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With Games Against Fake News – Developing Critical Thinking with the Help of the Card Game Follow Me

ABSTRACT

Recent serious events, such as the coronavirus pandemic and the war conflict in Ukraine, have significantly increased the amount of fake news in the online space. This news contributes to society's radicalization, destabilizes democratic regimes, and can result in violence and damage to health and property. The most effective approach to address fake news is prevention and the education associated with it. The current education system is not ready for these challenges, which is why more and more attention is being paid to alternative solutions such as game-based learning. Game-based learning enables the acquisition of new knowledge and skills in a fun yet effective way. These games include a game developed by *Impact Games* studio named *Follow me*, which is focused on developing critical thinking skills in the context of countering fake news. This study aims to validate the contribution of the game *Follow me* in building resilience to fake news through an experiment on a sample of 130 secondary school students from six different schools. The results suggest that although there was no global statistically significant improvement measured in students' ability to recognize fake news, students are healthily skeptical of information, this is also indicated by the fact that on average they were more likely to label news as untrustworthy despite varying attitudes towards the selected topics. We also managed to make findings based on the data acquired from this experiment, which provide a deeper look into students' attitudes toward fake news and therefore can improve games and experiments prepared in the future.

1 Introduction

The rapid development of communication technologies, the Internet, and the associated simple access to information has brought, in addition to countless benefits, significant risks for users and society. The ease of creating and disseminating content over the Internet has led to the emergence of a large amount of false and misleading information, called fake news or hoaxes.[1] Fake news can be understood as a set of reports about events of public interest that attempt to mimic reliable sources while containing false information.[2] Such news can be encountered in a variety of domains: news dealing with political events, information about the Covid-19 virus and other health topics, or fake studies on social issues.

Fake news can seriously influence public opinion and threaten the functioning of democratic systems, this phenomenon has been demonstrated during the 2016 and 2020 US presidential elections[3] and, likewise, in the United Kingdom during the Brexit vote.[4] In these cases, people's decisions were heavily influenced by fake news, and this influence was reflected in the results. Fake news can also have a negative effect on people's health, for example during the coronavirus pandemic, where the amount of fake and misleading news increased to such an extent that the World Health Organisation (WHO) warned of the so-called "Infodemic". Infodemic has caused a significant drop in interest in vaccination and caused a communication blackout while measures were being put in place to prevent the spread of the virus around the world.[5]

The reasons behind the spread of fake news can vary, but one of the most important is certainly the desire to increase the viewership and thus generate more profit. In the online space, the value of advertising space depends on the number of views of a given page, so authors aim to attract as much attention as possible. Fake news work very well to gain a bigger audience, because it is not expensive to create (as it does not require research and factual knowledge), and it can influence people's feelings and thus gain significant attention.[6]

At the same time, it shows that fake news can be successfully used to achieve political goals, influence public opinion, or dehumanize political opponents.[7] Another motivation for creating fake news can be to spread propaganda and to try to destabilize rival states.[8]

From the point of view of news consumers, rapid technological developments have contributed to the spread and popularity of fake news, in particular enabling new ways of consuming information. Nowadays, traditional media is getting side-lined, and people are more likely to get their information from online sources.[9] However, unlike traditional media, in the online space, the information does not have to go through any verification process, and therefore there

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1 ZHANG, X., GHORBANI, A. A.: An Overview of Online Fake News: Characterization, Detection, and Discussion. In *Information Processing & Management*, 2020, Vol. 57, No. 2, no paging.

2 See: PENNYCOOK, G., RAND, D. G.: The Psychology of Fake News. In *Trends in Cognitive Sciences*, 2021, Vol. 25, No. 5, p. 388-402.

3 GUNTHER, R. B. et al.: *Fake News Did Have a Significant Impact on the Vote in the 2016 Election*. [online]. [2023-04-13]. Available at: <https://bpb-us-w2.wpmucdn.com/u.osu.edu/dist/d/12059/files/2015/03/Fake-News-Piece-for-The-Conversation-with-methodological-appendix-11d0ni9.pdf>.

4 See: HÖLLER, M.: The Human Component in Social Media and Fake News: The Performance of UK Opinion Leaders on Twitter During the Brexit Campaign. In *European Journal of English Studies*, 2021, Vol. 25, No. 1, p. 80-95.

5 CARRION-ALVAREZ, D., TIJERINA-SALINA, P.: Fake News in COVID-19: A Perspective. In *Health Promotion Perspectives*, 2020, Vol. 10, No. 4, p. 290.

6 See: KSHETRI, N., VOAS, J.: The Economics of "Fake News". In *IT Professional*, 2017, Vol. 19, No. 6, p. 8-12.

7 GUNTHER, R. B. et al.: *Fake News Did Have a Significant Impact on the Vote in the 2016 Election*. [online]. [2023-04-13]. Available at: <https://bpb-us-w2.wpmucdn.com/u.osu.edu/dist/d/12059/files/2015/03/Fake-News-Piece-for-The-Conversation-with-methodological-appendix-11d0ni9.pdf>.

