of and the children learnt aspects that are currently not covered on the primary school curriculum. I think its important to recognise that this study is extremely pertinent to the modern digital age and the questionability of sources is something children should be taught.' [Teacher 1]

Several participants responded in the questionnaire with similar comments to this pupil, indicating that the value their teacher placed in the programme had been transmitted to them.

> ‘Ways to spot it are important.’ [Pupil 4]

The second sub-theme developed in relation to this main theme describes the way in which the interventionists linked the teaching materials to their knowledge of the pupils’ real-life experiences and relevant points of relevant. Here the contents of the programme are viewed as relevant and this is then communicated in which way makes it also seem relevant to the recipients:

> *The contents of the programme are highly relevant for the participants and linked to their real-life experiences.*

For example:

> ‘The children liked being able to pin things onto a hook, something that they’re familiar with.’ [Teacher 2]

> ‘They were particularly enthusiastic about giving examples of the bandwagon bias linked to Prime (the drink) and Stranger Things season 4.’ [Teacher 1]

Whilst this appears at first to be a further sub-theme around the value of the programme, a deeper re-examination of each of the codes led the researcher to view this as an outcome of the teaching programme which could only be reached through the teachers’ understanding of their classes and ways to inspire them. Teachers were interpreted as providing a vital bridge between the learning goals and pupil needs. The third sub-theme developed in relation to this main theme is:

> *New and unexpected learning occurred.*

Which summarises the idea that pupils seemed to make unexpected findings through the lessons and that there seemed to be a development in their ability able to judge news stories.

> ‘They were quite surprised at some of the stories that were so far out there, that were actually true….and it was more of the mundane ones that were actually fake.’ [Teacher 2]

This is an illustrative example of how pupils increased awareness of their own biases, and therefore fallibilities, as well as ways in which to mitigate these. One interventionist also shared:

> ‘We spoke about the cost of living with regard to hurtful truths and comforting lies. The children had a few examples of their own.’ [Teacher 1]

And furthermore:

> ‘We spent a long time thinking about and discussing the Bandwagon effect. The children were thinking of lots of ideas when this has happened to them.’ [Teacher 1]

The views expressed seemed to suggest that the development of pupil knowledge and skills may have been influenced by their participation in the programme. The fourth sub-theme developed in relation to this main theme is:

> *Pupils gained a greater understanding of the interaction between their own biases and the agendas of other agents.*

Both teachers described observing how the pupils seemed to apply their new learning around cognitive biases and thinking traps to considering the motivations of those who produce and share fake news. This suggests that participants were developing their understanding of these interactions and interventionists seemed to be saying that pupils were questioning the agendas of others. One teacher reported:

> ‘Contextualising the news stories and looking at their ridiculousness and their source helped the children make an informed decision – after the delivered content of the lessons.’ [Teacher 1]

The other teacher further described exchanges in which they were able to successfully cue the pupils into accessing the knowledge they had learned:

> ‘I was kind of prompting them in saying … do you actually believe everything you read … is it certain?’ [Teacher 2]

And

> ‘They know … it’s not all real and that sometimes it’s just click on there … just to get the readership up.’ [Teacher 2]

The views shared include a range of observations from the interventionists which seem to suggest that pupils developed a greater understanding of biases in themselves and others, in a way which was relevant to their lives and experiences.

3. General benefits within the school system.

This theme encompasses three sub-themes that together provide a picture of the broader experience from both children and adults in relation to the programme. Describing how all of the respondents reported enjoying the experience of participating in the programme and found it was congruent with the skills of the staff as well as with the needs and ability-levels of the students. Participants were of mixed ability levels but described developing in confidence around fake news, possibly suggesting that the intervention supported this. The sub-themes providing a richer illustration of this theme are:

The teaching programme was enjoyable for participants and interventionists.

It was easy to deliver (for the teachers)

It was accessible for the pupils

This first sub-theme focused on how participants reported their experience of the programme and suggests that they found this to be positive in a variety of ways:

The teaching programme was enjoyable for participants and interventionists.

This was referred to repeatedly by both participants and interventionists, with typical pupil responses which suggested that they viewed the programme as:

‘Fun and amazing. More of these lessons.’ [Pupil 7]

And from one teacher:

‘They really enjoyed it.’ [Teacher 1]

and

‘They were particularly enthusiastic about spotting fake news stories.’ [Teacher 2]

‘They loved discussing the different news stories and why they thought it was fake or real. They created a poster at the end of the session to show how to spot fake news stories.’ [Teacher 1]

Pupils described enjoying engaging with the topic through peer discussion and demonstrating the learning objectives of the lesson. Teacher assessment of pupil attainment of the learning outcomes for each session was extremely high, attaining a rate of 100% for each session for this school (see section 4.2). Participant enjoyment seemed to be influential to the programme outcomes.

A key to the enjoyment of the subject seems to be in its application for the pupils: both relating knowledge to real-world experiences and testing it out with examples of genuinely published news stories and headlines (which were in the lesson materials and included examples of both fake and real stories).

> ‘That was probably one of the highlights, like is this true or … is this fake, this headline…they really, really enjoyed that. If I was to do it again I think I’d probably start or even end with that for each session.’ [Teacher 2].

The second sub-theme considers teacher views linked to the manageability and ease of the delivery of the programme materials. This sub-theme suggests that the materials were easy to implement, with concepts that they seemed to feel comfortable being able to teach to the pupils:

> *It was easy to deliver (for the teachers)*

> ‘It was easy to go through the powerpoint and then kind of give modern examples as well. [Teacher 1]

The third sub-theme considers the other aspect to these teacher reflections: focusing on their views around how accessible the complex subjects were to primary-aged pupils:

> *It was accessible for the pupils*

Teachers seemed to feel that the programme was pitched appropriately for the age group of the class and that the content and materials seemed to lead to them being receptive to the contents. This was exemplified by this teacher comment:

> ‘They were quite receptive, especially for the one on the Bandwagon Effect, that was quite easy to describe.’ [Teacher 2]

The fourth sub-theme developed in relation to the main theme explored views around the elements of the programme which were based on psychological theory, representing

the new and original components of the overall programme. To contextualise this, it is important to understand that the lessons included the communication of new and complex psychological theories, which is unlike typical current programmes of study for this age group.

> *The psychological aspect of the programme was new, and added value/knowledge for pupils.*

For example, one teacher stated that,

> 'They enjoyed the lesson being different, and learning about a psychological aspect.' [Teacher 1]

Indicating that, from a teacher's perspective, a departure from the typical content of lessons within the National Curriculum was welcomed by pupils. The researcher considered this to be a positive finding which sat within the 'general benefits within the school system' theme.

4.2.5.2 Research sub-question 2

In relation to factors which explored what those involved in the programme perceive as important mechanisms that contributed to the observed outcomes, the following main themes were constructed from the participant and interventionist responses:

4. **Identifying the practical and logistical challenges of implementation.**

5. **Future direction and implementation (elements to keep, enhance or change).**

Each theme will be discussed in turn, in the context of their more specific sub-themes.

4. Identifying the practical and logistical challenges of implementation

This main theme focused on teacher views of the varied factors which challenged the implementation of the programme and includes three sub-themes, with views overall tending towards a creating a picture of barriers that were overcome. The distinct aspect illustrated by each sub-theme appears to demonstrate that prior to their involvement in the study, the teachers experienced significant demands on their time around delivering the curriculum. The personal resources teachers were required to draw on when implementing the teaching sessions are then discussed. Finally, the third sub-theme describes how teachers reported that engaging with the Bad News Junior game relied on a level of literacy which they also needed to support some students with:

Fitting sessions in with other curriculum demands and pressures.

The call on teacher skills in improvising and applying the lesson content to pupil experiences.

Pupil literacy was a factor for some participants in the Bad News Junior online game.

This first sub-theme focused on how teachers reported their experience of the logistical aspects of implementing the programme:

Fitting sessions in with other curriculum demands and pressures.

One teacher concisely defined the challenge as:

‘Fitting the teaching into the normal school day along with all the other needs of the Year 6 curriculum.’ [Teacher 2]

What is described as an additional challenge in the day of the interventionists is built on further with the challenges which then took place within the sessions. The second sub-theme focused on how teachers reported the skills that they drew on when interpreting and implementing the lesson materials to make them relevant to their pupils:

The call on teacher skills in improvising and applying the lesson content to pupil experiences.

One stated,

> ‘I’m alright with improvising … I’ve been doing it quite a while now, so I’ve got that experience to do that.’ [Teacher 2]

Here, improvisation is described as a key skill which is drawn on freely, although the respondent related this to their experience as a teacher. There may be an implication here that less experience might equate to a narrower range of improvisational skills. The other teacher reflected:

> ‘They found it hard to apply what they had learnt to real life. We tried to think of scenarios that they could relate to (e.g. Prime drinks).’ [Teacher 1]

This reflection describes the same aim in terms of supporting the pupils in generating relatable examples of learning points, when they found this hard to do themselves. Improvisation skills were drawn out here as a latent sub-theme, as teachers made only implicit references to the key part that their own skill-set played in the successful delivery of the programme.

The final sub-theme refers to the observation that some students were in need of additional teacher support when their literacy levels impacted on their ability to engage independently with the content of the game:

Pupil literacy was a factor for some participants in the Bad News Junior online game.

This was explained by one teacher as follows:

> ‘When playing the game, I think … the language was slightly above their age and so results may not have fully demonstrated the understanding some children showed during the sessions.’ [Teacher 1]

This seems to be a hindrance to the programme that was both identified by the teacher as being a possible factor in the outcome of the game, but also one which they were able to address during the classroom sessions, perhaps mitigating the potential effects of literacy skills in relevant pupils.

Overall, this theme is one of competing demands for interventionists, with views seeming to show that the programme contained a range of challenges that may have influenced the outcome. Teachers shared that they were required to fit the teaching and testing into their existing timetable as well as improvise solutions to challenges which arose during the sessions. However, the descriptions of the challenges were also matched with descriptions of solutions, such as drawing on skills of improvisation, and providing support to students where needed, in order to complete the programme.

5. Future direction and implementation (elements to keep, enhance or change).

This main theme contains contemporaneous feedback, brought together by the researcher with the intention that this may be useful in ultimately generating guidance for future implementation of the teaching programme. The thematic analysis involved a combination of semantic and latent analysis and interpretation. Much of this was viewed at the semantic level, but some deeper insights were also built from combining or reconsidering some of these observations in a latent analysis, discussed below. The sub-themes providing a richer illustration of this theme are:

> *Structure and lesson plans were viewed positively, with elements considered worth retaining.*
>
> *More real-life news stories to take apart would enhance the programme.*
>
> *Less of the psychological theory education would be a beneficial change to the programme.*

These three sub-themes will be discussed in more detail in turn:

Structure and lesson plans were viewed positively, with elements considered worth retaining:

This sub-theme focused on the adults' perceptions of what they found most useful from the programme resources and materials. This was sufficient to generate two separate third-order themes, as the researcher attempted to capture the specific domains that the teachers seemed to feel were key to this. There were two further third-order themes:

- Psychology information was positive.
- Pictorial elements of the lessons were helpful.

Each of these will be considered in turn, as each highlights a specific element of the programme which the interventionists seemed to view as positive and possibly worthy of retention in any future iterations.

- Psychology information was positive.

'They enjoyed doing something that was psychology-based.' [Teacher 2]

This element of the programme is incorporated into both the game and the classroom sessions.

- Pictorial elements of the lessons were helpful.

'I think visual representation, more visual representation could have helped the children.' [Teacher 2]

'More pictorials would have been better.' [Teacher 1]

The second sub-theme represents what the adults seemed to feel was a crucial area to be increased or enhanced:

More real-life news stories to take apart would enhance the programme.

Participants shared specific examples of how they seemed to feel that dissecting real-life news stories formed a valuable part of the pupils' learning within the programme.

> 'It became clear how few news stories our children see. Some examples of actual newspaper stories throughout the presentations would probably help them understand and relate to content more.' [Teacher 1]

Whilst this may seem to be a suggestion which can be converted to future guidance on the development and implementation of the programme, this was further viewed by the researcher as reflecting more than simply providing additional resources for interventionists. One teacher discussed a possible desire to have more in the programme around explicitly teaching children about the distinction between judging sources and judging content, using real news stories:

> '…to educate children to be able to unpick stories … the source. If you don't have that, its like clickbait … and I suppose its like junk mail from, you know, whatever your letterbox filled with in the 90s and early 00s… I suppose its that in an electronic sense.' [Teacher 2]

Here the teacher appears to be considering the notion that the volume of fake news children encounter is what makes it a key concern, and seems to be highlighting a perceived need for pupils to have the tools to recognise the source rather than the content as being trustworthy or not.

A further sub-theme initially seemed to be a similarly direct suggestion around reducing the quantity of psychological theory content, and was summarised as:

> *Less of the psychological theory education would be a beneficial change to the programme.*

Whilst this is the final sub-theme included, when generating and revising candidate themes at an early stage of the analysis it appeared to the researcher that participants seemed to feel some challenges around the inclusion of psychological theory. An earlier sub-theme ('The psychological aspect of the programme was new and added value/knowledge for pupils') reflected what appeared to be positive perspectives around what the inclusion of psychological theory brought to the programme. However, one teacher also seemed to feel that the quantity of the theoretical content could be reduced, describing it as a lot of new information for both the interventionist and the pupils:

> 'The theory side can be … too much.' [Teacher 1]

The possible reasons for what appear to be perceived challenges around psychological theory content, are explored in more detail in chapter 5. The psychological knowledge delivered through the teaching programme is a crucial part of the development of critical thinking skills and therefore the findings here may be a valuable illumination of what participants felt was the optimal balance of this element of the programme.

4.3.6 Summary

The picture of the data created by the Thematic Analysis provides a picture of factors that influenced the implementation and outcomes of a critical thinking skills programme, along with pupils' appreciation of what constitutes fake versus real news. Furthermore, qualitative data seems to reveal a picture of those aspects of the programme which facilitate and challenge, to enable the programme to engage participants, be accessible to them and resonate with them. This analysis presented five main themes and seventeen sub-themes, relating to two research questions:

1. Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?

2. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?

In relation to the first research question, pupils appeared to have made progress in gaining knowledge of ways to identify fake news and skills in critical thinking, as evaluated by themselves and their teachers. Main themes were constructed around the views of participants which explored the details of the development of pupil knowledge and skills, and the programme's real-world relevance and applicability to the lives of the participants.

In relation to the second question, the main themes identified have explored a range of factors which those involved in the programme seemed to perceive as important contributing mechanisms to the observed outcomes. The programme appeared to confer general benefits within the school system and participants also reported factors which challenged the implementation of the programme. Additionally, they were able to describe elements of the programme which could be revised, built upon or retained for any future implementation.

The following chapter will discuss these findings in relation to wider literature and theory, and consider their implications for schools, educational psychologists and future research, as well as discussing the limitations of this research.

Chapter 5. Discussion

5.1 Introduction

This study aimed to explore the outcomes of a bespoke critical thinking skills teaching programme for Year 6 (aged 10-11) pupils, using a mixed methods approach. This enabled the researcher to investigate the experiences and perspectives of participants as well as measuring the pupils' ability to identify fake news before and after the intervention. The research findings are therefore presented in two parts. The quantitative component outlines results from a real-world quasi-experiment examining the impact of both a prebunking intervention and critical thinking skills teaching programme. The second presents a reflexive Thematic Analysis to explore those things that teacher and pupil participants felt to be influential to the implementation and outcomes of the programme.

5.2 Research findings

The findings presented in this study are of an embedded sequential mixed methods evaluation of a critical thinking skills programme aimed at developing participants ability to recognise fake news. Both quantitative and qualitative data collection methods were used to explore the outcomes of the teaching programme and its implementation. Exploratory quantitative data around the impact of the critical thinking skills teaching programme on pupils' ability to identify fake news will be discussed. Following this, the qualitative data explores both what participants felt supported and challenged the implementation and outcomes of the teaching programme. The findings from both qualitative and quantitative analyses are then triangulated in order to strengthen conclusions.

The existing literature indicates that individual-level interventions are most effective in both inoculating against fake news and developing critical thinking (Roozenbeek, Culloty & Suiter, 2022).

In order to explore the outcome of the teaching programme which combines prebunking with teaching around critical thinking skills, the following research question was posed:

What are the outcomes of a bespoke critical thinking skills programme on children and young people's ability to identify 'fake news'?

Further sub-questions are asked in this research, which will be explored in the discussion of the qualitative findings:

1. Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?

2. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?

5.2.1 Quantitative findings

In order to answer the research questions, the findings from the present study will first be discussed in relation to the previous research. This will be followed by consideration of the contribution and limitations of the present study. The section will conclude with consideration of the implications for future research and practice.

As outlined in the methodology chapter, participants' ability to identify fake news was measured through their combined ratings across all items within the fake news game. Ratings were taken using a 7-point Likert scale, which rated the believability of a range of true and false news stories, presented in the form of social media headlines (appendices P and Q). The independent variable involved a bespoke programme with the aim of supporting the identification of fake news. This comprised a bespoke version of the inoculation-based Bad News Junior game and an original critical thinking skills teaching programme. The measures were taken prior to the intervention (pre-measures) and on its completion (post-measures). This enabled the overall outcome of the intervention to be evaluated.

The decision to analyse and present descriptive statistics for the pre and post quantitative data is due to the unexpectedly low sample size which had an implication on the statistical analyses that could be made. Therefore, the quantitative data in this study must be considered exploratory.

Hypothesised and observed directions of change are recorded in table 23, in relation to the experimental group (*n*=4), based on analysis of median scores.

Measure	Respondents	Hypothesised direction of change	Observed direction of change
Ability to identify fake news stories correctly (as measured via the Bad News Junior game)	Pupils	Decrease scores from pre to post assessment	Scores decreased
Ability to identify true news stories correctly (as measured via the Bad News Junior game)	Pupils	Increase scores from pre to post assessment	Scores increased
Ability to correctly identify news stories overall (as measured via the Bad News Junior game)	Pupils	Decrease scores from pre to post assessment	Scores decreased

Table 23: hypothesised and observed directions of change for each measure in the experimental group.

Pre-test to post-test changes observed in the experimental group were in the hypothesised direction. This suggests that the pupils' ability to identify fake news was developed by their participation in the intervention. However, pre-test to post-test changes observed in the control group also indicated an improvement in the participants ability to identify fake news, although this was a smaller difference than observed in the treatment group. Although it was not possible to conduct inferential analyses on the quantitative data, the findings have similarities with previous evaluations of inoculation effects as measured by the original version of the Bad News Junior game. However, supplementary ratings of the outcomes of the programme for each of their pupils suggest that teachers perceived it had had a positive impact on their pupils' ability to identify fake news and their critical thinking skills.

The study employed a quasi-experimental design involving experimental and control groups in an attempt to measure the impact of a bespoke teaching programme. However due to the real-world limitations around conducting research in an applied setting, participant sample size overall was smaller than intended, due to difficulties with obtaining parental consent for participation. Moreover, the sample size of the final quantitative data set was further reduced due to a technical issue in the recording of some of pupils' performance data. This meant that the resulting sample was too small to allow for a reliable comparison to be made between groups and it was only possible to undertake a descriptive statistical analysis of this aspect of the study. As such it is not possible to confidently state the experimental hypothesis that the programme developed participant critical thinking skills and their ability to identify fake news.

However, interventionist reports on the experimental group suggested that the intervention had a positive impact. All pupils in the experimental group were rated as attaining the expected learning outcomes for each session (see appendix BB). Teachers also reported that pupils in the experimental group had gained critical thinking skills. This suggests that the programme may have some positive outcomes for developing critical thinking skills and the ability to identify fake news. However, it is not possible to confidently conclude whether the treatment had a measurable impact in this research, due to the small sample size, which meant that it was not possible to use inferential statistics. Interpretation of the findings from these analyses is limited by the small sample sizes and the assumptions that can be made about the data. For example, this small sample size led to assumptions of the normality of the data not being possible, meaning that statistical comparisons could not be made between groups.

The assessment of the participants' ability to identify fake news via the examples presented within the Bad News Junior game is based on an established measure (Basol, Roozenbeek & van der Linden, 2020). However, in this study the examples of fake and real news stories presented followed a bespoke model created by the researcher and therefore although the measure has a strong evidence base, the stimulus materials are original. Although the evidence from the present study is inconclusive, evidence from previous research investigating the impact of interventions using inoculation theory and prebunking as an approach indicate that they have a positive impact on the ability to identify fake news and provide some protection against

disinformation techniques (Roozenbeek & van der Linden, 2019; Lewandowsky *et al*., 2020; Roozenbeek, Culloty & Suiter, 2022). The present study built on some of these established techniques whilst also incorporating key elements of supporting the development of critical thinking skills from other areas of the literature (Macedo-Rouet, *et al*, 2013; Renninger & Hidi, 2016; *Hui et al.,* 2019; Nygren & Guath, 2019).

5.2.2 Qualitative findings

This section will discuss the qualitative findings of the present study in relation what the literature and previous research has indicated about prebunking and critical thinking skills. Qualitative data gathered via both pupil and teacher questionnaires and a further teacher interview is considered. Figure 4 in chapter 4 illustrates the individual thematic maps in relation to each research sub-question. The discussion encompasses adult and pupil participants' views about various aspects of the programme and identifies points which may diverge or build upon convergence, with the literature presented in chapter 2.

The research sub-questions which informed the analysis will be explored in this section:

3. Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?

4. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?

Each research sub-question will be explored in relation to key themes arising from the data analysis:

1. Does the teaching programme seem to make a difference to children's ability to identify fake news, according to teacher and pupil participants?

Overall, factors which the adult and pupil participants seemed to feel made a difference to the pupils' ability to identify fake news were characterised by perceptions of observable, measurable progress for pupils and a view of the programme as pertinent to the lives of the participants. Three sub-themes relate particularly closely to research sub-question 1:

- *Development of critical thinking skills and concepts.*
- *The teaching programme was enjoyable for participants and interventionists.*
- *The contents of the programme are highly relevant for the participants and linked to their real-life experiences.*

The sub-theme *'development of critical thinking skills and concepts'* typifies a key area of the investigation, and discusses the ways in which this research has attempted to combine critical thinking skills with an established individual-level intervention. The sub-theme*, 'the contents of the programme are highly relevant for the participants and linked to their real-life experiences'* discusses the pertinence and the individual teacher delivery of the programme, whilst *'the teaching programme was enjoyable for participants and interventionists,'* discusses the part played by enjoyment and motivation in the outcomes of the programme. These themes will be discussed in turn in relation to the broader context of the relevant literature, before considering what they suggest about the teaching programme.

The sub-theme '*development of critical thinking skills and concepts,'* highlighted that participants perceived that pupils had increased confidence towards critical thinking skills and an awareness of underlying concepts. This is illustrated by pupil perceptions involving references to increased confidence in 'avoiding traps' that cognitive biases can represent. This is viewed as a key finding in relation to the overall research question of the study and the researcher felt that this theme reflects the main aim of what the programme was designed to achieve. It is consistent with previous literature which suggests that developing children's critical thinking skills can help them independently consider information they encounter (Howard, Neudert & Prakash, 2021) and that the participant group receiving the treatment in this study seem to be at a receptive age (Macedo-Rouet, *et al*, 2013) and stage of development (Kuhn, 1999). This sub-theme

also appears to indicate that increased knowledge and awareness of cognitive biases may have a positive effect on critical thinking (Aston, 2023).

This is an illustrative example of how pupils were felt to have increased awareness of their own biases, and therefore fallibilities, as well as ways in which to mitigate these:

> ‘We spent a long time thinking about and discussing the Bandwagon effect. The children were thinking of lots of ideas when this has happened to them.’ [Teacher 2]

The views expressed seemed to suggest that the development of pupil knowledge and skills may have been influenced by their participation in the programme and teacher questioning within sessions. Evidence from the literature is that participating actively in debate and discussion can support development of critical thinking skills (Oros, 2007), which suggests that this may be an important mechanism within critical thinking programmes of this kind.

The theme, ‘*the teaching programme was enjoyable for participants and interventionists,’* points to a possible factor around the programme outcomes which is consistent with previous literature around the effects of enjoyment on pupil motivation and on the development of critical thinking skills (Renninger & Hidi, 2016;). The theme of enjoyment and engagement was highlighted cross all of the voices in the study. A scaling activity completed at the end of the programme indicated that pupils typically signalled their enjoyment with a positive ‘emoji’ (see appendix CC). This was reinforced by pupil comments which highlighted their enjoyment and engagement as well as sharing their views via the open-ended questions in the questionnaire and sharing comments such as:

> ‘Fun and amazing. More of these lessons.’

