The effect of pre-class online video on improving knowledge retention and motivation

Suepphong Chernbumroong, Chiang Mai University, College of Art Media and Technology, Chiang Mai, Thailand. https://orcid.org/0000-0002-5446-2257

Phimphakan Thongthip, Chiang Mai University, Faculty of Humanities, Chiang Mai, Thailand. https://orcid.org/0000-0002-3630-3172

Kitti Puritat, Chiang Mai University, Faculty of Humanities, Chiang Mai, Thailand. https://orcid.org/0000-0003-0681-3064

Kanjana Jansukpum, Chiang Mai University, Faculty of Humanities, Chiang Mai, Thailand. https://orcid.org/0000-0002-2042-8181

Phichete Julrode[*], Chiang Mai University, Faculty of Humanities, Chiang Mai, Thailand. https://orcid.org/0000-0002-3255-7079

Abstract

Since humankind entered the computerised period, data and the amount of information available through digital sources have drastically increased, and people nowadays can also generate and distribute information. As a result of these changes, knowledge acquisition was characterised by a rapid increase in information. However, the retention of such information or knowledge can be challenging. To understand how it happened with the undergraduate students, we developed a 4-minute digital pre-class video designed specifically for undergraduate students and assessed its capacity to verify news based on the method of the International Federation of Library Associations and Institutions, which consists of eight evaluation criteria and key points to consider. To examine the video's efficacy, we used a randomised controlled design among the control and experiment groups, with an in-class session based on both a pre-class video and PowerPoint materials for the experiment group and an in-class session using PowerPoint materials only for the control group. The instructional materials motivation survey questionnaire and the fake news literacy test were utilised to examine motivation, knowledge acquisition and knowledge retention. The results showed that while students of both groups had similar performances as regards knowledge acquisition, they nonetheless showed a considerable difference in retention and motivation of knowledge from the perspective of attention and relevance. These results show a huge potential for using pre-class video and appropriate and effective content to combat false information in Thailand. Nevertheless, the research is subject to limitations. The study was only carried out at Chiang Mai University. More research experiments at other universities are required.

Keywords: Undergraduate students, news literacy, knowledge retention, motivation, pre-class video.

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[*] ADDRESS FOR CORRESPONDENCE: Phichete Julrode, Chiang Mai University, Faculty of Humanities, Chiang Mai, Thailand
E-mail address: phichete.j@cmu.ac.th/ Tel.: +66 818816114

Introduction

The concepts of information consumption, comprehension and dissemination have changed greatly since society has advanced into the computerised era. We are presented with data at an excessive volume and rate, which has affected how humans understand, distribute and use it. The Internet-fuelled overconsumption of information tends to have contributed to a 'post-truth' society in which people absorb data that supports their pre-existing ideas and principles rather than seeking the fact (Ohleiser, 2016). As the Internet world grows more complicated and difficult to understand, mistrust and ambiguity increase, with consumers preferring familiar information over trustworthy information (Gallagher, 2016). Correspondingly, the rise and growth of platforms of social media have affected the human–information relationship by encouraging the dissemination of false information by its functionalities and tools. Fake news article creators have taken advantage of this societal trend to allure and distribute false information articles for propaganda and/or monetary gain (Ohleiser, 2016).

In this digitalised era, undergraduate students have been struggling with evaluating information from digital sources since they have been consuming and receiving news and information from Internet sources every day (Musgrove et al., 2018). Accordingly, we designed and developed a pre-class video based on International Federation of Library Associations and Institutions (IFLA) fake news verifiability principles for educating and motivating learning in undergraduate students on spotting fake news. It is proved that watching pre-class video in a classroom has enhanced the viewer's success in academic performance in higher education (Neroni et al., 2019).

The project was funded by the Safe and Creative Media Development Fund, Thailand. The objective of funding for this project was to raise awareness, facilitate a self-evaluation of fake news and provide an understanding of the impact of fake news for students when encountering and consuming information from digital sources.