8 BRENNEN, B.: Making Sense of Lies, Deceptive Propaganda, and Fake News. In *Journal of Media Ethics*, 2017, Vol. 32, No. 3, p. 179.

9 ZHANG, X., GHORBANI, A. A.: An Overview of Online Fake News: Characterization, Detection, and Discussion. In *Information Processing & Management*, 2020, Vol. 5, No. 2, no paging.

is also significantly more false information. The use of online sources has also been boosted by the arrival of the coronavirus and the measures that have forced people to work from home and spend more time online. Fake news most often exploits flaws in our cognitive processes, so-called cognitive biases, which affect our thinking and judgment, so the authors of such news seek to appeal to emotions, create opinion bubbles, or report sensational news.[10] Various methods are currently being used to fight the negative effects of fake news. One of the most widespread is labeling information as fake or true. This can be accomplished by using human experts or machine learning methods.[11] Such labeling is very accurate in the vast majority of cases, but the downside is that fake news tends to spread significantly faster than the news that disproves it.[12] Another problem with these practices is that labeled fake news can grow in popularity and promote conspiracy theories claiming that secret government organizations want to hide the real truth from people. On the other hand, fact-checking portals, which contain analyses of the veracity of various articles and information, can greatly help people to make informed decisions about the credibility of the information they receive.

1.1 Game-Based Learning

Due to the disadvantages of reactive approaches to the phenomenon of fake news, more and more attention is being paid to prevention, especially in education. Proper education can significantly reduce the risk of people believing fake news or even spreading it.[13] The primary goal in teaching about fake news should be to develop critical thinking skills so that people can critically evaluate information without being influenced by cognitive biases.[14] Currently, public education is not sufficiently prepared for the challenges of modern times and is unable to respond flexibly enough to prepare students for new dangers. This is why increasing attention is being paid to other forms of learning, such as gamification and game-based learning (GBL).[15]

The so-called inoculation theory has been successfully used in game-based education.[16] This theory is based on the principle of inoculation as we know it from biology: an individual receives a small, weakened sample of a certain harmful microorganism, the body learns what antibodies it needs to produce to defeat it, and if it subsequently encounters the microorganism in everyday life, it will be able to react to it in a timely and effective manner. Similarly, educational games about fake news work the same way: the player is exposed to the impact of these messages in a safe, game-like environment, learns to recognize them, and as a result, becomes more resistant to the impact of false information in everyday life.[17]

10 PENNYCOOK, D. et al.: The Science of Fake News: Addressing Fake News Requires a Multidisciplinary Effort. In *Science*, 2018, Vol. 359, No. 6380, p. 1094.
11 SIMKO, J. et al.: A Study of Fake News Reading and Annotating in Social Media Context. In *New Review of Hypermedia and Multimedia*, 2021, Vol. 27, No. 1-2, p. 100.
12 See: FLINTHAM, M. et al.: Falling for Fake News: Investigating the Consumption of News via Social Media. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. New York, NY : Association for Computing Machinery, 2018, p. 1-10.
13 KUKLINSKI, J. H. et al.: Misinformation and the Currency of Democratic Citizenship. In *The Journal of Politics*, 2015, Vol. 62, No. 3, p. 809-810.
14 BAILIN, S., SIEGEL, H.: Critical Thinking. In BLAKE, N. ed.: *The Blackwell Guide to the Philosophy of Education*. New York, NY : John Wiley & Sons, 2008, p. 182-183.
15 PLASS, J. L. et al.: Foundations of Game-Based Learning. In *Educational Psychologist*, 2015, Vol. 50, No. 4, p. 260.
16 See: ROOZENBEEK, J., VAN DER LINDEN, S.: The Fake News Game: Actively Inoculating Against the Risk of Misinformation. In *Journal of Risk Research*, 2018, Vol. 22, No. 5, p. 570-580.
17 ROOZENBEEK, J. et al.: Inoculating Against Fake News About COVID-19. In *Frontiers in Psychology*, 2020, Vol. 11, Article No. 566790.

1.2 Related Work

The inoculation theory has been successfully used in several educational games aimed at fighting fake news, such as the *Bad News* game,[18] where the player is put in the role of a fake news spreader and tries to get as many followers as possible by using the techniques most commonly used in writing and spreading fake news. By using these techniques themselves within the game, the chances of them recognizing fake news when they see them in real life when gathering information are increased. Another similarly focused game is *Harmony Square*[19], where the player finds themselves once again in the role of the chief disinformer of a fictional city where everyone lives in peace and harmony. The player's goal is to use fake news to disrupt the mayhem in the city, stir up negative emotions and cause chaos. They achieve all this again by learning successful disinformation techniques during the gameplay. The next game, The *Fake News Detective*[20], puts the player in the opposite role, acting as a professional fact-checker. While playing, they try to label the articles they see as true or false based on certain characteristics they learn while playing.