In addition, interventionists reported that they observed pupils enjoying the sessions and engaging with the materials in an active way:

> ‘They loved discussing the different news stories and why they thought it was fake or real. They created a poster at the end of the session to show how to spot fake news stories.’ [Teacher 1]

And

> ‘That was probably one of the highlights, like is this true or … is this fake, this headline…they really, really enjoyed that. If I was to do it again I think I’d probably start or even end with that for each session.’ [Teacher 2].

This builds on the findings of Hui *et al* (2019) in that the interventionists seem to be facilitating motivation by creating relevance for the students. Additionally, the teaching materials are designed to be fun and accessible to pupils, exploring and extending the findings of Renninger & Hidi (2016) which indicated that this may contribute positively to pupil engagement. The theme focus of enjoyment and engagement suggests that teacher and pupil participants experienced it as fun (see appendix O, session 1). Pupils described enjoying engaging with the topic through peer discussion and the teacher in School 2 reported a high level of engagement in a class debate around whether dogs or cats are preferred, as an exercise in understanding and applying confirmation bias (Kahneman and Tversky, 1972).

The evidence from the present study, that pupil enjoyment and engagement was important to the outcome of the programmes, appears to relate to findings of research. This may be related to the collaboration required in group discussions and debates, which has been shown to have a positive impact on students’ sense of involvement in the subject (Qureshi, Khaskheli, Raza & Yousufi, 2021) and on their learning performance (Wyman & Watson, 2020). This seems to suggest that participants’ engagement and enjoyment were influential. Enjoyment is described as a powerful motivating factor in learning (Niemiec & Ryan, 2009) which was captured within the ‘general benefits within the school system’ main theme.

In addition, a key component for optimal intervention design which was noted from the literature review (see table 10, chapter 2) is that, ‘interventions relating to any aspect of

teaching around fake news should be planned around existing educational motivators for the participants.' Participant views would seem to suggest that the programme provides a way to achieve this.

The literature review also highlighted that student motivation can be viewed as a necessary partner to critical thinking abilities. This may be influenced by student perceptions around what they feel is the personal relevance or usefulness of their learning (Hui *et al* (2019). There is some evidence that teachers play a key role in developing pupils' interest (Renninger & Hidi, 2016). Indeed, the findings of the present study suggest that a further component to the enjoyment of the subject seems to be facilitated by opportunities in the sessions for pupils to relate the learning to real-world experiences, mediated by the teacher's personalisation of the lesson materials:

> 'It was easy to go through the PowerPoint and then kind of give modern examples as well. They were quite receptive, especially for the one on the Bandwagon Effect, that was quite easy to describe.' [Teacher 2]

Here the teacher seems to have found the programme provided useful teaching materials which could be enhanced with the interventionist's own unique knowledge and perspective. The teacher seems to have a key role as a mediator between the static materials provided by the researcher and the unique group of children they support. This aligns with the sociocultural development of cognitive abilities in which adults are posited as providing both knowledge and meaningful activities to apply this, to guide children's development and learning (Vygotsky, 1978). A teacher who knows their pupils and the school's community context appears well placed to recognise and work within the students' Zone of Proximal Development (Vygotsky, 1978).

The sub-theme, '*the contents of the programme are highly relevant for the participants and linked to their real-life experiences,'* highlighted the perceived pertinence of the teaching programme for both pupils and adults. It also relates to the important role the interventionist/teacher appeared to play in adapting the programme to make links with the pupils' lives.

One possible mechanism for this is intrinsic motivation (Deci, 1976) arising from the congruence of the programme with teacher values (Palermo & Thomson, 2019; Liu, Li & Zou, 2019) and another may be that by taking action to address a perceived deficit in pupil knowledge, teachers developed a greater sense of self-efficacy around this subject. There is some evidence that teacher-self efficacy moderates the link between pressure from imposed curriculum changes and perceived stress (Putwain & von der Embse, 2019).

The second research sub-question will be considered in relation to the analysis:

2. What did those involved in the programme perceive as important mechanisms that contributed to the observed outcomes?

Overall, factors which the adult and pupil participants seemed to perceive as the key mechanisms at work in their experience of the programme were characterised by competing demands on interventionists, areas of the programme which could be expanded and some mixed views about the inclusion of psychological theory in the programme. Two sub-themes from this area of the dataset relates particularly closely to research sub-question 2:

Fitting sessions in with other curriculum demands and pressures.

Less of the psychological theory education would be a beneficial change to the programme.

The sub-themes discuss the factors that the interventionists described as impacting on the implementation of the programme and their views of participating in the research. Possible reasons for the challenges experienced in “fitting sessions in with other curriculum demands and pressures’ are discussed below.

The sub-theme ‘*fitting sessions in with other curriculum demands and pressures’* highlighted the challenges of implementing a new teaching programme when there are

other competing demands on the Year 6 teachers, who support pupils during a statutory testing year. Some of their responses across other sub-themes yielded insight into their views about their choice of involvement in the study. The data seems to indicate that the interventionists may have been motivated in part by beliefs around the value of the programme's aims. The congruence between teacher values and the aims of the programme, demonstrated by teacher enthusiasm and espoused belief in the importance of inoculation against the negative effects of fake news, shared in initial discussions early in the research process, may be a driver for this sub-theme.

Completing the programme was achieved in spite of pressures from other curriculum demands which can change frequently and are recognised to be common sources of stress for teachers (Ofsted, 2019). Whilst the teachers involved showed initial enthusiasm and commitment to delivering the programme, their comments suggest that maintaining delivery in practice in real-world classroom setting can be challenging.

It should be noted that pupil voices seem to be represented less in the area of the dataset which is linked to the second research sub-question. This is a reflection of the way in which pupil views were coded and themed; falling more within the researcher's theme constructions of what supported the implementation of the programme than what challenged this. Although the pupil questionnaires included open questions, providing an opportunity to share views about any aspect of the programme, (see appendix CC), it is possible that this is a result of the positive phrasing of the pupil questionnaire. This focused on reporting enjoyment and confidence before asking more open questions which may have generated a positive priming effect (Neumann & DeSchepper, 1991). However an alternative explanation is that pupil views were generally focused on what they recalled from the sessions. Questionnaires were completed very soon after the end of the teaching programme as part of the post-measures, and therefore the participants experiences were recent and any effects likely to still be present. Additionally, although researcher interpretation is involved in Thematic Analysis, it would be outside of the axiology of this constructivist approach to negate the views shared by participants.

The sub-theme '*less of the psychological theory education would be a beneficial change to the programme,'* and possible reasons for the reported challenges experienced around this are discussed below.

Responses on the subject of the ‘psychological information’ element of the teaching programme seemed contradictory across some areas of the data, sometimes within responses from a single respondent. As final themes are constructed inductively by the researcher (Braun & Clarke, 2022) a choice was taken to reflect this tension by capturing references to psychological theory in two different sub-themes because the subject has relevance to both research sub-questions. In a system which is filled with tensions around everything from the best ways to educate children to the best allocation of resources, contributing to teacher pressures (Putwain & van der Embse, 2018), the tension around this aspect of the programme was reflected in the chosen themes. This reflects the different ways of viewing the psychological education aspects of the programme; as something which added some value but also, as captured in this sub-theme, as something which one participant seemed to feel could be reduced.

5.2.3 Summary

Overall, this analysis suggests that the experience of participating in the programme was felt to have developed both critical thinking skills and the ability to identify fake news, and was characterised by enjoyment and engagement from both pupils and teachers. The discussion of the findings of the present study in relation to previous research has highlighted that teachers seemed to play a key role in adapting the materials to the pupils’ interests and experiences to make them relevant and engaging. Both teachers and pupils appeared to find participation in the programme to be enjoyable as well as purposeful. Participant reports seemed to indicate that group discussions may have contributed to developing critical thinking skills. Additionally, interventionists seemed to overcome challenges around fitting the programme in with competing professional demands, and whilst there was a view that the programme was age-appropriate in its aims and pitch, this was perceived as an added pressure for the Year 6 teachers involved.

In order the strengthen the findings from the qualitative data further, the researcher also took an inductive approach to the Thematic Analysis (Braun & Clarke, 2022). This more open analysis of the data led to a picture of the views of participants in which attention

was given to different sub-themes and insight gained into what they describe as having facilitated the outcomes of the programme. The implications of these for future practice will be discussed in chapter 5.

5.2.4 Synthesis of the quantitative and qualitative findings

Within the pragmatist epistemology employed in this study, the priority of the research questions eclipsed the importance given to the method or underpinning philosophical assumption (Teddlie & Tashakkori, 2009). In real-world research, the complementary strengths of different approaches can be drawn together in an integration of all analyses to better understand the phenomena being explored (Mertens, 2015). The current study has not been able to empirically demonstrate that the teaching programme had a significant impact on the development of pupils' ability to recognise fake news, based on the quantitative analyses alone. This may be explained by the considerable methodological difficulties experienced in this aspect of the study (see chapter 4). However, triangulation with the qualitative data may have the potential to offer the additional perspective of a broader and more richly contextualised picture (Mertens, 2015). This may be an indication of the current demands placed on school staff and resources. This will be considered further within the discussion of the implications of this study for practice and future research.

5.3 Trustworthiness of the research

Mertens provides a framework for judging quality in mixed methods research (Mertens, 2015) in which criteria of trustworthiness are listed separately for qualitative and quantitative elements. The critical analysis approach taken here follows Mertens advice to use separate criteria for qualitative and quantitative methods so that they can be judged within the assumptions of the appropriate paradigm. Although there are circumstances when this may be a less suitable approach, such as when the sample sizes differ substantially across the two methods (Mertens, 2015). Although there were small differences in the sample size for each aspect of the present study, they were

judged to be sufficiently similar to adopt Mertens (2015) framework. Issues around reliability and validity will be discussed in relation to the quantitative data, followed by a subsequent discussion around the trustworthiness of the qualitative data.

5.3.1 Reliability and Validity of the Quantitative Data

Reliability

A description of the threats to the reliability of quantitative data in this study can be found in table 14 in chapter 4, with the greatest threat identified as participant error. The original study design included a larger sample size in an attempt to reduce the potential impact of individual participant differences. However, a reduction in anticipated numbers due to recruitment challenges, as well as additional data capture difficulties, meant that the threat of participant error could not be eliminated. A small sample size means that any individual performance differences have the potential to skew the data significantly. As a result, descriptive, rather than inferential, statistics had to be employed in this study.

Validity

- Internal validity

Whilst attempts were made to control for threats to internal validity, the greatest challenge came from mortality, as recruitment challenges meant that the number of participants initially involved in the programme was only 22. Following this there were further unforeseen circumstances when a data loss meant that pre and post measure results from only a small sub-set of each (experimental and control) condition and schools were recorded (pupils n=6). This influenced the choice of statistical tests and analyses that could be performed on the data and therefore the interpretations that could be offered.

The ‘waitlist’ design also meant that, whilst the threat of compensatory equalisation of treatments was reduced, it was not possible to completely eliminate the risk of diffusion

of treatments. Whilst guidance was offered to school staff to keep discussion within sessions, and treatment groups were in separate spaces during programme delivery. Pupils across the different conditions in each setting spent social time together during which elements of the programme may have been discussed, meaning that the possibility of treatment diffusion cannot be ruled out.

Finally, there is a risk that history was a threat to internal validity, as it was not possible to completely eliminate the possibility that participants were exposed to additional information about fake news and/or critical thinking skills outside, or elsewhere within, the school. The steps taken to reduce this risk included completing the programme within a two-week timescale and asking the teacher leading class discussions to highlight any extraneous influences or views which may have influenced the outcome, in order to be aware of and mitigate and misconceptions.

- External validity

External validity describes the extent to which quantitative research findings can be generalised to other contexts (Robson & McCartan, 2016). In real world research, the researcher must attempt to balance steps taken to reduce threats to internal threats to validity with attempting to maximise the generalisability of the findings.

This study includes a total sample size of *n*=15 participants in the treatment groups across both school settings, with pre and post quantitative measures captured for *n*=6 participants. Therefore the study may be susceptible to the threat of population validity. Therefore, it is essential to acknowledge that external validity is limited within this study and findings cannot be directly generalised to wider populations. The descriptive data analysis can, however, be combined with the qualitative data to offer some tentative exploratory findings as to the outcomes of the programme on the small number of pupils sampled.

5.3.2 Trustworthiness of the qualitative data

Trustworthiness of qualitative research is comparable with quantitative issues around validity, reliability, etc. (Mertens, 2015) and positions the researcher as being an integral part of the study through interpreting and generating meaning from the data (Braun & Clarke, 2022). A description of the threats to the trustworthiness of qualitative data in this study is to be found in table 15 in chapter 4 and the steps taken to mitigate these threats are described below.

Credibility

The issue of credibility can be considered as a parallel to internal validity within quantitative research (Mertens, 2015) and within this criterion, three main ways to enhance credibility were identified as pertinent to this study.

1. *Prolonged and persistent engagement*

To ensure that the researcher spent enough time with the data and avoided premature conclusions, the study took pace over several months, with data provided by participants from different sources. Moreover, the Thematic Analysis process (Braun & Clarke, 2022) was only completed following the combining of the entire dataset so that no early impressions would be formed by data taken from a single source.

2. *Member checks and peer debriefing*

The researcher shared the data with their Academic Supervisor and a peer with experience of Thematic Analysis across the iterations of the analysis to gain a meta-perspective on the process, however final decisions laid with the researcher. The Thematic Analysis process outlined by Braun & Clarke (2022) was adhered to closely, which means that because the themes are generated, rather than discovered, by the researcher, they do not require verification by participants. Nevertheless, during verbal

discussions with the adult participants, the researcher checked that they felt comfortable with informal summaries made at the time.

3. *Progressive subjectivity*

To maintain awareness of their own changing constructions throughout the study, the researcher completed a reflexive journal which captured reflections about positionality at different stages of the process. The researcher also utilised a range of peer and academic supervision opportunities to critically reflect on and discuss how constructions were developing throughout the study. This sometimes led to reconsiderations of themes and sub-themes in the light of new perspectives gained via these discussions. Therefore, it is recognised that the trustworthiness of the qualitative data in this study is influenced by the researcher's positionality and theoretical constructions.

Transferability

The issue of transferability can be considered as a parallel to external validity within quantitative research (Mertens, 2015) and two main ways to enhance transferability have been identified as pertinent to this study.

1. *Thick description*

The researcher has attempted provide thick description by recording the processes, evidencing the analysis and capturing reflexive considerations around this study. As the nature of the qualitative component of this research means that replication is not a goal, steps have been taken to furnish readers with sufficient detail to consider transferability to their own context.

2. *Multiple cases*

Whilst the qualitative component of this study design does not aim to create generalisable data as an epistemological goal, it is acknowledged that it sits within the

broader context of a mixed methods approach in which both elements should strengthen and enhance the other. The qualitative data may therefore support decisions about generalisation whilst not themselves providing a basis for this. Contributions from both participants and interventionists were included in the dataset, and a variety of methods were used to gather their perspectives. However, it is acknowledged that the data came from just two primary school settings, which further limits the transferability of its findings.

Dependability

This is a parallel of reliability in quantitative research (Mertens, 2015). In order to attempt to achieve a high level of dependability, the researcher has tracked and recorded each part of the research process, including how the themes and sub-themes were generated, with commensurate changes over time made visible via appendices Z and AA.

Confirmability

This is comparable with objectivity in quantitative research (Mertens, 2015) and requires researchers to demonstrate that data are traceable to their source and the process of interpretation is explicit. The reflexive approach to analysis set out by Braun & Clarke (2022) provides a clear description of the stages and processes of the Thematic Analysis and the overall treatment of the data is made clear in the study flow chart (fig. 3).

5.3.3 Summary

The purpose of this research was to explore the outcomes of a programme which combines the prebunking approach of a bespoke version of the BNJ game with a critical thinking skills teaching intervention on the participants ability to identify fake news. A mixed method design was used to answer the research questions to consider the

outcomes of the programme and the processes/mechanisms which appeared to be influential to this.

The researcher has taken steps to both reduce possible threats to reliability and validity within the quantitative component of this study, and also maximise trustworthiness in the qualitative component. However, threats to internal validity have been created by the small sample size which limits the conclusions that can be drawn from the quantitative data. In addition, the researcher adhered to the criteria defining quality for qualitative research, such as undertaking trustworthiness checks on the analyses and utilising a framework to support the process of thematic analysis, but the limited number of settings sampled may also have impacted on the potential transferability of the findings.

5.4 Implications of findings

5.4.1 Implications for research

The pragmatic philosophical assumptions of this study have focused on the production of actionable, transferable knowledge and intervention (Godlkuhl, 2012; Kelly & Cordeiro, 2020) via a mixed methods research design.

The analytical themes identified via an inductive Thematic Analysis, in the review of the literature (chapter 2), yielded four central implications for interventions which were incorporated into the study design, as follows:

1. Interventions for teaching children and/or adolescents to identify fake news are needed and should include a component related to raising awareness of any deficit in their existing ability to identify it accurately.

2. Interventions relating to any aspect of teaching around fake news should be planned around existing educational motivators for the participants.

3. Interventions relating to any aspect of teaching around fake news should incorporate components which relate to the psychological factors which influence thinking and behaviour, such as cognitive biases.

4. Interventions should be focused on providing children/adolescents with practical tools for verifying whether suspected fake news is fake or real are needed.

It is not possible to state that the teaching programme has had an impact on the participants ability to identify fake news based upon the quantitative data in this research, due to the data sample size limitations discussed previously. Further quantitative research is therefore needed using a larger sample size, in both comparison and control groups, to attempt to verify the positive impact noted in previous research and positive outcomes observed in this research. However, findings from the qualitative data suggest that the programme had perceived benefits for the participants and that interventionists felt it was pertinent, enjoyable and easy to deliver.

Chapter 2 presented a review of existing approaches to developing critical thinking skills in children and young people and found none of the approaches taken had been applied to Year 6 pupils. In line with previous studies, this study builds upon this by attempting to use an experimental methodology based in inoculation theory (McGuire, 1964; Roozenbeek & van der Linden, 2018, 2019; Roozenbeek, Culloty & Suiter, 2022) to investigate the effects of an inoculation and critical thinking skills teaching programme. Further steps to overcome the real world challenges of recruiting and maintaining adequate sample and in collecting data within a busy school environment will be needed in future research of this kind. More rigorous experimental methodologies are required such as randomised control trials, in order to establish the impact of combining prebunking approach with critical thinking skills to develop children's ability to identify fake news.

A further possibility for future research which is not present in the existing literature is exploration of any longer-term interaction between critical thinking skills and inoculation effects. Further investigation of how the inoculation effects may be affected by being situated within the broader context of a teaching programme may be of value to future

researchers, as there is an awareness currently that, in line with the medical vaccine analogy, the protective effects of the inoculation can fade over time (Maertens *et al.,* 2021; Traberg, Roozenbeek & van der Linden, 2022). Longitudinal and follow-up data may therefore be an area to consider within future research.

The qualitative findings suggest that participants perceived the mediating skills of the teachers was key to pupil outcomes and helped to make the programme accessible. This had the effect of inspiring the children and seemed to draw upon the theoretical knowledge, creativity and improvisational skills of the teachers. The exploratory findings of the present study suggest that the effects of enjoyment on interest and motivation may be important mechanisms underpinning the outcomes of the programme. This aligns with previous research which highlighted the effects of enjoyment on engagement and on the development of critical thinking skills (Renninger & Hidi, 2016; Hui *et al*., 2019). This research has only begun to tentatively explore the mechanisms that may be present. Future investigators may therefore wish to consider establishing the nature of any relationship between affective factors such as the perceived enjoyment of the pupils and the programme outcome and also any interaction between this and the style or approach of the teachers.

The views of the participants further suggested that teacher creativity in improvising in their response to some of the group discussions and in response to pupils' real-life experiences may have been influential to the outcome of the programme. The impression gained in the analysis of the qualitative data was that the school staff tailoring of the teaching/intervention materials to the unique situation and experiences of the children supported pupil engagement with the concepts covered in the programme. This is something future research may wish to further explore, via comparison of standardised versus bespoke delivery from different teachers and settings.

The present study highlighted that school staff were challenged by competing demands on teachers' time and attention. This seemed to require drawing on their commitment to and belief in the programme, which aligned with their espoused values. Future research could therefore usefully explore those things that support successful implementation in

a whole-class setting and curriculum, with greater scope for teacher involvement in the session designs.

5.4.2 Implications for EP practice

This research as several implications for the practice of educational psychologists (EPs) at the levels of systemic work and research. Braun & Clarke describe the concept of 'transferability' (2022, p.143), in preference to generalisability, in relation to Thematic Analysis, which means that broader inferences can be made from the data, by the reader. To support this, the present study aimed to provide sufficient detail about the programme, its context and outcomes to enable the reader to understand the issues and phenomenon. Within the contextualised research, the reader can make their own judgement around the extent to which they can transfer the findings of the Thematic Analysis to their own context. Therefore, potentially transferable findings are offered here for evaluation by educationalists and researchers, to consider the transferability of this research to their own settings and circumstances.

The role of the EP has developed towards working at the organisational and systems level, providing training and developing provision (Curran, Gersch & Wolfendale, 2003). In line with the approach taken in this research, training others is a key element of the EP role, in keeping with the philosophy described by Miller (Cline, Gulliford & Birch, 2015) this study attempted to give psychology away. This approach enables EPs to share their psychological knowledge and skills with other professionals in line with the scientist-practitioner role (Fallon, Woods & Rooney, 2010). Future implementation of the programme outlined in this study aligns with the Department for Education view of the EP role as incorporating early support and intervention in order to improve opportunities, rather than address difficulties after they have arisen at a later stage (DFE, 2011).

5.4.3 Implications for schools

Obtaining parental permissions for the young people to participate in this study was an essential but challenging part of the process, with interventionists reporting that it took significant time and resources for themselves and school colleagues, nevertheless

resulting in participant numbers lower than anticipated. Both experimental and control groups were therefore sub-sets of the Year 6 class groups, requiring further logistical challenges as separate simultaneous provision was made for the study as well as non-participants in the research. If a school or Multi-Academy Trust were to incorporate this programme into their teaching curriculum, most likely within the PSHE provision, this barrier to the implementation of the programme would be overcome.

A further finding to emerge from the study was around the challenge of implementing the programme due to competing demands on teachers' time. In the circumstances of the implementation of the programme across a group of schools, it is likely that there would be a range of teacher knowledge, skills and confidence in delivering the subject. EP time may therefore be useful in establishing this as part of a picture of the needs of the settings prior to commencing the programme, and also in ensuring that time is protected for this. A future EP role may therefore be around working at a high level within school systems to ensure senior leaders facilitate this. This may then be followed by the EP providing support or supervision to school staff following the initial training. These approaches have been shown to maximise the effectiveness of training (Balchin, Randall & Turner, 2006).

5.5 Researcher reflections

As described in previous chapters, a range of factors influenced the adaptations required from planning to the implementation and analysis phases of this research. At the earliest stages, a convergent parallel mixed methods design was preferred as a research approach, as the focus was placed equally on the empirical data from quantitative measures and the illuminating data from the qualitative contribution. The study encountered challenges with regard to recruitment of schools, with some demonstrating interest and initial commitment to participation, but reluctantly withdrawing due to time pressures. An additional time commitment, even for a programme considered to be potentially valuable and relevant to the school population, was not possible for some schools. Securing parental consents for children's participation was also a significant challenge for the schools involved in the study.

During the progress of the research, it became apparent that the intended strategy needed to be adapted due to the challenges faced in securing a sample of sufficient size and furthermore the treatment of the data needed to be adapted when there was an unexpected loss of quantitative data due to technical recording issues with the online measure used. It was then clear that it would not be possible to draw firm conclusions and statistical inferences from this data and the mixed methods strategy had to be adjusted accordingly. This was made possible by the pragmatic position of the research, which enabled the researcher to employ some flexibility around the overall emphasis placed upon the qualitative research questions. Participant views were explored in more depth around these research questions in order to enrich the data collected within the qualitative component of the study. This allowed the researcher to explore the underlying mechanisms that participants felt were influencing the research outcomes in greater depth and detail.

The researcher has further reflected upon whether there is anything further that could be done to reduce the risk of the likelihood of a similar data loss in future. A major learning point for the researcher, as a prospective EP practitioner-researcher, is the importance of ensuring shared back-up copies of data are downloaded and printed out as soon as possible after the data has been recorded electronically to avoid such data losses occurring in future research and practice. This would prevent a disappointing situation in which the measures were used by all the participants, but the data not captured. Alternatively future designs may consider employing a wholly analogue method for pre and post measures. The advantages and disadvantages of supporting others to deliver a programme, rather than taking the interventionist role was also a point of consideration for future research. Future implementation could involve additional support and supervision for the school staff to ensure fidelity to the intervention and the accurate capturing of pupil performance measures. A valuable point of learning for the researcher has been around responding flexibly to the pragmatic challenges faced by an applied researcher.

