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**Werewolf on Campus: A Case Study in Inoculation Theory and Gamified One-Shot  
Library Instruction**

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## **Werewolf on Campus: A Case Study in Inoculation Theory and Gamified One-Shot Library Instruction**

Abstract: This case study details the development and results of an information literacy game in which undergraduate students evaluated fictional sources to learn how to recognize a werewolf on campus. The game relied on inoculation theory and fiction to teach students to identify indicators of mis and disinformation outside of any real-world examples that might affect their learning experience. The game showed promise as students were far more engaged and demonstrated better retention later in the semester than students who received a more traditional lecture about disinformation and source evaluation. However, the game would likely be more effective if it were expanded beyond the one-shot model.

Keywords: gamification, instruction, one-shot, inoculation theory, fiction, information literacy, media literacy, misinformation, disinformation

### **Introduction**

Gamification based on inoculation theory shows promise in improving student engagement and learning during one-shot library instructional sessions on information and media literacy. Gamification is the process of adding gameplay elements into other contexts, such as education, to address a particular problem or challenge (Lee & Hammer, 2011, p. 1). Inoculation theory describes the attempt to address mis and disinformation by teaching people to recognize its markers before they encounter specific false claims, thereby preventing them from believing the incorrect or deceptive information (Roozenbeek et al., 2020). Gamified inoculation theory in the classroom uses games to teach students the skills they need to effectively guard against real

world mis and disinformation. Conveying enough information to teach applicable skills while holding students' attention during a limited interaction is a known challenge for academic librarians (Cook, 2022, p. 746). The researcher and author of this article began this project as a way to address obstacles that persisted even after adding basic, gamified elements to undergraduate information literacy one-shot instructional sessions. Using real world examples when discussing unreliable sources often caused students to withdraw and participate less. The examples might be too politicized, such as election security, too stressful, like gun violence statistics, or else too obvious, too personal, or simply too overwhelming to easily encapsulate. Students could not benefit from a gamified approach if they would not engage due to concerns over content or potential disagreement with classmates.

However, misinformation, disinformation, and unreliable sources show consistent indicators of fault regardless of topic (Lewandowsky & van der Linden, 2021, p. 16; Pilditch, Roozenbeek, Madsen, & van der Linden, 2022, p. 2). Using gamified inoculation theory presented via a fictional scenario to teach about those indicators could potentially solve the engagement problem while still working within the confines of the one-shot. Accordingly, the researcher set out to design an activity around fictional sources that would reduce the barriers of political, stressful, obvious, personal, or overwhelming topics. In theory, students would be able to engage in active learning while looking at the actual indicators of unreliability instead of making judgements based on what they already knew of the example topic. That would then translate to a greater understanding of source evaluation techniques and how to apply them in the real world. The researcher developed and deployed a game in which students had to look at fictional sources of variable quality to determine whether there was a threatening werewolf on campus, and if so, how to identify it. Students took pre, post, and retention tests to determine the

effectiveness of this approach. Other students received a more traditional lecture with real world examples and took the same assessment tests, providing a comparison to those playing the game.

With this case study, the researcher hoped to determine whether playing a fiction-based game during a library one-shot could prove more effective than a lecture in helping students build resilience against misinformation they encountered outside the classroom. Although other studies have explored gamified library instruction regarding information literacy, this adds further data to an important area of pedagogy by focusing on the game's use of fiction and inoculation theory.

