

Do Learning-by-Doing Interventions Work for Early Adolescents? Co-Evaluating a News Literacy Intervention

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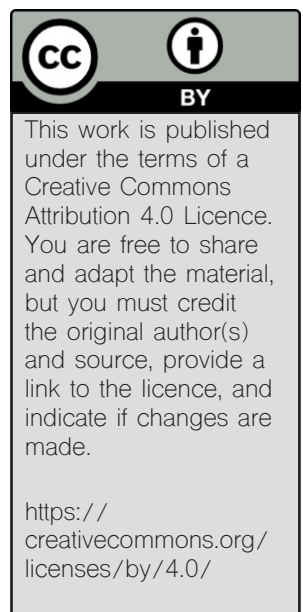
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Abstract

Early adolescents (12-15 years old) are confronted with a lot of online news, but often do not evaluate this news on its trustworthiness, relevance, and accuracy. To date, there is a lack of effective interventions to stimulate their news literacy application, that is, the extent to which they use their news literacy when encountering online (news) content. Therefore, this study details the development and co-evaluation of a classroom intervention to increase early adolescents' news literacy application. The intervention is based on news literacy theory, behavioral change theory, and co-creation, and presents an active approach to learning how to engage with news critically. In an online platform, participants learned to make the decisions involved in writing articles, writing their own news articles, and checking others' articles. To further develop and co-evaluate the intervention, participants (N = 26) worked in the online platform for three lessons, after which they evaluated the lessons. Based on their within-platform activity, evaluation survey, and evaluation discussion with students and their teacher, the intervention was further improved to support guidance within the lessons, emphasize the competition within the platform, manage assignment expectations, aesthetics, and technical issues. Overall, the evaluations were promising: the intervention lessons were positively evaluated, and participants indicated to have learned from the lessons.

Keywords: news literacy, intervention design, co-creation, early adolescents



Introduction

Early adolescents (12-15 years old) find a lot of news online, where it can be difficult to determine the trustworthiness, relevance, and

accuracy of news (e.g., Smahel et al., 2020; Tamboer et al., 2022a; Vraga et al., 2021). At the same time, research shows that they have difficulties evaluating news and are generally not motivated to do so (Tamboer et al., 2023a; Wineburg et al., 2016). There is thus a need for stimulating the extent to which early adolescents reflect on the trustworthiness of news, evaluate sources, and seek further information. This active engagement with news is also referred to as news literacy application (e.g., Tamboer et al., 2023a).

Effective interventions that stimulate news literacy application are not readily available. Previous initiatives often focus on increasing knowledge on the news production process, and, as a result, only impact knowledge or awareness instead of individuals' everyday life news literacy application (e.g., Ashley et al., 2013; Jones-Jang et al., 2019). In the current study, we describe a theory-based intervention that specifically aims to stimulate early adolescents' news literacy application. As intervention development is often a "black box" (e.g., Hoddinott, 2015), this study focuses on the development and co-evaluation of this intervention in order to provide relevant background information, but also to serve as an inspiration for others who develop interventions for early adolescents.

Combining Theory and Co-Creation in Developing a News Literacy Application Intervention

As a starting point, the intervention is built on news literacy theory (e.g., Fisher & Fisher, 2002; Potter, 2004; Rozendaal, 2017; Tamboer et al., 2023a; Vraga et al., 2021). Although there is not yet much known about elements that play a role in individuals' everyday news literacy application (e.g., Swart, 2021), (news) media literacy theory and behavioral change theory broadly indicate the need for a combination of knowledge, skills, motivation, and the social context (e.g., Swart, 2021; Tamboer et al., 2022a; 2023a; Vraga et al., 2020). Specifically in early adolescents, researchers have found the important role news literacy motivation, which is often limited in this group (Tamboer et al., 2022a; 2023a). Furthermore, news literacy skills, value for (news) media literacy and more positive social norms were found to correlate with news literacy application (Tamboer et al., 2023a). Although the role of knowledge is questionable, early adolescents likely do need to have basic insights regarding the news production process (Tamboer et al., 2023a). Therefore, the intervention will also include a solid knowledge base, following Vraga et al.'s (2021, p. 5) definition of news literacy, that is, "knowledge of the personal and social processes by which news is produced, distributed, and consumed, and skills that allow users some control over these processes".

For an intervention to be effective, the target group must have an active role in intervention development (Literat et al., 2020). Early

adolescents are generally passive in their news consumption and yield broad definitions of what can be considered news, beyond the traditional view on what news is (Tamboer et al., 2022b). They consume most news through other people and online. In previous research, we have discussed early adolescents' views on news literacy interventions (Tamboer et al., 2022a). This study showed that they prefer interventions that are accessible, interactive, and tailored to them. More specifically, this study led to a set of guidelines for developing news literacy interventions for early adolescents (Tamboer et al., 2022b), which informed the development of the intervention. To develop fitting and effective interventions, interventions should (1) consider early adolescents' needs, preferences, and news use, (2) find them where they are – for example in schools and online, (3) start from early adolescents' interests, but keep it serious and varied, (4) make news literacy application easy – for example through checklists, (5) not be boring, but engage them, (6) make news literacy application the norm with role models, (7) activate early adolescents – for example with games and competition, and (8) keep them involved in intervention development and evaluation.

Translating Theory and Co-Creation into a News Literacy Application Intervention

Based on the theory and in co-creation with early adolescents, we have developed the news literacy application intervention “Bubble”. It is an online environment in which participants will actively work with news during three lessons, that consecutively cover various aspects of news literacy. In the Bubble platform (see Figure 1), participants will first individually watch short videos on the news process and on news literacy skills – such as steps in the verification of news – to exercise more control over these processes (Step 1). These videos discuss the news production process by covering the content, context, consumption, circulation, and creation of news (following Vraga et al., 2021). They will also do a short quiz to check their attention to and understanding of the videos. Next, they prepare to write their own news articles in pairs (Step 2), using predetermined factsheets that present a topic, several bullet points with information, and several image options (see Figure 1). The third step is to determine their audience, outlet, and other article characteristics and to write their own news article based on the factsheet. After doing this, they will individually read each other's news stories and check whether they can determine the article characteristics (like the ones they filled out for their own article) based on the article itself (Step 4). All these steps allow them to gain points, resulting in a ranking per class (Step 5).

