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# Sixth graders evaluating online texts: self-efficacy beliefs predict confirming but not questioning the credibility

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## ABSTRACT

This study investigated how sixth graders' credibility evaluation self-efficacy was associated with their ability to evaluate the credibility of online texts. Students ( $N = 265$ ,  $M_{age} = 12.45$ ) worked in a web-based environment, where they read and evaluated two more credible texts and two less credible texts that required confirming and questioning the texts' credibility, respectively. Students were asked to evaluate the author's expertise, the author's benevolence, and the quality of evidence in each text. They were also asked to assess their credibility evaluation self-efficacy during the task. The structural equation model indicated that students' self-efficacy was positively associated with their ability to confirm the more credible texts but not with their ability to question the less credible texts. The instructional implications of this study are discussed.

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## KEYWORDS

Credibility evaluation; self-efficacy; digital literacies; online evaluation; primary school students

## Introduction

Cultivating critical consumers of online information is undoubtedly one of the key aims of schooling (Organisation for Economic Co-operation and Development, 2021). This imposes significant demands on teachers, as research suggests that a significant proportion of adolescents lack adequate skills to critically evaluate online information (Coiro et al., 2015; Macedo-Rouet et al., 2019; McGrew et al., 2018). Furthermore, the differences in students' abilities to evaluate online information are striking (Leu et al., 2015; McGrew et al., 2018). To develop students' ability to confront and process diverse information, it is important to understand not only the underlying cognitive factors (e.g., prior knowledge, epistemic beliefs, and working memory) in online evaluation but also the role of motivation (List & Alexander, 2017). Motivation is important because students who feel positive, engaged, and efficacious toward the task typically invest more mental effort in complex and cognitively challenging tasks (Bandura, 1997; Niemiec & Lachowicz-Tabaczek, 2015; Schunk, 2012).

Critical evaluation of online information is one such task (Barzilai et al., 2020; Forzani et al., 2022; Lee & List, 2021), as it requires motivation to consider the credibility of online texts from different perspectives (List & Alexander, 2017). Lack of motivation may lead to shallow processing and the use of superficial evaluation strategies. Consequently, readers may rely on false information when learning or making important decisions.

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Despite the importance of motivational factors, research on the critical evaluation of online information has mainly focused on cognitive factors (Anmarkrud et al., 2022; List & Alexander, 2017). Therefore, in this study, we aimed to understand motivation in credibility evaluation by focusing on self-efficacy beliefs—one of the most significant motivational factors—in students' credibility evaluation performance. More specifically, we examined how students' self-efficacy beliefs varied during the evaluation task and how their beliefs were related to their actual credibility evaluation performance.

### ***Credibility evaluation of online texts***

In online contexts, readers may encounter information of varying quality, particularly when reading multiple texts on controversial issues. Therefore, to select and read accurate and reliable information, online readers are required to evaluate texts from different perspectives, as suggested by two recent frameworks: the bidirectional model of first- and second-hand evaluation strategies (Barzilai et al., 2020) and the three-tiered framework for critical online resource evaluation (Forzani et al., 2022).

The bidirectional model of first- and second-hand evaluation strategies by Barzilai et al. (2020) suggests that, when readers are confronting multiple, conflicting texts, they can use first- and second-hand evaluation strategies to make judgments about the credibility of the texts (see also Stadler & Bromme, 2014). First-hand evaluation strategies can be used to evaluate the accuracy of claims and the quality of content, whereas second-hand evaluation strategies can be used to evaluate the trustworthiness of information sources. Successful critical online readers employ both evaluation strategies reciprocally: readers' considerations of a source's trustworthiness inform their judgments about the content, and vice versa.

First-hand evaluation can be accomplished by validating the content with one's own prior knowledge or beliefs (Richter, 2015) or by corroborating the text content with information provided by other trustworthy resources (Wineburg, 1991). Learners can also evaluate the quality of arguments by assessing the consistency of the argumentation and whether the claims are sufficiently justified (Barzilai et al., 2020). However, first-hand evaluation strategies may be ineffective in several situations. For example, social media platforms may favor homogeneous information, limiting exposure to diverse perspectives (Barberá et al., 2015). In the worst-case scenario, these views may reinforce existing incorrect beliefs. If a reader's prior knowledge is insufficient, greater emphasis must be placed on second-hand evaluation strategies (Barzilai et al., 2020; Stadler & Bromme, 2014).

Second-hand evaluation strategies focus on assessing the characteristics of the source, such as the author's expertise, benevolence, and purposes (Braasch et al., 2009; Forzani et al., 2022). When evaluating the author's expertise, readers can seek information on the author's experience, profession, knowledge, and reputation (Bråten et al., 2018; Coiro et al., 2015). Evaluating the author's expertise is important because readers often need to rely on expert knowledge when learning about new issues (Barzilai et al., 2020). However, leveraging "expertise" can also be used to increase the persuasiveness of misleading information (Sinatra & Lombardi, 2020). For example, commercial websites may use expert statements to support otherwise questionable information. Therefore, it is also important to evaluate authors' or publishers' intentions and motives by considering whether they are benevolent, biased, or persuasive (Ault et al., 2017).

The three-tiered framework of critical online resource evaluation (Forzani et al., 2022) adds context as an additional layer to first- and second-hand evaluation strategies. This tertiary evaluation, which concerns the contextual features of texts, is particularly important in the online context, as it aids readers in understanding how a text is socially and temporally situated. Context can be evaluated by assessing the publication platform of the text, the genre of the text, and the recency of the published information. Moreover, website structures and endorsements, such as advertisements, are contextual information that can inform readers about a text's purposes (Ault et al., 2017). Similar to Barzilai et al.'s (2020) bidirectional content-source evaluation model, the critical online

resource evaluation framework emphasizes that effective online readers triangulate evidence across all three credibility aspects of the content, source, and context when determining what to trust.