## **Literature Review**

Many recent studies have demonstrated the effectiveness of gamification in education across subjects and age ranges from elementary through graduate school. The aggregated gamification research of the last twenty years indicates that using well-designed games to teach is both more effective and more engaging than traditional models (Manzano-León et al., 2021, p. 11). Despite the wealth of evidence and increasingly frequent gamification panels at academic conferences, the lecture seems to remain dominant for undergraduate learners (Kovarik et al., 2022, p. 5; Stains et al., 2018, p. 1469). Major hurdles to implementing games or simulations include the necessary time and effort that goes into preparation along with gaining buy-in and participation from uncertain students (Moore-Russo et al., 2018, p. 4). However, the more students engage with a game and enjoy it, the more likely they are to learn from it (Brom et al., 2016, p. 337). Role playing games that require students to imagine themselves making decisions in a fictional or constructed scenario proved particularly effective in engaging critical thinking in other studies (Blanchard & Buchs, 2015, p. 11; Zeller, 2018, p. 334). Additionally, playfulness in

class activities motivates students to learn, improves soft skills, and is generally equally effective when compared to more traditional classroom learning (López-Fernández et al., 2021, p. 103129)

Gamification also shows strong promise in addressing the rampant challenge of so-called fake news and the tremendous volume of misinformation that students encounter every time they go online (Lewandowsky & van der Linden, 2021). Particularly, a gamified approach to inoculation theory has helped other study participants learn to recognize misinformation across a surprising range of subjects. Inoculation theory looks at “how to build psychological ‘immunity’ against online misinformation” (Roozenbeek et al., 2020). It has shown promise in education about politics, health, vaccines, climate change, and general scientific information (Compton et al., 2021, p. 2). For example, researchers in one study developed an online game called Fakey to address poor media literacy practices on social media and “confirmed that the game can enhance information evaluation skills and increase digital literacy” via inoculation (Micallef et al., 2021, p. 17). In another case, researchers developed an inoculation based game called Go Viral in response to Covid and found it “positively impacts people’s ability to identify misinformation about the virus for at least one week after playing, and significantly reduces intentions to share misinformation with others” (Basol et al., 2021, p. 14). Currently though, many broad information literacy efforts, including those using inoculation theory, rely on more traditional teaching methods such as reading persuasive articles and fact checking (Compton et al., 2021, p. 9).

Gamified inoculation improves engagement and can be easily modified to include new technology, address new false claims, and generally respond in an active way to upcoming threats (Alsawaier, 2018, p. 63; Basol et al., 2020, p. 466). When a game is fun, people are more likely to both engage with it and share their experiences with it, which improves its

effectiveness. This then gives it a stronger chance of competing with the “virus” of false claims when compared to conventional fact checking (Lewandowsky & van der Linden, 2021, p. 37).

While games tailored to specific lessons and contexts tend to generate better results, broadly applicable games can still “kick off important conversations” (Rumore et al., 2016, p. 20). This feature can be especially useful when dealing with challenging or confusing topics.

Using real world propaganda and disinformation techniques in games allows students to practice recognizing deceptive or incorrect claims in a low-stakes environment. These methods include emotional and inflammatory language, creation of conspiracy theories, attempts to discredit the correct claims, false experts, and questionable motives (Roozenbeek et al., 2020). Additionally, using fiction rather than real world examples allows students to explore sources and ideas without either being swayed by real knowledge of specific claims or worrying about getting an incorrect answer. The inherent lower risk of a fictional game can increase engagement by encouraging students to mentally gamble on a wrong answer because it will not negatively reflect on their real views or knowledge (Basol et al., 2021).

Furthermore, directing students to engage in problem solving with incomplete knowledge or instruction can also be an effective pedagogical tool. The combination of students working to discover the answer on their own followed by formal instruction has proven effective in other academic scenarios (Sinha & Kapur, 2021, p. 790). In a video game based on virology, “the players who benefited the most from the game were not the ones who completed it easily, but the ones who struggled through it... Even when players complain about the difficulty, similar to PF [productive failure] environments, struggling until you succeed appears to support learning” (Anderson et al., 2018, p. 142).