These and other games have been studied through several experiments that have demonstrated their effectiveness in developing critical thinking skills.[21] These experiments in most cases include two questionnaires, one before and one after playing, where the player's task is to judge the truthfulness of the short news displayed. Based on these data it is then possible to determine the effect of the games on the players.

1.3 The Follow Me Card Game

Our work aims to use an experiment to verify the contribution of the *Follow Me* card game on critical thinking of secondary school students. *Follow Me* is a card game developed by a Slovak game development studio *Impact Games*. The game is available in print in the Slovak language, but the authors have already prepared a freely available and printable pdf version of the game in English, Croatian and Slovenian languages as well. The game is focused on the development of critical thinking and digital literacy. Players are put in the role of users of a fictional social networking site named *Duckface*, where they try to gain as many followers as possible. The primary target audience are high school students, but the game can also be enlightening for other generations. The game teaches about the functioning of social media, how to distinguish between fake and true news, how fact-checking works, and also about responsible online behavior.

The game can be played by two to four players at a time; for a larger group of players (such as in a classroom), it is recommended to divide the entire group into smaller teams and provide each team with its own game set. Players compete while playing, but are also given tasks that they must solve together. In principle, one game can last until all the cards are spent. The recommended playing time is approximately thirty to forty-five minutes (eight rounds for four players and nine rounds for three players).

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[18] ROOZENBEEK, J., VAN DER LINDEN, S.: Fake News Game Confers Psychological Resistance Against Online Misinformation. In *Palgrave Communications*, 2019, Vol. 5, No. 1, p. 7.

[19] ROOZENBEEK, J., VAN DER LINDEN, S.: Breaking Harmony Square: A Game That "Inoculates" Against Political Misinformation. In *Harvard Kennedy School Misinformation Review*, 2020, Vol. 1, No. 8, no paging. [online]. [2023-02-03]. Available at: <https://misinforeview.hks.harvard.edu/wp-content/uploads/2020/11/roozenbeek_harmony_square_game_misinformation_20201106.pdf>.

[20] JUNIOR, R. B.: *The Fake News Detective: A Game to Learn Busting Fake News as Fact Checkers Using Pedagogy for Critical Thinking*. [online]. [2023-02-03]. Available at: <https://repository.gatech.edu/entities/publication/a4a72f54-bf59-4974-955d-c908fa22bf51>.

[21] See: BASOL, M. et al.: Good News About Bad News: Gamified Inoculation Boosts Confidence and Cognitive Immunity Against Fake News. In *Journal of Cognition*, 2020, Vol. 3, No. 1, p. 2-9.

The game introduces several creative elements, offering interesting educational potential in the development of critical thinking. The game does not allocate the "bad" or "good" roles to the players; they are ordinary Internet users. Their goal is to attract as many followers as possible, and they can decide for themselves what strategy they will use to achieve victory. Another interesting element is the rather large amount of information that the player has to keep track of: news in front of themselves and the other players, news that no one has shared yet, followers that no one has convinced yet, and the credibility of the other players, and the action cards in their hand. This aspect of the game looks unnecessarily confusing at first glance, but it actually illustrates social media, where we are also exposed to a huge amount of information, quite convincingly.

The authors of the game recommend that after the game is finished in the class, the teacher conduct a debriefing. Thanks to this, it is possible to increase the educational effect and to sort out the acquired knowledge with the students. Such a "block" of playing and debriefing can be done in free time but also during formal education, as its duration is about an hour and a half (so around two formal classes with a duration of 45 minutes). During the debriefing, there must be a discussion between the teacher and the students. For example, instead of having the teacher list the characteristics of the hoaxes that were used in the game, the teacher should ask on what basis the students were deciding which news to share. During this discussion, topics such as the reasons why fake news spreads, the reasons why ordinary people share fake news, the characteristics of fake news, the role and use of fact-checking portals, and the reasons why we are prone to believe fake news can be addressed.

2 Methods

Based on previous findings, we set the following research questions, which we will test using the data obtained from the experiment:
- RQ1: Do players have a significantly higher ability to detect fake news after playing *Follow Me* than before playing it?
- RQ2: Are players significantly more confident in determining the truthfulness of messages after playing *Follow Me* than before playing it?

Based on these research questions, we can set our hypotheses as follows:
- $H_{RQ1}0$: players do not have a significantly different ability to detect fake news after playing *Follow Me* than before playing it.
- $H_{RQ1}1$: players have a significantly higher ability to detect fake news after playing *Follow Me* than before playing it.
- $H_{RQ2}0$: players' confidence in determining the truthfulness of messages after playing *Follow Me* is at the same level as before playing it.
- $H_{RQ2}1$: players' confidence in determining the truthfulness of messages after playing *Follow Me* is at a higher level than before playing it.