1. Literature review

1.1. Literacy defending fake news

With regard to the definition of 'fake news', Levy (2017) noted that fake news is the spread of inaccurate statements intending to be about reality in a format and with material similar to that of genuine media organisations. A fake news story purposely depicts situations that are not reality by imitating the conventional patterns of media reporting, yet its makers already know the false information. Fake news is distributed for two purposes, to be being broadly retransmitted and to mislead some news consumers (Rini, 2017). The definition of fake news is 'a baseless, created story with the intent of engaging and deceiving others' (Plothow, 2017).

Regarding media literacy, based on the National Association for Media Literacy Education (Media literacy defined, 2020), media literacy is defined as 'having the skills to obtain, examine, judge, produce, and act employing all types of communication' (para. 1). In the United States, media literacy usually emphasises on the concepts of mass media – their intended employment and production goals. In this context, the media talks about data created by mass-market creators, such as developers of social media, with profit, control or power as primary goals. Magazines and newspapers, telecasts, movies and clips are all examples of mass media. Pictures, sound and behaviours are frequently used in mass media as they have a purpose, namely convincing the viewers to purchase their items or promote their cause, the viewers should realise their objectives in order to make a decision on how to interpret and act (Farmer, 2019). The literature around the area of media literacy has been defined as 'a wide, intricate patchwork of concepts' (Potter, 2010). Individuals' perceived ideas about their

abilities to critically receive, evaluate, and examine information are highlighted in the several studies on media literacy. Therefore, it can be assumed that individuals' perceived skills of media literacy can identify incorrect news stories (Jones-Jang et al., 2021). Apart from media literacy, accessing, comprehending, analysing and interpreting news information are what news literacy entails. It could be regarded as a subtype of media literacy (Farmer, 2019). News literacy, which arose from the same conceptual background as media literacy, emphasises the significance of literacy in terms of civic and democratic participation among citizens (Malik et al., 2013). News literacy aims to involve comprehending the purpose of news in society, having an interest in finding out news, the capacity to search/digest/perceive information, the capacity to carefully judge and examine information and the potential to create news (Jones-Jang et al., 2021). These aims can be accomplished by news viewers gaining a better knowledge of the circumstances under which news is delivered, such as its normative aims and motivations, which often contrast with journalistic values of impartiality and fact (Ashley et al., 2013). It is possible that consumers of news who are informed about the methods and motives underlying news sharing – that some news is not a thorough, totally impartial depiction of actuality and is, in fact, a profitable company with its own influences will seriously identify and interpret the accuracy, veracity and latent favouritism of stories in the information obtained online (Jones-Jang et al., 2021). With regard to information literacy, Livingstone (Coiro et al., 2008, p. 106) distinguishes between information literacy and media literacy by saying, 'Media literacy considers media as perceiving the world through a window or lens and indicating oneself, whereas information literacy views data as a means with which to react to the world'. Information literacy is the conceptual foundation for comprehending, obtaining, analysing and utilising data (Iannuzzi, 2000). As information literacy focuses on the capacity to explore and discover data (Coiro et al., 2008), it may be anticipated that individuals with higher information literacy are better at spotting lies and misinformation (Jones-Jang et al., 2021). However, the greatest defences against misinformation include critical thinking, gathering news from a range of sources, especially those that do not reinforce your own prejudices, being sceptical of information that appears too good (or terrible) to be genuine and other self-defences. To defend fake news, individuals should learn to be discriminating in their news consumption, distinguishing between information and rumour, facts and advertising, news and view, and prejudice and impartiality (Pandey, 2018).