One key challenge for the researcher in taking a reflexive approach, was to maintain awareness of their influence on the data. As themes are constructed when following Braun and Clarke's Thematic Analysis process (2022) some influence is inevitable, although both a reflexive diary and supervision were used throughout the research to

facilitate critical reflection upon the researcher's influence on the process and its outcome. The purpose of the analysis was to attempt to generate insight into the participants' views about the programme and its outcome. The hybrid approach identified by Proudfoot (2022) of employing both inductive and deductive analyses meant that the researcher's identification of themes is likely to have been particularly influenced by their prior theoretical knowledge and experience in this area, as a Trainee Educational Psychologist and previously as a Year 6 primary school teacher.

During reflexive journalling, the researcher was also aware that the framing of themes and sub-themes tended towards literal descriptions. An attempt was made to mitigate any potential negative impact of this on the analysis by allowing an incubation period of several days between each stage of the analysis with regular reviews, and by seeking the views of a colleague and an Academic Supervisor, both of whom have experience of Thematic Analysis. The descriptions of the themes which were finally selected were therefore the result of extensive consideration and reflect the research question and sub-questions which aimed to explore pragmatic and operationalisable elements of the participants' views. This also guided the researcher's views around the directions of future research and practice, as the researcher's contribution emphasises practical applications and possible future implementation of the study findings.

As well as reflexive insights, the current study provided the researcher with valuable experience working closely with teachers during their learning about and implementation of a fake news and critical thinking skills, and their implementation of the programme. The researcher was also able to gain useful experience in undertaking applied research and managing the challenges of doing this in a real-world setting. These new areas of knowledge have been brought into the researcher's role as a Trainee Educational Psychologist working in real-world settings and will continue to inform future practice.

Chapter 6. Conclusions

Addressing a gap identified in the current literature, the main aim of this mixed-methods study was to investigate the outcomes of an original critical thinking skills teaching programme on Year 6 pupils' ability to identify fake news online. This is an age group that is potentially vulnerable to the negative effects of fake news but is not represented in the literature. Additionally, previous research around the prebunking techniques used in this study has not explored school settings.

Quantitative results using descriptive statistics showed that at post-test, pupils who participated in the programme improved their ability to recognise both fake and real news stories. Both groups seemed to improve their ability to recognise true news stories by the same amount. Average scores relating to the recognition of fake news, however, seemed to show that although the control group also made some gains, the change in score from pre to post was greater for the experimental group. This meant that overall, the combined score for recognising all types of news stories showed a greater improvement for the experimental than in the control group.

The study results indicate that there may be benefits to this programme and for further exploration of combining inoculation techniques with critical thinking skills. However, the significant challenges experienced around recruitment and data collection for the quantitative measures meant that these conclusions are tentative, as they are based on a small sample size.

Much of the previous research around prebunking approaches has involved self-selecting participants of an older age group. This research suggests that the programme's approach seems to be appropriate to the aged 10-11 age group. Teacher assessments, conducted at the end of the programme, indicated that they viewed the pupils as having made 'some' or 'excellent' gains in their levels of critical thinking skills and ability to recognise fake news. It also suggests that enjoyment of the programme may be a factor in pupil motivation and engagement with the subject which could be incorporated into similar future interventions.

A further original contribution of this research was to explore both pupil and teacher views about the mechanisms that may be at work within the programme, and their views about what contributed towards the programme outcomes, seeking to address, “what works, for whom, in what circumstances,” (Pawson & Tilley, 1997, p.84). Thematic Analysis of qualitative data provided five main themes which were relevant to the two research sub-questions. These themes arose from combining pupil and teacher data, treating all views inclusively with the intention of creating an authentic picture of how the programme was perceived contemporaneously with participation in it.

Analysis of this data identified that the intervention seemed to be perceived as having a high level of importance and relevance to the development and application of pupil thinking skills. Exploration of factors which may have facilitated this suggested that the enjoyment reported by pupils may have contributed to their engagement and motivation in the sessions.

Combining critical thinking skills with prebunking in one approach may potentially offer benefits to upper primary-aged children, around inoculation against some of the negative effects of fake news. The research also offers tentative early evidence that a group approach in a school setting may be a possible approach, rather than individual self-selection as seen in much of the previous research. The programme explored in the present study may, therefore, have implications for possible further research, adaptation and implementation in the future.

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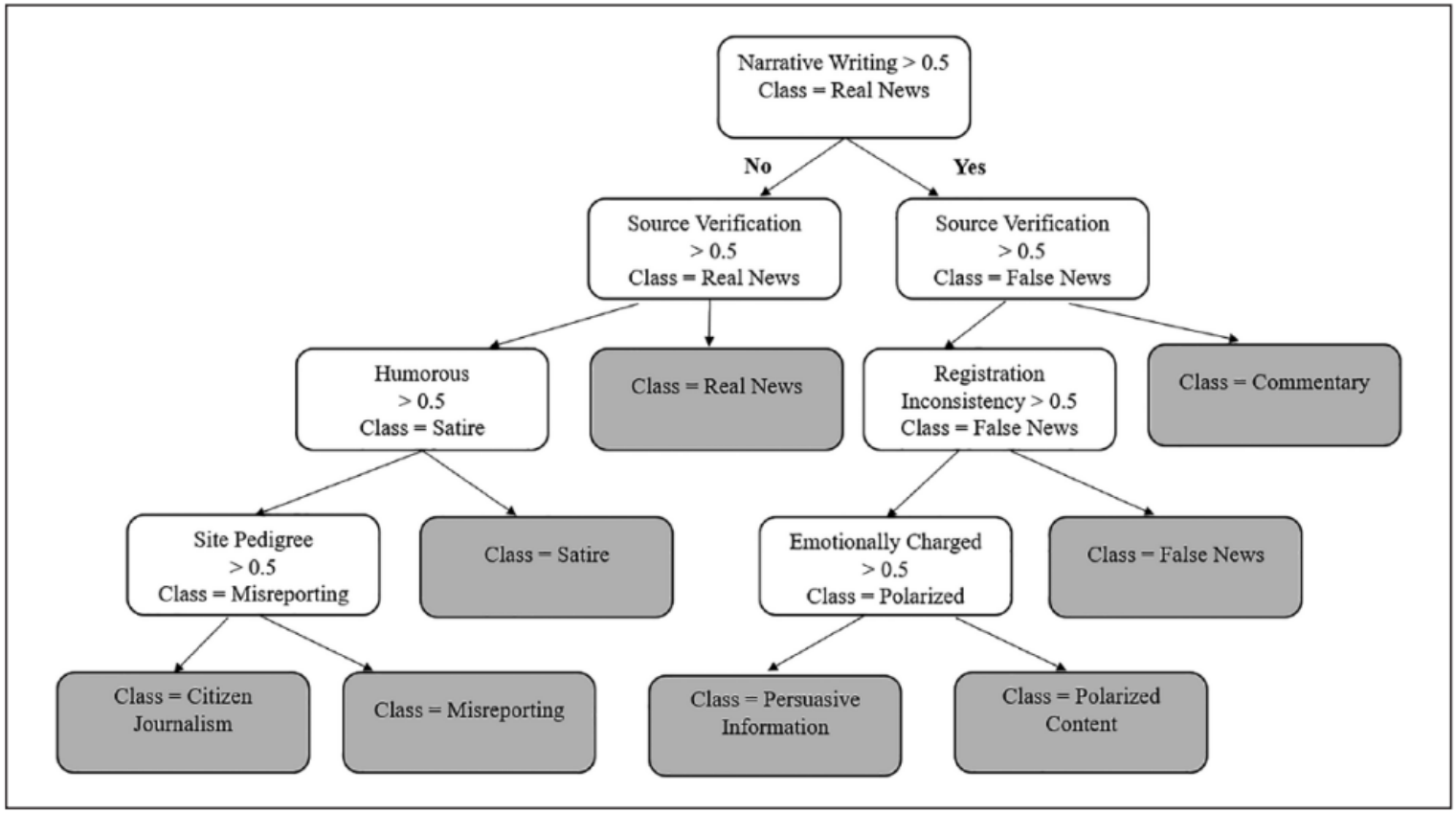
Appendices:

Appendix A

Decision-tree flowchart to determine whether information is fake news (Molina et al*, 2021)*



Appendix B

Table 3 - Inclusion and exclusion criteria:

	Inclusion criteria	**Exclusion criteria**	**Rationale**
Participants	Studies where some or all of the participants are between the ages of 4-21 and therefore includes the target population (children and adolescents).	The study does not include any young people aged 4-21	This represents the age group of full-time school/education attendance and a population identified in the literature as vulnerable to the effects of fake news online.
	Both genders represented in the group of participants	The study includes participants of only one gender	The focus is on findings that can be applied across genders. Findings from one gender can not be extrapolated reliably across both genders.
Setting	Any setting is considered, including the digital environment. International settings and papers are included.		The aim of this review is to explore what is known about ways to develop children and young people's skills in identifying fake news online. These skills may be examined or developed in a range of settings and locations.
Outcome measure	Studies that include quantitative scales or qualitative analysis to measure or explore what is known about developing the ability to identify fake news.	Studies that did not investigate any element of this area.	To measure intervention effects and themes within results to allow for a meta-synthesis comparison the factors which relate to the research question.

Research design	Studies that use experimental, observation or simulation designs. Primary research	Studies with no measures or research protocols. Systematic reviews. Secondary research	To evaluate the impact of interventions or approaches which develop the ability of children and/or young people to identify fake news online. Demonstrates robustness of research.
Language	English language	Non-English language	Non-English language papers were beyond the remit of the researcher during this review.
Publication	Peer reviewed	Non-peer reviewed	Demonstrates robustness of paper.

Appendix C

Table 4 - exclusion at full text and rationale.

Title	Author/Authors	Rationale
Story and science, *Human Vaccines and Immunotherapeutics 9*(8), 1795–1801	Shelby, A. and Ernst, K. (2013)	This study focused on an intervention to support parental knowledge of misinformation.
Populist Disinformation: Exploring Intersections Between Online Populism and Disinformation in the US and Netherlands, *Politics and Governance 8*(1) 146-157	Hameleers, M. (2020)	This explores the relationship between disinformation and political populism.
How users validate the information they encounter on digital content platforms: the proliferation of fake social media news, the likelihood of consumer exposure and online deceptions, *Geopolitics, History, and International Relations 10*(2) 51–57	Adamko, P., Fielden, M. & Grupac, A. (2018)	This study measures the proportions of individuals who have been exposed to fake news and what level of confusion this has caused them.
Fighting 'Fake News': how we overhauled out website evaluation lessons, *Knowledge Quest 47*(1)	Johnson, M. (2019)	This does not include a formal record of required research elements such as participant numbers and research materials.
Evaluating online information: Attitudes and practices of secondary English Language Arts teachers, *Journal of Media Literacy Education, 12*(1), 42-56	Korona, M. (2020)	This study measures the perceived importance and frequency of teaching students about fake news, as reported by teachers.
The use of critical thinking against fake news, *Education and Educational Research,* conference paper	Babii, A. (2020)	This paper proposes a model for mitigating acceptance of fake news without any measures of its effectiveness.
An overview of online fake news: Characterization, detection, and discussion, *Information Processing and Management* (57)	Zhang, X. & Gorbani, A.A. (2020)	This paper focuses on the features of the content of misinformation.
You're Definitely Wrong, Maybe: Correction Style Has Minimal Effect on Corrections of Misinformation Online, *Media and Communication, 9,* (1), 120–133	Martel, C., Mosleh, M. & Rand, D.G. (2021)	This paper focuses on fake news correction efficacy, rather than identification and response.
"Fake News" Is Not Simply False Information: A Concept Explication and Taxonomy of Online Content, *American Behavioral Scientist, 65*(2) 180–212	Molina, D., Shyam S., Sundar, S. S., Le, T. & Dongwon, L. (2021)	This paper focuses on a description of disinformation types without including any measures of the effectiveness of the taxonomy.

The Swiss cheese model for mitigating online misinformation*, Bulletin of the Atomic Scientists, 7*(3) 129–133	Bode, L. & Vraga, E. (2021)	This paper summarises a review of models for mitigating online misinformation.
Vulnerable populations and misinformation: A mixed-methods approach to underserved older adults' online information assessment, *New Media and Society, 23*(7) 2012–2033	Seo, H., Blomberg, D., Hong, A. & Vu, T. (2021)	This focuses on an older adult population.
Online misinformation about climate change, *WIREs Climate Change, 11*(665)	d'I. M., Hywel T., Williams, P & O'Neill, J. (2020)	This paper is concerned with the spread of misinformation and factors to mitigate this.
Designing for fake news literacy training: A problem-based undergraduate online-course, *Computers in Human Behavior 121*(106796)	Scheibenzuber, C., Hofer, S. & Nistor, N. (2021)	This paper proposes a model for mitigating acceptance of fake news without any measures of its effectiveness.
Protection from 'Fake News': The Need for Descriptive Factual Labeling for Online Content. *Future Internet 13*(142)	Spradling, M., Straub, J. & Strong, J. (2021)	This paper proposes a model for mitigating acceptance of fake news for possible future research.
Scottish citizens' perceptions of the credibility of online political "facts" in the "fake news" era: an exploratory study, *Journal of Documentation, 75*(5), 1100-1123	Graeme Baxter, Rita Marcella & Walicka, A. (2021)	This paper focuses on perceptions of credibility of online information and includes a cohort described as 'the general public' and is therefore likely to include individuals aged over 21.
Libraries Fight Disinformation: An Analysis of Online Practices to Help Users' Generations in Spotting Fake News, *Societies. 11*(133)	Herrero-Diz, P.& López-Rufino, C. (2021)	This paper summarises a review of models used in library services for mitigating online disinformation.
How to Combat Health Misinformation: A Psychological Approach, *American Journal of Health Promotion 36*(3), 569-575	Roozenbeek, J & Van der Linden, S (2022)	This is a summary of psychological models employed in fake news research but does not include original research.
Fighting Fake News: Interdisciplinary Online Literacies for Social Justice *Voices from the Middle 25*(4)	Pennell, S. & Fede, B. (2018)	This paper summarises research undertaken which focuses on critical literacy/numeracy skills with the aim of developing advocacy skills in social justice. It does not include a clear description of the thematic analysis undertaken in the qualitative appraisal.

Title excluded during updated search on 1/4/23

Effects of Inductive Learning and Gamification on News Veracity Discernment, Journal of Experimental Psychology: Applied. 1-17	Modirrousta-Galian, A., Higham, P.A. & Seabrooke, T. (2023)	This paper measures the effects of inductive learning training to improve the identification of news veracity and focuses on adult participants up to age 65.
Students Evaluating and Corroborating Digital News, *Scandinavian Journal of Educational Research 66*(4), 549-565	Nygren, T. & Guath, M. (2022)	This paper compares participant backgrounds and choice of college course on performance in the evaluation of online news.

Appendix D

Table 8. JBI methodological approach for conducting mixed methods reviews:

Data	Primary data obtained from quantitative studies, qualitative studies, or mixed methods studies.
Data transformation	The process of transforming qualitative data into a quantitative format ("quantitizing") or quantitative data into a qualitative format ("qualitizing").
Integration	The combining of quantitative data with qualitative data following transformation OR of combining quantitative evidence and qualitative evidence without transformation.
Synthesis	Can be either a quantitative synthesis or a qualitative synthesis.Quantitative synthesis refers to the process of combining extracted data from quantitative studies (including data from the quantitative component of a mixed methods study), resulting in the generation of quantitative evidence.Qualitative synthesis refers to the process of combining extracted data from qualitative studies (including data from the qualitative component of a mixed methods study), resulting in the generation of qualitative evidence.
Sequence of synthesis	Refers to whether the quantitative synthesis and qualitative synthesis occur *simultaneously* (i.e., convergent) or *consecutively* (i.e., sequential, where the results/findings from a synthesis of one type of evidence informs the synthesis of the other type of evidence).

Appendix E

Part I: Mixed Methods Appraisal Tool (MMAT), version 2018

Category of study designs	Methodological quality criteria	Responses			
		Yes	No	Can't tell	Comments
Screening questions (for all types)	S1. Are there clear research questions?				
	S2. Do the collected data allow to address the research questions?				
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.				
1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?				
	1.2. Are the qualitative data collection methods adequate to address the research question?				
	1.3. Are the findings adequately derived from the data?				
	1.4. Is the interpretation of results sufficiently substantiated by data?				
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?				
2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?				
	2.2. Are the groups comparable at baseline?				
	2.3. Are there complete outcome data?				
	2.4. Are outcome assessors blinded to the intervention provided?				
	2.5 Did the participants adhere to the assigned intervention?				
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?				
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?				
	3.3. Are there complete outcome data?				
	3.4. Are the confounders accounted for in the design and analysis?				
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?				
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?				
	4.2. Is the sample representative of the target population?				
	4.3. Are the measurements appropriate?				
	4.4. Is the risk of nonresponse bias low?				
	4.5. Is the statistical analysis appropriate to answer the research question?				
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?				
	5.2. Are the different components of the study effectively integrated to answer the research question?				
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?				
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?				
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?				

Part II: Explanations

1. Qualitative studies	Methodological quality criteria
"Qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem" (Creswell, 2013b, p. 3). Common qualitative research approaches include (this list if not exhaustive): **Ethnography** The aim of the study is to describe and interpret the shared cultural behaviour of a group of individuals. **Phenomenology** The study focuses on the subjective experiences and interpretations of a phenomenon encountered by individuals. **Narrative research** The study analyzes life experiences of an individual or a group. **Grounded theory** Generation of theory from data in the process of conducting research (data collection occurs first). **Case study** In-depth exploration and/or explanation of issues intrinsic to a particular case. A case can be anything from a decision-making process, to a person, an organization, or a country. **Qualitative description** There is no specific methodology, but a qualitative data collection and analysis, e.g., in-depth interviews or focus groups, and hybrid thematic analysis (inductive and deductive). Key references: Creswell (2013a); Sandelowski (2010); Schwandt (2015)	1.1. Is the qualitative approach appropriate to answer the research question? Explanations The qualitative approach used in a study (see non-exhaustive list on the left side of this table) should be appropriate for the research question and problem. For example, the use of a grounded theory approach should address the development of a theory and ethnography should study human cultures and societies. This criterion was considered important to add in the MMAT since there is only one category of criteria for qualitative studies (compared to three for quantitative studies). 1.2. Are the qualitative data collection methods adequate to address the research question? Explanations This criterion is related to data collection method, including data sources (e.g., archives, documents), used to address the research question. To judge this criterion, consider whether the method of data collection (e.g., in depth interviews and/or group interviews, and/or observations) and the form of the data (e.g., tape recording, video material, diary, photo, and/or field notes) are adequate. Also, clear justifications are needed when data collection methods are modified during the study. 1.3. Are the findings adequately derived from the data? Explanations This criterion is related to the data analysis used. Several data analysis methods have been developed and their use depends on the research question and qualitative approach. For example, open, axial and selective coding is often associated with grounded theory, and within- and cross-case analysis is often seen in case study. 1.4. Is the interpretation of results sufficiently substantiated by data? Explanations The interpretation of results should be supported by the data collected. For example, the quotes provided to justify the themes should be adequate. 1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation? Explanations There should be clear links between data sources, collection, analysis and interpretation.

2. Quantitative randomized controlled trials	Methodological quality criteria
Randomized controlled clinical trial: A clinical study in which individual participants are allocated to intervention or control groups by randomization (intervention assigned by researchers). Key references: Higgins and Green (2008); Higgins et al. (2016); Oxford Centre for Evidence-based Medicine (2016); Porta et al. (2014)	2.1. Is randomization appropriately performed? Explanations In a randomized controlled trial, the allocation of a participant (or a data collection unit, e.g., a school) into the intervention or control group is based solely on chance. Researchers should describe how the randomization schedule was generated. A simple statement such as 'we randomly allocated' or 'using a randomized design' is insufficient to judge if randomization was appropriately performed. Also, assignment that is predictable such as using odd and even record numbers or dates is not appropriate. At minimum, a simple allocation (or unrestricted allocation) should be performed by following a predetermined plan/sequence. It is usually achieved by referring to a published list of random numbers, or to a list of random assignments generated by a computer. Also, restricted allocation can be performed such as blocked randomization (to ensure particular allocation ratios to the intervention groups), stratified randomization (randomization performed separately within strata), or minimization (to make small groups closely similar with respect to several characteristics). Another important characteristic to judge if randomization was appropriately performed is allocation concealment that protects assignment sequence until allocation. Researchers and participants should be unaware of the assignment sequence up to the point of allocation. Several strategies can be used to ensure allocation concealment such relying on a central randomization by a third party, or the use of sequentially numbered, opaque, sealed envelopes (Higgins et al., 2016).
	2.2. Are the groups comparable at baseline? Explanations Baseline imbalance between groups suggests that there are problems with the randomization. Indicators from baseline imbalance include: "(1) unusually large differences between intervention group sizes; (2) a substantial excess in statistically significant differences in baseline characteristics than would be expected by chance alone; (3) imbalance in key prognostic factors (or baseline measures of outcome variables) that are unlikely to be due to chance; (4) excessive similarity in baseline characteristics that is not compatible with chance; (5) surprising absence of one or more key characteristics that would be expected to be reported" (Higgins et al., 2016, p. 10).
	2.3. Are there complete outcome data? Explanations Almost all the participants contributed to almost all measures. There is no absolute and standard cut-off value for acceptable complete outcome data. Agree among your team what is considered complete outcome data in your field and apply this uniformly across all the included studies. For instance, in the literature, acceptable complete data value ranged from 80% (Thomas et al., 2004; Zaza et al., 2000) to 95% (Higgins et al., 2016). Similarly, different acceptable withdrawal/dropouts rates have been suggested: 5% (de Vet et al., 1997; MacLehose et al., 2000), 20% (Sindhu et al., 1997; Van Tulder et al., 2003) and 30% for a follow-up of more than one year (Viswanathan and Berkman, 2012).
	2.4. Are outcome assessors blinded to the intervention provided? Explanations Outcome assessors should be unaware of who is receiving which interventions. The assessors can be the participants if using participant reported outcome (e.g., pain), the intervention provider (e.g., clinical exam), or other persons not involved in the intervention (Higgins et al., 2016).
	2.5 Did the participants adhere to the assigned intervention? Explanations To judge this criterion, consider the proportion of participants who continued with their assigned intervention throughout follow-up. "Lack of adherence includes imperfect compliance, cessation of intervention, crossovers to the comparator intervention and switches to another active intervention." (Higgins et al., 2016, p. 25).

3. Quantitative non-randomized studies	Methodological quality criteria
Non-randomized studies are defined as any quantitative studies estimating the effectiveness of an intervention or studying other exposures that do not use randomization to allocate units to comparison groups (Higgins and Green, 2008). Common designs include (this list if not exhaustive): **Non-randomized controlled trials** The intervention is assigned by researchers, but there is no randomization, e.g., a pseudo-randomization. A non-random method of allocation is not reliable in producing alone similar groups. **Cohort study** Subsets of a defined population are assessed as exposed, not exposed, or exposed at different degrees to factors of interest. Participants are followed over time to determine if an outcome occurs (prospective longitudinal). **Case-control study** Cases, e.g., patients, associated with a certain outcome are selected, alongside a corresponding group of controls. Data is collected on whether cases and controls were exposed to the factor under study (retrospective). **Cross-sectional analytic study** At one particular time, the relationship between health-related characteristics (outcome) and other factors (intervention/exposure) is examined. E.g., the frequency of outcomes is compared in different population subgroups according to the presence/absence (or level) of the intervention/exposure. Key references for non-randomized studies: Higgins and Green (2008); Porta et al. (2014); Sterne et al. (2016); Wells et al. (2000)	3.1. Are the participants representative of the target population? Explanations Indicators of representativeness include: clear description of the target population and of the sample (inclusion and exclusion criteria), reasons why certain eligible individuals chose not to participate, and any attempts to achieve a sample of participants that represents the target population.
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)? Explanations Indicators of appropriate measurements include: the variables are clearly defined and accurately measured; the measurements are justified and appropriate for answering the research question; the measurements reflect what they are supposed to measure; validated and reliability tested measures of the intervention/exposure and outcome of interest are used, or variables are measured using 'gold standard'.
	3.3. Are there complete outcome data? Explanations Almost all the participants contributed to almost all measures. There is no absolute and standard cut-off value for acceptable complete outcome data. Agree among your team what is considered complete outcome data in your field (and based on the targeted journal) and apply this uniformly across all the included studies. For example, in the literature, acceptable complete data value ranged from 80% (Thomas et al., 2004; Zaza et al., 2000) to 95% (Higgins et al., 2016). Similarly, different acceptable withdrawal/dropouts rates have been suggested: 5% (de Vet et al., 1997; MacLehose et al., 2000), 20% (Sindhu et al., 1997; Van Tulder et al., 2003) and 30% for follow-up of more than one year (Viswanathan and Berkman, 2012).
	3.4. Are the confounders accounted for in the design and analysis? Explanations Confounders are factors that predict both the outcome of interest and the intervention received/exposure at baseline. They can distort the interpretation of findings and need to be considered in the design and analysis of a non-randomized study. Confounding bias is low if there is no confounding expected, or appropriate methods to control for confounders are used (such as stratification, regression, matching, standardization, and inverse probability weighting).
	3.5 During the study period, is the intervention administered (or exposure occurred) as intended? Explanations For intervention studies, consider whether the participants were treated in a way that is consistent with the planned intervention. Since the intervention is assigned by researchers, consider whether there was a presence of contamination (e.g., the control group may be indirectly exposed to the intervention) or whether unplanned co-interventions were present in one group (Sterne et al., 2016). For observational studies, consider whether changes occurred in the exposure status among the participants. If yes, check if these changes are likely to influence the outcome of interest, were adjusted for, or whether unplanned co-exposures were present in one group (Morgan et al., 2017).