To find answers to our research questions, we will use an experiment that will be constructed similarly to published experiments with similar games, such as *Bad News*[22] or The *Fake News* game.[23] We will evaluate the results with double sided t-test with confidence interval of 90%.

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[22] See: BASOL, M. et al.: Good News About Bad News: Gamified Inoculation Boosts Confidence and Cognitive Immunity Against Fake News. In *Journal of Cognition*, 2020, Vol. 3, No. 1, p. 2-9.

[23] ROOZENBEEK, J., VAN DER LINDEN, S.: Fake News Game Confers Psychological Resistance Against Online Misinformation. In *Palgrave Communications*, 2019, Vol. 5, No. 1, p. 7.

In the experiment, we investigate the causality and the relationship between playing the game and the ability to detect fake news. Therefore, we can define the dependent variable as the ability to determine the truthfulness of the news and the independent variable as whether the player has played the game or not. In addition, we will also observe the confidentiality of the respondents in entering their answers, i.e., how confident they are that they have determined the truthfulness of the news correctly; this will be our second dependent variable observed. Our hypotheses are based on the assumption that we expect that players will have higher accuracy and confidence after playing. During the experiment, we examine the respondents' attitudes towards the selected topics and quantify their ability to determine the truthfulness of the news before and after playing the game with the help of questionnaries.

2.1 Sample and Procedure

The experiment targets high school students between the ages of 15-18. The reason for selecting this group is that the *Follow Me* game was developed primarily with this audience in mind, in an effort to make the game usable within a formal learning process. The game was tested in six secondary schools in southern Slovakia with a total of 130 respondents. All parts of the experiment were conducted in the Slovak language.

The experiment consists of five parts:

1. A questionnaire regarding respondents' demographics and attitudes – in this questionnaire, we focus on the basic demographics of the respondents (age, gender) and their attitudes towards the selected topics. With this data, we can evaluate the correlation between the respondents' attitudes and their ability to determine the veracity of the news. Several studies have shown that our attitudes affect the perception of the truthfulness of news.[24] In determining attitudes, we draw on the methodology used in the work of Simko et al.[25]: The respondents are asked to comment on 4 to 6 statements on each selected topic and rate on a five-point scale whether they agree (+2) or disagree (-2) with the statement. This procedure allows us to get a more accurate picture of opinions than if we just asked one generic question. For each topic, we select statements to represent extreme views with both positive and negative attitudes. For example, in the case of global warming, the statements might be as follows:
   a) Global warming is a natural process, the impact of mankind is negligible (denialist attitude).
   b) Fighting global warming is just a trend used to increase the popularity of companies or products (denialist attitude).
   c) Strong measures must be taken to slow global warming (alarmist attitude).
   d) Global warming may significantly change social circumstances in the near future (alarmist attitude).
2. A questionnaire for assessing the truthfulness of news before playing – in this questionnaire, the respondents are asked to determine the truthfulness of short articles shown on a five-point scale, while also indicating on the same scale how confident they are that they have correctly estimated the truthfulness of the article. The order of the news is random for each respondent. The news in the questionnaire is constructed to represent both true and false news on each selected topic (Covid-19, global warming, and the European Union) and each extreme position. The reason for this selection is to avoid favoring one

24 See: FLINTHAM, M. et al.: Falling for Fake News: Investigating the Consumption of News via Social Media. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems.* New York, NY : Association for Computing Machinery, 2018, p. 1-10.
25 See: SIMKO, J. et al.: A Study of Fake News Reading and Annotating in Social Media Context. In *New Review of Hypermedia and Multimedia,* 2021, Vol. 27, No. 1-2, p. 97-127.

opinion group over another, which could bias the results obtained.[26] Each message is displayed as a post on *Facebook* and has an author, a title, a short description, a link to the website, and the number of reactions and comments (see Figure 1.). We created the news based on real events/articles whose veracity had been sufficiently clearly verified. We reformulated these messages to suit the purposes of the experiment. We relied on the data from well-known fact-checking portals to verify the veracity of the selected reports.

3. Playing the *Follow Me* game – in this step, we explain the rules of the game to the students and they play the *Follow Me* game in groups of three or four for about 30 to 45 minutes.

4. Debriefing – after playing the game, a debriefing session takes place, where we follow the methodological guide from the authors of the game and discuss the risks associated with fake news, the signs of fake news, cognitive bias, and how to build resilience to fake news.

5. A questionnaire for assessing the truthfulness of the news after playing – to verify the benefits of the game, the respondents are given the same questionnaire as before playing, where again they have to determine the truth value of the messages and the degree of certainty with which they have determined it. The order of the messages is the same as in the pre-game questionnaire to keep the same conditions for completion. In this questionnaire, we use eight of the same news items as in the first questionnaire, while swapping out four news items so that we can determine the effect of playing on both the known and new articles.