1.2. Multimedia to fight against fake news

The progression of self-media reports has been encouraged by the advancement of multimedia from written articles to multimedia articles with videos and pictures. These video and picture articles draw more interest from the consumer and offer a more trustworthy narrative. On the contrary, visual information, including videos and pictures, is more appealing and outstanding than simple words because of its colourful description format and accordingly increases news distribution. For example, the percentage of Internet user engagement increases by 18% in the case of tweets with pictures, and these get 89% more likes and 150% more re-tweets compared to tweets without pictures (Brandtzaeg et al., 2016). Visual information is frequently utilised to support a story's evidence which boosts the story's trustworthiness (Cao et al., 2019). Nevertheless, fake news creators usually utilise visual information to their advantage. Fake news typically involves distorted or even altered pictures or videos in order to entice and deceive customers. Subsequently, visual information has become an essential component of misleading information that cannot be overlooked, posing a significant difficulty in detecting false multimedia information. news detection attempts to identify false information by efficiently leveraging information Multimedia false from various modalities, including written, social and graphic modalities. The graphic modality provides a lot of graphic information, which has been shown to be beneficial in the identification of false news (Jin et al., 2017). Jin et al.

(2017) were the first to use deep neural networks to include multimodal information to address the issue of false news identification. It presented a new RNN with an attention mechanism for combining written, graphic and social context characteristics efficiently. The content and social context of a tweet are first merged with an LSTM to form a combined representation. Then, such a representation is combined with graphic information collected from a pre-trained deep CNN. On the basis of event-invariant multimodal characteristics, a complete situation adversarial neural system was presented to identify new false news situations (Wang et al., 2018). There are three major parts to this detector, including the multimodal characteristic extractor, the situation discriminator and the false information detector. The written and graphic aspects of articles are extracted using the multimodal characteristic extractor. It functions together with the false information detector to understand a discriminable representation for detecting false information. The event discriminator's purpose is to retain shared features between events while removing event-specific characteristics (Cao et al., 2020).

1.3. Effects of watching videos in a classroom

Kanjug et al. (2018) noted that knowledge obtained from watching instructional videos prior to a collaborative in-class event is required to comprehend the lecturer's elaborations, complete works with peers and engage in conversation in flipped class-room. This earlier learning, from a constructivist viewpoint, helps learners to comprehend the last formed schemata with the objective content in the in-class activity, allowing them to effectively create their own knowledge system (Tolks et al., 2016).

The flipped learning approach encourages the construction of a macrostructure by providing a conceptual description of an overall view of subjects related to the course through instructional videos shown prior to in-class activities. Learners' knowledge can be developed and enhanced via many activities in the following in-class activities because comprehension and remembering's fundamental cognitive systems have appeared prior to the in-class activity (Hadie et al., 2019). Viewing instructional videos ahead of time is expected to enhance the use of deep learning methods in in-class activities, which have been demonstrated to entirely correlate with academic success in higher education (Neroni et al., 2019). Learners' newly acquired knowledge is able to be utilised and shifted to new events in hands-on in-class tasks. Furthermore, learners can identify knowledge gaps and misunderstandings and address them immediately with the assistance of their peers and/or an educator (Tolks et al., 2016). In class or group conversations, the educator can assist pupils in making connections between concepts and their own ideas, as well as reflect back on general misunderstandings (Bouwmeester et al., 2019). According to processes of active knowledge formation, learners can construct more precise, strongly connected and easily retrievable cognitive schemata, therefore encouraging educational success. Viewing the videos earlier is also concerned with knowledge retention since learners look for the definition of and connection between the provided content from various viewpoints (Kanjug et al., 2018). Craik and Tulving, famous memory researchers, discovered that regularly displayed and recognised stimulators increase long-term knowledge retention since entails studying through comprehending rather than studying by memorisation (Engelbrecht et al., 2007). In this respect, pre-class video and in-class activity interdependencies aim at promoting learners to study on a consistent and timely schedule across the whole term rather than in a short period immediately before the test. Learners who learn consistently and stay consistent with the content of the lesson do better in independent online learning lessons as well as in the flipped classroom, according to Neroni et al. (2019).

From the above-mentioned studies, it can be concluded that watching and learning from a pre-class video are associated with knowledge acquisition and retention in an educational context. Such a method can have the potential to enhance and improve the acquisition and retention of knowledge,

particularly in modern society in which people can easily receive a large amount of information at any moment.