While the aforementioned frameworks accentuate the importance of employing multiple evaluation strategies, many students' use of strategies remains fairly limited (Coiro et al., 2015). In particular, students may struggle to evaluate biased texts (Kiili et al., 2018; List et al., 2022; McGrew et al., 2018). Notably, prior studies have found that adolescent readers require two abilities when evaluating texts: the ability to confirm more credible texts and the ability to question less credible texts (Kiili et al., 2018; Kiili et al., 2023). Furthermore, students seem to struggle particularly with the questioning of credibility.

Previous studies have also shown that individual differences in the credibility evaluation of online texts are considerable (Coiro et al., 2015; McGrew et al., 2018) and that these can be related to cognitive and motivational factors (Anmarkrud et al., 2022; List & Alexander, 2017). In this study, we have focused on self-efficacy, one of the most influential motivational factors, and its associations with students' abilities to confirm and question the credibility of online texts.

### **Self-efficacy beliefs**

Self-efficacy refers to situation-specific beliefs about one's capability to perform successfully in a specific task that affects students' motivation (Bandura, 1986, 1997). Self-efficacy beliefs direct an individuals' choice of activities, effort invested in the task, and persistence when facing obstacles (Moos & Azevedo, 2009; Schunk, 2012) and, ultimately, promote or inhibit learning (Schunk & DiBenedetto, 2016). Consequently, self-efficacy beliefs have been shown to be associated with general academic performance (Talsma et al., 2018) as well as performance in specific areas, such as mathematics (Pajares & Miller, 1994; Skaalvik et al., 2015), reading (Peura et al., 2021; Unrau et al., 2018), and writing (Bruning et al., 2013; Pajares, 2003).

Self-efficacy is a pivotal concept in Bandura's social cognitive theory (1986, 1997), which accentuates the dynamic interaction of behavioral, personal, and environmental factors in learning. In essence, behavior, such as learning a new skill or reading a chapter in a book, occurs in relation to personal (prior beliefs, cognition, emotions) and external (social and physical environments) factors. The interaction between behavioral, personal, and environmental factors in learning is reciprocal. For example, an environment, such as a classroom, can promote or hinder students' personal needs or beliefs (Schunk & DiBenedetto, 2016); however, reciprocally, students can bring their personal beliefs and behavior to the social environment and change it (Bandura, 1997).

Social cognitive theory delineates four sources that may enhance or diminish self-efficacy; these are mastery experiences, vicarious experiences, social persuasion, and emotional states (Bandura, 1997). Mastery experiences comprise the most important source of self-efficacy. This is because experiences of success engender the feeling that one can master the task in the future as well, whereas experiences of failure inhibit feelings of efficacy (Gist & Mitchell, 1992; Schunk, 2012). In addition to the direct learning experience, self-efficacy can also be developed through vicarious experiences (i.e., seeing others, particularly peers, succeed). Verbal social persuasion from teachers, peers, or parents can also enhance or diminish self-efficacy. With accurate and constructive feedback, teachers can support students in increasing their confidence in a specific task (Niemi-virta & Tapola, 2007). Finally, interpretations of psychological or emotional states, such as anxiety, fatigue, or stress, can also affect students' efficacy beliefs (Huang & Mayer, 2019).

Students' self-efficacy beliefs can be measured at three different specificity levels (Bandura, 1997; Bong, 2006). The general level refers to one's efficacy beliefs in a general area, without any specific reference to a particular domain, task, or activity (e.g., "I feel confident that I am a good reader"). At the intermediate level, the items are more targeted at certain competencies (e.g., "I feel confident that I can read cartoons"). At the specific level, the focus is on self-efficacy beliefs in a specific task (e.g., "I can comprehend the next chapter in this history textbook"). Previous research suggests that the association between self-efficacy beliefs and performance is stronger when the

measurement level corresponds to the task at hand (Zell & Krizan, 2014). Consequently, in the present study, we measured self-efficacy at the specific level (i.e., during the credibility evaluation task).

### **Previous studies on self-efficacy in reading**

Self-efficacy has been shown to support reading performance in various areas, such as reading fluency (Peura et al., 2021), the identification of the main ideas in the text (Schunk & Rice, 1993), and reading comprehension (Unrau et al., 2018). The studies on self-efficacy in online evaluation have examined the role of self-efficacy, for example, in the context of deceptive scareware messages (Ormond et al., 2016), social media (Hocevar et al., 2014), educational web sources (Andreassen & Bråten, 2013), and online inquiry (Sormunen et al., 2021). For example, Andreassen and Bråten (2013) examined teachers' ( $N = 263$ ) self-efficacy with regard to the evaluation of online sources and found that the teachers' self-efficacy beliefs were associated with their self-reported source evaluation skills.

Furthermore, only a few studies have examined the associations between self-efficacy and school-aged students' actual performance of online reading. Aesaert et al. (2017) investigated how primary school students' self-efficacy beliefs with regard to processing and communicating online information were related to their actual skills, such as searching for, evaluating, and communicating online information. They found that primary school students made positively biased self-efficacy judgments, suggesting that students tended to overestimate their competence in processing online information. It is common for young children to overestimate their ability to complete tasks successfully, especially when they have difficulties accomplishing the task (Miller & Geraci, 2011; Zell & Krizan, 2014).