Repetition of claims was another significant element included in the game since repeating an unknown claim makes people both more likely to believe that claim and also more likely to remember the details (Dechêne et al., 2010, p. 242). “Illusory truth” caused by repeated exposure to misinformation, in combination with other factors, can make people far more likely to buy into false claims (van der Linden, 2022, pp. 461–462). Thus, both accurate and inaccurate statements in the game were repeated to simulate the repetition seen on social media and from those deliberately spreading disinformation. Researchers on other games also found that increased playtime led to increased retention, suggesting a repetitious or longer-form approach may be beneficial (Micallef et al., 2021, p. 16). Repetition in the gamified classroom environment can help counter repetition of real world false claims.

## **Methodology**

The researcher gathered data from select undergraduate classes during the 2022 – 2023 school year. They administered pre-tests to determine students’ general knowledge of source evaluation, and then either introduced the werewolf game or gave a lecture-based presentation on source evaluation indicators of mis and disinformation. Students took a post-test after completing the game or hearing the lecture. Approximately nine weeks later, the professors for all the courses involved issued a retention test to their students and passed the results on to the researcher. The researcher then coded the qualitative test responses for analysis and comparison.

The pre-test asked students to list up to five indicators of mis/disinformation or an unreliable source. If they did not have answers for all five, they were instructed to leave the lines blank. The terms misinformation and disinformation were respectively defined for students as information that is incorrect and information that is deliberately created to deceive. The presence



of either would make a source unreliable when trying to determine the accuracy of a claim. Then students in the game-playing classes were presented with the fictional scenario: reports are circulating of a werewolf on campus. Within the game, participants could assume that werewolves are real and intend to eat people. Werewolves do not want to be caught and will take measures to hide themselves or confuse the issue. A mix of sources from various authors and organizations discuss the alleged threat and suggest ways to identify werewolves before they can eat anyone. It was the students' job to read through all the sources and, using real world indicators of unreliable information, determine which sources were reliable, and therefore how to accurately identify a werewolf.

Before beginning the game portion of the activity, students received a list of all the possible answers, but they did not know how many answers were correct. They did not receive any initial guidance on how to make determinations of accuracy or reliability either. Students then got into groups of three to five to work through a physical packet of eight sources (See **Error! Reference source not found.**[FigShare: Game Materials & Sources](#)). Two of the sources, modeled on an article from the local newspaper and an infographic issued by the university, were accurate within the fictional structure. Another was technically accurate, but distinctly outdated.

Three sources contained a mix of accurate claims and misinformation, designed to imitate unverified internet sources like inexpert blogs and social media posts. Two contained active disinformation. One of those was an ad seeking to profit from the werewolf-incited chaos, and the other was an article written by the werewolves themselves to discredit the accurate information that might lead to their capture.

Students could use a QR code provided in the source packets to take an online quiz asking first if there was a werewolf on campus, and second, how to recognize one. The quiz

immediately told them whether they had the correct combination of answers or not, and they could retake it multiple times. After roughly 20 minutes, the groups came back together to go over the sources and correct answers. The researcher broke down each source step-by-step, describing all the indicators of either reliability or unreliability for the students (See [FigShare: Werewolf Game Slides & Discussion](#)). At the end, students learned specific details about source evaluation and had a brief discussion of real-world examples. Then, students took a post-test, again asking them to list up to five indicators of mis/disinformation or unreliable sources. They also had the opportunity to provide anonymous feedback on the activity. The professors of each class issued a retention test identical to the pre-test roughly nine weeks after their students played the game.

The werewolf game paralleled recent games designed for inoculation studies about scientific misinformation, including the creation of a fully fictitious scenario, elements of playfulness that make engagement feel lower-stakes, drawing inspiration from real world propaganda, and using real misinformation-spreading methods to create the game details (Roozenbeek et al., 2020). It also required that students assess the sources without first receiving instructions about indicators of reliability, and it included easily applied real-world parallels. The fictional element sought to avoid overtly political topics, issues the students could already clearly identify as false or unreliable, and to increase their confidence in trying to determine the best answer. However, it still needed to imitate real world indicators quite closely to be effective. The final product drew from several college's online resources regarding "fake news" and media literacy (Clemson University Libraries, n.d.; Coward et al., 2022; Kearns, n.d.; Polger, n.d.)