To optimally stimulate early adolescents' news literacy application using this platform, the intervention follows the guidelines for

interventions (Tamboer et al., 2022b, see Figure 2) and makes news literacy more relevant for them by aligning with their frame of reference, incorporating news production in actively writing and checking news, considering early adolescents' social contexts, and by incorporating motivation-enhancing elements.

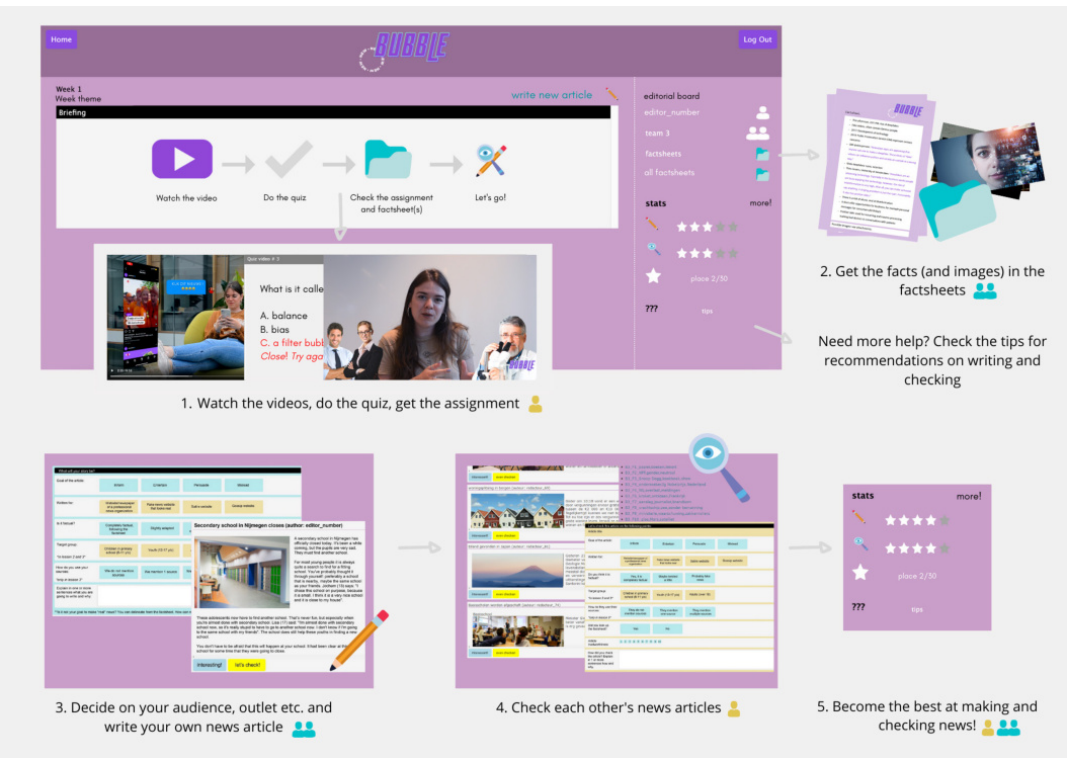


Figure 1: Overview of the Bubble platform and intervention procedure

Guidelines for Developing News Literacy Interventions for Early Adolescents (Tamboer, Daalman, et al., 2022)		News Literacy Application Intervention
Guidelines	Example implementations	Implementation
1. Consider the specific target group	Consider early adolescents' specific needs, media use, and preferences	The platform is social medium-like, designed based on early adolescents' preferences
2. Find them where they are	Intervene in schools, use age-specific media platforms	In schools, using an online platform
3. Start from their interests, but keep it serious and varied	Include sports and make it fun, but also discuss serious topics	Alternation between more serious and fun topics
4. Make it (really) easy to apply news literacy	Offer checklists, clear steps	One checklist that they used for writing and checking
5. Don't bore them	Create short and engaging videos, avoid long texts	Information is brought through videos
6. Make news literacy the norm	Use role models	Videos are presented by an older adolescent
7. Let's get active	Include games and competition	Possibility to gain points, ranking in class
8. Keep them in the loop	Co-creation and evaluation	Evaluation with early adolescents and a teacher, and adaptation based on these evaluations

Figure 2: Alignment between intervention guidelines and the intervention

Fit with Early Adolescents' Frame of Reference

Early adolescents are pretty knowledgeable about the news production process and believe news to be necessary, but not personally relevant (Tamboer, et al., 2022a; Van Damme et al., 2022). Throughout the set-up of the intervention, it aims to increase the relevance of news literacy application for them. Participants will be informed on how news media and the news cycle work by short 'briefings' that introduce each session. In these videos, we use examples that resonate with early adolescents' online news use and their broad definitions of news (e.g., Guideline 1 and 5: Tamboer et al., 2022b; Tamboer et al., 2022). Early adolescents consume a broad range of content and often prefer content on social media on topics such as sports and celebrities (Tamboer et al., 2022a). For example, we mention "Maybe you don't watch the evening television news broadcast, but you still see quite a bit of news". To show early adolescents that individuals act upon news, whether they are aware of it or not, we, for example, mention that someone brings an umbrella when the weather report predicts that it is going to rain, or can text friends when hearing news about their favorite soccer team. As such, we want to approach news from a news-ness perspective (e.g., Edgerly & Vraga, 2020), meaning that the audience gives meaning to what is considered news.