Forzani et al. (2021) developed and validated the Motivations for Online Reading Questionnaire to examine how students' ( $N = 1798$ ) motivation for online reading was associated with their online reading performance. In this questionnaire, self-efficacy was one of the motivational dimensions measured; curiosity/value and self-improvement beliefs were also measured. Of these three dimensions, self-efficacy was the strongest predictor, accounting for 12% of the variation between students in online reading performance (i.e., the ability to locate, evaluate, synthesize, and communicate online information).

### **Present study**

This study sought to understand the role of self-efficacy beliefs in students' ability to evaluate the credibility of online texts. Our recent study (Kiili et al., 2023) revealed that the credibility evaluation of online texts requires two separate abilities: confirming the credibility of more credible online texts and questioning the credibility of less credible online texts. We used the same data as in our previous study to advance our understanding of the underlying motivational factors of credibility evaluation.

In the present study, students' self-efficacy beliefs were measured during a credibility evaluation task (see, for example, Niemivirta & Tapola, 2007). Students read and evaluated four online texts, one at a time, on a controversial health topic. Students' credibility evaluation self-efficacy was measured four times during the task.

As previous studies in mathematics and science have shown that self-efficacy beliefs can vary between lessons (Bernacki et al., 2015; Street et al., 2022) or even during the same task (Huang & Mayer, 2019; Niemivirta & Tapola, 2007), we were interested in whether students' self-efficacy beliefs varied during the credibility evaluation task. Furthermore, we examined how students' credibility evaluation self-efficacy beliefs were associated with their actual evaluation performance (i.e., confirming the credibility of more credible online texts and questioning the credibility of less credible online texts). The following research questions were addressed:

1. Do credibility evaluation self-efficacy beliefs vary during the credibility evaluation task?

2. How is credibility evaluation self-efficacy associated with students' abilities to confirm more credible texts and question less credible texts when students' prior beliefs about the text topic, the reading order of the texts, and gender are controlled for?

We assumed that the self-efficacy measured during the credibility evaluation task would be positively associated with students' credibility evaluation performance. This assumption was based on previous research that has shown that self-efficacy is an important predictor for reading comprehension of single (Unrau et al., 2018) and multiple texts (Lee & List, 2021) and of online texts (Forzani et al., 2021) when students' prior beliefs about the text topic, the reading order of texts, and gender are controlled for.

In the present study, students' prior beliefs about the text topics were controlled for because previous studies have shown that these may affect the use of evaluation strategies and the credibility judgments (Ault et al., 2017; van Strien et al., 2016). The reading order of the texts was also controlled for because it has been shown to be associated with students' reading comprehension (Richter, 2015). Finally, we also controlled for students' gender because previous research has shown that girls outperform boys in basic reading (OECD, 2019; Torppa et al., 2018) and credibility evaluation (Forzani, 2018), especially in questioning the credibility (Kanniainen et al., 2019). Further, we also set gender as a control variable for credibility evaluation self-efficacy as boys tend to overestimate their self-efficacy beliefs in contexts involving information and communication technology (e.g., Aesaert et al., 2017; Sormunen et al., 2021).

## Methods

### Participants

The participants of this study consisted of 265 sixth graders ( $M = 12.45$  years,  $SD = 0.32$ ) from 15 classrooms, representing five different Finnish elementary schools that follow the Finnish national curriculum (see The Finnish National Board of Education, 2016). Of these students, 53.6% were girls, 44.5% were boys, and 1.9% were non-binary. The majority of the students (90.9%) spoke Finnish at home, 7.6% spoke Finnish and some other language at home, and 1.5% did not speak Finnish at home. Regarding the students' guardians (482 reported their educational background), 58% had a higher education degree (university or university of applied sciences). This proportion is somewhat high compared to the general Finnish population (44%; Official Statistics of Finland, 2020). All students participated voluntarily, and signed consent was received from students and their guardians.

### Measures

#### Measure for credibility evaluation of online texts

To assess students' ability to evaluate the credibility of online texts, we utilized the Critical Online Reading Research Environment (Kiili et al., 2023), which is a web-based environment where researchers can create critical online reading tasks. For this study, we created a task in which students were asked to read and evaluate four fictitious online texts about the effects of sugar consumption (see Figure 1). The four texts were similar in length and were grouped into two text pairs, which considered the same subtopic with contradictory views (see Figure 2). Two texts concerned sugar's effects on children's hyperactivity (Subtopic 1), and two texts concerned sugar's effects on memory (Subtopic 2). From each of the text pairs, one text was more credible (a newspaper article and a popular science text), while the other was less credible (personal blog text by a layperson and a commercial text). As shown in Figure 2, students read the texts in two different orders, which were randomly assigned.

The design of the texts followed the ideas presented in the bidirectional model of first- and second-hand evaluation strategies by Barzilai et al. (2020) and the three-tiered framework for

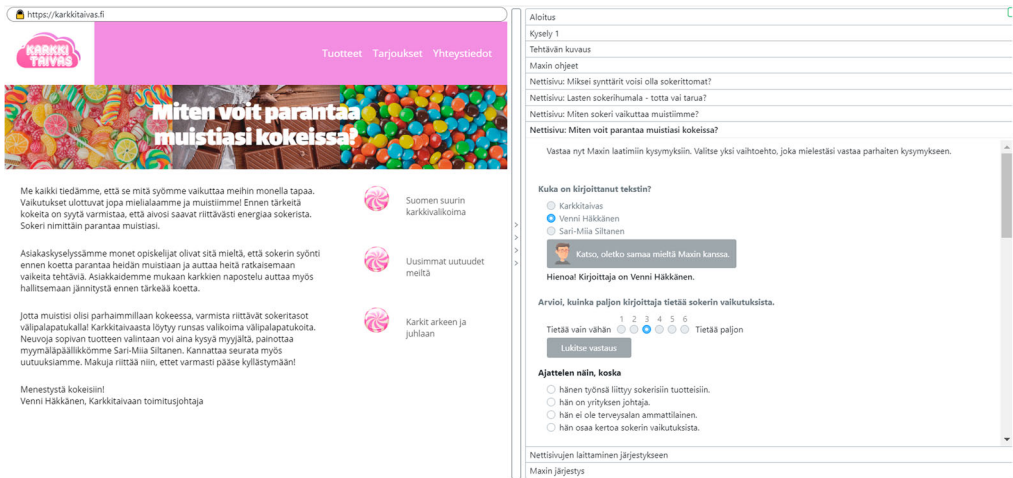


Figure 1. Screenshot of the Task Environment.