229 students in four different classes played the game and heard the accompanying break-down of the fictional sources, and 95 students received a traditional lecture with real-world

examples. All the classes discussed the same IF I APPLY acronym as a basis for summarizing and discussing source evaluation and indicators of unreliability (Phillips, 2019). The acronym serves a similar purpose to the better known CRAAP test. The first two words, “If I”, focus on a researcher’s personal actions while the latter part offers various considerations about the source itself.

I - Identify any personal emotions related to the topic

F - Find a mix of quality, reliable sources

I - “Intellectual courage is needed to seek authoritative voices on the topic that may fall outside your comfort zone or thesis” (Phillips, 2019).

A - Authority

P - Purpose or point of view

P - Publisher

L - List of sources

Y - Year of Publication

All the classes involved were for lower-level undergraduates attending a large state university, with majors in informatics, emergency preparedness, homeland security, and cybersecurity. All the classes received identical pre-tests, post-tests, and retention tests, and all students were aware the tests were part of a case study on teaching methods. The control group students in the lecture-based class heard exclusively real-world examples and anecdotes to illustrate each of the categories, indicators, and actions fitting the IF I APPLY framework. The class selections for the game and control groups meant that none of the students hearing the lecture were likely to be in a class that played the game. All responses came from students’ prior

experience and education rather than hearing this specific content via library instruction within the last semester.

The student responses to the three tests were sorted into spreadsheets based on whether they played the game or heard the traditional lecture. From there, each response was coded twice. The first level of coding, as shown in Table 1, determined each answer's general accuracy, and the researcher categorized each response as "accurate," "inaccurate," or "partially accurate." Unusable answers were filtered out at this stage as well.

<b>Accuracy Coding</b>		
<b>Code</b>	<b>Definition</b>	<b>Example</b>
<b>Accurate</b>	This response is a correct and/or useful indicator of un/reliability	"Fact checker says it's fake"
<b>Inaccurate</b>	This response is not correct and/or not a useful indicator of un/reliability	"Online sources that don't end in .org"
<b>Partially accurate</b>	This response is neither fully correct nor incorrect, and therefore <b>not</b> a useful indicator of un/reliability on its own	"Never heard of it"
<b>Blank</b>	The student left the line blank as directed or wrote "I don't know"	
<b>Discard</b>	This response cannot be used due to unclear meaning, obvious misunderstanding of instructions, or a joke answer	"Audience"

The second round of coding involved sorting the responses into various categories indicating reliability and unreliability. (See Appendix – Code Book) The secondary code book was an expansion of the indicators commonly taught in the CRAAP and IF I APPLY tests, supplemented with common disinformation techniques present in both the game and the lecture (Meriam Library, 2010). That list consisted of Accuracy, Authority, Bias / Opinion, Citations / Evidence, Date, Intent / Purpose, Presentation, Source of Info / Publisher, and Other. To ensure consistency, the researcher established clear definitions for each code before sorting the

responses. Nearly all the answers fit cleanly into a single category, such as classifying “look at how long ago it was published” under the Date code.

One challenge that arose was a matter of phrasing. The pre and post-tests both asked the students to describe up to five indicators of an unreliable source or misinformation. On the pre-test, most did exactly that. However, on the post-test, many answers were semantically opposite: ways to verify reliability. For example, one student wrote, “States sources used to help arrive at conclusion.” Accordingly, the coding categories needed to account for both variations. Rather than noting either the presence or absence of a list of citations, both could be classified under simply “Citations / Evidence.” The broad categories also allowed a range of nuance in the responses without resulting in too many codes for effective analysis.