FIGURE 1: *Example of news used in the questionnaires during the experiment*
Source: own processing, 2023

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[26] See: SIMKO, J. et al.: A Study of Fake News Reading and Annotating in Social Media Context. In *New Review of Hypermedia and Multimedia*, 2021, Vol. 27, No. 1-2, p. 97-127.

3 Results

In the experiment, we worked with eight groups from six secondary schools in southern Slovakia and received responses from 130 students in total. The respondents included 79 females and 51 males between the ages of 15 and 19. The age and gender distribution are shown in Figure 2.
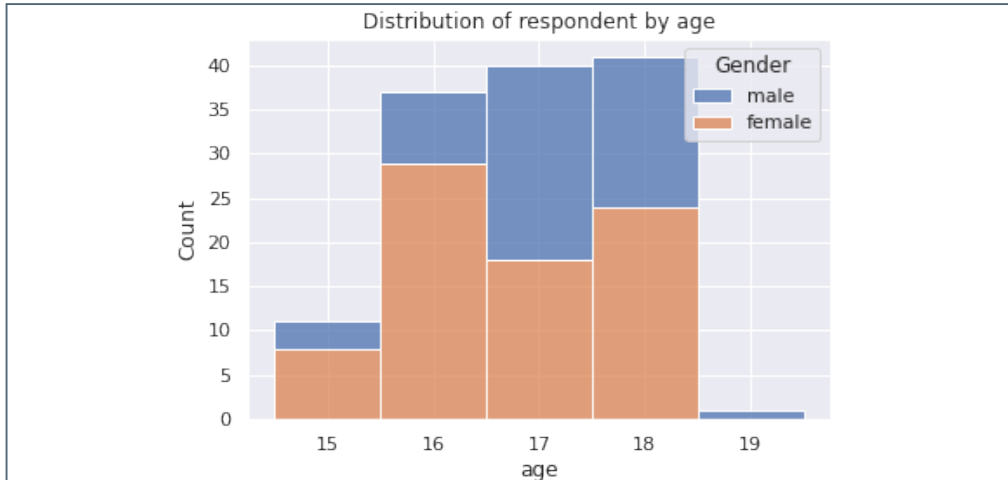
The respondents' attitudes towards the selected topics (Covid-19, global warming, and the European Union) were obtained by summing their ratings for each statement shown in the first questionnaire, multiplying denialist statements' scores by -1. They answered six questions on each topic, thus they could obtain scores ranging from -12 to 12. A negative score indicates a denialist attitude and a positive score an alarmist attitude. The resulting distribution of players for the different topics is shown in Figure 3. In the graphs we can see that the distribution of views is different for each topic: while for global warming the majority of players have a fairly alarmist attitude, for Covid-19 their attitudes are mostly slightly denialist or slightly alarmist, and the European Union is perceived by the majority without a clear negative or positive attitude.
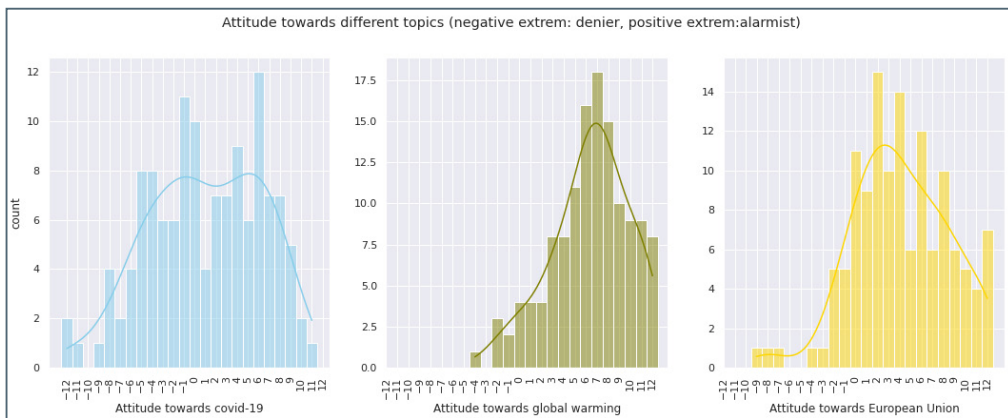
The attitudes of the respondents were also tracked by age and gender (see Figure 4). The graphs indicate that fifteen-year-old boys are most likely to take a denialist attitude toward Covid-19, with this tendency turning to a mildly alarmist attitude with increasing age, for both boys and girls. This phenomenon is difficult to explain without further research, but we can assume that with increasing age, students are better informed about the topic of Covid-19 and therefore perceive the threats more clearly. On the other hand, we did not observe an improving success rate by age when determining the truthfulness of the articles, so this hypothesis still requires further and deeper research.
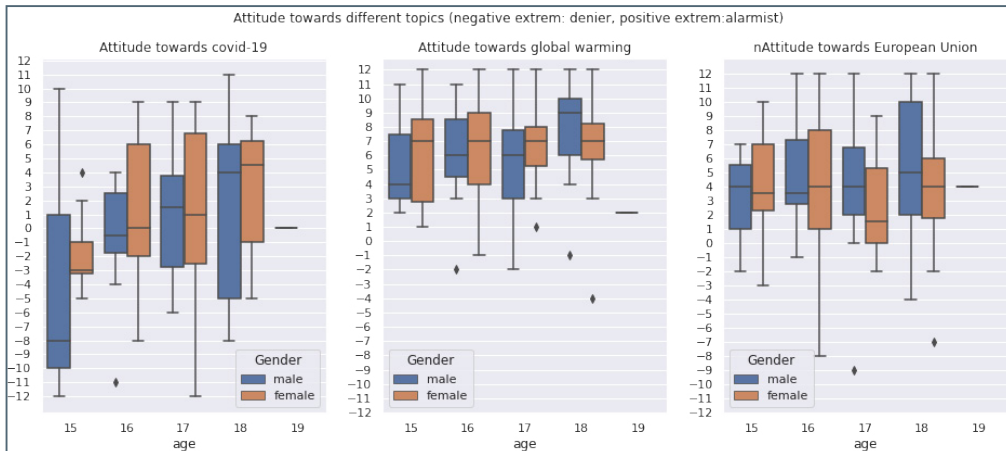