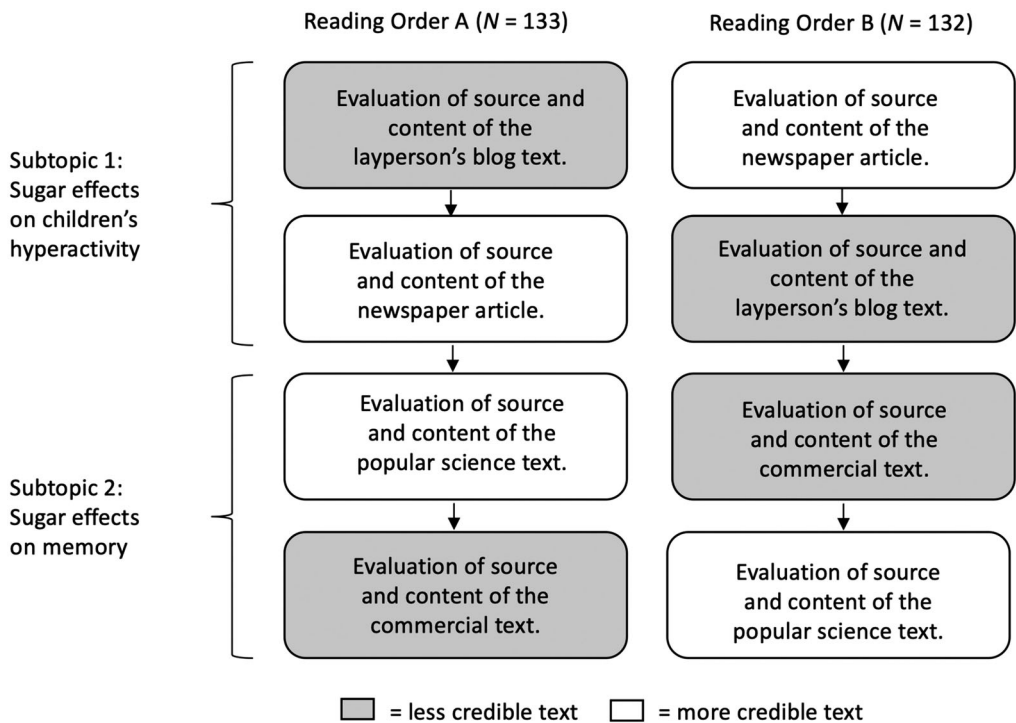


Figure 2. The Subtopics of the Task and the Reading Order of the Texts.

critical online resource evaluation by Forzani et al. (2022). We manipulated the source (author's expertise and author's benevolence), the content (quality of the evidence), and the genre of the texts. Detailed descriptions of the texts are presented in Appendix A.

Students were asked to evaluate the author's expertise, the author's benevolence, and the quality of the evidence in each text using a 6-point scale. For each evaluation, they received 2 points when choosing their answer from the right end of the scale (e.g., for the more credible texts, Options 5 or



6 and for the less credible texts, Options 1 or 2). Students received 1 point if they chose their answer from the middle of the scale (Options 3 or 4) and 0 points if their response was from the wrong end of the scale.

Prior to being given the evaluation items, students were asked to identify the author, the main claim, and the evidence supporting the main claim. If they did not succeed in the identification task, they were provided with the correct answer. The aim was to ensure that all students evaluated the same author and the evidence related to a specific claim. In addition, students were asked to justify their evaluations (multiple-choice items). At the end of the task, students ranked the texts according to their credibility. In the present study, we have focused solely on students' credibility evaluations.

### ***Measure for credibility evaluation self-efficacy***

Students' credibility evaluation self-efficacy beliefs were measured during the critical evaluation task. After completing the evaluation of each online text, students' self-efficacy was measured by asking them to assess how well they believed that they could evaluate the next online text ("I believe that I can evaluate the next page well"). Students responded to this item on a 7-point scale (1 = "Describes me very poorly" and 7 = "Describes me very well"). McDonald's omega for the credibility evaluation self-efficacy measure was .89.

### ***Prior-belief measure***

Students' prior beliefs about the text topics were assessed before they completed the evaluation task. Two claims were presented to students: (a) "Sugar causes hyperactivity in children" and (b) "Sugar boosts memory." Students were asked to evaluate whether they agreed with the claim or not on a 7-point scale (1 = "Totally disagree" and 7 = "Totally agree"). Two variables were formed: prior belief about sugar's effects on hyperactivity and prior belief about sugar's effects on memory.

### ***Data collection procedure***

The data were collected during the school year 2020–2021. Owing to the COVID-19 pandemic, the researchers used a video connection to join the class. All data were collected with the Critical Online Reading Research Environment (Kiili et al., 2023), with the exception of the background information (students' age, students' home language, and guardians' educational level), which was collected along with the information letters and consent forms sent to students' homes.