## Results

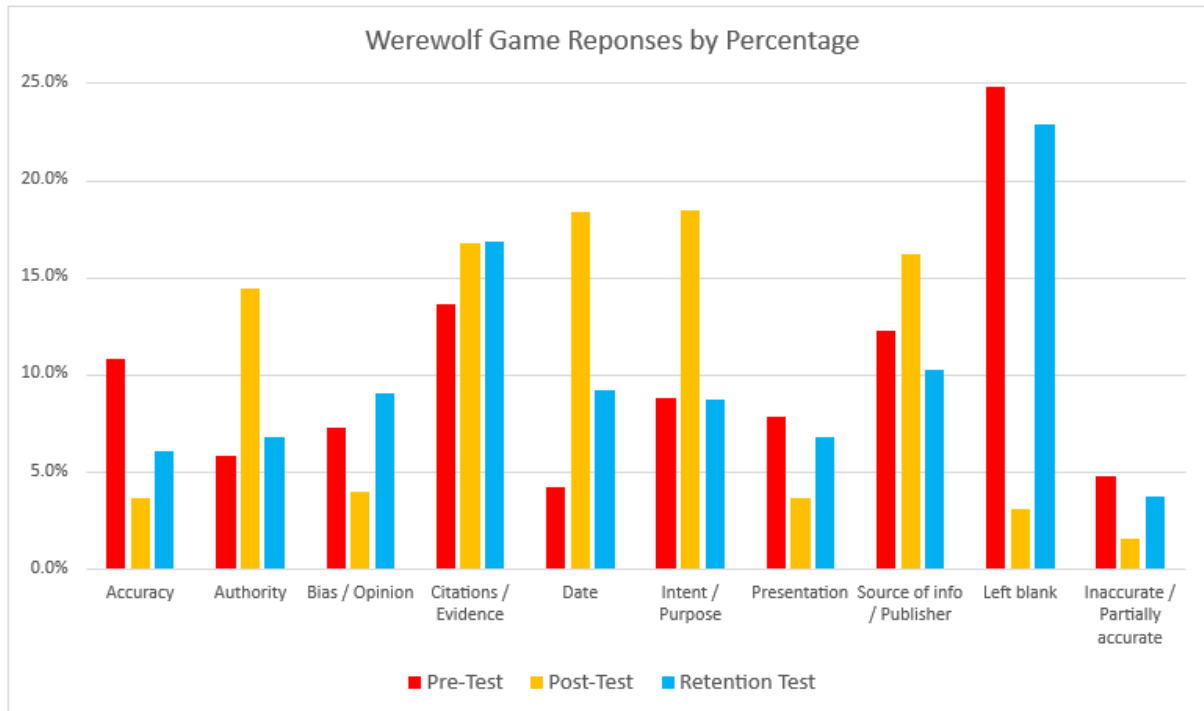
Overall, the results of the pre and post-tests indicated that students found the game engaging, and it at least temporarily improved their knowledge of misinformation indicators. Almost 25% of the pre-test responses were left blank, meaning a student took the test, but offered fewer than five answers. A few pre-tests were submitted without any responses, although most students supplied at least three answers and left the remainder blank. Nineteen students either left their class before it ended or opted not to take the post-test, but the number of blanks in the post-test dropped to three percent. Thus, nearly all the remaining students were able to list five indicators of misinformation or an unreliable source after completing the game. The number of inaccurate responses also dropped, from 4.7% to 1.5%.

<b>Werewolf Game Responses by Number &amp; Percentage</b>						
<b>Category</b>	<b>Pre-Test #</b>	<b>Pre-Test %</b>	<b>Post-Test #</b>	<b>Post-Test %</b>	<b>Retention Test #</b>	<b>Retention Test %</b>