4. Quantitative descriptive studies	Methodological quality criteria
Quantitative descriptive studies are "concerned with and designed only to describe the existing distribution of variables without much regard to causal relationships or other hypotheses" (Porta et al., 2014, p. 72). They are used to monitoring the population, planning, and generating hypothesis (Grimes and Schulz, 2002). Common designs include the following single-group studies (this list if not exhaustive): **Incidence or prevalence study without comparison group** In a defined population at one particular time, what is happening in a population, e.g., frequencies of factors (importance of problems), is described (portrayed). **Survey** "Research method by which information is gathered by asking people questions on a specific topic and the data collection procedure is standardized and well defined." (Bennett et al., 2011, p. 3). **Case series** A collection of individuals with similar characteristics are used to describe an outcome. **Case report** An individual or a group with a unique/unusual outcome is described in detail. Key references: Critical Appraisal Skills Programme (2017); Draugalis et al. (2008)	4.1. Is the sampling strategy relevant to address the research question? Explanations Sampling strategy refers to the way the sample was selected. There are two main categories of sampling strategies: probability sampling (involve random selection) and non-probability sampling. Depending on the research question, probability sampling might be preferable. Non-probability sampling does not provide equal chance of being selected. To judge this criterion, consider whether the source of sample is relevant to the target population; a clear justification of the sample frame used is provided; or the sampling procedure is adequate.
	4.2. Is the sample representative of the target population? Explanations There should be a match between respondents and the target population. Indicators of representativeness include: clear description of the target population and of the sample (such as respective sizes and inclusion and exclusion criteria), reasons why certain eligible individuals chose not to participate, and any attempts to achieve a sample of participants that represents the target population.
	4.3. Are the measurements appropriate? Explanations Indicators of appropriate measurements include: the variables are clearly defined and accurately measured, the measurements are justified and appropriate for answering the research question; the measurements reflect what they are supposed to measure; validated and reliability tested measures of the outcome of interest are used, variables are measured using 'gold standard', or questionnaires are pre-tested prior to data collection.
	4.4. Is the risk of nonresponse bias low? Explanations Nonresponse bias consists of "an error of nonobservation reflecting an unsuccessful attempt to obtain the desired information from an eligible unit." (Federal Committee on Statistical Methodology, 2001, p. 6). To judge this criterion, consider whether the respondents and non-respondents are different on the variable of interest. This information might not always be reported in a paper. Some indicators of low nonresponse bias can be considered such as a low nonresponse rate, reasons for nonresponse (e.g., noncontacts vs. refusals), and statistical compensation for nonresponse (e.g., imputation). The nonresponse bias is might not be pertinent for case series and case report. This criterion could be adapted. For instance, complete data on the cases might be important to consider in these designs.
	4.5. Is the statistical analysis appropriate to answer the research question? Explanations The statistical analyses used should be clearly stated and justified in order to judge if they are appropriate for the design and research question, and if any problems with data analysis limited the interpretation of the results.

5. Mixed methods studies	Methodological quality criteria
Mixed methods (MM) research involves combining qualitative (QUAL) and quantitative (QUAN) methods. In this tool, to be considered MM, studies have to meet the following criteria (Creswell and Plano Clark, 2017): (a) at least one QUAL method and one QUAN method are combined; (b) each method is used rigorously in accordance to the generally accepted criteria in the area (or tradition) of research invoked; and (c) the combination of the methods is carried out at the minimum through a MM design (defined *a priori*, or emerging) and the integration of the QUAL and QUAN phases, results, and data. Common designs include (this list if not exhaustive): **Convergent design** The QUAL and QUAN components are usually (but not necessarily) concomitant. The purpose is to examine the same phenomenon by interpreting QUAL and QUAN results (bringing data analysis together at the interpretation stage), or by integrating QUAL and QUAN datasets (e.g., data on same cases), or by transforming data (e.g., quantization of qualitative data). **Sequential explanatory design** Results of the phase 1 - QUAN component inform the phase 2 - QUAL component. The purpose is to explain QUAN results using QUAL findings. E.g., the QUAN results guide the selection of QUAL data sources and data collection, and the QUAL findings contribute to the interpretation of QUAN results. **Sequential exploratory design** Results of the phase 1 - QUAL component inform the phase 2 - QUAN component. The purpose is to explore, develop and test an instrument (or taxonomy), or a conceptual framework (or theoretical model). E.g., the QUAL findings inform the QUAN data collection, and the QUAN results allow a statistical generalization of the QUAL findings. Key references: Creswell et al. (2011); Creswell and Plano Clark, (2017); O'Cathain (2010)	5.1. Is there an adequate rationale for using a mixed methods design to address the research question? Explanations The reasons for conducting a mixed methods study should be clearly explained. Several reasons can be invoked such as to enhance or build upon qualitative findings with quantitative results and vice versa; to provide a comprehensive and complete understanding of a phenomenon or to develop and test instruments (Bryman, 2006).
	5.2. Are the different components of the study effectively integrated to answer the research question? Explanations Integration is a core component of mixed methods research and is defined as the "explicit interrelating of the quantitative and qualitative component in a mixed methods study" (Plano Clark and Ivankova, 2015, p. 40). Look for information on how qualitative and quantitative phases, results, and data were integrated (Pluye et al., 2018). For instance, how data gathered by both research methods was brought together to form a complete picture (e.g., joint displays) and when integration occurred (e.g., during the data collection-analysis or/and during the interpretation of qualitative and quantitative results).
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted? Explanations This criterion is related to meta-inference, which is defined as the overall interpretations derived from integrating qualitative and quantitative findings (Teddlie and Tashakkori, 2009). Meta-inference occurs during the interpretation of the findings from the integration of the qualitative and quantitative components, and shows the added value of conducting a mixed methods study rather than having two separate studies.
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed? Explanations When integrating the findings from the qualitative and quantitative components, divergences and inconsistencies (also called conflicts, contradictions, discordances, discrepancies, and dissonances) can be found. It is not sufficient to only report the divergences; they need to be explained. Different strategies to address the divergences have been suggested such as reconciliation, initiation, bracketing and exclusion (Pluye et al., 2009b). Rate this criterion 'Yes' if there is no divergence.
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved? Explanations The quality of the qualitative and quantitative components should be individually appraised to ensure that no important threats to trustworthiness are present. To appraise 5.5, use criteria for the qualitative component (1.1 to 1.5), and the appropriate criteria for the quantitative component (2.1 to 2.5, or 3.1 to 3.5, or 4.1 to 4.5). The quality of both components should be high for the mixed methods study to be considered of good quality. The premise is that the overall quality of a mixed methods study cannot exceed the quality of its weakest component. For example, if the quantitative component is rated high quality and the qualitative component is rated low quality, the overall rating for this criterion will be of low quality.

Appendix F

Initial codes from thematic analysis:

Information perceived as a hoax/trustworthy
Satire
Hyperbole
Reliability rating change
Inoculation effect – influencing factors (order, psychometric properties)
Influencing factors on participants:

- Formal environment
- Peer pressure
- Trust in the teacher
- Presentation of material (e.g. animal presented as endangered)

Learning to adapt to any situation presented in text
Importance of visual information
Texts/materials used (real or fictional)
The use of fact-checking and search-operator tools/ack of mechanisms for this
Student perceptions of reliability and doubt
Student reasoning and rationale for decisions
Vertical reading vs lateral reading techniques
Lateral reading and additional searches

- But not acting on the outcomes
- Corroboration seeking

Consequences of children/young people having high awareness
Discrepancy between reported and actual ability to identify fake news
Moving from definitive judgements to checking strategies
Reverse image searching
Understanding of scientific consensus
User engagement with intervention materials
Motivation
Fun challenges
Manipulation
Intimidation

Appendix G

Teacher post-treatment pupil assessment questionnaire

Please indicate your views about the following two questions for each pupil who has participated in the programme, using the scale below:

No progress **Some progress** **Excellent progress**

1 2 3 4 5 6 7

1. Please write a number in each of the two boxes to indicate the progress for each pupil.

Pupil number	To what extent has the programme made a difference to the pupil's ability to identify fake news?	To what extent has the programme made a difference to the critical thinking skills being developed in the pupil?
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

2. What helped the pupils achieve the outcomes of the programme?

3. What hindered the pupils in achieving the outcomes of the programme?

4. Please share any additional information or feedback below:

Appendix H

Consent form for teachers

Recruitment and consent letter for school staff:

Dear Sir/Madam,

I am a Trainee Educational Psychologist at the University of Nottingham, undertaking a research study on the effectiveness of a bespoke teaching programme to help pupils identify 'fake news' online, whilst on placement with Applied Psychologies (Educational Psychology service provider). This aims to understand the effectiveness of a new three-session teaching programme on Year 6 children by teaching critical thinking skills. The study will form part of my course requirements, and I will be supervised throughout by Dr Nicholas Durbin (Course Director) at the University of Nottingham. Due to your involvement with the education of young people I am writing to ask for your consent to be involved with this study.

The study requires staff to identify two year 6 classes that are receiving no other teaching programme focusing on identifying fake news. One class will receive the teaching sessions and the other will not, as they will form a 'control' group for comparison. Informed consent to take part in the study would then be gathered from parents/guardians of the identified children. The class teacher of the group who will receive the teaching programme will be trained in the approach. Both class teachers will be asked to administer some questionnaires to their pupils before and after the programme.

I appreciate the time constraint and demands on school staff, and that the study requires commitment from the school. I aim to support the school staff in terms of providing all materials and resources, training, piloting, providing the pre and post and measures and also having regular check-ins with the staff, in order to reduce these demands. I can also assure you that all of the work will be carried out professionally in line with the ethical guidelines of the British Psychological Society. All data obtained will be anonymous, and will be stored securely and confidentially during the study. All raw data will be destroyed two years after the completion and publication of the research. I would also ensure that parents/guardians are fully informed and have given consent for their child to participate in the study

If you are happy to participate in this study, please sign and return the consent form attached as soon as possible (21st October 2022). Even if you consent to participating now but feel you would like to withdraw from the study at a later stage, you can withdraw from the study at any time.

On completion of the study I will be happy to offer feedback both in person and by means of an Executive Summary of the study for all those involved.

If you require any further information on the study, please feel free to contact me or my supervisor using the details given below.

Thank you in anticipation,

yours sincerely,

Louise Rodgers (Trainee Educational Psychologist)

Do you agree to take part in this study? **YES / NO**

"This study has been explained to me to my satisfaction, and I agree that I will take part. I understand that I am free to withdraw consent at any time".

Signature: .....

Name: .....

Date: .....

Contact details for comments or complaints:

Louise Rodgers (Trainee Educational Psychologist)

Louise.rodgers@nottingham.ac.uk

Dr Nicholas Durbin (Academic Supervisor and Course Director, DAppEdPsy)

Nicholas.durbin@nottingham.ac.uk

Professor Stephen Jackson (Chair of the School of Psychology Ethics Committee)

stephen.jackson@nottingham.ac.uk

Appendix I

Consent form for head teachers

Recruitment and consent letter for head teacher:

Dear Sir/Madam,

I am a Trainee Educational Psychologist at the University of Nottingham, working for Applied Psychologies, undertaking a research study on the effectiveness of a bespoke teaching programme on pupils' ability identify 'fake news'. The study aims to understand the effectiveness of a new three-session teaching programme on Year 6 children's ability to recognise 'fake news' by teaching critical thinking skills. The study will be supervised throughout by Dr Nicholas Durbin (Course Director) at the University of Nottingham. Due to your involvement with the education of young people I am writing to ask for your consent to be involved with this study.

The study requires staff to identify two year 6 classes who have not previously received a teaching programme focusing on identifying fake news. One class will receive the teaching sessions and the other will form a 'wait list' control group for comparison, receiving the teaching sessions following the first group. Informed consent to take part in the study will be gathered from parents/guardians. The class teachers of both groups will be trained in the approach. Both class teachers will be asked to administer measures of their ability to identify fake news, to their pupils, before and after the programme.

I appreciate the time constraint and demands on school staff, and that the study requires commitment from the school. I aim to support the school staff in terms of providing all materials and resources, training, piloting, providing the pre and post measures and also having regular check-ins with the staff, in order to reduce these demands. I can also assure you that all of the work will be carried out in line with the ethical guidelines of the British Psychological Society and the University of Nottingham. All data obtained will be anonymous, and will be stored securely and confidentially during the study. All raw data will be destroyed two years after the completion and publication of the research. I would also ensure that parents/guardians are fully informed and have given consent for their child to participate in the study.

If you are happy for your school to participate in this study, please sign and return the consent form attached as soon as possible (before 21st October 2022). Even if you consent to participating now but feel you would like to withdraw from the study at a later stage, you can withdraw from the study at any time.

On completion of the study I will be happy to offer feedback both in person and by means of an Executive Summary of the study for all those involved. If you require any further information on the study prior to giving consent, please feel free to contact me or my supervisor using the details given below.

The University of Nottingham

Thank you in anticipation,

yours sincerely,

Louise Rodgers (Trainee Educational Psychologist)

Do you agree for your school to take part in this study? **YES / NO**

"This study has been explained to me to my satisfaction, and I agree that my school will take part. I understand that I am free to withdraw consent at any time".

Signature: ……

Name: ……

Date: ……

Contact details for comments or complaints:

Louise Rodgers (Trainee Educational Psychologist)

Louise.rodgers@nottingham.ac.uk

Dr Nicholas Durbin (Academic Supervisor and Course Director, DAppEdPsy)

Nicholas.durbin@nottingham.ac.uk

Professor Stephen Jackson (Chair of the School of Psychology Ethics Committee)

stephen.jackson@nottingham.ac.uk

Appendix J

Risk assessment for participants

Business Unit: School of Psychology	**Location(s) of Activity:** Primary school	**Risk Assessment Ref:** Master RA 1
Activity Title: General classroom-based tasks within the school setting		
Activity Outline: Completing classroom-based discussion and written work with participants aged 10-11, led by class teacher.		
Those at risk / affected parties: Class teacher/Participant		
Author **(Produced original master risk assessment)** Name: C Reinert	Signature:	Date:21/01/2020
Risk Assessor, **(Has reviewed Master and adapted to local area as required)** Name: Louise Rodgers (Trainee Educational Psychologist)	Signature:	Date:09/05/2022
Responsible Person / Line Manager Approval Name: Dr Nicholas Durbin, University of Nottingham	Signature:	Date:09/05/2022
Review Period: N/A	**Related procedure references or links:** N/A	

What are the hazards?	**List the harm associated with the hazard**	**Risk Evaluation without controls in place** High/Med/Low	**What control measures are, or will be put, in place to control the risk?** List all elimination, substitution, engineering and/or administrative controls	**Risk Evaluation with controls in place** High/Med/Low
Fire (potential use of personal computers)	Injury from smoke/fire - burns	Low	*The Researcher will follow the school's Health and Safety policy.* Fire drills are planned regularly within building.	Low

			Fire alarms are tested regularly by school site staff. Fire alarm systems and extinguishers are routinely checked and maintained by school site staff.	
Upsetting news/fake news materials	Emotional distress	Low	*Please refer to the control measures and appended example documents outlined in the ethics risk assessment.* Low-impact news stories will be used in the study materials in order to mitigate any possible emotional distress	Low
Exposure to age-inappropriate online material when accessing the internet to complete the pre/post measures.	Emotional distress	Low	*The Interventionist will follow the school's Internet Safety policy.* *Participants will be supervised by their class teacher during access to the online materials.* *Participants will be briefed prior to the relevant sessions about the importance of remaining on-task and the dangers of deviating from this.* *Access to the internet for the pre/post measures will be time-limited to reduce the opportunity for non-directed activities.* *Internet search histories are available to check if there is a concern about one or more participants.*	Low

Justification for selection of controls

Summarise justification for selecting control measures that are not to the highest, reasonably practicable standard or compliant with industry standard e.g. use of personal protective equipment rather than engineering means of control: N/A

Additional Requirements (if not recorded elsewhere)

First Aid	**N/A**
Waste handling	**N/A**
Emergency	**N/A**
Training, supervision and competency	**N/A**
Other	**N/A**

Competency Record

Name of worker	Measure of competency	Assessor comments	Competent to perform activity Y/N?	Signature (Worker)	Signature (Assessor)	Date

Guidance on completing the form

This form may be used to record the risk assessment for any University activity whether that be lab or workshop-based, an event, on or off-site working, etc. Separate templates exist for Biological work, Laser work and Fieldwork.
Only complete a risk assessment if you have a good understanding of the activity being assessed and you have been instructed in the principles of carrying out a risk assessment (refer to your Business Unit arrangements on risk assessments).

- **Responsible Person**
  The manager who is responsible for the activity should approve the risk assessment, this indicates they agree the risk assessment is sufficiently detailed, they agree the control measures are appropriate and will be implemented and they authorise the work to commence. The Responsible Person may be a PI in the academic setting or a local line manager or head of section in non-academic sections of Schools/Faculties and Professional Services.

- **Those at risk / affected parties**
  Identify individuals or groups of people who might be affected by the Hazard. Besides staff and students consider visitors, members of the publics, volunteers and others who could be affected.

- **What are the hazards?**
  The definition of a Hazard is the potential for something to cause harm, e.g. chemicals, radiation, lasers, fire. In the Hazards column, list the hazards which could reasonably be expected to result in significant harm.

- **List the harm associated with the hazard**
  For each hazard, there may be one or more types of harm that could occur. For example, working with cryogenic substances - harm may be asphyxiation, cold burns or fire/explosion and each is likely to require different control measures to be implemented. It is recommended each is given a separate line on the form.

- **Risk Evaluation – High (H), Medium (M) or Low (L)**
  Decide whether the hazard presents a high, medium or low risk, based upon your knowledge of the severity of harm, frequency of activity and number and nature of the people involved. This is subjective which is why you must have good knowledge of the activity in order to undertake the risk assessment. Hazards that remain high risk once evaluated after control measures are put in place, must not proceed without further consideration.

- **What control measures are, or will be put, in place:**
  List what is, or will be put in place to reduce the likelihood of harm or make any harm less serious. These precautions should meet legal standards, represent good practice and reduce risk as far as reasonably practicable. They should also take into account the hierarchy of control and favour elimination, substitution, engineering methods over administrative controls. Fundamentally, ensure the risks are reduced so far as is reasonably practicable.

- **Review Period:**
  The University advises that all risk assessments are revised every two years to ensure validity. For activities undergoing change, consider a shorter timeframe for review. For lower risk activities, you may consider a longer timeframe. Comply with your Business Unit arrangements.

- **Justification for selection of controls**
  In brief, the hierarchy of control in terms of robustness is: (1) Elimination (2) Substitution (3) Engineering Control (4) Administrative Control. If not implementing a higher level of control, justify the reasons why a low level is appropriate in the situation.

- **Areas for additional consideration in your risk assessment or associated procedures**
  Consider training and supervision, manual handling, waste disposal, first aid, emergency situations such as spillage, access to medical assistance. It may be more appropriate for these to be covered as part of a safe working procedure or standard operating procedure.

Appendix K

GDPR and participant information sheet

Participant Information Sheet & GDPR Privacy Notice

Section 1 - Participant Information Sheet

Date: 17th October 2022

Title of Study: What are the outcomes of a bespoke critical thinking skills programme on children and young people's ability to identify 'fake news'?

Name of Researcher(s): Louise Rodgers (Trainee Educational Psychologist)

We would like to invite you to take part in our research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. One of our team will go through the information sheet with you and answer any questions you have. Talk to others about the study if you wish. Ask us if there is anything that is not clear.

What is the purpose of the study?

The aim of this study is to find out whether learning new digital literacy skills will help students to identify 'fake news.'

Why have I been invited?

You are being invited to take part because you are a Year 6 student. We are inviting around 120 participants like you to take part.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form (completion and return of a questionnaire can be taken as implied consent). If you decide to take part you are still free to withdraw at any time and without giving a reason. This would not affect your legal rights.

What will happen to me if I take part?

You will have a new lesson in your school timetable which will help you to understand how to recognise fake news. Your usual class teacher will be the person to teach you this and they will also ask you to play a game before and after the lessons.

Expenses and payments

Participants will not be paid an allowance to participate in the study.

What are the possible disadvantages and risks of taking part?

The new lessons are similar to the PSHE lessons you already attend in school. Some of the class discussions around fake news stories might be uncomfortable or lead to disagreements between people in the class.

What are the possible benefits of taking part?
We cannot promise the study will help you but the information we get from this study may help schools and other professionals to know more about what helps to protect students from the harms of fake news.

What if there is a problem?
If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions. If you remain unhappy and wish to complain formally, you can do this by contacting the School Research Ethics Officer. All contact details are given at the end of this information sheet.

Will my taking part in the study be kept confidential?
We will follow ethical and legal practice and all information about you will be handled in confidence.

If you join the study, the data collected for the study will be looked at by authorised persons from the University of Nottingham who are organising the research. They may also be looked at by authorised people to check that the study is being carried out correctly. All will have a duty of confidentiality to you as a research participant and we will do our best to meet this duty.

All information which is collected about you during the course of the research will be kept **strictly confidential**, secured within the University of Nottingham. Any information about you which leaves the University will have your name and address removed (anonymised) and a unique code will be used so that you cannot be recognised from it. Anonymised data may also be stored in data archives for future researchers interested in this area.

Your personal data (address, telephone number) will be kept for two years after the end of the study so that we are able to contact you about the findings of the study *and possible follow-up studies* (unless you advise us that you do not wish to be contacted). All identifiable research data will be kept securely for 7 years. After this time your data will be disposed of securely. During this time all precautions will be taken by all those involved to maintain your confidentiality, only members of the research team will have access to your personal data.

Although what you say in the interview is confidential, should you disclose anything to us which we feel puts you or anyone else at any risk, we may feel it necessary to report this to the appropriate persons.

What will happen if I don't want to carry on with the study?
Your participation is voluntary and you are free to withdraw at any time, without giving any reason, and without your legal rights being affected. If you withdraw then the information collected so far may not be possible to extract and erase after two months and this information may still be used in the project analysis.

What will happen to the results of the research study?
The results will be published in a study and your parent/s or guardian/s have been offered the chance to have a summary of this, or the complete publication, if they would like it. You will not be identified in the research. The people who will be most likely to read the research are Educational Psychologists, teachers and people working in education.

Who is organising and funding the research?
This research is being organised by the University of Nottingham and is being funded by Applied Psychologies.

Who has reviewed the study?
All research in the University of Nottingham is looked at by a group of people, called a Research Ethics Committee (REC), to protect your interests. This study has received a favourable ethical review by the School of Sociology and Social Policy Research Ethics Committee.

Further information and contact details

Researcher: Louise Rodgers (Trainee Educational Psychologist)
Louise.rodgers@nottingham.ac.uk

Supervisor/PI: Dr Nicholas Durbin (Academic Tutor)
Nicholas.durbin@nottingham.ac.uk

Professor Cees van der Eijk, Research Ethics & Integrity Officer, REC Chair & Associate Professor of Social Science Research Methods. email: cees.van_der_eijk@nottingham.ac.uk,

Section 2

Privacy information for Research Participants

For information about the University's obligations with respect to your data, who you can get in touch with and your rights as a data subject, please visit: https://www.nottingham.ac.uk/utilities/privacy.aspx.

Why we collect your personal data

We collect personal data under the terms of the University's Royal Charter in our capacity as a teaching and research body to advance education and learning. Specific purposes for data collection on this occasion are academic research.

Legal basis for processing your personal data under GDPR

The legal basis for processing your personal data on this occasion is Article 6(1a) consent of the data subject OR Article 6(1e) processing is necessary for the performance of a task carried out in the public interest OR Article 6 (1b) processing is necessary for the performance of a contract OR Article 6 (1f) processing is necessary for the purpose of the legitimate interests pursued by the controller.