Before completing the task, students were informed about the purpose and voluntary nature of the study and that participating would not have an influence on their grades. At the beginning of the lesson, students were shown an introductory video on the features of the task environment. Following this, they completed the credibility evaluation task and answered the four credibility evaluation self-efficacy items embedded in the task. Students could proceed with the task at their own pace. The lesson lasted 45 min.

### ***Data analysis***

Descriptive analyses and Friedman's test were conducted with the IBM SPSS Statistics 26 software. To study whether students' self-efficacy beliefs differed across the credibility evaluation task (RQ1), we used Friedman's test. The test was run separately for both reading orders. The pairwise comparisons were run using the Wilcoxon rank test. Non-parametric methods were employed because of the non-normality of some variables. We used the correlation coefficient  $r$  as a measure of the effect size.

Confirmatory factor analysis (CFA) and structural equation modeling (SEM) were performed using the Mplus software, Version 8.6 (Muthén & Muthén, 1998–2017). To study the associations between students' credibility evaluation self-efficacy and credibility evaluation performance (RQ2), we used SEM.

The model fit for the CFA and SEM models was evaluated using multiple indices, including the chi-square test ( $\chi^2$ ), root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker–Lewis index (TLI), and standardized root mean square error (SRMR). The cut-off values indicating a good model fit were set as follows:  $p > .05$  for the chi-square test, RMSEA value  $< .06$ , CFI and TLI values  $> .95$ , and SRMR value  $< .08$  (Hu & Bentler, 1999).

Prior to SEM, the unidimensional structure of the credibility evaluation self-efficacy measure was assessed using CFA. The analysis indicated that the model did not fit our data well ( $\chi^2(2) = 17.24$ ,  $p = .002$ , CFI = .93, TLI = .79, RMSEA = .17, and SRMR = .04). However, a high modification index value (17.18) suggested that the model could be improved if the residuals of self-efficacy after the evaluation of the newspaper article and the personal blog post were allowed to covary. As both texts concerned the same subtopic (sugar's effects on hyperactivity), this suggestion was considered theoretically reasonable, and the residual covariance of this text pair was added to the model. The modified CFA model fulfilled the criteria for a good model fit ( $\chi^2(1) = 2.46$ ,  $p = .117$ , CFI = .99, TLI = .96, RMSEA = .07, and SRMR = .01), extracting a single unidimensional factor for credibility evaluation self-efficacy. The factor loadings for all four self-efficacy items ranged from .70 to .92 ( $ps < .001$ ).

The structure of students' credibility evaluation performance was previously examined (Kiili et al., 2023). This examination, which used 12 observed variables that represented the evaluation of the author's expertise, the authors' benevolence, and the quality of evidence in each text, revealed four first-order factors representing each text genre and two second-order factors labeled as confirming the credibility of the more credible texts and questioning the credibility of the less credible texts. This second-order factor model demonstrated a good fit to the data ( $\chi^2(79) = 107.68$ ,  $p = .018$ , CFI = .97, TLI = .97, RMSEA = .04, and SRMR = .08, with factor loadings ranging from .52 to .92.)

In the SEM analysis, students' prior beliefs about the text topic and the reading order of texts (Reading Order A = 0; Reading Order B = 1) were controlled for. In addition, gender (girls = 0, boys = 1, and other = 2) was set as a control variable (boys as a reference group) for credibility evaluation self-efficacy, confirming the credibility, and questioning the credibility. We used the variance-adjusted weighted least square estimator (Muthén & Muthén, 1998–2017) because a few of the observed variables were skewed and because the data included categorical variables. Students were nested within 15 classes; therefore, we used the option TYPE = COMPLEX in the analyses in Mplus, with the class as a clustering variable. This option took into account the nestedness of the data by correcting standard errors in the parameter estimates.

## Results

### Descriptive results

The descriptive analysis showed that mean scores of the credibility evaluation items that required confirming the credibility varied from 1.60–1.78 (range of SDs = 0.44–0.53), while the mean scores of credibility evaluation items that required questioning the credibility seemed to be lower, varying from 0.52–0.98 (range of SDs = 0.59–0.72).

Credibility evaluation self-efficacy was measured after completing the evaluation of each text, and the means were as follows:  $M = 5.28$  and  $SD = 1.16$  for self-efficacy after reading the popular science text;  $M = 5.10$  and  $SD = 1.09$  for self-efficacy after reading the newspaper article;  $M = 5.15$  and  $SD = 1.18$  for self-efficacy after reading the layperson's blog text; and  $M = 5.12$  and  $SD = 1.17$  for self-efficacy after reading the commercial text. The descriptive results suggested that, on average, students were fairly confident in their ability to evaluate the credibility of online texts. Over 90% of the students reported their self-efficacy to be 4 or more on a 7-point scale. The descriptives are presented in Appendix B.

In terms of prior beliefs about the text topics, prior belief about sugar's effects on children's hyperactivity ( $M = 5.18$ ,  $SD = 1.60$ ) was statistically significantly higher than prior belief about

sugar's effects on memory ( $M = 2.79$ ,  $SD = 1.37$ ;  $t(264) = 18.34$ ,  $p < .001$ ). The Spearman correlations between all examined variables are presented in Appendix C.