<b>Accuracy</b>	123	10.80%	38	3.65%	34	6.02%
<b>Authority</b>	66	5.79%	150	14.42%	38	6.73%
<b>Bias / Opinion</b>	83	7.29%	41	3.94%	51	9.03%
<b>Citations / Evidence</b>	155	13.61%	174	16.73%	95	16.81%
<b>Date</b>	48	4.21%	191	18.37%	52	9.20%
<b>Intent / Purpose</b>	100	8.78%	192	18.46%	49	8.67%
<b>Presentation</b>	89	7.81%	38	3.65%	38	6.73%
<b>Source of info / Publisher</b>	139	12.20%	168	16.15%	58	10.27%
<b>Other</b>	0	0.00%	0	0.00%	0	0.00%
<b>Left blank</b>	282	24.76%	32	3.08%	129	22.83%
<b>Inaccurate / Partially accurate</b>	54	4.74%	16	1.54%	21	3.72%
<b>Total</b>	<b>1139</b>	<b>100%</b>	<b>1040</b>	<b>100%</b>	<b>565</b>	<b>100%</b>
<b>Discard</b>	6		10		0	
<b>All responses</b>	1145		1050		565	
<b># students</b>	229		210		113	

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Table 2: “Werewolf Game Responses by Number and Percentage” shows a breakdown of all the coded responses to the pre, post, and retention tests for the students playing the game. 89% of the incorrect or partially correct responses in the pre-test pertained to the source of the online information, as did 100% of incorrect or partially correct responses in the post-test. They either addressed the website’s domain or indicated that a source without sufficient name recognition was suspect. The other 11% in the pre-test were answers relating to personal bias or experience such as “Does it fit my beliefs?”



*Figure 1*

Interestingly, the trends among accurate answers shifted between the pre and post-tests, as demonstrated in Figure 1, “Werewolf Game Responses by Percentage.” Student responses that fell under the categories of Accuracy, Bias, and Presentation all dropped. The categories of Authority and Intent showed notable increases, and Source of Information / Publisher saw an increase as well. The number of responses referencing poor spelling and grammar dropped, as reflected in the drop in Presentation category responses. Similarly, broad answers like “clickbait” were high in the pre-test, with that specific word appearing 49 times, but far less present in the post-test where it only appeared in eight responses. The Date category showed the largest jump, growing from 4.2% to 18.4% of the total responses. The numbers indicate that many of the students who left blanks initially added a response about determining whether a source is outdated. Answers in the Citations / Evidence category also increased, although that category was already high in the pre-test. The highest category in the post-test was Intent / Purpose.

Results of the retention tests were similar to the pre-test answers overall. Only half the number of students responded compared to the pre and post-tests, which makes the results less reliable. Nonetheless, the retention test results offer some insights. The percentage of answers regarding Bias, Citations / Evidence, and Date were all higher than the pretest. Aside from blanks, the most common responses fell into the Citations category. Retention was not ideal, but as shown below, the game playing group demonstrated higher retention than the lecture group.

<b>Lecture Responses by Number &amp; Percentage</b>						
<b>Category</b>	<b>Pre- Test #</b>	<b>Pre- Test %</b>	<b>Post- Test #</b>	<b>Post- Test %</b>	<b>Retentio n Test #</b>	<b>Retentio n Test %</b>
<b>Accuracy</b>	42	8.86%	32	7.48%	45	11.90%
<b>Authority</b>	24	5.06%	59	13.79%	23	6.08%
<b>Bias / Opinion</b>	31	6.54%	16	3.74%	38	10.05%
<b>Citations / Evidence</b>	29	6.12%	36	8.41%	31	8.20%
<b>Date</b>	12	2.53%	58	13.55%	10	2.65%
<b>Intent / Purpose</b>	36	7.59%	43	10.05%	37	9.79%
<b>Presentation</b>	41	8.65%	4	0.93%	28	7.41%
<b>Source of info / Publisher</b>	83	17.51%	65	15.19%	53	14.02%
<b>Other</b>	1	0.21%	1	0.23%	0	0.00%
<b>Left blank</b>	155	32.70%	111	25.93%	105	27.78%
<b>Inaccurate / Partially accurate</b>	20	4.22%	3	0.70%	8	2.12%
<b>Total</b>	<b>474</b>	<b>100%</b>	<b>428</b>	<b>100%</b>	<b>378</b>	<b>100%</b>
<b>Discard</b>	1		7		2	
<b>All responses</b>	475		435		380	
<b># students</b>	95		87		76	