Furthermore, participants receive 'factsheets' detailing a topic to guide them in writing their news articles (see Figure 3). Participants will receive several factsheets covering more serious and fun topics, reflecting their news use (Guideline 3: Tamboer et al., 2022b). For example, we included factsheets on how the Frappuccino was accidentally invented (based on Van Hamersveld, 2021) and about a Dutch actor who plays in the movie Black Widow (based on Oliver 'The Dutch Giant', 2021). At the same time, we also included more serious news stories, such as on the rise of deepfakes (based on Heisen, 2021) and on an earthquake in Mexico (based on Mexico shocked by, 2021). All stories are based on real events, although more generally described to reduce participants' recognition of the stories. With the factsheets, participants receive multiple images to choose from (from the Dutch news agency ANP, n.d.). Participants eventually check each other's news articles, but also read some (news) articles that were written by us, aiming to resonate with early adolescents' frame of reference. These articles, for example, included a story about a famous influencer, Nikkie de Jager, and a story about the closing of a secondary school (see Figure 4).

Eventually, when participants write articles, they choose from several article goals and forms – such as a gossip website or fake news website. As such, we recognize and reflect upon the blurring lines between different kinds of content (e.g., Tandoc Jr et al., 2018), and stay close to the range of content they encounter in their

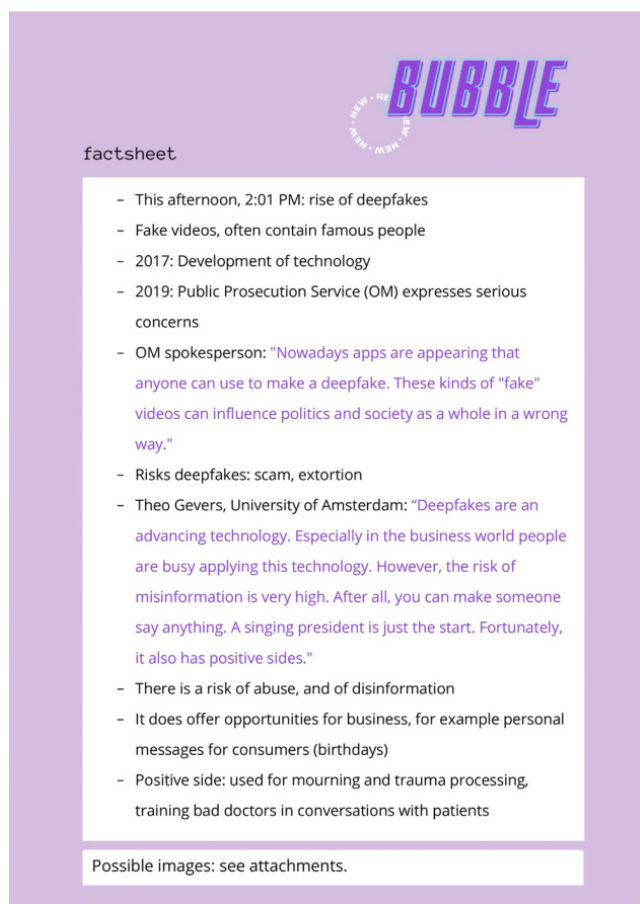


Figure 3: Factsheet example

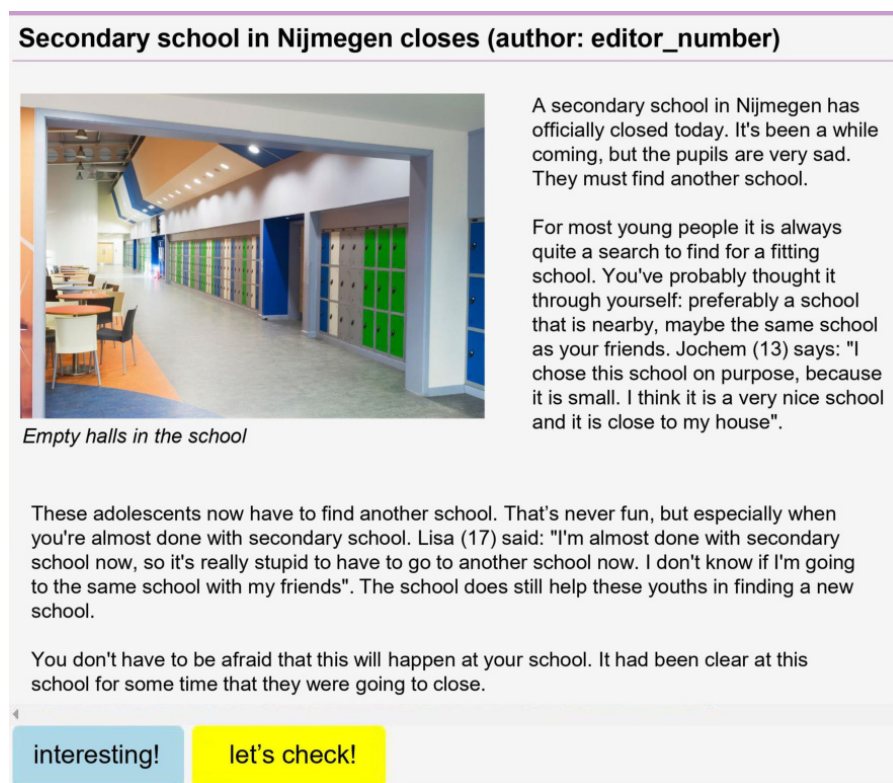


Figure 4: Article example

daily news use. Together, the intervention starts from the learner's interests and connects the classroom to the world (Hobbs, 2010; Hobbs et al., 2013). By making news literacy application more relevant, considering early adolescents' preferences, and explaining the news production process, early adolescents can become more motivated and confident to apply their news literacy tactics in their everyday news use (Ryan & Deci, 2000; Swart, 2021; Tamboer et al., 2022b).