### Students' credibility evaluation self-efficacy beliefs across the task

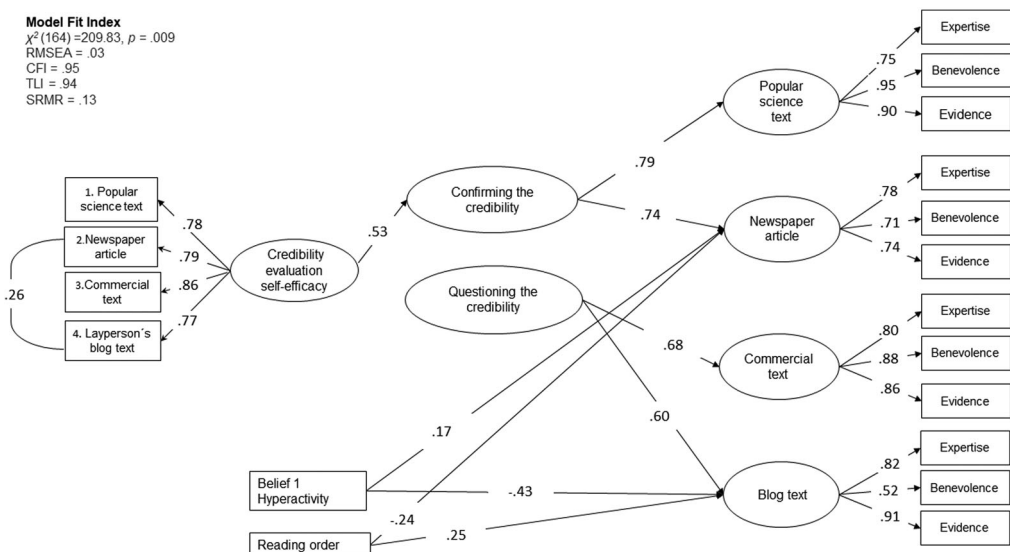
Regarding RQ1, students' self-efficacy beliefs varied during the task ( $\chi^2(3) = 7.85$ ,  $p = .049$ ) only when they read and evaluated the texts in Reading Order A (see Figure 2). The pairwise comparison showed that, after evaluating the popular science text, students estimated their self-efficacy higher ( $M = 5.22$ ,  $SD = 1.15$ ) than after evaluating the commercial text following it ( $M = 5.06$ ,  $SD = 1.16$ ). This difference was statistically significant ( $Z = -2.46$ ,  $p = .014$ ), but the effect size ( $r = .21$ ) was small (Cohen, 1988). When students read and evaluated the texts in Reading Order B, their self-efficacy beliefs did not vary during the task.

### Associations between self-efficacy and credibility evaluations of online texts

Regarding RQ2, we examined the associations between students' credibility evaluation self-efficacy and their credibility evaluation performance while controlling for student's prior beliefs, the reading order of the texts, and gender. Figure 3 presents the SEM model and the goodness-of-fit indices, which indicate that the model exhibited a good fit for the data. The standardized path coefficients of the model are presented in Figure 3. The results showed that self-efficacy contributed positively to students' ability to confirm the credibility of the more credible online texts. The higher students' self-efficacy, the better they were able to confirm the credibility of the more credible texts. However, credibility evaluation self-efficacy was not statistically significantly associated with students' ability to question the credibility of the less credible online texts ( $\beta = -.07$ ,  $p = .304$ ).

## Discussion

The present study sought to understand the association between students' self-efficacy beliefs and their credibility evaluation performance. The study extended the existing knowledge on the role of



**Figure 3.** The SEM Model Showing the Statistically Significant Associations Between Credibility Evaluation Self-Efficacy and Students' Credibility Evaluation Performance. Reading Order of the Text, Prior Beliefs and Gender Were Treated as a Control Variable.

self-efficacy beliefs in online reading (see Forzani et al., 2021; Sormunen et al., 2021) by focusing specifically on the credibility evaluation self-efficacy beliefs. The novelty of this study lies in how it has measured students' self-efficacy beliefs during the task in four measurement points and examined the self-efficacy beliefs' associations with two latent credibility evaluation abilities, namely the ability to confirm the credibility of more credible texts and the ability to question the credibility of less credible texts.

The results showed that the majority of the students estimated their self-efficacy to be relatively high. This is in line with previous studies that have suggested that primary school students tend to make positively biased judgments about their abilities in relation to their actual skills, especially in complex tasks (Aesaert et al., 2017; Miller & Geraci, 2011); evaluating online texts can be regarded as one such task (Forzani et al., 2022). Furthermore, on average, students' self-efficacy beliefs were quite stable during the evaluation task, suggesting that sixth graders did not differentiate their self-efficacy beliefs after evaluating texts that were more and less credible.

In terms of the contribution of self-efficacy beliefs to students' actual credibility evaluation performance, our expectations were only partially confirmed. Students' credibility evaluation self-efficacy beliefs were positively associated with their ability to confirm the credibility of the more credible texts: the higher students' self-efficacy, the better they performed in the evaluation items that required confirming the credibility. This finding is in line with previous studies that have shown that self-efficacy contributes to students' reading performance in offline (Peura et al., 2021; Unrau et al., 2018) and online contexts (Aesaert et al., 2017; Forzani et al., 2021).

Contrary to our expectations, the credibility evaluation self-efficacy was not associated with students' ability to question the credibility of the less credible texts. This result implied that students' self-efficacy judgments were inaccurate, particularly when evaluating texts that required questioning the credibility. There may be several explanations for this.