2. Research Methodology

2.1. Hypotheses of the research

A video titled 'How to spot fake news' was developed to train information literacy and facilitate the ability of identify fake news for students of various areas. The video content employed the evaluation criteria developed by the IFLA which we will explain in the next section.

To verify the effectiveness of the video, we examined the effect of the video on such factors as learning achievement, motivation and learning retention of fake news. Moreover, the experiment aimed at verifying the following hypotheses:

Hypothesis 1 (H1): The participant of the experiment group who watches the pre-class video and then receives the PowerPoint-based teaching material in the classroom will have a higher knowledge acquisition than the participant of the control group using PowerPoint-based teaching material only.

Hypothesis 2 (H2): The participant of the experiment group who watches the pre-class video and then receives the PowerPoint-based teaching material in the classroom will have higher knowledge retention than the participant of the control group using PowerPoint-based teaching material only.

Hypothesis 3 (H3): The participant of the experiment group who watches the pre-class video and then receives the PowerPoint-based teaching material in the classroom will have higher motivation than the participant of the control group using PowerPoint-based teaching material only.

2.2. Research design

To determine the efficacy of the video, we used a randomised controlled design. We also asked the participants to sign an informed consent before their inclusion in the study, which was approved by the Chiang Mai University Research Ethic Committee (CMU REC No.64/092). Additionally, to verify H1, we obtained the knowledge score from the experimental and control groups during the analysis at baseline (pre-test) and follow-up section (post-test).

2.3. Participants and procedure

Undergraduate students of Chiang Mai University were invited to join the training workshop of fake news using an announcement published at the project's official Facebook page. Finally, we recruited 90 undergraduate students who joined the training workshop. 45 students were assigned at random to both experiment and control groups consisting of 20 male and 25 female students with an average age of 20.54 (SD = 0.52) years. Then, both groups of students were invited to attend the workshop which was held at the two classrooms set separate for each group at the Chiang Mai University. We began to explain the informed consent to students and then obtained the consent. Note that we informed the students that they could stop the session anytime if feeling uncomfortable. After obtaining students' information, the pre-training data collection form was filled in both groups within 30 minutes to evaluate students' knowledge on fake news and their knowledge on how to identify which digital source is fake news or not. In the experiment group, we let students watch the pre-class video about 'how to spot fake news' before the workshop. Then, we asked our lecturer from the Chiang Mai University's Department of Library and Information Science to conduct the 2-hour workshop using the PowerPoint-based learning material. At the end of the workshop, we re-evaluated students' knowledge about fake news and their learning motivation. Moreover, after 1 month, we also

did a follow-up on knowledge retention with the same assessment of knowledge. The overview of the procedure is shown in Figure 1.
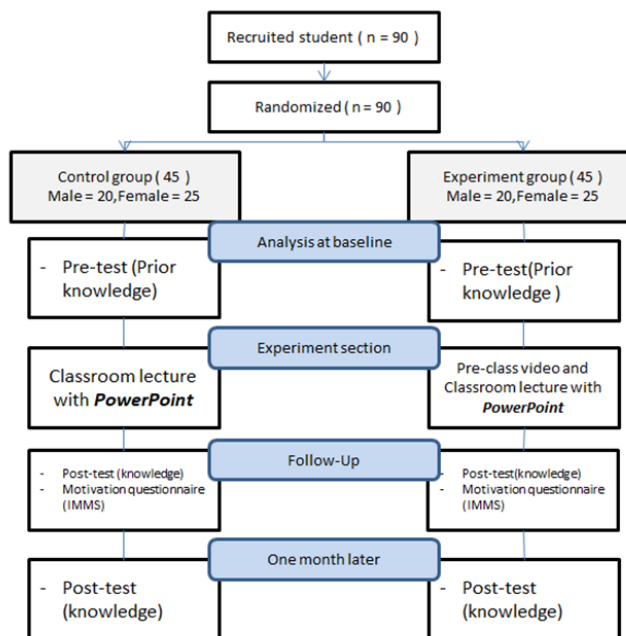