An Active Approach: Writing and Checking News

Next to the fit with early adolescents' frame of reference, the intervention allows them to practice with applying news literacy: participants actively write and check news, instead of only receiving information on the news production process. The intervention is based on learning-by-doing principles (Dewey, 1916). By actively engaging early adolescents with news and its (repeated) analysis and evaluation, it is expected that they will gain news literacy skills and become more confident about their news literacy application. Throughout the lessons, participants will write their own news articles and check each other's articles. By immediately putting what they have learned to practice in novel situations, participants are expected to learn effectively (Ebbens et al., 2013; Marzano & Miedema, 2011). This active approach aligns with early adolescents' preferences for active interventions (Guideline 7: Tamboer et al., 2022b). Moreover, practicing news literacy application can increase skills and a feeling of competence and consequently increase news literacy motivation (Ryan & Deci, 2000) and news literacy application (Tamboer et al., 2023a). To amplify these effects, the intervention offers feedback on elements of their writing and checking – such as the amount of correctly checked articles and a fake news detection score – to guide early adolescents in their learning and to increase their feelings of competence (Kusurkar et al., 2012; Ryan & Deci, 2000)

Next to the theoretical base in learning-by-doing, the act of writing news articles is also practice in critically thinking about news. Journalists are expected to “be informed and critical thinkers, question and attribute sources, explore opposing views and consider their perspectives and biases” (Smirnov et al., 2018, p. 2). Producing news can lead to a more in-depth perspective of the process of news production and platform characteristics (Lim & Tan, 2020). Therefore, engaging in journalistic practices has excellent potential to develop civic and information literacies (Smirnov et al., 2018; Tan & Kim, 2015), especially when news production is combined with knowledge and awareness of news literacy (e.g., Hobbs, 2010). In the current intervention, early adolescents practice deciding what kind of content they write, choosing between news topics, deciding what to include in their articles, choosing suitable pictures, balancing

different sides of the news, and writing for various audiences (see Figures 5 and 6 for an overview of their choices in writing and checking articles).

What will your story be?				
Goal of the article:	Inform	Entertain	Persuade	Mislead
Written for:	Website/newspaper of a professional news organization	Fake news website that looks real	Satire website	Gossip website
Is it factual?	Completely factual, following the factsheet	Slightly adapted	Same topic, but completely fake**	
Target group:	Children in primary school (6-11 y/o)	Youth (12-17 y/o)	Adults (over 18)	
<i>*in lesson 2 and 3*</i>				
How do you use your sources:	We do not mention sources	We mention 1 source	We mention several sources	
<i>*only in lesson 3*</i>				
Explain in one or more sentences what you are going to write and why:				
**Is it not your goal to make "real" news? You can delineate from the factsheet. How can readers find out that it is not completely factual?				

Figure 5: Choices in writing news articles

Let's check this article on the following points:				
Article title				
Goal of the article:	Inform	Entertain	Persuade	Mislead
Written for:	Website/newspaper of a professional news organization	Fake news website that looks real	Satire website	Gossip website
Do you think it is factual?	Yes, it is completely factual	Maybe twisted a little	Probably fake news	
Target group:	Children in primary school (8-11 y/o)	Youth (12-17 y/o)	Adults (over 18)	
<i>*in lesson 2 and 3*</i>				
How do they use their sources:	They do not mention sources	They mention one source	They mention multiple sources	
<i>*only in lesson 3*</i>				
Did you look up the factsheet?	Yes	No		
Article trustworthiness	1	2	3	4
	5	6	7	8
	9	10		
How did you check the article? Explain in 1 or more sentences how and why.				

Figure 6: Checking news articles

A Social Intervention

To acknowledge news literacy application as an inherently social issue (Swart, 2021), the intervention explicitly considers the social context of early adolescents. Education has a crucial role in aiding youth in their critical thinking skills and ability to analyze and evaluate information (European Commission, 2022). At the same time, schools are an essential socializing sphere in early adolescents' lives. Furthermore, early adolescents prefer interventions to find them where they already are (Guideline 2: Tamboer et al., 2022b). Therefore, the current intervention is developed and tested in secondary schools and based on cooperative learning principles. Working in pairs can stimulate students' achievement and self-esteem (e.g., Bertucci et al., 2010). The intervention videos are presented by an older adolescent (instead of an adult), increasing the chance for identification and more positive social norms. Overall, the intervention adheres to early adolescents' preferences for accessibility (at school), makes news literacy the norm by using a role model, and lets students actively work together in pairs (Guideline 2 and 6: Tamboer et al., 2022b).

Motivating News Literacy Application

Motivating students to become more digitally literate can be challenging (European Commission, 2022). As early adolescents describe themselves, they are a really specific group that is hard to motivate for news consumption and news literacy (Tamboer et al., 2022b). Within the intervention, early adolescents' motivation is further boosted by giving them the freedom to choose (e.g., what kind of article they write and about which topic). This increases their autonomy, which can, in turn, increase their motivation (Ryan & Deci, 2000). Furthermore, they are motivated by providing rationales for engaging in news literacy application (Kusurkar et al., 2012; Ryan & Deci, 2000), and by adding an element of competition (Guideline 7, Tamboer et al., 2022b). Finally, news literacy application is made more comprehensible by providing clear steps to analyze and evaluate information (Guideline 4: Tamboer et al., 2022b). Participants repeatedly fill out the same decision questions on writing and checking news and are offered a set of recommendations for both writing and checking. As such, news literacy application is made more accessible, which can enhance their perceived competence and motivate news literacy application (e.g., Ryan & Deci, 2000, Guideline 4: Tamboer et al., 2022b).

The Current Study

Combining theory and co-creation, we have developed a basic version of a news literacy application intervention for early adolescents. A crucial next step is to discuss the intervention with early adolescents, to strengthen their role in the development and evaluation of the intervention (Literat et al., 2020; Guideline 8:

Tamboer et al., 2022b). Therefore, in the current study, pilot test and co-evaluate the intervention with a small group of early adolescents and a teacher to further develop and adapt the intervention.