First, if students' own understanding and causal attributions (i.e., why they performed as they did) about their past performance are biased or misunderstood, their self-efficacy judgments may be less accurate (Kruger & Dunning, 1999). Second, when forming an accurate self-efficacy judgment, one has to analyze the task as well as their own capabilities and resources (Gist & Mitchell, 1992). If students are not familiar with the demands of a task, it is not only hard to perform the task but also to recognize whether they are underperforming; consequently, the self-efficacy estimates may initially be less accurate (Bandura, 1997). It is likely that students have not had sufficient opportunities to practice evaluating less credible online texts or that the demands of the task have not been made explicit to them. For example, classroom instructions often guide students to search for and evaluate credible online texts, and as a result, less credible online texts are excluded from further inspection. A lack of experience in evaluating less credible texts may lead to an incomplete understanding of what is required to successfully evaluate less credible online texts. Third, students might not have received feedback about their credibility evaluation abilities in a manner that would have helped them reflect on their capabilities (Schunk & DiBenedetto, 2016).

To conclude, in accordance with previous studies, sixth graders were more capable of accurately evaluating the more credible texts than the less credible texts (see also Kiili et al., 2018; McGrew et al., 2018). However, students' credibility self-efficacy beliefs were similar after evaluating the texts that were more and less credible. Consequently, their self-efficacy beliefs were positively associated with their ability to confirm the credibility of the more credible texts but not with their ability to question the less credible texts.

### ***Instructional implications***

Our results suggest that students may have inaccurate credibility evaluation self-efficacy beliefs, especially with regard to the ability to question the credibility of less credible texts. There are several ways in which teachers can help students acquire more accurate and positive self-efficacy beliefs.

First, students must be given opportunities to evaluate different types of online texts (i.e., online texts that vary in quality and represent different genres). As students in this study struggled specifically with questioning the credibility, providing opportunities to evaluate less credible texts has particular importance. As critical evaluation is challenging even for older students (McGrew et al., 2018), younger students' credibility evaluation should be scaffolded. Teachers could begin with simple, straightforward critical evaluation tasks, as these may be more conducive to accurate judgments than complex tasks (Zell & Krizan, 2014). In addition, simple tasks provide students with mastery experiences that positively affect their self-efficacy (Bandura, 1997). When students feel confident in evaluating less credible texts accurately, teachers can gradually add complexities to the evaluation tasks.

Second, in addition to providing students with mastery experiences, students' self-efficacy can be supported via vicarious experiences (Bandura, 1997). Previous studies have found considerable individual differences among adolescents' credibility evaluation skills (e.g., Kiili et al., 2018); therefore, students with effective evaluation strategies can serve as models to other students. Peer modeling also aids students who share their strategies with others, as the situation may raise their confidence in credibility evaluation. In general, modeling effective evaluation strategies, whether modeled by a teacher or a peer, is crucial because information on evaluation strategies may not be available otherwise (Gist & Mitchell, 1992).

Third, teachers can support students' understanding of the demands of a task by explaining that students must consider content, source, and context features when evaluating the credibility of online texts. Teachers can exemplify the consequences of superficial credibility evaluation to develop students' understanding of the complexities in credibility evaluation and to emphasize the importance of striving to consider credibility from multiple perspectives. This will allow students' understanding of their own capabilities to become clearer (Gist & Mitchell, 1992; Schunk & DiBenedetto, 2016).

Finally, students can be supported in reflecting on their own performance and efficacy beliefs through explicit feedback. It is crucial to maintain positive efficacy beliefs while providing feedback; feedback should not turn students' self-efficacy into self-doubt. Therefore, feedback should be realistic and adapted to students' current skills (Bandura, 1997). Furthermore, to be beneficial, feedback should focus on the task, effort, and performance rather than on students' abilities; this ensures that the student understands they can improve their evaluation skills (Huang & Mayer, 2019).

### ***Limitations and suggestions for future research***

The present study has certain limitations, which future research should seek to address. First, students' self-efficacy beliefs were measured with a credibility evaluation task, which included both more and less credible texts in mixed reading order. This might have been confusing to some students and could have affected their self-efficacy judgments. However, as the self-efficacy judgments were fairly stable across the task, it is possible that the text quality does not play a significant role in primary school students' self-efficacy judgments. To better understand the reasoning behind self-efficacy judgments and whether or not the quality plays a role, a think-aloud methodology could be applied. In addition, future research could investigate the associations between self-efficacy beliefs and actual performance by employing separate tasks for confirming the credibility and questioning the credibility.

Second, the online texts that students evaluated were created by the researchers and were fictitious; thus, they did not fully represent authentic online contexts. In an authentic online context, students could have, for example, used additional cues (e.g., "about us" pages) or source knowledge (e.g., well-known news media) to inform their evaluations. However, using research-created texts, we were able to systematically manipulate the credibility of online texts and ensure that the texts were age-appropriate in terms of length, vocabulary, and sentence structure. Future research should

examine credibility evaluation self-efficacy in authentic online contexts to extend our understanding of the role of self-efficacy in critical online reading.

Third, this study was limited in examining how students' self-efficacy beliefs predicted their credibility evaluation of online texts. The future research should also investigate the reciprocal relationship between self-efficacy beliefs and credibility evaluation performance.

## Conclusion

The present study revealed that students' self-efficacy beliefs were associated with confirming the credibility of the more credible online texts but not with questioning the credibility of the less credible texts. This finding suggests that, when considering the association between self-efficacy and credibility evaluation of online texts, credibility evaluation should be considered a complex process that requires two types of abilities: confirming the credibility of more credible texts and questioning the credibility of less credible texts. Therefore, self-efficacy beliefs must be regarded separately in relation to these two abilities.

It is important to consider that, without explicit support and feedback, students may not recognize the skills and effort required to evaluate the credibility of online texts. Furthermore, overconfidence may cause the evaluation to be superficial and also engender misunderstandings. Thus, practicing evaluation of the credibility of different types of texts, combined with constructive and developmentally appropriate feedback, may best aid teachers in helping their students become better evaluators whose accurate self-efficacy beliefs will lead to a positive developmental cycle.