Figure 1. Procedure overview

2.4. Data collection procedure

Regarding knowledge acquisition and retention, we developed a test about fake news to measure students' knowledge acquisition. The assessment comprised 15 questions consisting of 2 sections: the first section targets general knowledge on evaluating the source of news with 10 questions, the second section focuses on fake news competency providing news from the real world in order to decide whether they are fake or not over 5 questions. The pre- and post-tests we used were similar. Knowledge acquisition, according to the definition, is the process of acquiring knowledge through learning. The quantity of information that a person is able to promptly grasp based on established learning goals is applied to determine knowledge acquisition achievement (Anderson, 2007). With regard to the meaning of knowledge retention, it is the long-term memory of information obtained via learning. The amount of information preserved represents a person's capacity to think once gaining information (Anderson, 2007).

Regarding learning motivation, and in order to verify the same, we employed the instructional materials motivation survey (IMMS) to assess the learning motivation of students. The IMMS questionnaire was created based on the ARCS Model of Motivational Design (Keller, 2010). This questionnaire was developed to assess the requirements and reactions of pupils pertained to instructional materials.

The IMMS questionnaire contains 36 questions applying 5-point Likert-scale items that assess 4 motivational factors, including the attention of the student towards the workshop, confidence in success with the workshop, relevancy of the workshop to the learning objective and sentiments of contentment with the learning experience. We also translated the IMMS questionnaire into Thai language. The IMMS in Thai language has been read by three experts, and the four factors had an

adequate reliability for attention, relevance, confidence and satisfaction (Cronbach's α = 0.85, 0.77, 0.80 and 0.84, respectively).

2.5. Material design

To create the video content on how to detect fake news, we created storyboards, characters, background, voice-over recording and background music for the video media designed for our target audiences to help them learn how to spot false information. The quality of the video content was evaluated by experts. The satisfaction regarding the video content was also evaluated in order to learn from real users on how to improve the video media's quality for learning to spot disinformation using the fake news evaluation criteria created by the IFLA, as shown in Figures 1 and 2. The IFLA (2016) (Table 1) has the following principles: 1) Consider the source; 2) Continue reading; 3) Check the author; 4) Look at the supporting sources; 5) Look into the date; 6) Is this some sort of joke? 7) Examine your prejudices; and 8) Seek advice from experts. The video content for learning to identify fake news has been made and can be watched at https://angkaew.com/fakenews/ apps/index.php (Thai).

Figure 2. IFLA Outline for Fake News Literacy Shown in Video

Figure 3. Video Design for Fake News Literacy (1) Consider the Source; (2) Continue Reading; (3) Check the Author; (4) Look at the Supporting Sources; (5) Look into the Date; (6) Is this Some Sort of Joke? (7) Examine your Prejudices; and (8) Seek Advice from Experts

Table 1. Fake News Evaluation Criteria and Key Points to Consider used to Enhance the Video for Learning Fake News Detection

Fake news evaluation criteria	Key points to consider
Examine the source	Click away from the content to learn more about the site, its purpose, and its contact information.
Continue reading	Headlines can be provocative in order to gain clicks. What is the full story?
Inspect the author	Make a fast search for the authors. Are they trustworthy? Are they genuine?
Look at the supporting sources	Click on the corresponding links. Check whether the data provided truly supports the story.
Look into the date	Reposting previous news stories does not imply that they are relevant to current situations.
Is this some sort of joke?	It may be a mockery if it's too outrageous. To be sure, look into the site and the writer.
Examine your prejudices	Determine whether your personal beliefs may have an impact on your decision-making.
Seek advice from experts	Consult a librarian or a fact-checking website.