Method

To pilot test and co-evaluate the intervention, it was tested in two Dutch secondary schools in April 2022. The study, together with the subsequent experiment testing the effectiveness of the intervention (Tamboer et al., 2023b), was reviewed by the Ethics Committee of the Faculty of Social Sciences at Radboud University (ECSW-2021-143). The total project was registered on the Open Science Framework (https://osf.io/axz6f/?view_only=0528dcea54444b859f89e62ff8c21b87).

Participants

Two Dutch secondary schools (both publicly funded schools) participated in the pilot testing and evaluation of the intervention lessons. Both schools gave active informed consent, as well as all parents of the participating students. In total, 26 early adolescents from two classes participated. Participants were between 12 and 15 years old ($M = 12.48$, $SD = 0.75$) and 42.9% of them were girls. Participants in the first class attended pre-vocational to higher general education, participants in the second class followed pre-university education¹.

The number of participants fluctuates slightly over the measurements, due to participants who were absent during the last lesson or who did not want to partake in the evaluation survey ($N = 21$) or discussions ($N = 23$). Furthermore, one teacher (of the first class) actively participated in the lessons and in the evaluation of the lessons.

Lesson Plan and Research Procedure

Participants took part in three lessons, outside of their existing curriculum, in which they worked in the intervention platform (Figure 7). Participants started the first lesson by providing informed consent and filling out a survey to pilot the survey questions, including participants' comprehension. They then received a cotton bag with an information booklet and personal login credentials. The information booklet included written information on how to log in to the platform and on the lesson plan for that week. After participants had logged into the platform, we explained the intervention platform and the procedure: watching the video, doing the quiz, writing news articles based on the factsheet, and then checking news articles.

¹ In the Dutch school system students are divided into different streams based on their achievement levels at the end of primary education (around age 12) to adapt learning processes to individuals' needs. Students go to pre-vocational secondary education (VMBO), higher general secondary education (HAVO), or pre-university level (VWO).

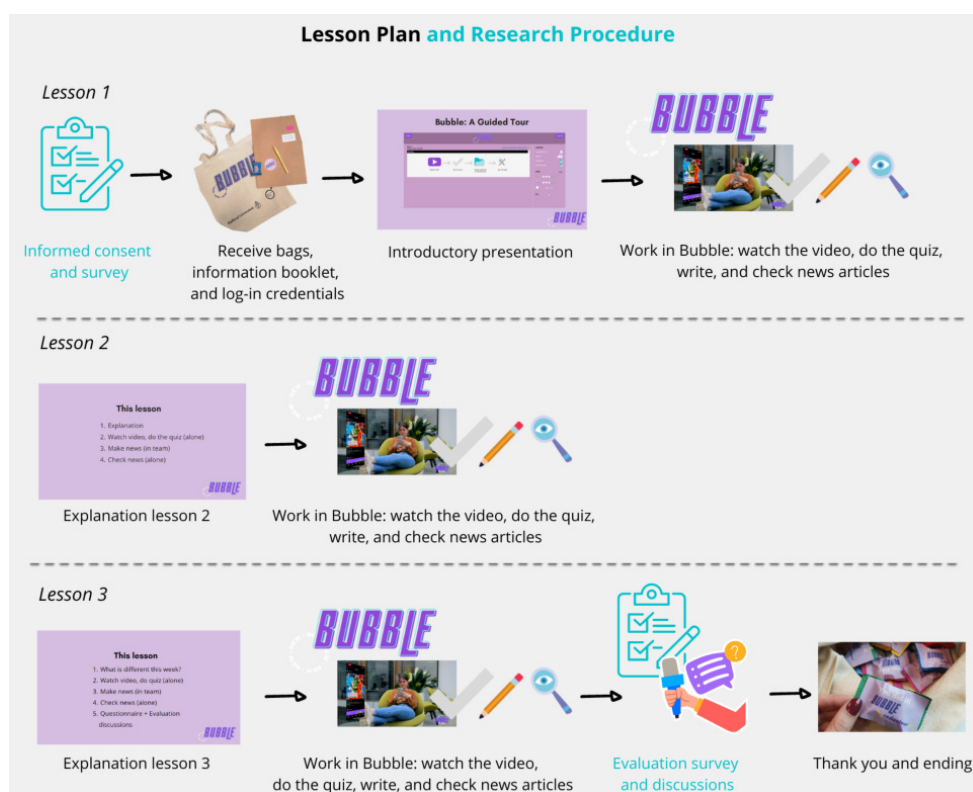


Figure 7: Lesson plan and research procedure

Participants then started working in the platform. In the second and third lesson, we introduced the specific topic and assignment of that week, after which participants continued their work in the intervention platform. In the third lesson, participants also filled out a survey, including evaluation questions, and participated in evaluation discussions. At the end of the third lesson, participants were thanked for their participation and got a piece of chocolate.

The lessons cover three main themes: ‘What’s New(s)?’, ‘News for Various Audiences and Outlets’, and ‘Balance, Bubbles, and Credibility’. In the first week, participants learn about the basics of the news production process and the differences between various kinds of content. Based on the information, they write and check their first articles. In the second week, we discuss topics such as framing, bias, and writing for various audiences. They then get the assignment to write at least two articles about the same topic, but for different audiences, and to check each other’s articles. In the third lesson, participants reflect on their news consumption, learn about algorithms, balance, and fairness. The final assignment is to think about their source use, and write and check articles that mention no, one, or several sources.

Evaluation Methods and Analysis

To evaluate how well the intervention works and fits with the target group, we look at three aspects. First, we look at participants’

within-platform activity. We examine how many articles participants have written and checked during the three lessons, indicating participants' activity within the platform and what realistic goals are about the number of news articles we can expect them to write and check. Furthermore, we look at the choices they have made in writing these articles. Second, participants filled out an evaluation survey after the third lesson. This survey contained questions regarding their liking and perceived usefulness of the lessons and platform and differed slightly per class (for a complete overview of the survey, see Table 1). We will provide descriptive statistics for these evaluations. Finally, we had evaluation discussions with 23 participants (in pairs) and with one teacher. These discussions were short conversations in which we discussed their general evaluation of the lessons, including their liking of the lessons, their learning, and evaluation of the specific intervention elements. These discussions were transcribed verbatim and summarized to provide an overview of participants' and the teacher's evaluations.