How long we keep your data

The University may store your identifiable research data for a minimum period of 7 years after the research project finishes. The researchers who gathered or processed the data may also store the data indefinitely and reuse it in future research. Measures to safeguard your stored data include the anonymisation of data.

Appendix L

Parent/guardian consent form

University of Nottingham
UK | CHINA | MALAYSIA

CONSENT FORM (parent/guardian)

The evaluation of a bespoke critical thinking skills programme on students' ability to identify 'fake news.'

Investigators: Louise Rodgers (Trainee Educational Psychologist) and Dr Nicholas Durbin
School of Psychology, University of Nottingham.

Name of pupil:.....

School:.....

Year Group: .....

Gender:.....

Class teacher: .....

Please circle as appropriate:

Have you read and understood the participant information sheet? **YES / NO**

Have you been given an opportunity to ask questions and discuss the study? **YES / NO**

Have any questions been answered satisfactorily? **NOT APPLICABLE / YES / NO**

Have you received enough information about the study? **YES / NO**

Do you understand that you are free to withdraw your child from the study: at any time? **YES / NO** without giving a reason? **YES / NO**

Do you agree to your child taking part in this study? **YES / NO**

Does your child agree to take part in this study? **YES / NO**

"This study has been explained to me to my satisfaction, and I agree that my child will take part. I understand that I am free to withdraw consent at any time".

(Parent) Signature: .....

Date: .....

Contact details for comments or complaints:

Louise Rodgers (Trainee Educational Psychologist) Louise.rodgers@nottingham.ac.uk

Dr Nicholas Durbin (Academic Supervisor and Course Director)
Nicholas.durbin@nottingham.ac.uk

Professor Stephen Jackson (Chair of the School of Psychology Ethics Committee)
stephen.jackson@nottingham.ac.uk

Appendix M

Information sheet provided to parent/guardians.

University of Nottingham
UK | CHINA | MALAYSIA

Parent information sheet

Dear Parent/Guardian,

I am a Trainee Educational Psychologist at the University of Nottingham, undertaking a research study on the effectiveness of a bespoke teaching programme to help pupils identify 'fake news' online, whilst on placement with Applied Psychologies (Educational Psychology service provider). This aims to understand the effectiveness of a new three-session teaching programme on Year 6 children by teaching critical thinking skills. The study will form part of my course requirements, and I will be supervised throughout by Dr Nicholas Durbin (Course Director) at the University of Nottingham.

Due to your child's attendance at ……| Primary School, I am writing to ask for consent for your child to be involved with this study. Your child has been identified as a possible participant in the study as they are in a year 6 class at the school. One class will receive the teaching sessions first and the other will be on a 'wait list', as they will form a 'control' group for comparison. This means that the second group will receive the teaching programme after the first one. The classes will be selected at random so it is not yet possible to say whether your child will be in the first or second condition. The other group will be on a waiting list for the intervention and will do their usual PSHE lessons.

Your child's usual class teacher will be trained to deliver the teaching programme and then administer some questionnaires to the pupils before and after the programme. The format of the lessons will be similar to existing teaching within the PSHE curriculum and will involve learning about thinking skills and using these to identify fake news stories. Children will view examples of real and fake stories published online and will be involved in discussions around these. Should you wish to view any of the teaching materials beforehand, this can be arranged.

In order for your child to benefit from this additional teaching programme, I need to obtain informed consent of your child's participation from yourself (through this letter). I can assure you that the work will be carried out in line with the ethical guidelines of the British Psychological Society and the University of Nottingham. All data obtained will be anonymous, and will be stored securely and confidentially during the study. All raw data will be destroyed two years after the completion and publication of the research. The finished results of the study will be made available to you and the school. If you are happy for your child to participate in this study, please sign and return the consent form attached as soon as possible (before 4th November 2022). Even if you consent to participating now but feel you would like to withdraw your child from the study at a later stage, you can withdraw them from the study at any time without giving a reason. However, if you withdraw after two

months following the end of the teaching programme then the information collected it may not be possible to extract and erase information from the project analysis.

If you require any further information on the study, please feel free to contact me or my supervisor using the details given below. Otherwise, if you are happy for your child to participate in the study, please indicate your consent by signing and returning the consent form below.

Thank you in anticipation,

yours sincerely,

Louise Rodgers (Trainee Educational Psychologist)

Contact details for comments or complaints:

Louise Rodgers (Trainee Educational Psychologist)

Louise.rodgers@nottingham.ac.uk

Dr Nicholas Durbin (Academic Supervisor and Course Director, DAppEdPsy)

Nicholas.durbin@nottingham.ac.uk

Professor Stephen Jackson (Chair of the School of Psychology Ethics Committee)

stephen.jackson@nottingham.ac.uk

Appendix N

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

School of Psychology
The University of Nottingham
University Park
Nottingham
NG7 2RD

T: +44 (0)115 8467403 or (0)115 9514344

SJ/tp

Ref: **S1450**

Friday 15th July 2022

Dear Louise Rodgers and Nick Durbin,

Ethics Committee Review

Thank you for submitting an account of your proposed research 'What is the impact of a bespoke critical thinking skills programme on children and young people's ability to identify 'fake news'?'
That proposal has now been reviewed by the Ethics Committee and I am pleased to tell you that your submission has met with the committee's approval.

Final responsibility for ethical conduct of your research rests with you or your supervisor. The Codes of Practice setting out these responsibilities have been published by the British Psychological Society and the University Research Ethics Committee. If you have any concerns whatever during the conduct of your research then you should consult those Codes of Practice. The Committee should be informed immediately should any participant complaints or adverse events arise during the study.

Independently of the Ethics Committee procedures, supervisors also have responsibilities for the risk assessment of projects as detailed in the safety pages of the University web site. Ethics Committee approval does not alter, replace, or remove those responsibilities, nor does it certify that they have been met.

Yours sincerely

Professor Stephen Jackson
Chair, Ethics Committee

Appendix O

Session 1 teaching materials:

Introduction to the 3 sessions

What do the children think this will be about and why is it important?

Learning objectives

- To understand what a *cognitive bias means*.
- To understand *confirmation bias*.

Cognitive bias

Any ideas what this means????

Cognitive bias

Cognitive = to do with thinking

Bias = unfairness

What are cognitive biases?

- Cognitive biases are thinking mistakes that everyone makes (until they learn how to notice and stop them!)
- They come from our brain's efforts to simplify the incredibly complex world in which we live.
- Although these thinking mistakes are usually made without us knowing, there are small steps we can take to train our minds to adopt a new pattern of thinking and avoid them (yay!)

That's what we're going to find out more about in the next 3 lessons

- Cognitive biases are unconscious errors in thinking, which means we're not aware of them and they happen very, very fast.
- Cognitive biases have a direct effect on our safety, our interactions with others, and the way we make judgments and decisions in our daily lives.

Can you think of any thinking mistakes you might make?

How many types do you think there are?

Some examples the children may be able to talk about from their own experience are below. If they can't think of anything you might ask them: *have you ever thought any of these things:*

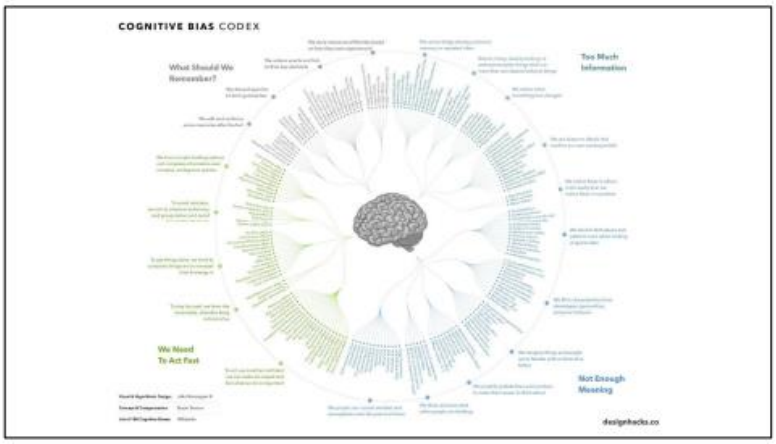
- People in 'other' groups are not as good as us at things, or not as clever as us (e.g. people in the other gender or race group, people of a different class or generation, or people in Year 5!)
- When I get something wrong (e.g. trying a new skill in PE, answering a question in class) its because I'm unlucky but when someone else does it, its because they're stupid.

Spoiler alert: there are quite a few!

There are over 100 known types of cognitive bias (there's a picture on the next slide) and some are more common than others.

We need to know that we can't just trust our intuition and feelings all the time.

We're just going to focus on one biggie today ('confirmation bias').

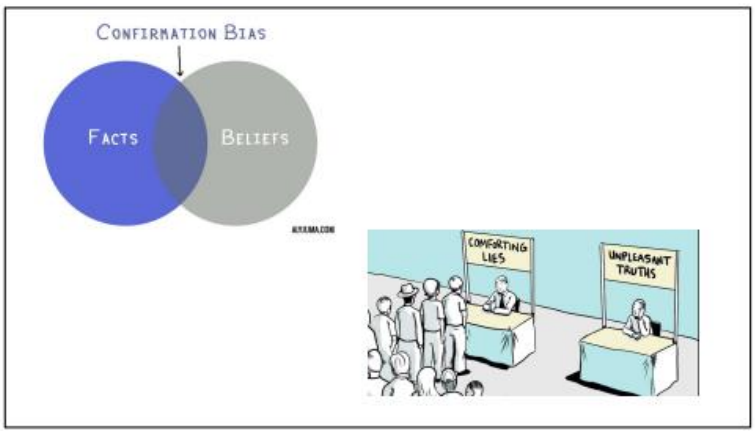


Confirmation bias

We know what 'bias' means … what was it again?

But what does 'confirmation' mean?

Confirmation bias is the tendency of people to favour information that confirms their existing beliefs and to undervalue information which contradicts their beliefs.



What messages do you think these cartoons show? Open discussion

Confirmation bias

Doesn't it feel good when we see news or opinions that back up our own beliefs?

- Posts or points of view that we agree with make us feel reassured and it's always nice to know that other people think the same way.
- But because we're less likely to question something that we like the sound of, it's easy to be taken in by fake news that falls in line with what we believe. Fake news can often spread quickly like this, preying on our emotions as we share and react to stories that we'd like to think are true.
- Watch the clip to find out how this **confirmation bias** can affect what we believe.

BBC video https://www.bbc.co.uk/bitesize/articles/znbytrd

Activity

Can you summarise the message of the film in exactly 10 words?

Can anyone remember any of the 3 types of confirmation bias mentioned in the film?

Types of confirmation bias

We all tend to prefer the information or news that confirms what we already believe, rather than challenging it. Here are the 3 types:

1. **Research bias** (we could also call this 'what we look for bias' or maybe 'googling bias' if you usually use Google to find information)
2. **Interpretation bias** (we could also call this 'taking things the wrong way bias')
3. **Memory bias** (we could also call this 'selective memory bias')

Types of confirmation bias

Have you ever done any of these??

1. Research bias:

This is when you search for evidence to back up your views by only looking in places that agree with you. (we could also call this 'what we look for bias' or maybe 'googling bias' if you usually use Google to find information)

Where would you look up information about:

- Your football or rugby team?
- Your favourite band or singer?

This leads to being really selective when researching and avoiding anything that might challenge you.

What are the pros and cons to the sources of information answered in response to the questions about looking up information about football teams or bands?

Where should people look up information about the political party they are thinking of voting for?

Types of confirmation bias

Have you ever done any of these??

2. Interpretation bias:

If you think a certain way, you might take other people's normal everyday actions as being really negative! (we could also call this 'taking things the wrong way bias')

If someone disagrees with you, you might find you think they are being rude or loud or you might even think they are giving you angry looks when they are just talking normally!

This happens when you're looking for reasons to disagree with something

Types of confirmation bias

Have you ever done any of these??

3. Memory bias:

If you don't like someone, you probably won't remember all the times when they were actually quite nice. (we could also call this 'selective memory bias')

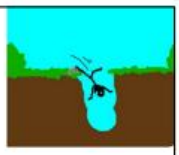
If you don't like something (like a team) you won't remember the times they played well or showed a good attitude.

What might you remember instead?

Memory bias makes it easy to forget about past events in favour of believing things that make your own opinions seem more truthful than they are.

This reinforces and strengthens your beliefs.

How can we avoid falling into the confirmation bias trap?



The 4 steps are:

1. PAUSE when you view something. Don't jump to conclusions.
2. 'Name it to tame it.' When you see something that makes you feel super-sad or super-happy, it might be playing on your emotions to get a reaction.
3. Talk about yourself in the third person in your head or out loud.
4. Seek out new information from other sources.

1. Make a decision to slow down your decision-making.

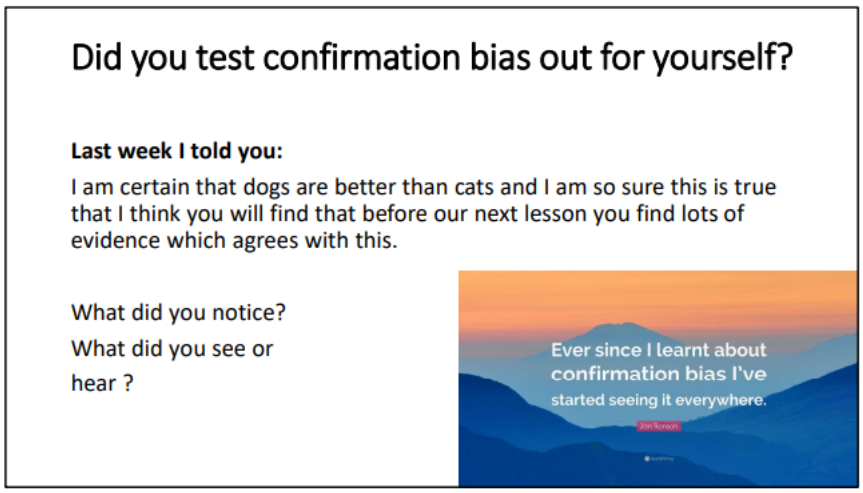
2. 'Name it to tame it.' How does it make you feel? Does that put you in danger of disengaging your rational brain?

It only takes one 250th of a second to react to emotional content which means there is no time to think rationally and critically, unless we make a conscious decision to override the emotional part of the brain.

3. 'What should Jack do about this?'

4. See if you can test/disconfirm/disprove your initial suspicions.

Session 2 teaching materials:



There is likely to be (hopefully!) examples of the following in the children's observations:

- Research bias – did they look up anything related to the topic and find info to confirm this?
- Memory bias – did they remember times when a dog (or cat) was better in real life, on a TV show/film, in an article…?

If they had a strong opposing view (e.g. that cats are better) did they find evidence to confirm this in the same way? Either way, they are likely to have found evidence to confirm their existing bias!

This week ...MORE cognitive biases!

Learning objectives

- To understand what *The Bandwagon Effect*
- *To understand Availability Bias*

There's no shame in being fooled. The shame is in failing to learn from it.

The Bandwagon Effect:

When people do something primarily because other people are doing it, regardless of their own beliefs.

The origin of the phrase comes from the use of a bandwagon, which is a float in a parade that encourages people to jump aboard and enjoy the music that is being played. The contagious effect of music and celebration ensured that large numbers of people would be jumping on.

Other people doing something is always contagious!

Can children think of any examples of times they've joined in with others even if they didn't 100% agree with them?

Some examples of the Bandwagon Effect:

- **Elections:** People are more likely to vote for the person that they think is winning (that's includes TV show votes!)
- **Fashion:** Many people begin wearing a certain style of clothing as they see others adopt the same fashions.
- **Music:** As more and more people begin listening to a particular song or artist, it becomes more likely that other individuals will listen as well.

Can children add any examples of personal experiences of any of these?

What is a current popular fashion which wasn't around a few years ago?

- Beards
- Dying hair grey (for girls and women)
- Big duvet puffa coats
- ?

Social Networks: As increasing numbers of people start using certain online social networking websites, other individuals become more likely to begin using those sites as well. The bandwagon effect can also influence how posts are shared as well as interactions within online groups.

Why might you jump on the Bandwagon?

Everyone likes to be right, right?

People want to be right. They want to be part of the winning side. If it seems like everyone else is doing something, then people are left with the feeling that it must be right thing to do.

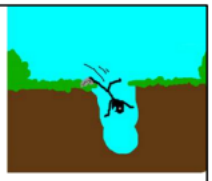
Fear of being left out

People generally do not want to be the odd one out, so going along with what the rest of the group is doing is a way to be sure you are included

Part of the reason people go along with a crowd is that they look to other people in their social group for information about what is right or acceptable

Fear of exclusion and FOMO also play a role in the bandwagon effect

How can we avoid falling into the Bandwagon Effect trap?



The 4 steps are:

1. PAUSE when you view something. Don't jump to conclusions.
2. 'Name it to tame it.' When you see something that makes you feel super-sad or super-happy, it might be playing on your emotions to get a reaction.
3. Try to identify who's promoting the story and why they're doing it
4. Think about what would be the good side of doing something different to everyone who is on the Bandwagon?

1. Make a decision to slow down your decision-making.

2. 'Name it to tame it.' How does it make you feel? Does that put you in danger of disengaging your rational brain?

It only takes one 250th of a second to react to emotional content which means there is no time to think rationally and critically, unless we make a conscious decision to override the emotional part of the brain.

3. e.g. A marketer is promoting it because they're trying to get people to buy their product

4.. What advantages could there be to taking a different position to the Bandwagon?

The Availability Bias:

- Hundreds of millions of people participate in lotteries every year, and yet very few are successful. So why do people continue to play?
- The availability bias can help to explain why people have an unfortunate tendency to totally misjudge the chance that they will win the lottery.
- The probability of winning the lottery jackpot is approximately 1 in 300 million.
  - Many people are scared of flying because they think it is really dangerous. In reality it has been calculated that driving the distance of an average flight path is 65 times more risky than flying itself! People probably find it easier to remember times they have seen plane crashes on TV and in movies than seeing stories about safe flights.

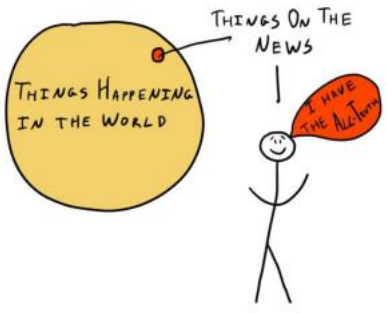
Information that is more easily brought to mind (i.e., more memorable) is assumed to reflect more frequent and/or more probable events, whilst information that is more difficult to bring to mind (i.e. less memorable) is assumed to reflect less frequent and/or less probable events.

Activity:

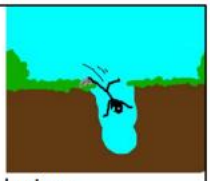
- Can children describe/draw an image of a lottery winner they have seen?
- Then a lottery loser. This is much harder to think of.

Given that it is easier to bring to mind images of lottery winners (and their winnings) than lottery losers (and their lack of winnings), it is feels like winning the lottery is far more likely than it actually is.

What is this cartoon saying?



How can we avoid falling into the Availability Bias trap?



The 2 steps are:

1. PAUSE when you view something. Don't jump to conclusions. The availability bias is just laziness so remind yourself you'll have to do a little bit of work. If a story seems to be everywhere, remember that doesn't mean it's 100% fact.

2. 'Name it to tame it.' When you see something that makes you feel super-sad or super-happy, it might be playing on your emotions to get a reaction.

1. Make a decision to slow down your decision-making.

2. 'Name it to tame it.' How does it make you feel? Does that put you in danger of disengaging your rational brain?

It only takes one 250th of a second to react to emotional content which means there is no time to think rationally and critically, unless we make a conscious decision to override the emotional part of the brain.

Do you want to test out The Bandwagon effect for yourself?

We are going to …

Please notice anything you see or hear before our next lesson so you can tell everyone about it!

Could everyone start a meme to see if the school /family members copy it? E.g. a saying … or all wearing a red wristband or similar?

Session 3 teaching materials:

Starter/baseline assessment

Nav's story: Pupils consider the following character situation: Nav is reading a news story. Nav wants to know whether the story is 'fake news'. *What does Nav mean? If it is fake news, does it matter (why/why not)? What will help Nav decide? What should Nav do about it?*

Learning activity

1. Using the **Fake or real headlines** pupils vote on whether each headline is real or fake, making a 'gut reaction' decision (don't reveal the answers yet!). *What do you think about this story headline? Is it easy to tell if a story is real or fake (especially if we only read it quickly)? Did you have enough information to make an informed decision? How might people react to each of these headlines?*

   Compare the 'gut reaction' process to what happens when people share a funny/shocking story they have heard in conversation/via text/social media before taking time to question if it's true. Relate this to spreading rumours and gossip in the playground.

2. Investigate two of the stories in detail by questioning the source and checking the coverage (**News story 1 and 2**). Pupils use the evidence and clues provided to work out which news story is fake and which is real. Pupils can use support materials: **Trustworthy news sources** and **Fake news clue words** for professional news organisations and fake news vocabulary to look out for in their investigations. *What clues helped you to identify the fake news? What clues showed that you could trust the real story?*

3. Pupils read two examples of **Fake news stories**, inferring how they might make someone feel and what they might motivate someone to do (teacher note: these are not real examples, but have been developed for the purpose of this lesson). *How might someone feel reading this story? How does the article try to make the reader feel an extreme emotion? What would happen if someone believed this story? Could it affect how they think or act? How could it affect their actions? What is the motivation of the story/writer? Why has this story been made up? What type of fake news might cause harm?*

Plenary

1. *Where can we get trustworthy news from?* As a class, create a list of reliable sources where pupils can get real and trustworthy information, including children's news organisations. Emphasise the importance of reading across different organisations and sources of information - whether (and how) a story is being reported elsewhere. When searching for a story, include the source that you want the news to come from; eg, football: BBC news. If you are unsure about a story, always talk to a teacher or parent about it first.

2. Reveal the answers to all the **Fake or real headlines** stories. *If Nav was reading any of the fake stories we have looked at, what should Nav do about it?*

Questions for assessment

What is fake news? Why might fake news be harmful? How do we know if the news we hear, see or read is true? What can you do if you think a story is fake?

Online resources checklist

- ✓ News navigator
- ✓ Nav's story
- ✓ Fake or real headlines
- ✓ Fake or real voting sheets
- ✓ News story 1 and 2
- ✓ Trustworthy news sources and fake news clue words
- ✓ Fake news stories
- ✓ Emotional and action responses

Extension opportunities

- As a class, create a fake news detective toolkit for the future or create a guide for other pupils in the school.
- Deliver a 'fake or real' news quiz in assembly, explaining how to question the source and check the coverage of a news story.
- Choose an age-appropriate item from one of the main news stories of the day that everyone can investigate. Give pupils their own News navigator to take home to investigate the story with their family. Compare findings and the effectiveness of the News navigator.
- Pupils create a comic strip/storyboard to demonstrate the fake news reaction chain: reading a fake news story > feeling an extreme emotion > developing a thought-pattern or taking action. Some pupils might add a fourth step to their chain to demonstrate the effect of more than one person taking action or the impact their thinking might have on others. Pupils can use the **Emotional and action responses** resource for support.