FIGURE 4: *Attitudes towards different topics split by age and gender*
Source: own processing, 2023

A slightly increasing age-related alarmist attitude can also be observed in the case of global warming, especially among boys, while girls tend to adopt an alarmist attitude irrespective of their age. In the case of the perceptions of the European Union, changes by age are minimal; one possible explanation for this phenomenon is the growing apathy of young people toward traditional politics.[27]

Based on the obtained data, we tested our hypotheses. Results for identical questions showed no significant improvement in either accuracy ($p = 0.85$) or confidence ($p = 0.98$) in determining the truthfulness of the articles displayed. On the other hand, in the case of the switched articles, we observed a statistically significant improvement in both accuracy ($p = 0.0002$) and confidence ($p = 0.0005$). The problem with the results for different articles is that the new articles may have been objectively easier to judge and we cannot positively claim that the improvement was due to the game, especially when considering the results for identical questions where we did not observe an improvement. A summary of the results is shown in Figure 5. In the graphs we can see a rather tendency toward worsening results for both determining the truthfulness of the news and for self-confidence. These results do not necessarily suggest that the game has a negative effect on players; on the contrary, we can assume that after playing, players were more cautious in determining the truthfulness of news and were more skeptical than before playing, which is appropriate behavior when reading unverified news from unknown sources. This phenomenon, however, requires further research.

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[27] See: SLOAM, J.: New Voice, Less Equal: The Civic and Political Engagement of Young People in the United States and Europe. In *Comparative Political Studies*, 2012, Vol. 47, No. 5, p. 663-688.
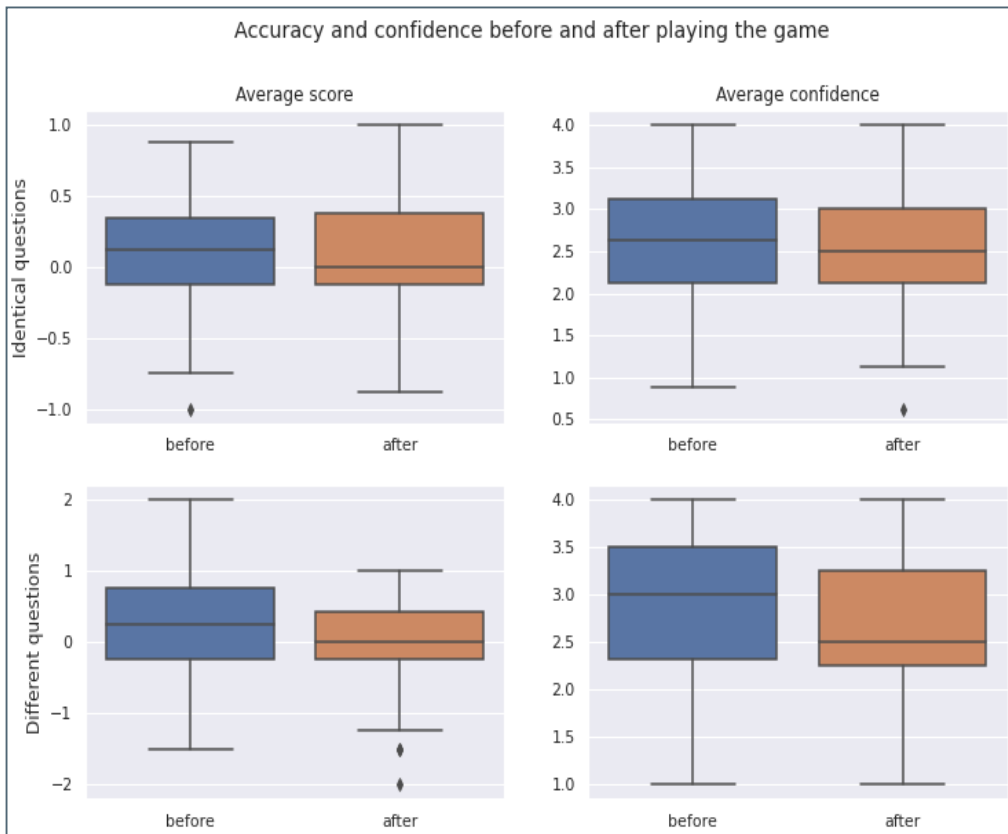
FIGURE 5: *Accuracy and confidence during the questionaries before and after playing the game*
Source: own processing, 2023