Class	Questions/Statements	Mean (SD)
Class 1	How much fun were the lessons?	4.92 (1.08)
	How interesting were the lessons?	4.75 (.97)
	How important were the lessons?	4.33 (.89)
	How much did you learn from the lessons?	4.42 (1.08)
	Did you learn things you did not know yet?	4.58 (.79)
	How useful do you think the lessons were?	4.67 (.89)
	How clear was the 'Bubble' platform?	4.33 (1.07)
	Did you understand what you had to do during the lessons?	4.92 (.90)
	How clear was the instruction in class?	5.00 (.85)
Class 2	The lessons were interesting	4.22 (1.30)
	The lessons were fun	4.44 (1.42)
	The lessons were important	4.00 (1.66)
	I learned a lot from these lessons	4.33 (1.73)
	I learned things I did not know yet	4.00 (1.87)
	The lessons were useless (reversed)	1.67 (.71)

Note. Class 1: $N = 12$, class 2: $N = 9$. Scales were all 1 (not at all fun/interesting/etc.) to 6 (completely fun/interesting/etc.).

Table 1: Evaluation survey – descriptive statistics per class

Results

Within-Platform Activity

Throughout the three lessons, participants, on average, wrote one to two articles per person ($M = 1.27$, $SD = 1.12$). Because they wrote articles in teams of two or three, they on average wrote three to four news articles per team over the three lessons. Before writing the articles, participants decided on several article characteristics. Of the articles that were written, most had the goal to inform (67.5%), followed by entertain and mislead (15%) and persuade (2.5%). The articles were most often written for professional newspapers or websites (70%), followed by real-looking fake news websites (17.5%), gossip websites (7.5%), and satire websites (5%). In their writing, participants most often stuck to the factsheets, thus writing factual articles (60%), followed by articles that departed from the model offered by the factsheets (30%), and articles that did consider the same topic, but were completely made up (10%). Participants individually checked a total of four to five articles over the three lessons ($M = 4.81$, $SD = 5.42$).

Evaluation Survey

Participants in both classes evaluated the lessons rather positively, often scoring between 'a little fun/interesting/important/useful' and 'fun/interesting/important/useful'. They indicate to have learned from the lessons and learned some things they did not know yet. Based on the survey in the first class, the platform was clear; they often understood what was expected of them during the lessons, and they believed the instruction in class was often clear.

At the end of the evaluation survey, we asked for recommendations and further comments. In the second class, only one participant answered, who mentioned that they did not like participating in the lessons. In the first class, most answers were 'no recommendations' and one participant mentioned: 'I don't have any recommendations, it was really good and fun'. Two recommendations that were given, were that they would like: 'a help sheet with the rules [how to check articles] would be useful' and to 'make the assignments more fun'. One participant also mentioned that there were glitches in the system. Four participants mentioned that they had really enjoyed the lessons.

Evaluation Discussions

General Evaluation and Active Approach

The general evaluation of the lessons ranged from "boring" (e.g., ID4, male) to "fun" (e.g., ID6, female). Multiple participants mentioned that they thought it would be boring, but that they eventually enjoyed participating in the lessons ("I did not choose it [to participate in these lessons], but in hindsight, it was actually fun", ID21, female). Some participants had different expectations

of the lessons, for example: “I did not expect to have to write something, I thought it would be looking at an article and deciding whether it is fake or real. I like that better” (ID18, female). Nevertheless, the active approach of the intervention was also often mentioned as a positive point, both by participants and the teacher. One participant, for example, mentioned: “I also liked making news articles, because I had never done that before. And checking others’ news stories on whether they were real” (ID19, male). Another girl mentioned: “I like to be able to make something, because then you can decide how you want to make it” (ID15, female). Compared to a regular lesson, participants enjoyed the more creative approach: “It was fun. Normal lessons are boring, this was more creative”, ID7, female).

Differentiation in Guidance

Of course, it was not only fun. Participants and the teacher offered various recommendations for increasing the fit between the intervention and the target group. Regarding the lesson plan, several participants mentioned that they needed some time to get into the lessons and that some more guidance at the start would be preferred. One participant said (ID20, male): “In the beginning I liked it a bit less, but it became more fun over time. (Moderator: Why?) Because we started writing more and checking more instead of only explaining”. Another participant mentioned that “some things are a little bit difficult to understand” (ID11, female), meaning all the steps in working in the platform.

The teacher echoed this sentiment and mentioned that the lessons would benefit from a bit more explanation or smaller steps: “It is not that they are unable to do it [write news articles], but they do not know how to. So you should present it in smaller steps, or link to what they have done in class before, for example in their language courses. Or you give them examples and analyze why”. Another recommendation was to offer a help sheet with the tips in writing and checking news or to provide a summary of the most important points from the briefing video. The checklists and recommendations for writing and checking articles were mentioned in the video and featured on the platform, but not yet easy to use while writing and checking articles. A cheat sheet would be easy for “when you are in the middle of your article and you have forgotten what you have learned” (ID11, female).

Overall, this test and evaluation showed that there are quite some differences in the need for guidance between participants. While the lessons were quite challenging for some, others asked for more challenge. On the whole, participants in the first class struggled more with the lessons than participants in the second class. Only the first class’s teacher was actively involved in the lessons and participated

in the evaluation. In his evaluation, he said: “If you ask me what to change, it is not the platform itself. That was quite clear and it is the same platform every lesson in which everything is in the same order. I can imagine that, in all first year classes, you have to demonstrate and discuss everything a bit more”. Next to more often explaining things plenary, the teacher mentioned that it might be an option to do pre-teaching on analyzing and writing news articles before participants get these lessons.