Pupils vote on whether each headline is real or fake, making a 'gut reaction' decision. (Don't reveal the answers yet!). *What do you think about this story headline? Is it easy to tell if a story is real or fake (especially if we only read it quickly)? Did you have enough information to make an informed decision? How might people react to each of these headlines?*

Fake or Real Headlines – Teacher Notes

All of these stories appeared in the news and are therefore real news or real 'fake news'. For your information we have included the source below. If you decide to view these stories online in the classroom, be aware that advertising and other stories may pop up. It is therefore best to select the relevant sections and prepare these as a teaching resource to ensure safe use in the classroom. When researching stories at home, pupils and parents should be made aware that online news portals may include adult content. **Please note that we cannot be responsible for other content and advertising on these websites.**

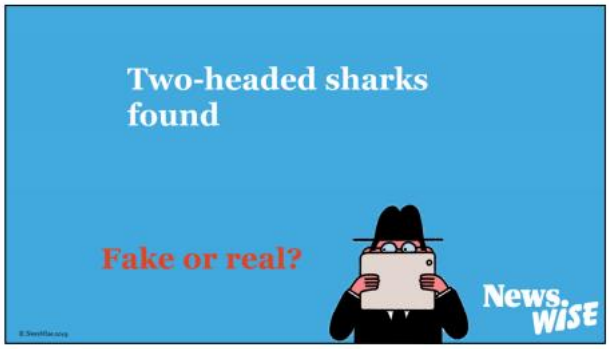
Real

- Police in Germany rescue a man chased by baby squirrel *The Guardian, August 2018*
- Canadian zoo fined after taking bear out for ice-cream *The Guardian, May 2018*

- Man with the longest fingernails gets them cut off after 66 years *Sky News, July 2018*
- Teenager on trial after refusing to pay fine for feeding a chip to a pigeon *Wales online, November 2016*

Fake

- Two-headed sharks found *Twentytwowords.com*
- Mysterious 7-foot creature spotted in Argentina *Altererdimages.net* and *The Mirror: weird news, April 2018*
- Elderly Woman trains 65 cats to steal from her neighbours *World News Daily Report: where facts don't matter, August 2019*
- Camel survives after losing half of its body *Instagram.com*


Two-headed sharks found
Fake or real?
News. WISE


Mysterious 7-foot creature spotted in Argentina
Fake or real?
News. WISE


Police in Germany rescue man chased by baby squirrel
Fake or real?
News. WISE

EMOTIONAL RESPONSES

- angry, furious
- shocked, horrified, disgusted
- frustrated
- upset, heartbroken
- worried, anxious, concerned
- scared, frightened, terrified
- confused
- joyful, happy, relieved
- excited, thrilled

ACTION RESPONSES

- Share the story on social media
- Share the story with family/friends
- Take part in a protest
- Start/sign a petition
- Boycott (stop going somewhere/stop buying something)
- Change who you vote for or stop supporting someone
- Send a letter of complaint

MYSTERIOUS SEVEN-FOOT CREATURE SPOTTED IN ARGENTINA

A strange creature has apparently been photographed in Argentina. It looks like a combination of a camel, rabbit and horse. It walks on all fours and could be seven feet tall. There is only one photograph of this animal.

CAN YOU TRUST THIS STORY?

Question the source

Who reported on this story?

Altered Dimensions

What type of company are they?

Website about UFOs, ghosts and aliens

What other sorts of stories have they published?

High-speed UFO captured on video

Ghost caught on security camera in Japan

Have you heard of this company before?

Do they seem trustworthy?

Check the coverage

Who else reported on this story? What did they say?

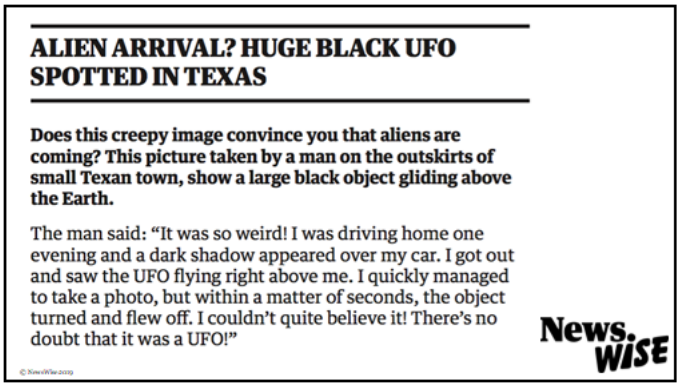
Outerplaces, a science fiction website: *Mysterious 'half-human half-animal' captured on video*

Newsweek, an American news magazine: *Half-human, half-animal 'dogzilla' threat is latest internet hoax*

The Daily Mirror, UK news company: *Weird news - Huge 7ft beast described as 'half human, half animal '*

Snopes, a fact-checking website: *False: The creature is actually a manipulated image based on designs for a 'Harry Potter' werewolf*

BASED ON ALL THE EVIDENCE, DO YOU THINK THIS STORY IS REAL OR FAKE?


ALIEN ARRIVAL? HUGE BLACK UFO SPOTTED IN TEXAS
Does this creepy image convince you that aliens are coming? This picture taken by a man on the outskirts of small Texan town, show a large black object gliding above the Earth.
The man said: "It was so weird! I was driving home one evening and a dark shadow appeared over my car. I got out and saw the UFO flying right above me. I quickly managed to take a photo, but within a matter of seconds, the object turned and flew off. I couldn't quite believe it! There's no doubt that it was a UFO!"
News. WISE

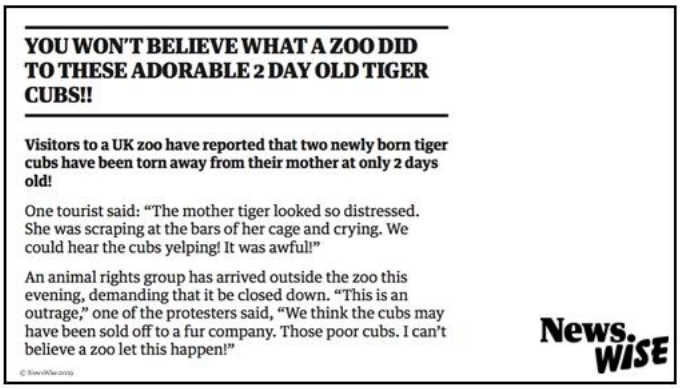
1


SHOCK REVEAL: PRIME MINISTER SPENT MILLIONS OF GOVERNMENT MONEY ON LUXURY HOLIDAY AND MORE!!!!
The Prime Minister of the UK has spent over £1 million of the Government's money on a luxury villa in the Caribbean and 1st class flights to go on holiday!
An anonymous source revealed this yesterday, only one week before the UK election is set to take place! This is only the start; who knows what else the Prime Minister has been spending our money on!
News. WISE

2


NEWSWISE ROVERS COACH CLAIMS: "FOOTBALL HAS NO PLACE FOR WOMEN!"
Robert Smith, the coach of local football team NewsWise Rovers, has caused outrage for saying there was "no place" at his football club for women.
Footballer Sarah Li tweeted: "How dare he? Women footballers have as much right as men to play here. You can watch women's football on television now, so why can't we watch women play at our local club? We should boycott the club until he changes his mind" #sexist #women #womensfootballisgreat
News. WISE

3


YOU WON'T BELIEVE WHAT A ZOO DID TO THESE ADORABLE 2 DAY OLD TIGER CUBS!!
Visitors to a UK zoo have reported that two newly born tiger cubs have been torn away from their mother at only 2 days old!
One tourist said: "The mother tiger looked so distressed. She was scraping at the bars of her cage and crying. We could hear the cubs yelping! It was awful!"
An animal rights group has arrived outside the zoo this evening, demanding that it be closed down. "This is an outrage," one of the protesters said, "We think the cubs may have been sold off to a fur company. Those poor cubs. I can't believe a zoo let this happen!"
News. WISE

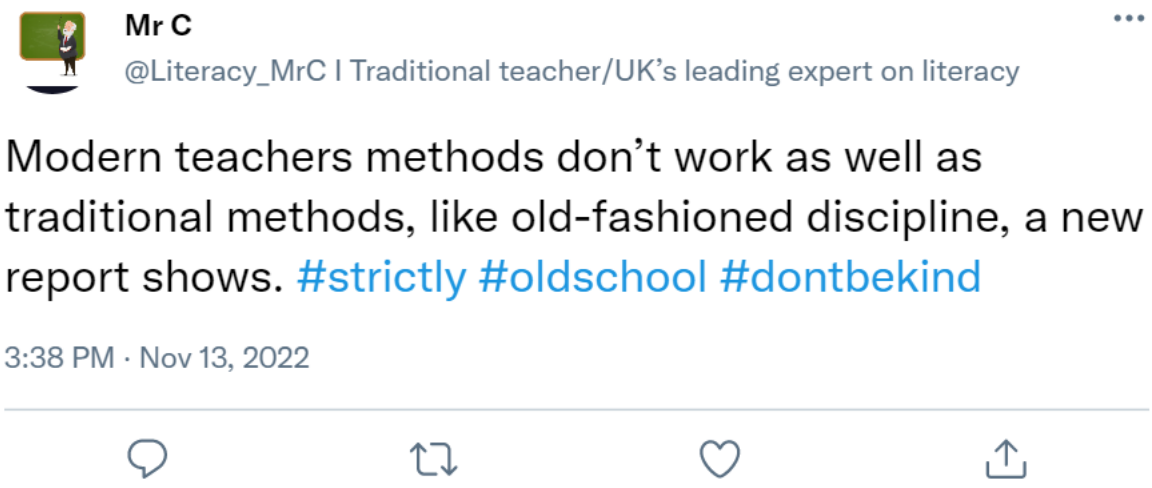
4

Appendix P

Fake news stories from the Bad News Junior game pre and post measures:

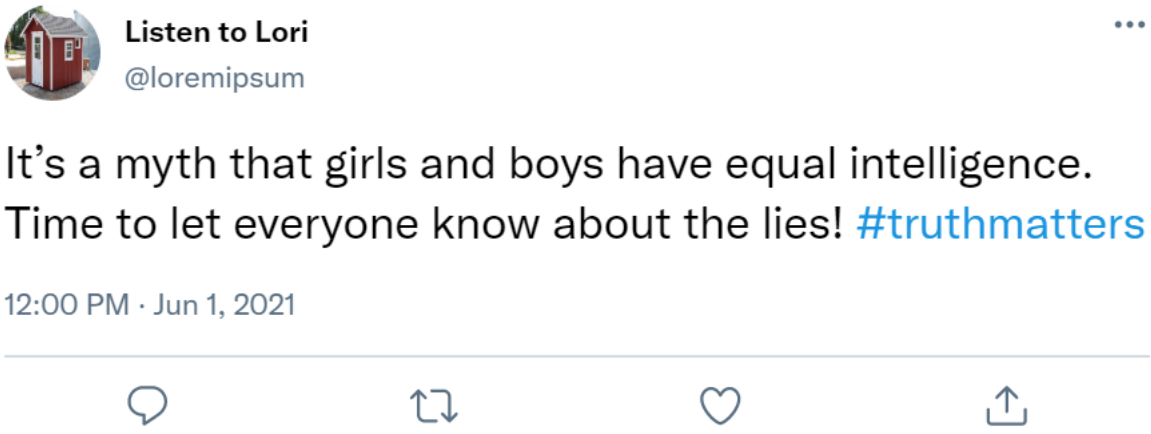
1. Disinformation technique: conspiracy theory

2. Disinformation technique: discrediting opponents



3. Disinformation technique: emotional content

4. Disinformation technique: polarisation

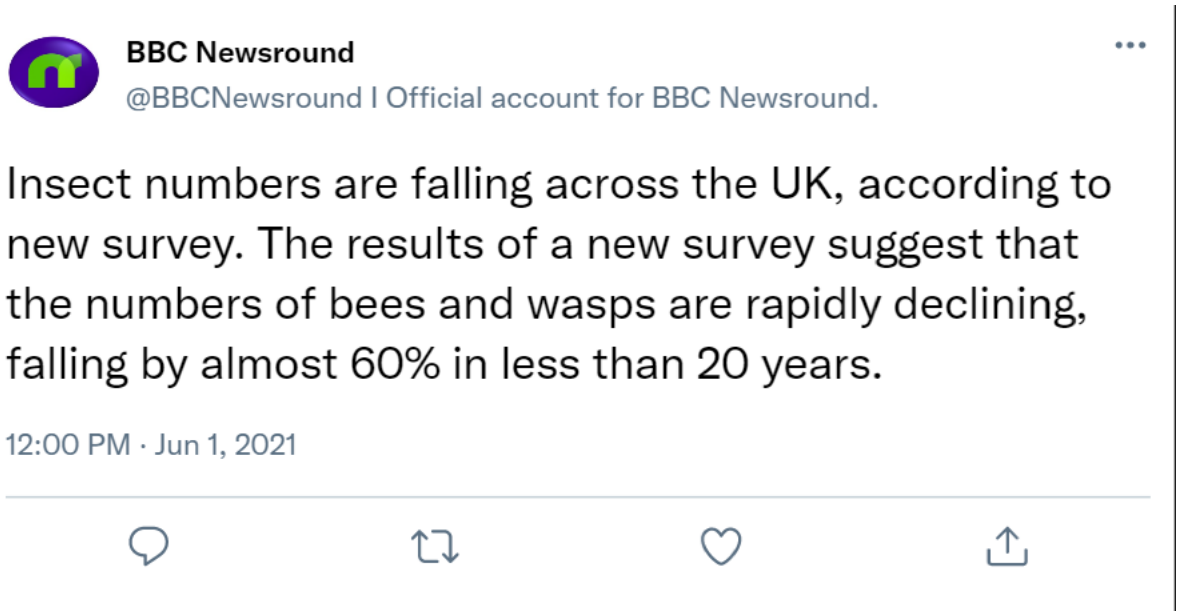


5. Disinformation technique: impersonation

6. Disinformation technique: trolling

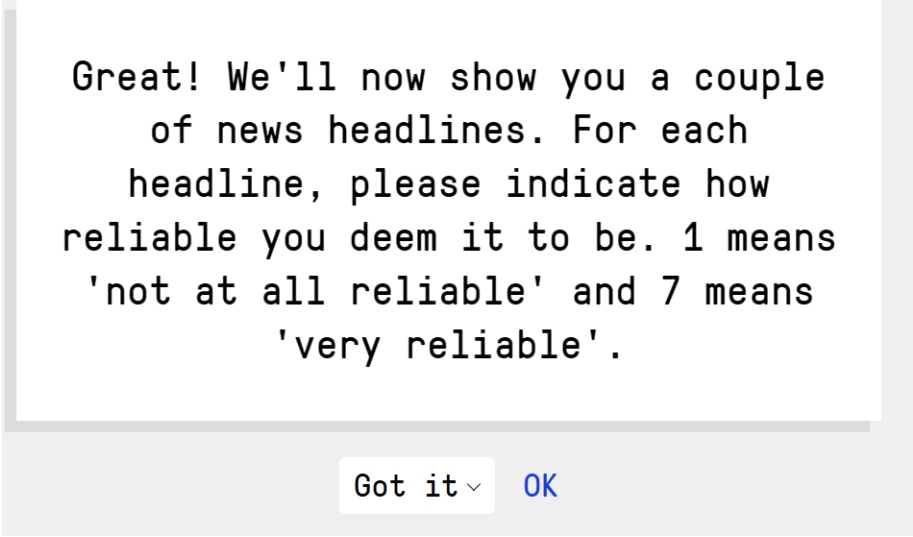
Appendix Q:

True news stories from the Bad News Junior game pre and post measures:



Appendix R

Participant consent and right to withdraw within the pre and post assessment



Appendix S

Image of ‘likes’ and ‘credibility’ meters within the Bad News Junior game

Appendix T

Fidelity Checklist (for use with class teacher/facilitator)

Date	Session number	Teacher name	School name

1. Number of students present in the session:

2. Session length:

3. Did the facilitator use the session plan provided?

4. Did the facilitator use the resources and materials provided?

5. Did the facilitator introduce any additional materials (e.g. news story examples)? If yes, please provide copies to the researcher.

6. Number of students who met the learning objectives by the end of the session:

7. Any additional information/feedback?

Appendix U

Results of interventionist fidelity checks

School	Session number	Number of students who attended all three sessions:	Adherence to the session plans	Adherence to the session materials	Did the facilitator introduce any additional materials?	Number of students who met the learning objectives by the end of the session
1	**1**	10	Yes	Yes	No	7
	2	10	Yes	Yes	No	9
	3	10	Yes	Yes	No	9
2	**1**	5	Yes	Yes	No	5
	2	5	Yes	Yes	No	5
	3	5	Yes	Yes	No	5

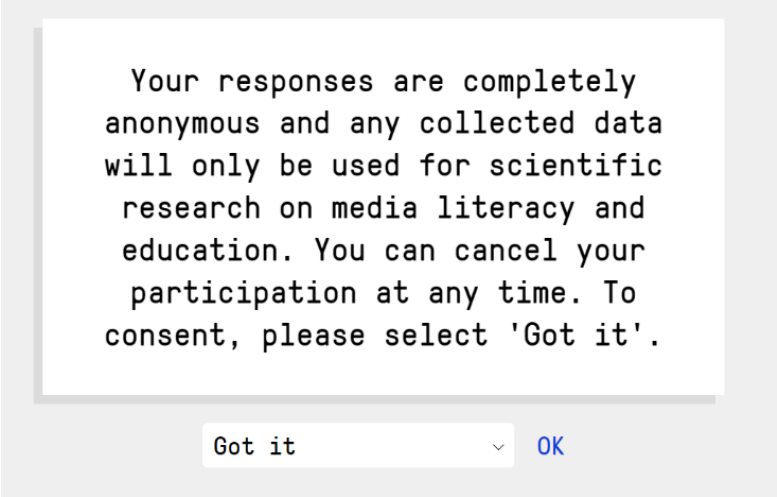
Appendix V

Debriefing script for class teachers to read to participants.

Debriefing for participants (script to be delivered verbally by the class teacher)

Thank you for joining in with the lessons about ways to spot fake news online which were part of a study. The lessons have been completed and the study is now finished. Please talk about what you have learned with me, your parent or carer and your friends. If you have any questions about it, please tell me.

Appendix W

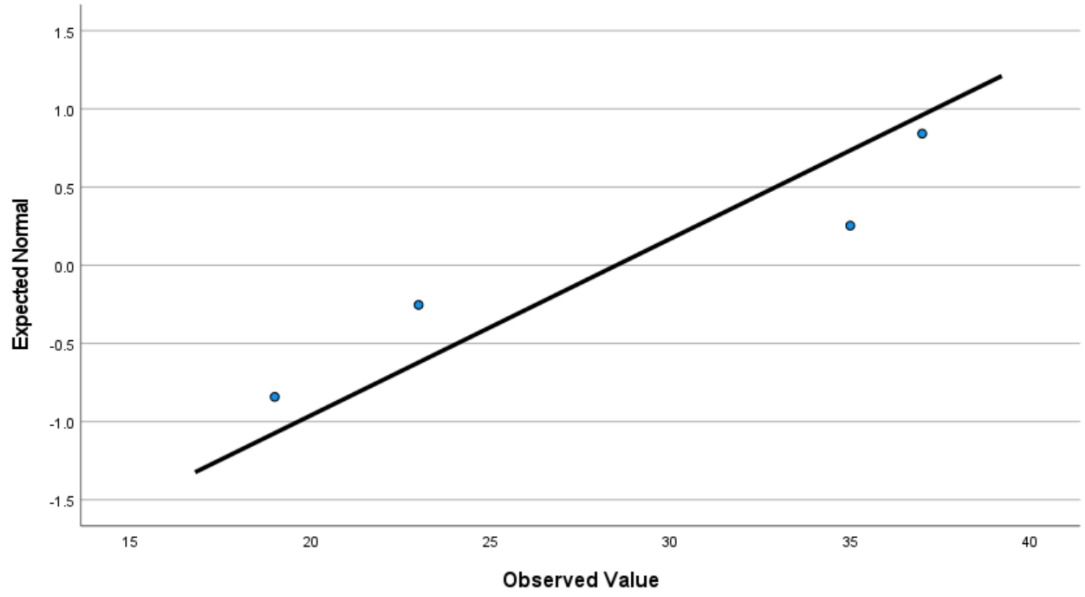

Your responses are completely anonymous and any collected data will only be used for scientific research on media literacy and education. You can cancel your participation at any time. To consent, please select 'Got it'.
Got it
OK

Appendix X

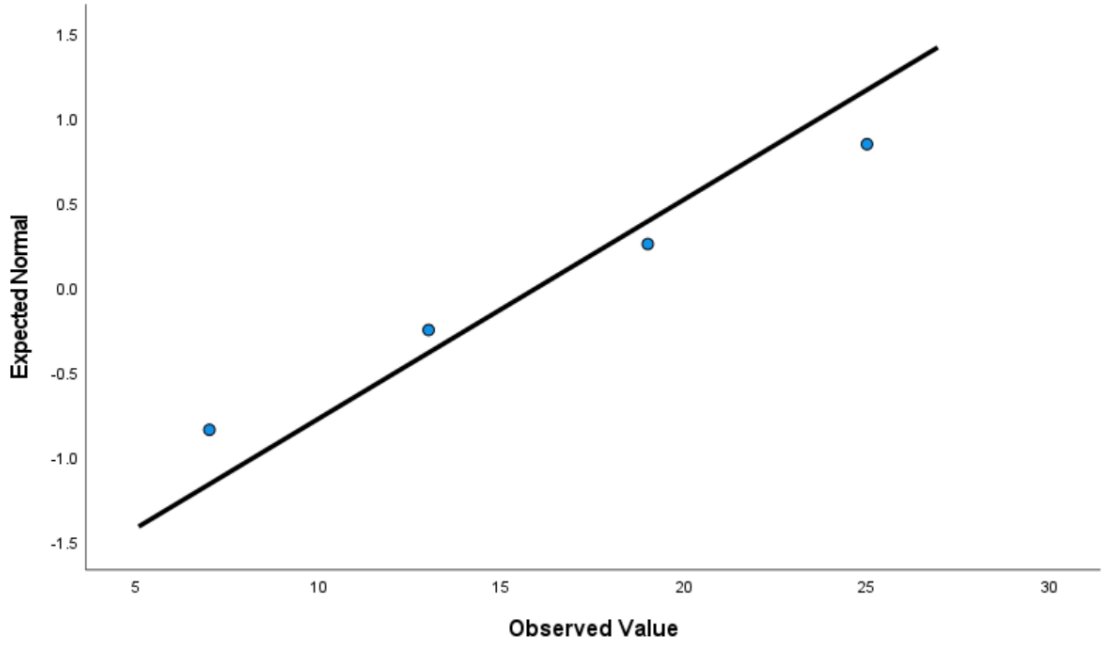
Q-Q plots from quantitative data:

Experimental condition:

Q-Q plot of total overall score (pre-test)

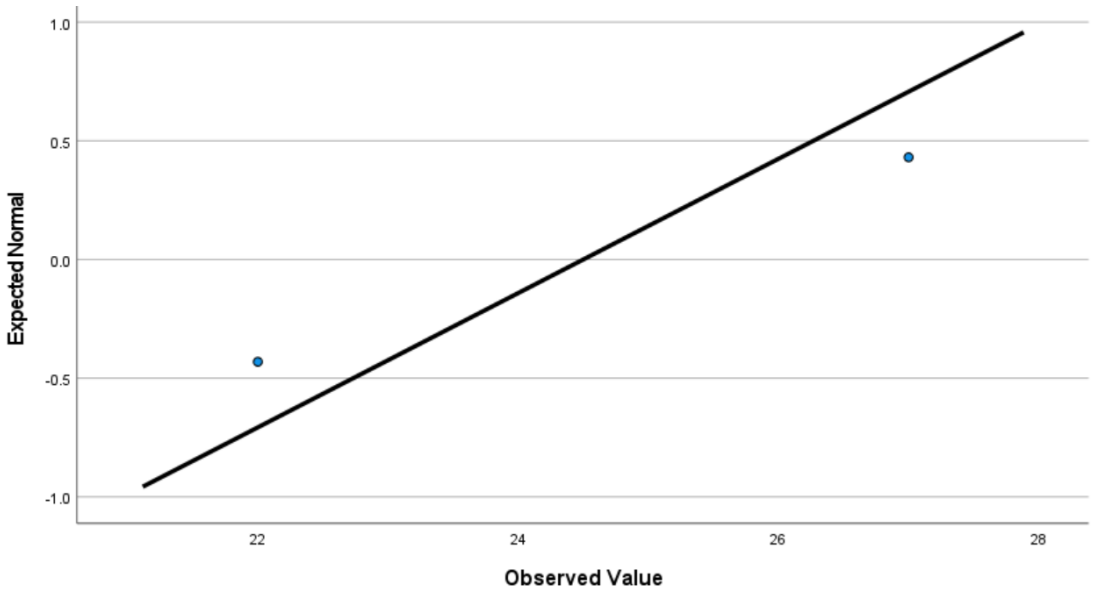


Q-Q plot of total overall score (post-test)