Based on the results by topic, it was found that students had most difficulty in determining the veracity of the articles about global warming, scoring a mean total score of -0.59 on a scale of -16 to 16 (4 questions for each topic, both before and after the game, and they could score -2 to 2 for each question), with a mean total score of 0.74 for Covid-19 and 1.72 for the European Union. These results suggest that the questions in the questionnaire were difficult, and for better results, it is advisable to repeat the experiment with a different set of questions.

We also looked at the correlation between attitude toward a topic and success in determining the truthfulness of articles. The results are shown in Figure 6. A slight positive correlation can be seen in the case of Covid-19, where an alarmist attitude is indicated by higher questionnaire scores. For the other two topics, we did not observe a similar phenomenon and there does not appear to be any correlation between attitude and success in determining the truthfulness of articles.
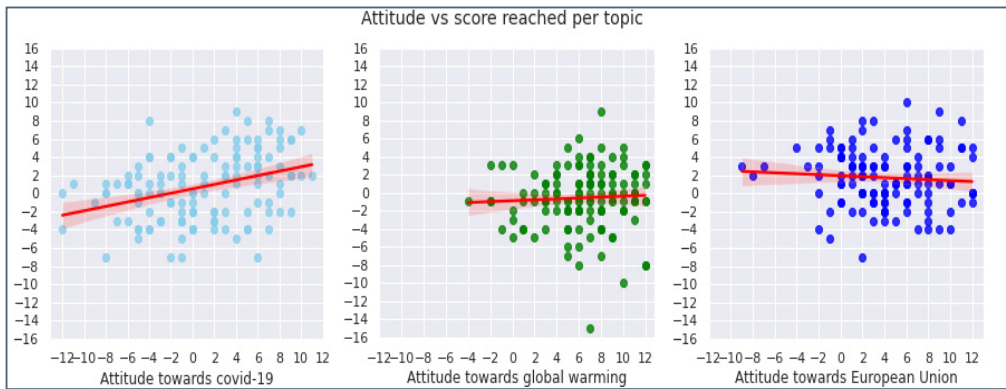
FIGURE 6: *Players' attitudes vs score reached in questionaries per topic*

Source: own processing, 2023

4 Discussion

In the experiment, we collected data to gain a better insight into the level of critical thinking of high school students in Western Slovakia, and at the same time, we verified the benefits of the *Follow Me* card game. Although we were unable to show satisfactory improvement after playing and thus could not support our hypotheses, we did gain valuable knowledge.

The data on attitudes suggest that high school students have a relatively strong perception of the threat of global warming, while for Covid-19 and the European Union we found a greater number of negative views. The "success" of global warming may also be due to the fact that the issue has not been the subject of sharp political debate in Slovakia (compared to the USA, for example), but a more or less uniformly alarmist view is being promoted. On the contrary, the other two topics have been more often used for polarization and are the subject of a lot of fake news in our area as well.

Among the limitations of the research is that (based on the results) some articles were too difficult to evaluate without the ability to search for information online, and therefore most respondents rated them as fake, for which they lost points, hence the rating of these articles did not provide fully relevant information. On the other hand, the fact that students were rather doubtful about most of the articles suggests that they are aware of the dangers of fake news and are therefore more likely to be suspicious early on and tend to label the news as false.

Another limitation of the research was the high level of detail in the articles displayed, due to which we were unable to measure the change in identifying fake news. This granularity may have made it easier for the students to remember the articles in question and their responses to them at the beginning, and they automatically gave the same answers in the post-play questionnaire without thinking or reading the articles again. This is also indicated by the fact that they spent on average ten seconds less on the articles on the second reading than on the first reading (average of 25.65 seconds vs. 14.52 seconds).

Despite the unfavorable statistical results, we were able to use the *Follow Me* game during the experiment to open up the topic of fake news and discuss current issues with students that are not always a topic in the traditional lesson. Our experiment took three classes (45 minutes each), but without the questionaries, the game is playable with debriefing within two classes without any time pressure, so it can be easily implemented into formal education as well.