3. Results

3.1. H1

To verify H1, 'The participant of the experiment group who watches the pre-class video and then receives the PowerPoint-based teaching material in the classroom will have a higher knowledge acquisition than the participant of the control group using Power-Point-based teaching material only', the results of the knowledge score of both groups are presented in Table 2. Table 3 show the result of paired-samples t-test for both groups, with a p-value of 0.452, demonstrating no significant difference in the knowledge acquisition between the control group (PowerPoint in workshop) and the experiment group (PowerPoint and Video in workshop) at a significance level of p-value = 0.05. Based on the data analysis, developing video multimedia of fake new literacy to support PowerPoint in workshop cannot improve knowledge acquisition better than only using PowerPoint for training workshop in fake news literacy.

Table 2. Results for Pre-Test, Post-Test and Post-Test 1 Month Later

Group	N	Pre-test (SD)	Post-test (SD)	Post-test 1 month later (SD)
Control group	45	3.26(1.74)	8.54(3.16)	4.56(2.49)
Experiment group	45	2.95(1.69)	7.69(2.84)	5.52(1.87)

Table 3. Results of the T-Test for the Control and Experiment Groups

	Control group (MD)	Experiment group (MD)	*t*-value	*p*-value
Pre-post(immediately)	5.28	4.73	0.75-	0.452
Pre-post(1 month later)	1.30	2.56	2.40-	0.021

3.2. H2

To verify H2, 'The participants of the experiment group who watched the pre-class video and then received the PowerPoint-based teaching material in the classroom will have higher knowledge retention than the participant of the control group using PowerPoint-based teaching material only', we executed a follow-up session with the same students of both groups using a post-test 1 month after the workshop. We also utilised a t-test for the results, similar to RQ1, as shown in Table 3. Surprisingly, the difference between the groups has a p-value of 0.021, demonstrating a significant difference in knowledge retention. Based on the statistical evidence, we can state that the use of an additional multimedia video on fake news literacy supporting the PowerPoint-based material in the workshop can improve knowledge acquisition in the long term as opposed to using PowerPoint-based learning material only.

3.3. H3

(H3). The participant of the experiment group who watches the pre-class video and then receives the PowerPoint-based teaching material in the classroom will have higher Motivation than the participant of the control group using PowerPoint-based teaching material only. To verify the H3, we employed the IMMS questionnaire to assess participants' motivation. The results for the IMMS are presented in Table 4.

We asked the students to finish the IMMS questionnaire for both group after answering the post-test. We summarised the data as shown in Table 4. The compare the mean between the two groups, a paired-sample t-test was used for the information regarding attention, relevance, confidence and satisfaction. As regards using video to improve motivation, the results show no significant difference for confidence (t = 1.478, p = 0.146) and satisfaction (t = 1.743, p = 0.088). However, we found significant differences in attention (t = 2.732, p = 0.009) and relevance (t = 2.043, p = 0.047).

To summarise the data of the IMMS questionnaire for both groups, the experiment group showed significant differences only for attention and relevance, which means that the pre-class video can enhance motivation regarding attention and relevance but not for confidence and satisfaction.

Table 4. *IMMS questionnaire t-test results*

Motivation	Group	N	Mean	SD	t-value	p-value
Attention	Control	45	3.26	0.44	2.732-	**009.
	Experiment	45	3.52	0.50		
Relevance	Control	45	3.28	0.45	2.043-	*047.
	Experiment	45	3.52	0.58		
Confidence	Control	45	3.41	0.49	1.478-	146.
	Experiment	45	3.56	0.50		
Satisfaction	Control	45	3.39	0.46	1.743-	088.
	Experiment	45	3.56	0.50		

4. Discussion

As the rapid increase of knowledge and information was prevalent as knowledge acquisitions, as a result, several false news stories have been published since the creators of false information have

taken advantage of the human–information relationship (Ohleiser, 2016). Individuals accept data that reinforces their pre-existing opinions and ideas rather than searching for the truth Ohleiser (2016) to create and spread false news stories for propaganda and/or financial benefit (Ohleiser, 2016). Retention of such information and knowledge, therefore, can be challenging for people in this digitalised era. To verify hypotheses of the research, we developed 'Animation media development for learning to spot false information based on the International Federation of Libraries Associations and Institutions' fake news evaluation criteria', project for teaching individuals to fight against false information and collecting data concerning undergraduate students' knowledge acquisition and retention. The video based on IFLA is straightforward to comprehend, compact and suitable for people of all genders and ages. The video content is not difficult to comprehend and does not take a long time to fully watch, and it is suitable for adding to the school's teaching media because it can help students think more critically. These are in accordance with the research of Phongthanachote et al. (2019), who used animation to raise awareness of energy-saving solutions among students.