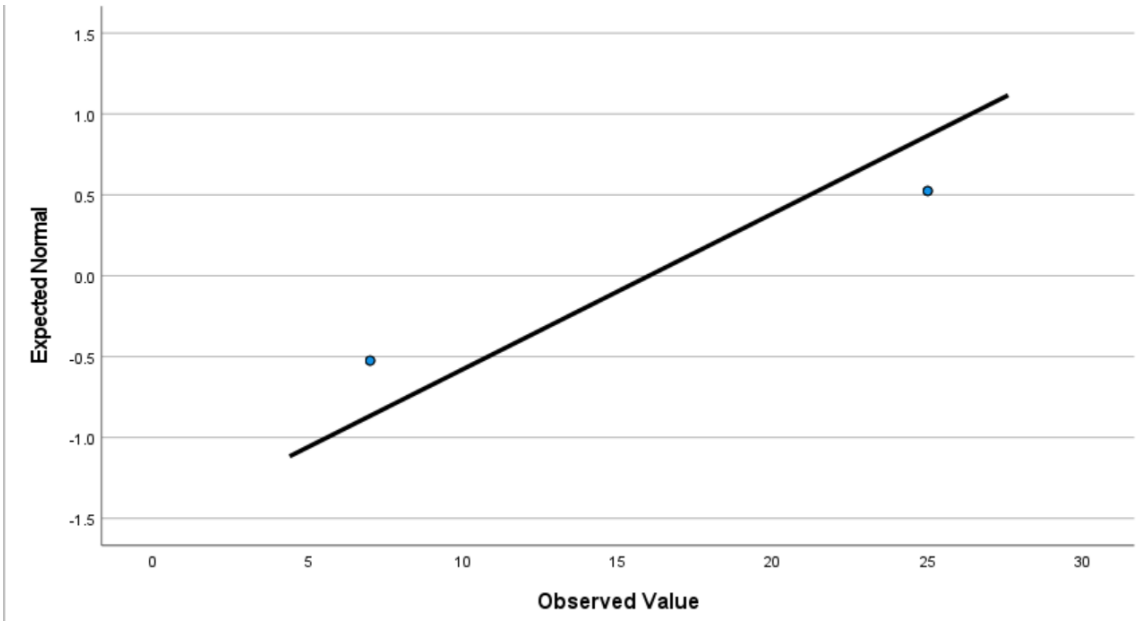


Control condition:

Q-Q plot of total overall score (pre-test)

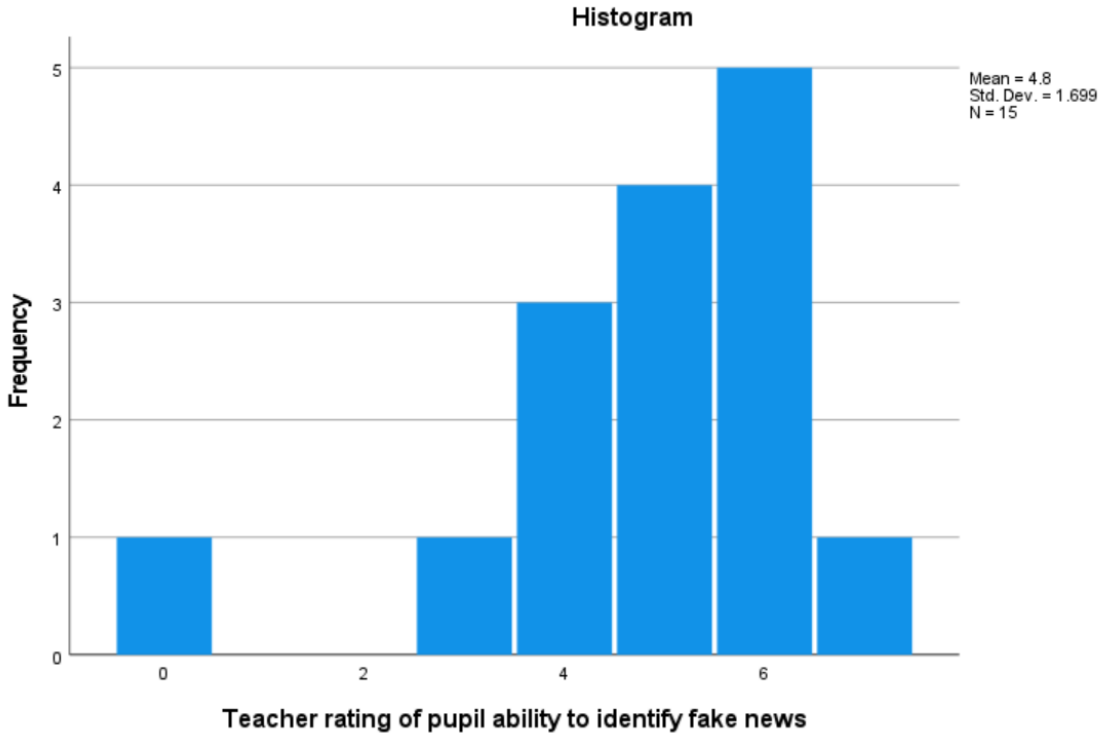


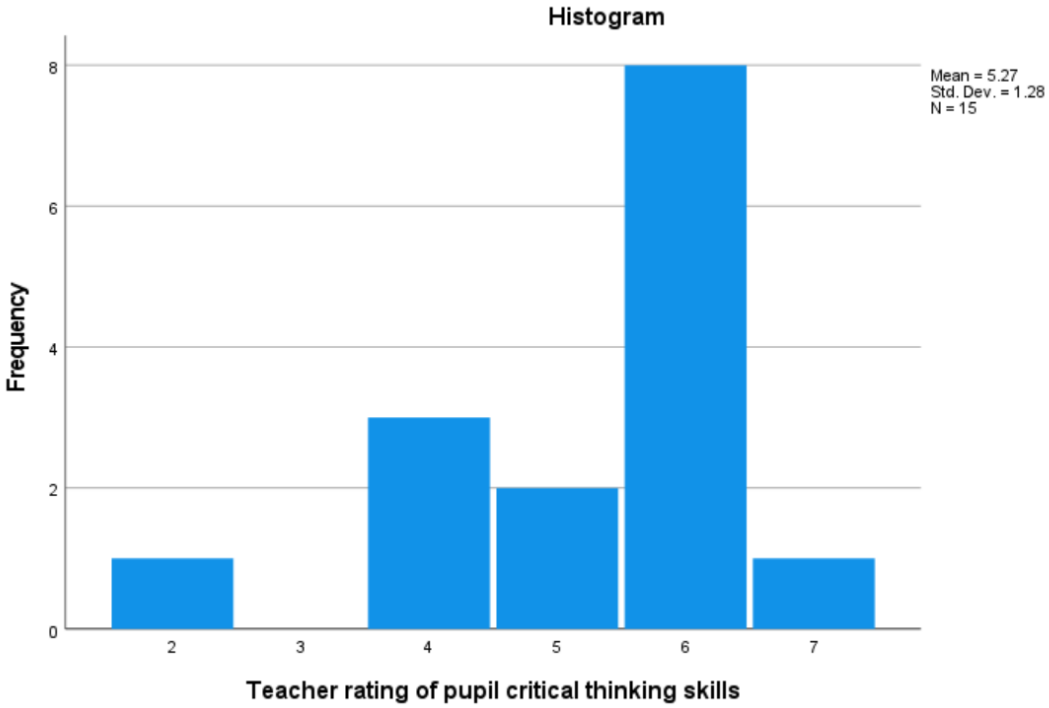
Q-Q plot of total overall score (post-test)



Appendix Y

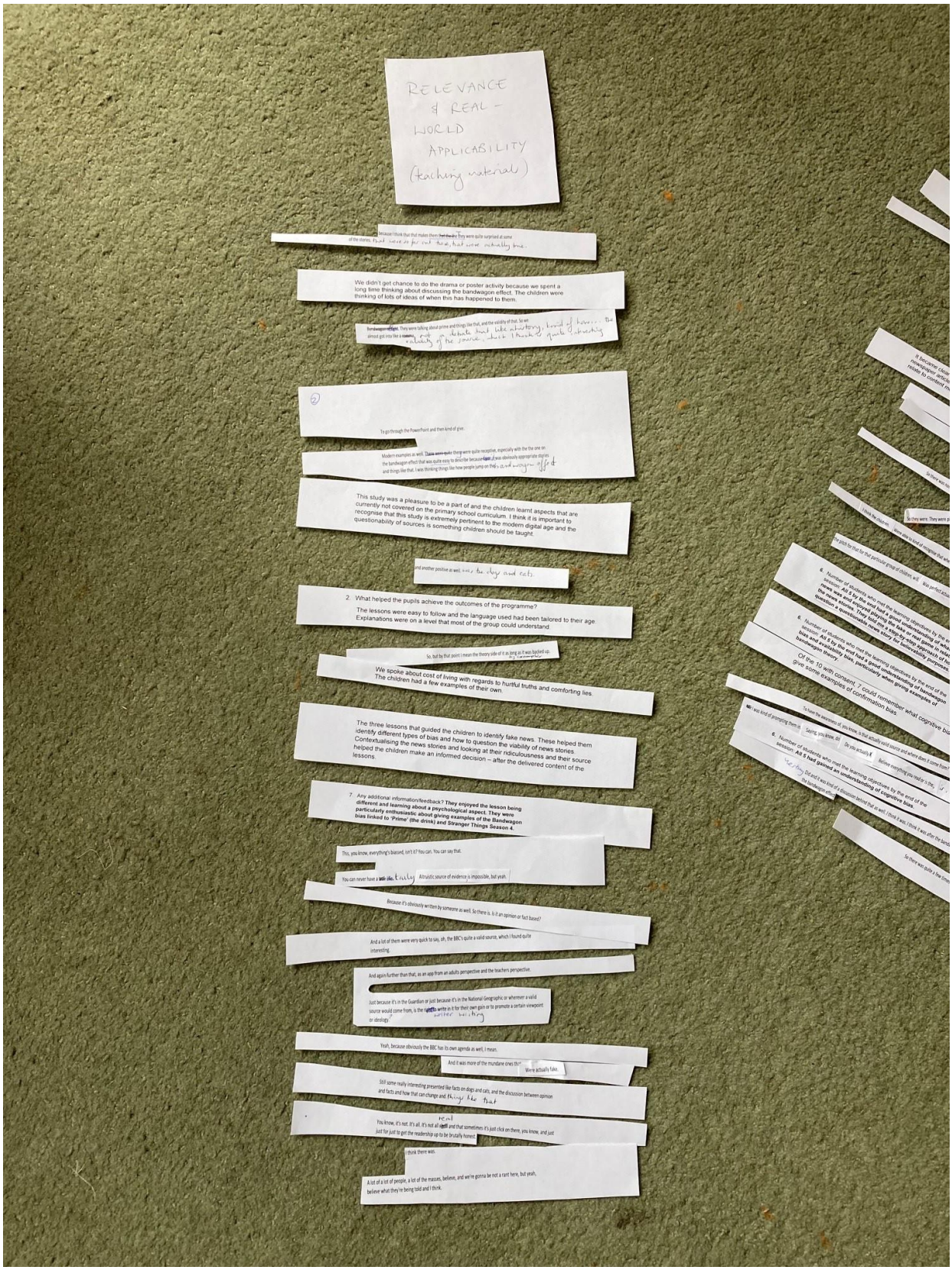
Teacher ratings of pupil skills, assessed following the completion of the programme:

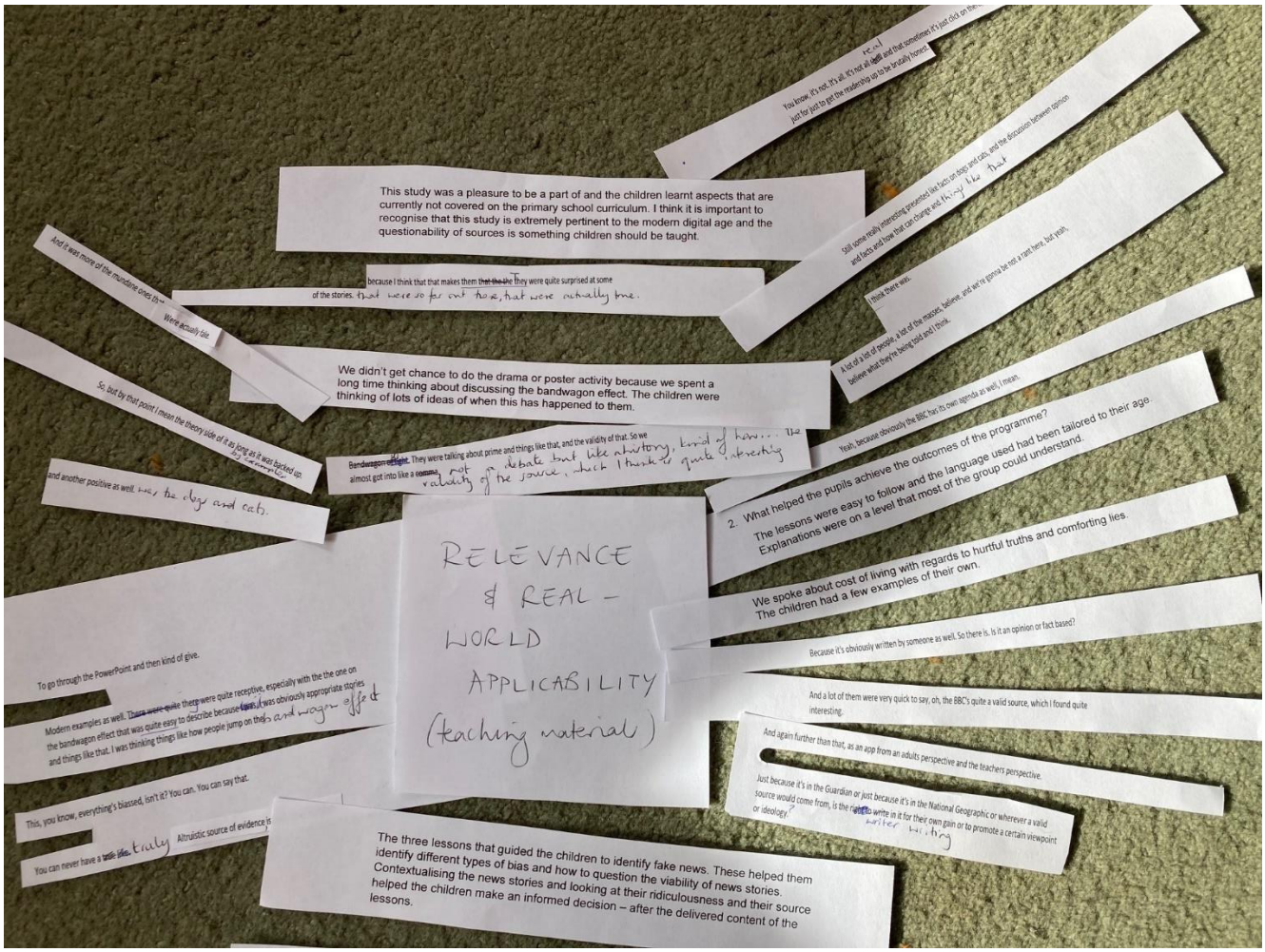


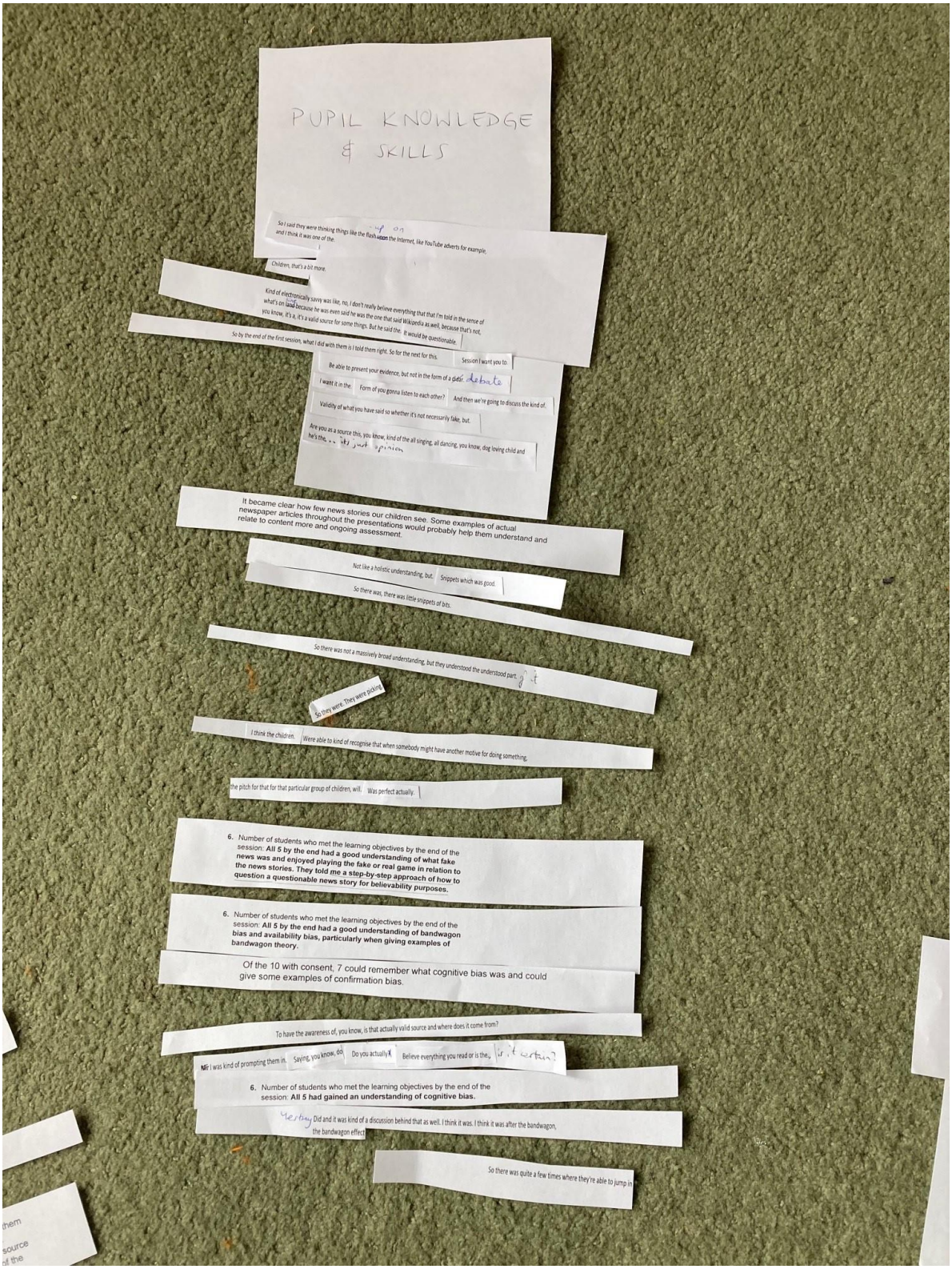

Histogram
Mean = 5.27
Std. Dev. = 1.28
N = 15
Frequency
0
2
4
6
8
2
3
4
5
6
7
Teacher rating of pupil critical thinking skills

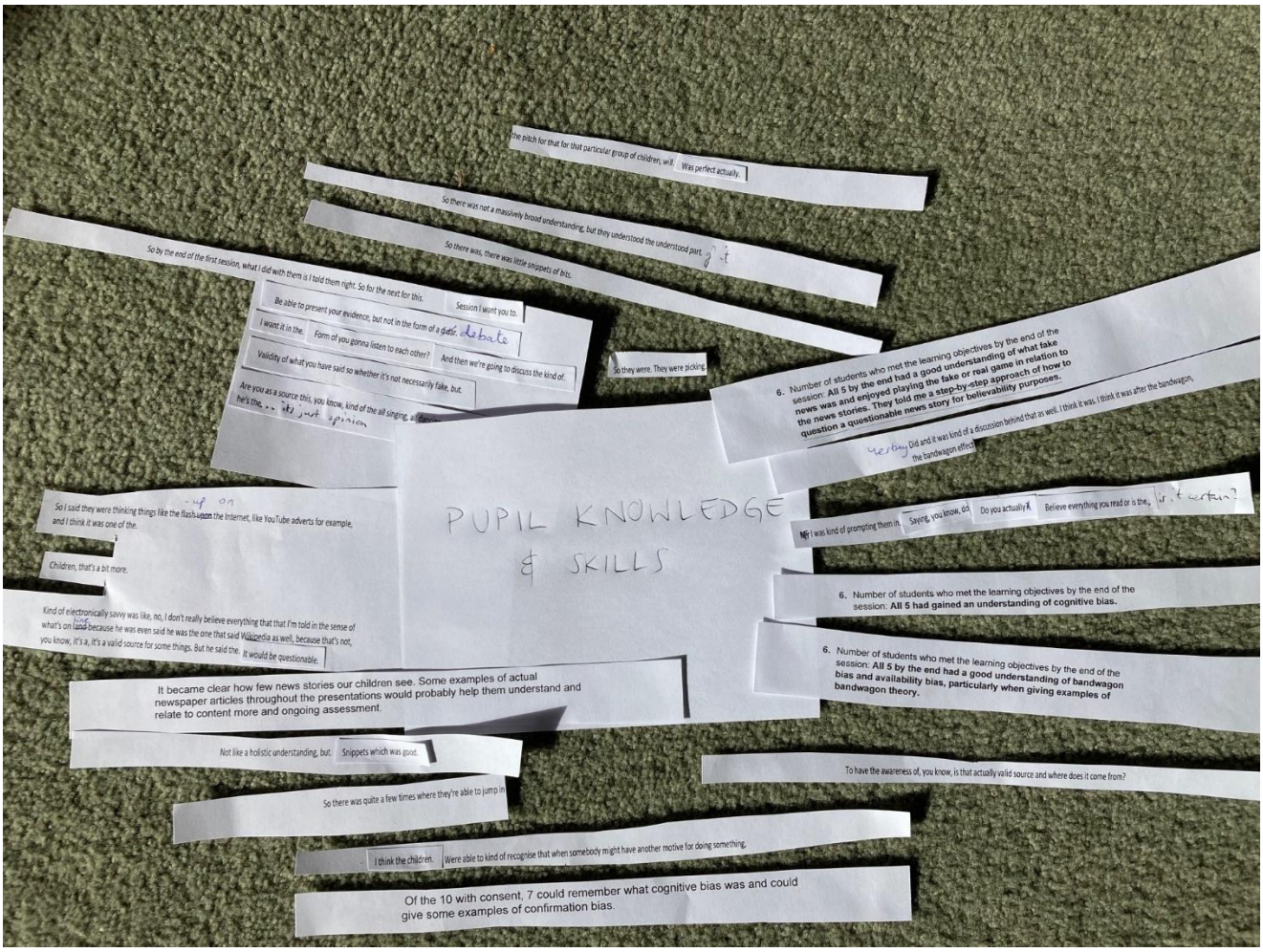
Appendix Z:

Initial codes and themes from thematic analysis of study data




This study was a pleasure to be a part of and the children learnt aspects that are currently not covered on the primary school curriculum. I think it is important to recognise that this study is extremely pertinent to the modern digital age and the questionability of sources is something children should be taught.
We didn't get chance to do the drama or poster activity because we spent a long time thinking about discussing the bandwagon effect. The children were thinking of lots of ideas of when this has happened to them.
RELEVANCE & REAL-WORLD APPLICABILITY (teaching material)
2. What helped the pupils achieve the outcomes of the programme?
The lessons were easy to follow and the language used had been tailored to their age. Explanations were on a level that most of the group could understand.
We spoke about cost of living with regards to hurtful truths and comforting lies. The children had a few examples of their own.
The three lessons that guided the children to identify fake news. These helped them identify different types of bias and how to question the viability of news stories. Contextualising the news stories and looking at their ridiculousness and their source helped the children make an informed decision – after the delivered content of the lessons.