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## Data availability

Data available on request from the authors

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## Ethics approval statement

The ethical statement has been given by the Ethics Committee of the Tampere Region.

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## Appendices

### Appendix A. Descriptions of the online texts

Subtopic	Title	Description
Sugar and hyperactivity	Children's sugar high -True or false? <sup>1</sup>	A newspaper article written by a journalist specialized in health and well-being informs about children's sugar highs. The article claims that sugar does not cause hyperactivity in children by relying on a pediatrician's statement.
	Why not have sugar-free birthday parties? <sup>2</sup>	A mother's blog persuades other parents not to offer candy on birthdays. The mother claims that sugar causes hyperactivity in children by relying on her observations of her daughter after a birthday party.
Sugar and memory	How does sugar affect your memory? <sup>1</sup>	A research institute's column text written by a researcher shares information about studies of sugar's effects on memory. The researcher claims that sugar is essential for memory functions, but excessive sugar use is harmful to memory. She relies on research results.
	How can you boost your memory in exams? <sup>2</sup>	A commercial text on a candy company's website written by a chief executive officer encourages students to eat candy to boost their memory before exams. He claims that sugar improves memory by relying on a customer survey.

Note. <sup>1</sup> = a more credible text, <sup>2</sup> = a less credible text

### Appendix B. Description of test variables (N = 264–265)

	Mean	SD	Skewness	Kurtosis
<i>Prior beliefs</i>				
Prior belief of hyperactivity	5.18	1.60	-0.79	-0.01
Prior belief of memory	2.79	1.38	-0.70	0.56
<i>Credibility evaluation of the popular science text</i>				
Expertise	1.67	0.51	-1.14	0.19
Benevolence	1.78	0.44	-1.73	1.97
Evidence	1.72	0.47	-1.19	-0.01
<i>Credibility evaluation of the newspaper article</i>				
Expertise	1.60	0.53	-0.87	-0.37
Benevolence	1.70	0.47	-0.98	-0.74
Evidence	1.70	0.48	-1.19	0.14
<i>Credibility evaluation of the commercial text</i>				
Expertise	0.94	0.66	0.06	-0.72
Benevolence	0.87	0.72	0.20	-1.06
Evidence	0.93	0.65	0.07	-0.65
<i>Credibility evaluation of the blog text</i>				
Expertise	0.98	0.71	0.03	-0.99
Benevolence	0.52	0.59	0.66	-0.52
Evidence	0.88	0.69	0.16	-0.90
<i>Credibility evaluation self-efficacy</i>				
Self-efficacy after evaluation of the popular science text	5.28	1.16	-0.70	0.77
Self-efficacy after the evaluation of the newspaper article	5.10	1.09	-0.60	0.83
Self-efficacy after evaluation of the commercial text	5.12	1.17	-0.55	0.09
Self-efficacy after the evaluation of the blog text	5.15	1.18	-0.88	1.13

Note. Prior belief on hyperactivity: "Sugar causes hyperactivity in children" and Prior belief on memory: "Sugar boosts memory". Scales for prior belief and self-efficacy items were 0–7; Scale for evaluation items was 0–2.

**Appendix C. Spearman correlations among variables**

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1. Prior belief on hyperactivity																		
2. Prior belief of memory	-.03																	
3. SE after EV of popular science text	.10	.08																
4. SE after EV of newspaper article	.06	.01	.64***															
5. SE after EV of blog text	.18**	.02	.61***	.71***														
6. SE after EV of commercial text	.10	.09	.75***	.69***	.70***													
7. EV of popular science text - Expertise	.06	.06	.23***	.19**	.21**	.28***												
8. EV of popular science text - Benevolence	.05	.05	.32***	.30***	.32***	.29***	.51***											
9. EV of popular science text- Evidence	.05	.04	.26***	.25***	.24***	.29***	.48***	.54***										
10. EV of newspaper article - Expertise	.11	.02	.16*	.20**	.194**	.18**	.27***	.16**	.23***									
11. EV of newspaper article - Benevolence	.15*	.04	.12	.18**	.17**	.06	.21***	.27***	.17**	.45***								
12. EV of newspaper article - Evidence	.13*	.09	.13*	.17**	.18**	.14*	.26***	.27***	.31***	.37***	.34***							
13. EV of blog text - Expertise	-.38**	.03	-.02	-.05	-.18**	-.04	-.03	.01	-.02	-.14	-.03	.05						
14. EV of blog text - Benevolence	-.19**	.05	-.18**	-.16**	-.17**	-.14	-.12	-.04	-.10	-.12	-.19**	-.04	.29***					
15. EV of blog text - Evidence	-.34**	.01	-.03	-.06	-.18**	-.11	-.08	.04	-.00	-.18**	-.17**	-.04	.62***	.38***				
16. EV of commercial text - Expertise	-.16*	-.04	.03	-.07	-.07	-.03	-.06	.02	-.10	-.05	-.06	-.09	.23***	.16**	.25***			
17. EV of commercial text - Benevolence	-.18**	-.10	.02	-.05	-.03	.01	.03	.06	.04	-.08	-.12	-.07	.28***	.21**	.34***	.60***		
18. EV of commercial text - Evidence	-.16**	-.05	.02	-.04	-.09	.02	-.03	-.02	-.06	-.15*	-.10	-.10	.24***	.18**	.36***	.59***	.63***	
19. Reading order	-.06	.074	.05	-.03	-.00	.05	-.06	-.02	-.13*	-.21**	-.06	-.09	.24**	.10	.18**	.04	-.01	-.02

Note. SE = Self-Efficacy, EV = Credibility evaluation