During the experiment, we also observed the effectiveness of the mechanics of the *Follow Me* game. The topic of the game itself is close to high school students, as most of them use social networks on a daily basis, so the concepts of sharing news and collecting followers are familiar to them. Due to this, most of them had no problem immersing themselves in the game

and focusing on achieving their in-game goals. The game offers a safe environment to experiment for sharing different news without players knowing whether they share true or false information.

The game represents quite accurately the principle of fact-checking. Players have the opportunity to select one article from their opponents during their round and apply fact-checking to it, i.e., use the included factsheet to verify whether it is a true news story or a hoax. This fact-checking is an important element of the game, as it allows players to gain or lose credibility, which has a direct impact on the number of their followers. At the same time, players may experience the sense of failure and disappointment when they find out that an article they thought was true is actually a lie. By being a game, this setback is only temporary, but may motivate players to be more careful in real life and to verify messages more carefully before sharing. Besides that, this mechanic teaches players about the use of fact-checking, which can be helpful for them in everyday life as well.

One of the important positives of the game is the detailed methodology for educators that helps to manage the debriefing session after the game has been played. This debriefing is primarily used to discuss the player's experience of the game and to point out parallels with the real world. The debriefing is carried out as a discussion with the students, where the educator does not give them direct answers to all the questions, but just tries to guide them, based on the game experience. A good example is a question about the characteristics of fake news, which the students were able to list due to the fact that during the gameplay they had had the opportunity to experience the difficulty of distinguishing between true and false information and had been forced to look for certain characteristics to guess the truthfulness of the articles in the game. So in this case, debriefing reinforces the inoculation effect, helps students to recapitulate the knowledge gained during the gameplay, and directs them to be cautious of fake news in everyday life as well. Based on our experience, the students were very active and open during these discussions, they were giving positive feedback on the game and they were able to point out the knowledge they could transfer from the game to everyday reality.

A possible problem with debriefing is that its effectiveness is conditioned by the good preparation of the educator, who should have a clear understanding of the issues and be technically and personally prepared to answer questions of various kinds and to address any differences of opinion among students in an assertive manner. For these purposes, the above-mentioned methodological manual created by the authors of the game is an excellent tool, containing explanations of basic concepts, examples of questions, references to other sources, and sample activities.

During the experiment, we were also able to map out some problematic aspects of the game design, which include the difficulty of the rules and a large number of different cards at the desk. The game may seem too complicated at first glance, but it is a suitable simulation of a social network where users are also overwhelmed with information. On the other hand, this means that players may have difficulty getting started and may lose interest before they even get into the game. Therefore it is crucial for the educator to intensively help the students to start the game and understand the basic rules. To this end, the authors of the game have also created a short video to present the rules, but in our experience, this was not entirely sufficient on its own, so we recommend briefly going through the rules with the students before playing and helping them to start the first round.

5 Conclusion

The mass spread of fake news poses an ever-increasing danger to society as a whole as well as to individuals. Fact-checking methods are not effective enough to prevent the spread of fake news and therefore the most effective solution seems to be prevention, the development of critical thinking, which makes it easier for people to detect fake news. Game-based learning, i.e., games that contain mechanics with an educational purpose, also

contributes to the development of critical thinking. The key to success of these games is that they offer players a safe environment to experiment and learn. This knowledge acquired during gameplay can then be used by players in real-life situations.

In this paper, we worked with the *Follow Me* game and investigated its impact on players' critical thinking. For this reason, we conducted an experiment on 130 high school students. The experiment consisted of three questionnaires, playing the *Follow Me* game itself and a debriefing session after playing it, according to the methodologies prepared by the authors of the game. Although we were unable to show a significant improvement in the students' ability to recognize fake news due to the limitations of the experiment, the fact that the students tended to distrust and were skeptical of the news may be a light of hope. We also obtained valuable information on the attitudes of students in our region regarding three frequently discussed topics: Covid-19, global warming, and the European Union. We observed that students tended to take an alarmist attitude in the case of global warming, but for the other topics there were a higher number of respondents with negative attitudes.

At the same time, during the experiments, we tested the use of the *Follow Me* game in a formal educational process and found that the game is suitable for such use. It can be played in a traditional 45-minute lesson, and it is appropriate to make up two class periods for playing it in conjunction with debriefing. The game was able to engage the students, but at the beginning, they had problems understanding the rules, so increased attention from the educator at the beginning of the game is crucial. The debriefing after the game offers an excellent opportunity to address the topic of fake news from several perspectives and to start a discussion with the students.

This experiment provided us with useful information about the effectiveness of the game mechanics used in *Follow Me*, which could be used as a basis for creating new games on this and other themes in the future. In future work, it will be useful to focus on a larger sample of players with a modified data collection methodology for even more relevant results that could help to obtain more accurate information about the effectiveness of the *Follow Me* game. Another goal of the authors is to conduct a comparable experiment with other educational games in order to benchmark the results obtained and find the game mechanics that can be most effectively used to develop critical thinking.

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