Other participants mentioned that, after a while, they became a bit bored by the repetition within and throughout the lessons and did not use the information booklet. One participant mentioned: “It just took a bit long, and at a certain point if you do that [checking news articles] for a long time then I didn’t feel like it anymore” (ID15, female). A solution could be to add some more challenge for participants who are up for it, as one participant mentioned: “maybe you can add something else for when you have already checked the news articles” (ID16, female).

Lesson Plan and Assignments

Looking at the lesson plan of the three lessons, the first lesson turned out to be a bit too much: it was not feasible to do the survey, the explanation of the platform, and to complete the first lesson within the platform (with watching the video, doing the quiz, and writing and checking articles). As a recommendation, a participant suggested: “if there is not enough time to make news, maybe we can check news together in class” (ID20, male). A couple of participants mentioned that they would “like to do more checking than writing” (ID18, female). Besides, one participant mentioned to dislike the obligation of writing a certain amount of articles about pre-defined factsheets: “that you have to make that many articles. And it would be more fun to come up with your own topic” (ID22, female).

Content and Competition

Regarding the lesson platform content, participants liked the platform and the content presented on the platform. The quizzes could be a bit nicer “by adding an image” (ID17, male). There were some more comments on the briefing videos. Some participants mentioned that they liked the videos (“I did like the videos”, ID21, female), but that they were “a little long” (ID5, female). But regarding the content, they were positive: “They do explain it clearly” (ID5, female). Participants did not explicitly mention their liking of the presenter. Again, there were some differences in the evaluation of the videos. While watching a 5-minute video for some participants was fine, for others this was more difficult. The teacher offered a solution: “Maybe the videos are too long [for this group], but you are of course not going to make 10 different versions of the videos. That is fine, but then you should summarize the information afterwards”.

Another option, mentioned by the teacher, would be to split the videos in two and put a quiz question in between.

The competition element was not yet clear to participants. When asked about it, almost all participants mentioned that they did not look at their writing and checking statistics and were unaware of the competition. Some participants did mention that adding game elements would be interesting, for example: “Maybe you can add some more games that have to do with news” (ID15, female).

Working Together

Participants’ evaluations of working in pairs were somewhat mixed. While some participants mentioned that they liked working together, others believed that working together with the same partner for three lessons was sub-optimal. Some participants emphasized that they liked working at their own pace which contributed to their learning process, for example: “I liked that you could do it all at your own pace, you could watch the video, and replay it if you did not yet understand it” (ID16, female) and “then you can really do it yourself. If you do everything together, you sometimes do not learn at all.” (ID16, female). Other participants mentioned that they would prefer mixing up the pairs throughout the three lessons: “we are in the same team now the whole time, maybe mix that up” (ID16, female). Finally, some participants mentioned that they preferred plenary discussions and assignments, for example in discussing the news or in writing articles together: “I’d like to work together with the whole class more. Like a really big group assignment. For example, you write one big news articles with the whole class.” (ID17, male).

Technical Issues

Some technical issues were mentioned by participants. In the first class, participants worked on tablets, for which downloading the factsheets did not work optimally. In the other class, most participants mentioned that the platform worked okay (“Yes, it is easy-to-use, because I could easily reach everything. With the factsheets and everything and then you could easily go back to the news item to check and stuff. I thought it was a useful website”, ID19, male). However, the platform was rather slow in both classes, which sometimes annoyed participants (“Sometimes the platform had to load for quite some time. But I don’t know if that’s the website or the school’s WiFi”, ID20, male).

Learning and Perceived Effectiveness

Finally, most participants mentioned that they have learned something from the lessons. For example, “And I think it’s quite educational too, because that way you can distinguish a bit between what is real and what isn’t real” (ID1, female). Participants often liked it best to write news articles, but mention having learned

Wet owl spotted for the first time in 5 years (author: editor_number)



About the wet owl: The wet owl is from Alaska and has feathers that lower down. It is well equipped to stand cold weather. Its diet exists mainly of squirrels and insects.

This news item was brought to you by www.NaboNieuwz.nl

interesting! let's check!

Figure 7: Example of an article made and discussed in class

“how to check articles” (ID10, female) best from participating in the lessons. During the last lesson in the first class, an article was posted about the supposed “wet owl” – this was an image of a wet owl combined with an article presenting the wet owl as a breed of owls (see Figure 7). The discussion in class on this article indicated that participants had indeed learned to check articles:

Teacher: Why do you think it is not real?

Student 1: I looked it up but could not find any information. I checked multiple sites, but there was no information. No image or something that shows that it [the wet owl] really exists.

Teacher: I think you are right. But why can I find pictures of the wet owl when I type “wet owl” in a search engine? Is that the same as the article?

Student 2: The image is real, but it is just a normal owl that has gotten wet. It is not a special breed or anything, just a wet owl.

Some participants mentioned that they had “no idea” (ID14, male) whether they looked at news differently after participating, others noted that they “do not look at news at all” (ID13, male). Other participants said that they were more aware of the need to check news and as a result reflect more on the accuracy of news. As one participant mentioned: “I now think about what is fake news and what is real much better. I used to believe almost everything I came across. I pay more attention now” (ID13, male). Another participant mentioned to also cross-check information: “Well sometimes I looked it up a bit, to see if it was true. Just because I was bored. I did find a few that didn’t make sense to me so I looked it up, but 9 times out of 10 it was just true” (ID12, male). Still, most participants

did not really know whether they had changed anything in their engagement with news.

Discussion

In this study, we described the development and co-evaluation of an intervention to stimulate early adolescents' news literacy application. Overall, participants' and their teacher's evaluations were rather positive. The within-platform data show that they, on average, wrote and checked one to two articles per lesson. Most participants liked this active approach of writing and checking news, appreciated the platform, and believed the lessons to be considerably interesting and fun. However, the evaluations also showed the need for more attention to (differences) in guidance throughout the lessons, mixed ideas about working in pairs, and the competition element of the intervention platform was not yet clear to participants. Overall, the discussions of participants' learning through the intervention lessons are promising for the intervention lessons' effectiveness in increasing news literacy application.