PUPIL KNOWLEDGE & SKILLS
So I said they were thinking things like the flash on the Internet, like YouTube adverts for example, and I think it was one of the.
Children, that's a bit more.
Kind of electronically savvy was like, no, I don't really believe everything that that I'm told in the sense of what's on and because he was even said he was the one that said Wikipedia as well, because that's not, you know, it's a, it's a valid source for some things. But he said the. It would be questionable.
So by the end of the first session, what I did with them is I told them right. So for the next for this.
Session I want you to.
Be able to present your evidence, but not in the form of a debate.
I want it in the.
Form of you gonna listen to each other?
And then we're going to discuss the kind of.
Validity of what you have said so whether it's not necessarily fake, but.
Are you as a source this, you know, kind of the all singing, all dancing, you know, dog loving child and he's the,
It became clear how few news stories our children see. Some examples of actual newspaper articles throughout the presentations would probably help them understand and relate to content more and ongoing assessment.
Not like a holistic understanding, but.
Snippets which was good.
So there was, there was little snippets of bits.
So there was not a massively broad understanding, but they understood the understood part.
So they were. They were picking
I think the children.
Were able to kind of recognise that when somebody might have another motive for doing something.
the pitch for that for that particular group of children, will.
Was perfect actually.
6. Number of students who met the learning objectives by the end of the session: All 5 by the end had a good understanding of what fake news was and enjoyed playing the fake or real game in relation to the news stories. They told me a step-by-step approach of how to question a questionable news story for believability purposes.
6. Number of students who met the learning objectives by the end of the session: All 5 by the end had a good understanding of bandwagon bias and availability bias, particularly when giving examples of bandwagon theory.
Of the 10 with consent, 7 could remember what cognitive bias was and could give some examples of confirmation bias.
To have the awareness of, you know, is that actually valid source and where does it come from?
I was kind of prompting them in.
Saying, you know, do
Do you actually
Believe everything you read or is the,
6. Number of students who met the learning objectives by the end of the session: All 5 had gained an understanding of cognitive bias.
Did and it was kind of a discussion behind that as well. I think it was. I think it was after the bandwagon, the bandwagon effect
So there was quite a few times where they're able to jump in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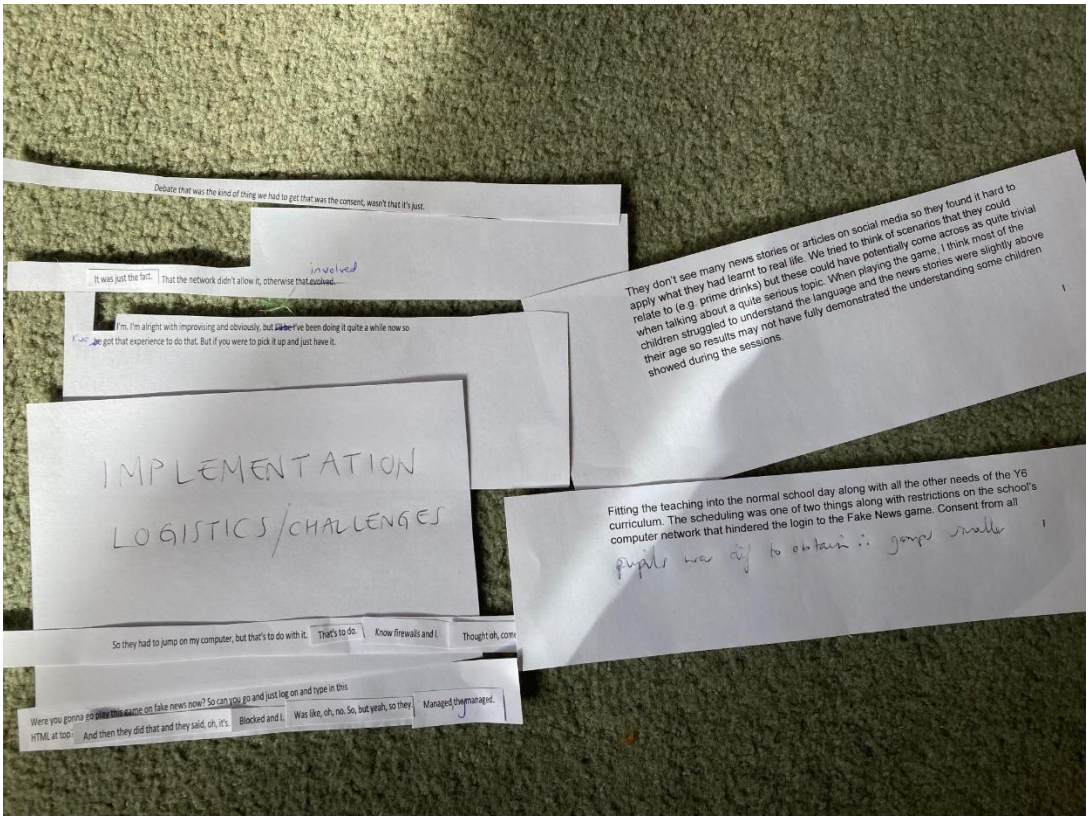
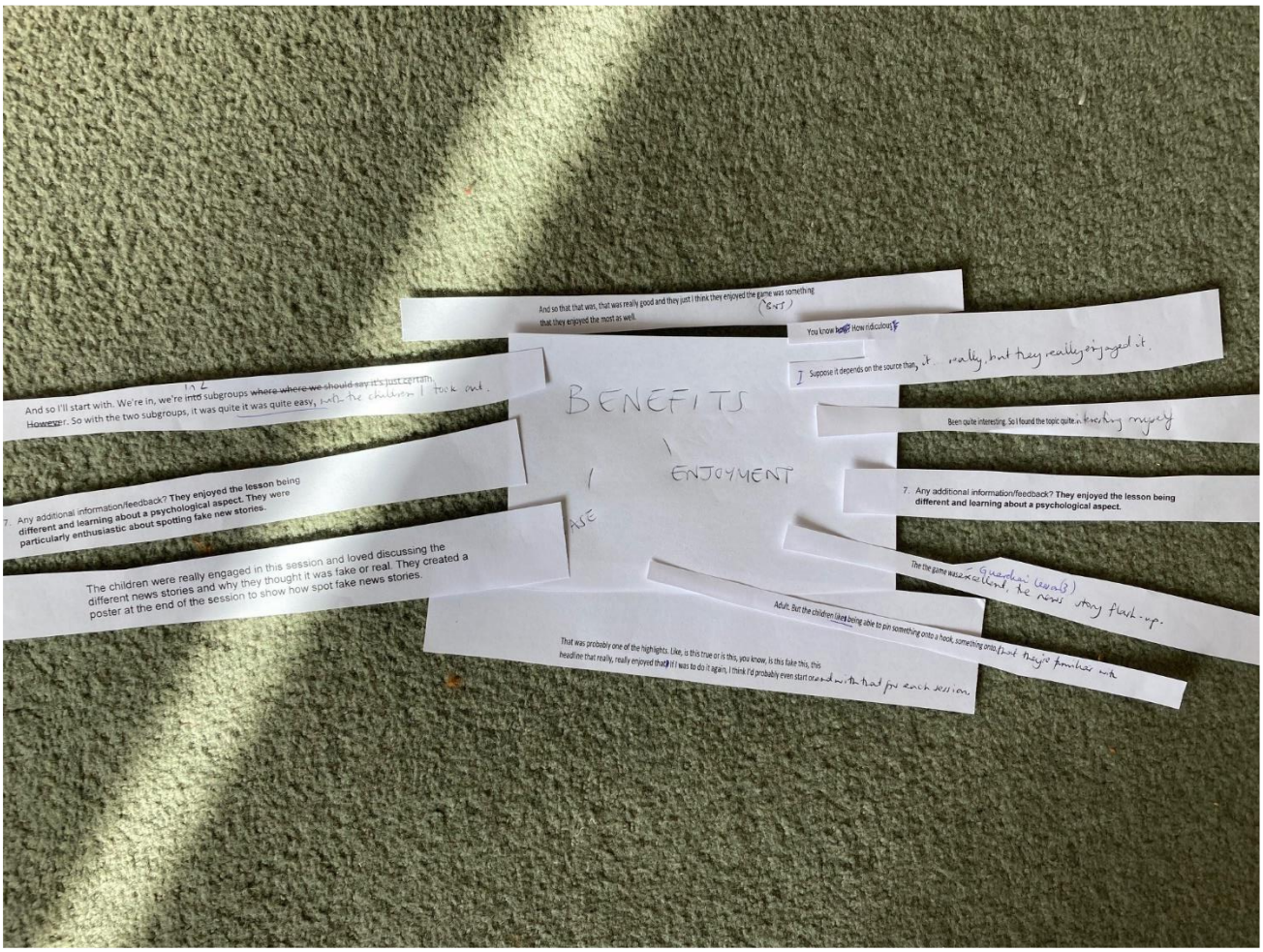
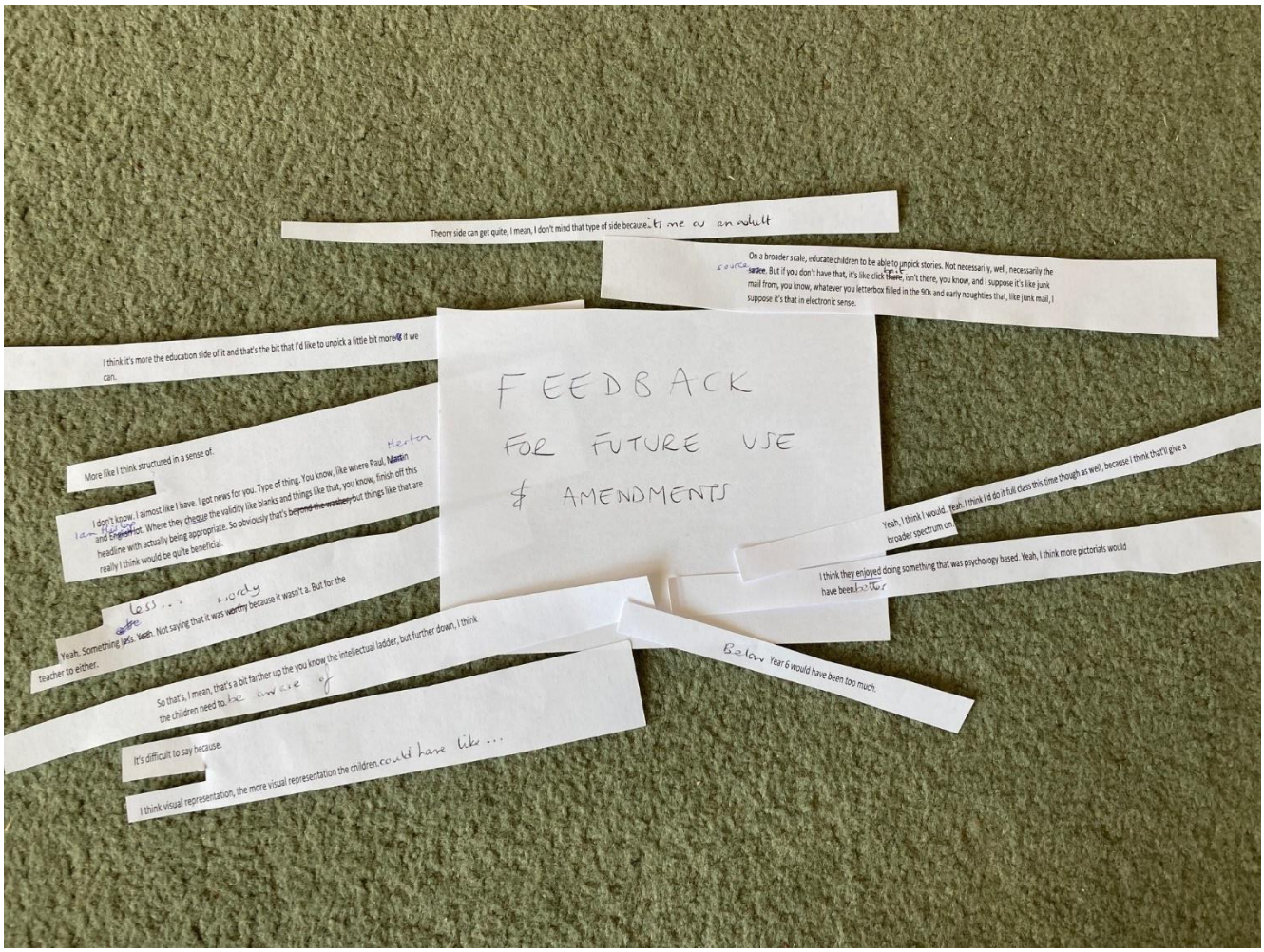
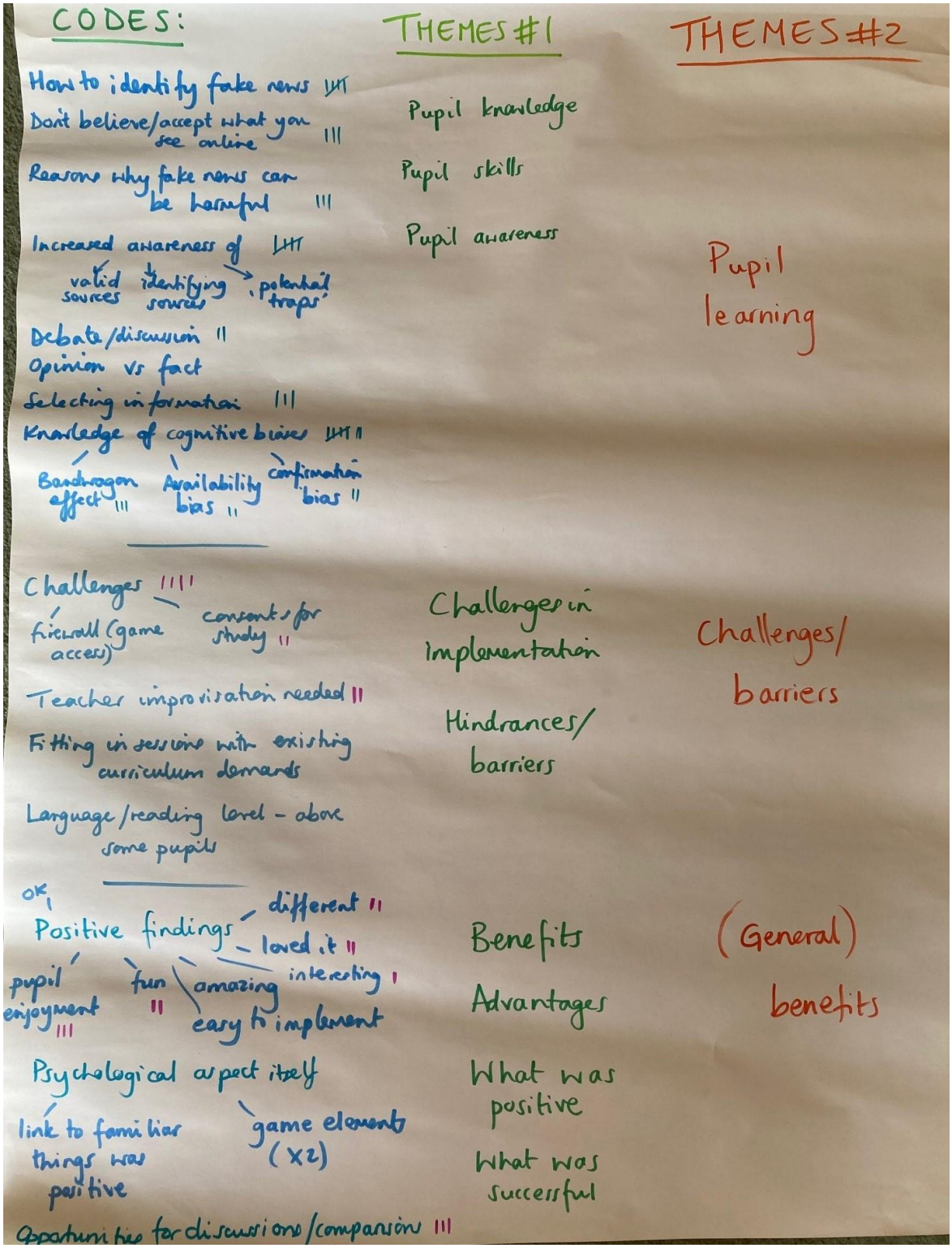

Debate that was the kind of thing we had to get that was the consent, wasn't that it's just.
It was just the fact.
That the network didn't allow it, otherwise that evolved.
involved
I'm, I'm alright with improvising and obviously, but I've been doing it quite a while now so
IMPLEMENTATION
LOGISTICS/CHALLENGES
They don't see many news stories or articles on social media so they found it hard to apply what they had learnt to real life. We tried to think of scenarios that they could relate to (e.g. prime drinks) but these could have potentially come across as quite trivial when talking about a quite serious topic. When playing the game, I think most of the children struggled to understand the language and the news stories were slightly above their age so results may not have fully demonstrated the understanding some children showed during the sessions.
Fitting the teaching into the normal school day along with all the other needs of the Y6 curriculum. The scheduling was one of two things along with restrictions on the school's computer network that hindered the login to the Fake News game. Consent from all
So they had to jump on my computer, but that's to do with it.
That's to do.
Know firewalls and I.
Were you gonna go play this game on fake news now? So can you go and just log on and type in this
HTML at top
And then they did that and they said, oh, it's.
Blocked and I.
Was like, oh, no. So, but yeah, so they
Managed they managed.

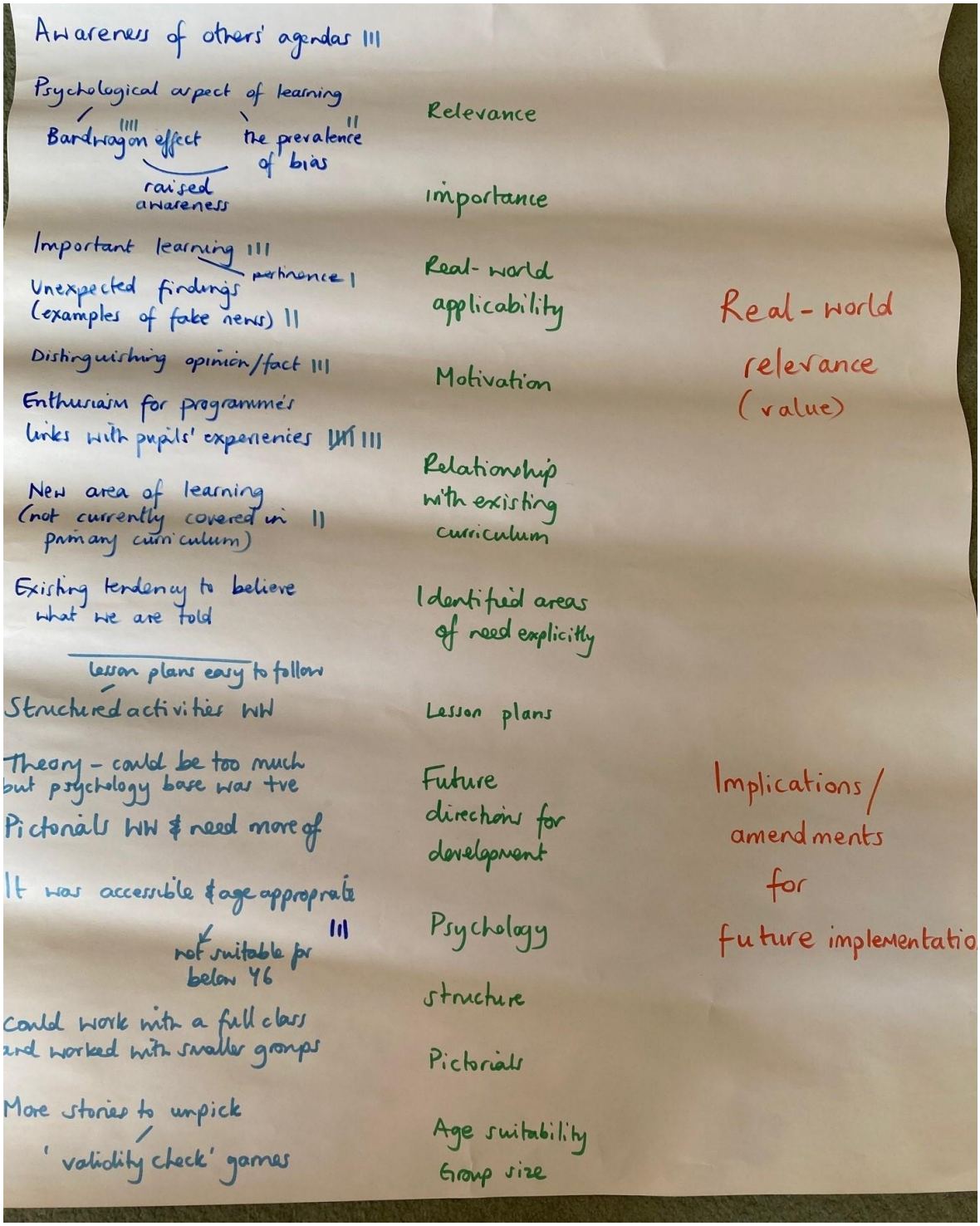

And so that that was, that was really good and they just I think they enjoyed the game was something that they enjoyed the most as well.
You know how? How ridiculous?
I Suppose it depends on the source than, it. really, but they really enjoyed it.
BENEFITS
ENJOYMENT
And so I'll start with. We're in, we're into subgroups where where we should say it's just certain. However. So with the two subgroups, it was quite it was quite easy, with the children I took out.
Been quite interesting. So I found the topic quite interesting enjoyed
7. Any additional information/feedback? They enjoyed the lesson being different and learning about a psychological aspect. They were particularly enthusiastic about spotting fake new stories.
7. Any additional information/feedback? They enjoyed the lesson being different and learning about a psychological aspect.
The children were really engaged in this session and loved discussing the different news stories and why they thought it was fake or real. They created a poster at the end of the session to show how spot fake news stories.
The the game was excellent, the news story Guanghai (sarah) flash-up.
Adult. But the children like being able to pin something onto a hook, something onto that they're familiar with
That was probably one of the highlights. Like, is this true or is this, you know, is this fake this, this headline that really, really enjoyed that? If I was to do it again, I think I'd probably even start on and with that for each session.


Theory side can get quite, I mean, I don't mind that type of side because it's me as an adult
On a broader scale, educate children to be able to unpick stories. Not necessarily, well, necessarily the sensationalist. But if you don't have that, it's like click bait, isn't there, you know, and I suppose it's like junk mail from, you know, whatever you letterbox filled in the 90s and early noughties that, like junk mail, I suppose it's that in electronic sense.
I think it's more the education side of it and that's the bit that I'd like to unpick a little bit more if we can.
FEEDBACK
FOR FUTURE USE
& AMENDMENTS
More like I think structured in a sense of.
I don't know, I almost like I have, I got news for you. Type of thing. You know, like where Paul, Martin and Stephen Hat. Where they choose the validity like blanks and things like that, you know, finish off this headline with actually being appropriate. So obviously that's beyond the realm but things like that are really I think would be quite beneficial.
Yeah, I think I would. Yeah. I think I'd do it full class this time though as well, because I think that'll give a broader spectrum on
Yeah. Something like. Yeah. Not saying that it was worthy because it wasn't a. But for the teacher to either.
I think they enjoyed doing something that was psychology based. Yeah, I think more pictorials would have been better.
So that's, I mean, that's a bit farther up the you know the intellectual ladder, but further down, I think the children need to be aware of
Below Year 6 would have been too much.
It's difficult to say because.
I think visual representation, the more visual representation the children could have like ...

Appendix AA:

Codes and themes from second analysis




Awareness of others' agendas III
Psychological aspect of learning
Bandwagon effect IIII
the prevalence of bias II
raised awareness
Important learning III
pertinence I
Unexpected findings (examples of fake news) II
Distinguishing opinion/fact III
Enthusiasm for programmes
Links with pupils' experiences IIII III
New area of learning (not currently covered in primary curriculum) II
Existing tendency to believe what we are told
lesson plans easy to follow
Structured activities WW
Theory - could be too much but psychology base was tve
Pictorials WW & need more of
It was accessible & age appropriate III
not suitable for below Y6
could work with a full class and worked with smaller groups
More stories to unpick
'validity check' games
Relevance
importance
Real-world applicability
Motivation
Relationship with existing curriculum
Identified areas of need explicitly
Lesson plans
Future directions for development
Psychology
structure
Pictorials
Age suitability
Group size
Real-world relevance (value)
Implications / amendments for future implementatio

Appendix BB:

Teacher assessments of pupil progress (post-intervention):

Teacher post-treatment pupil assessment questionnaire (school 1)

Please indicate your views about the following two questions for each pupil who has participated in the programme, using the scale below:

No progress **Some progress** **Excellent progress**

1 2 3 4 5 6 7

1. Please write a number in each of the two boxes to indicate the progress for each pupil.

Pupil number	To what extent has the programme made a difference to the pupil's ability to identify fake news?	To what extent has the programme made a difference to the critical thinking skills being developed in the pupil?
1	**5**	**6**
2	**2**	**2**
3	**6**	**6**
4	**5**	**6**
5	**4**	**4**
6	**3**	**4**
7	**4**	**4**
8	**4**	**5**
9	**5**	**5**
10	**5**	**6**
11		
12		
13		
14		
15		

Teacher post-treatment pupil assessment questionnaire (School 2)

Please indicate your views about the following two questions for each pupil who has participated in the programme, using the scale below:

No progress **Some progress** **Excellent progress**

1 2 3 4 5 6 7

1. Please write a number in each of the two boxes to indicate the progress for each pupil.

Pupil number	To what extent has the programme made a difference to the pupil's ability to identify fake news?	To what extent has the programme made a difference to the critical thinking skills being developed in the pupil?
1 Group 1	**6**	**6**
2 Group 1	**6**	**6**
3 Group 1	**6**	**6**
4 Group 1	**6**	**6**
5 Group 1	**7**	**7**

Appendix CC:

The University of Nottingham

Post-research contextual questionnaire:

Pupil information

- Did you participate in all the 'fake news' lessons?

If you are happy to answer the following questions, your answers will help me find out more about what helped you to recognise 'fake news.'

1. Did you enjoy the three lessons about 'fake news'? Please choose an emoji to match how much you enjoyed them.

2. How confident do you now feel about spotting 'fake news'? Please mark where you feel you are on the scale below:

Not at all confident — Completely confident

3. What is the most important thing you have learned from the lessons?

_____

_____

_____

4. Please tell me anything else you would like to share about the lessons or about fake news:

_____

_____

_____

Thank you

Louise Rodgers (Trainee Educational Psychologist)