The results of our study indicate that as regards undergraduate students, watching pre-class video and then teaching from PowerPoint-based materials in the classroom cannot support knowledge acquisition of fake news literacy better than using PowerPoint-based teaching materials in the classroom exclusively. However, we found that the pre-class video can help teaching fake news literacy in the long term by enhancing knowledge retention. This finding offers proof for the effectiveness of our video, as a suitable choice for other universities around Thailand supporting classroom teaching. Our results are in line with the findings of the pre-class video of knowledge retention (Förster et al., 2022; Hung & Chen, 2018). In terms of motivation, we found a significant difference in improving motivation only for attention and relevance in the IMMS. Accordingly, learners who viewed the pre-class videos prior to the in-class training experienced an improved motivation for the instructional materials, resulting in an attention to focus on the video and significantly better understood the relevance of the learning objective of the study compared to students who learnt from the PowerPoint-based material only during the in-class training. Our research corroborates that the pre-class video has been demonstrated to be helpful for the development of motivation of learners who are interested in fake news literacy.

5. Conclusions and future work

This research aims to create a learning video with the purpose of learning and understanding undergraduate students' knowledge acquisitions and knowledge retention during the period of the rapid increase in information. The video comprehends a method of evaluation based on the IFLA evaluation criteria to tackle fake news which serves as an easy way to spot fake news. We also studied the effect of the video as a learning material by using a pre-class video before classroom teaching. In addition, the in-depth analysis of results shows that the students show a significant difference between both groups in knowledge retention and an improved motivation regarding fake news literacy. Ultimately, this research proves the finding that it is worth using a pre-class video for undergraduate students to improve the knowledge retention of information literacy with respect to spotting fake news.

For the future work, first the researcher aim to conduct further studies with other universities in order to enhance the overall of result for the stability of the data collection. Finally, we plan to collect more data regarding the behaviour of students in order to collect more information for analysing participant behaviour, for example, the average time spent on watching the video.

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Appendix

A.1. Knowledge test

1. The reader found news from two difference sources, with t different information provided. Which part of the news should be used for the consideration of fakes news based on IFLA?

2. Which part of the news the publisher wants the reader to pay attention to and clickon for reading the news?

3. The reader finds that in Mr. A's post that reports on the COVID-19 situation , it is mentioned that the information is private because the author works in the hospital. How can the reader decide whether this news is fake news or not?

4.A researcher provides news about the end of the world with a reference from a local magazine. How can the reader verify this news?

5. The reader remembers that a certain news has already been published before but a similar news is still circulating. Is this news fake news or not?

6.Thereader finds that the news is too outlandish or satiric. Is this news fake news or not? How can the reader verify the news based on IFLA?

7. Against how many criteria does fake news need to be verified based on the IFLA method? What is the name of each criteria?

8. There is a criterion "Ask the experts" to verify the fake news. Could you explain this criterion?

9. There is a criterion "Check your biases" to verify the fake news. Could you explain this criterion?

10. What are the benefits of stopping fake news in economic, social and cultural terms?

A.2. Please verify the news

11		☐ Real news ☐ Fake news If fake news please provide the details ....
12		☐ Real news ☐ Fake news If fake news please provide the details ....
13		☐ Real news ☐ Fake news If fake news please provide the details ....
14		☐ Real news ☐ Fake news If fake news please provide the details ....

15		☐ Real news ☐ Fake news If fake news please provide the details ……………………………………………………………………… ………………………………………………………………………