Zooming in on participants' general evaluations and learning, their liking of the intervention lessons suggests that the intervention has succeeded in fitting their frame of reference (as discussed in Tamboer, Daalmans, et al., 2022; Tamboer, Kleemans, & Daalmans, 2022). Furthermore, participants mentioned that they had mainly learned to check news articles and also applied that outside the intervention. This is in line with the intervention's aim to increase the extent to which early adolescents reflect on the trustworthiness of information, evaluate sources, and seek further information. Still, this study is a small-scale pilot test and evaluation, and some participants also mentioned that they had no idea whether they had changed anything or that they did not consume news at all. Moreover, perceptions of learning may not accurately reflect actual learning gains (e.g., Persky et al., 2020). We thus need a large-scale study to examine the effectiveness of the intervention lessons in increasing news literacy application. Future research could also shed more light on differences in participants' experiences and learning due to their social contexts and socio-economic background, and to the intervention's effectiveness in other areas, such as in improving participants' news writing skill and news production knowledge.

Based on participants' activity within the intervention platform and their and the teacher's evaluations, the intervention was improved. The adaptations conder (1) increased guidance, (2) emphasis on the competition elements, (3) alterations in the assignments, (4) more attractive quizzes, and (5) fixed technical issues. First and foremost, we have increased the guidance that participants receive throughout the lessons. Based on cognitive learning theory, which posits that individuals have limited cognitive capabilities and that overload

reduces learning, providing more guidance could help participants to focus more effectively on the learning task at hand (e.g., Hospel & Galand, 2016). Furthermore, increased guidance and information on how to write and check news could potentially increase students' feelings of competence in starting to write and check news. This could, eventually, also increase students' motivation (e.g., Ryan & Deci, 2000).

Therefore, in the first lesson, we take more time to introduce the lesson series and expectations, demonstrate the intervention platform, and examine examples of articles together. Participants will then only check articles and not yet write their own. In the second lesson, we will look at examples of (the structure of) articles before writing articles in teams and checking articles individually. The third lesson remains the same and thus will have the most time to write and check articles. Besides, the information booklet that students receive will be more extensive. Next to the general information, it will include all steps within the intervention platform, a glossary of difficult words – words that participants in this study struggled with – per lesson, and checklists for writing and checking news articles.

Second, we further emphasize the competition within the classroom and the feedback. Competition and feedback are potentially motivation-enhancing elements (Kusurkar et al., 2012; Ryan & Deci, 2000; Tamboer et al., 2022b), but were not yet prominent enough to function as such. Therefore, the scores within the intervention platform and the competition will be more clearly explained during the first lesson. This could also improve students' evaluations of working together, which were somewhat mixed in this group because the competition could instigate a common goal – an essential factor in collaborative learning (e.g., Rimor et al., 2010).

Third, we have adjusted the expected amount of article writing and checking per lesson. As aforementioned, students will only write articles in lesson two and three, and check articles throughout all lessons. We will expect participants to, over the course of three lessons, write at least a total of two to three articles per team, and check four to five articles individually. Fourth, we have made the quizzes more attractive by adding images. Fifth and finally, we have fixed the technical issues that participants mentioned. Altogether, we expect that these decisions in the development of the intervention will further improve the fit with early adolescents and possibly increase the effectiveness of the intervention.

Based on this study's co-evaluation, the improved intervention appears to fit early adolescents' needs and preferences and has the potential to increase early adolescents' news literacy application.

As such, this intervention presents an important step in the development of news literacy interventions. Nonetheless, there are limitations to the current study and interesting avenues for future specifications and alterations of the intervention lessons. First, because the evaluation discussions were led by the researcher who also gave the intervention lessons, participants might have given socially desirable answers. As such, they might have been more positive in their evaluations than in reality.

Second, the contrast in need for guidance between the two classes in this study points to the necessity of differentiation of these kinds of intervention lessons. This could, for example, be done based on educational level or age. The adapted intervention offers some more opportunities for differentiation in guidance, such as in the extent to which participants use the extra information in the booklet. However, future intervention lessons could be more strongly tailored to students' characteristics. Going one step further, future news literacy interventions could account for differences between students and their learning trajectories by using adaptive instruction – adjusting the materials and teaching strategies based on students' learning (Aleven et al., 2016).

Finally, although studying teaching dynamics was not one of the goals in this study, it cannot be neglected that the teacher is highly important in students' engagement and learning. In this pilot, all lessons were given by one of the researchers. However, there was a difference in the teacher's activity between the two classes. In the first class, the teacher was present and actively supported students throughout these lessons, while the teacher of the second class was not present during all lessons. Research has shown that what a teacher does, for example in supporting autonomy and providing structure, explains a large part of differences in engagement between classes (Hospel & Galand, 2016). Furthermore, teachers have a critical role in collaborative learning, by, for example, giving feedback and prompting questions, teachers can guide students' collaborative learning (Van Leeuwen & Janssen, 2019). Therefore, there should be thorough attention to teachers' roles in developing and potentially launching interventions in education settings. Teachers could, for example, be instructed on how to guide students through these lessons optimally.

To conclude, this study has detailed the development and co-evaluation of a theory-based and co-created intervention to stimulate early adolescents' news literacy application. As such, we aimed to provide more insight into what is often the "black box" of intervention development (e.g., Hoddinott, 2015) and hope to inspire others who develop interventions for early adolescents. It can be difficult to develop interventions that effectively stimulate

early adolescents' news literacy application (as mentioned by early adolescents, Tamboer et al., 2022b). The current study underlines the need for initiatives to be smooth-running, and to contain appropriate guidance and information to facilitate early adolescents' learning through active assignments and application. By evaluating and adapting the current intervention, this study has set the next steps toward more effective news literacy interventions. Hopefully in the future, this will lead to more early adolescents who say: "I used to believe almost everything I came across. I pay more attention now".

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