As a control group, 95 students received a traditional lecture-based lesson on indicators of reliability and misinformation and took the same pre, post, and retention tests. Table 3, “Lecture Responses by Number and Percentage,” shows the breakdown of those coded responses. Results from the lecture were similar to the game group, but less dramatic in their



variations, as shown in Figure 2, “Lecture Responses by Percentage.” The largest and most noteworthy variations speak to student engagement more than content.

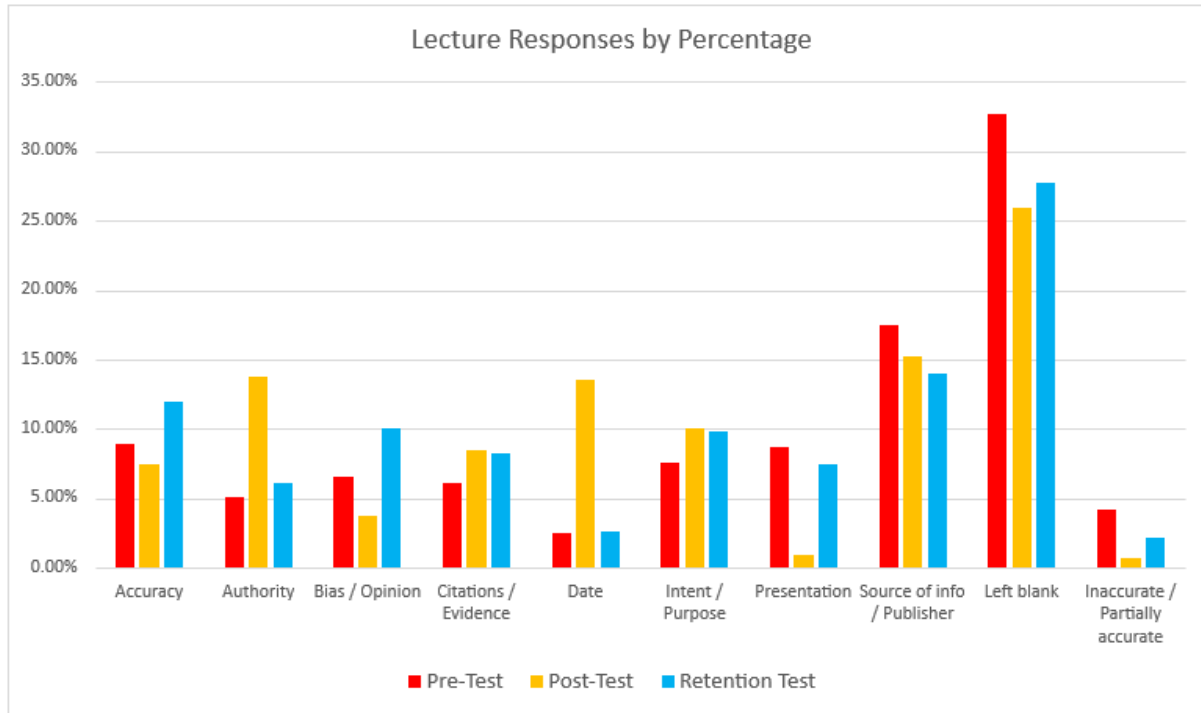


Fig 2

As expected, the pre-test results for the lecture group aligned with those of the game group. Some minor variations existed, demonstrated visually in Figure 3, “Game and Lecture Pre-Test Comparisons by Percentage,” such as a higher percentage of responses in the Citations / Evidence category among the game players and a higher number of accurate answers regarding the Source of Info / Publisher from the lecture group. The percentage of answers left blank was higher in the lecture group. Still, the student populations for both groups were similar, and the results the pre-tests were comparable.

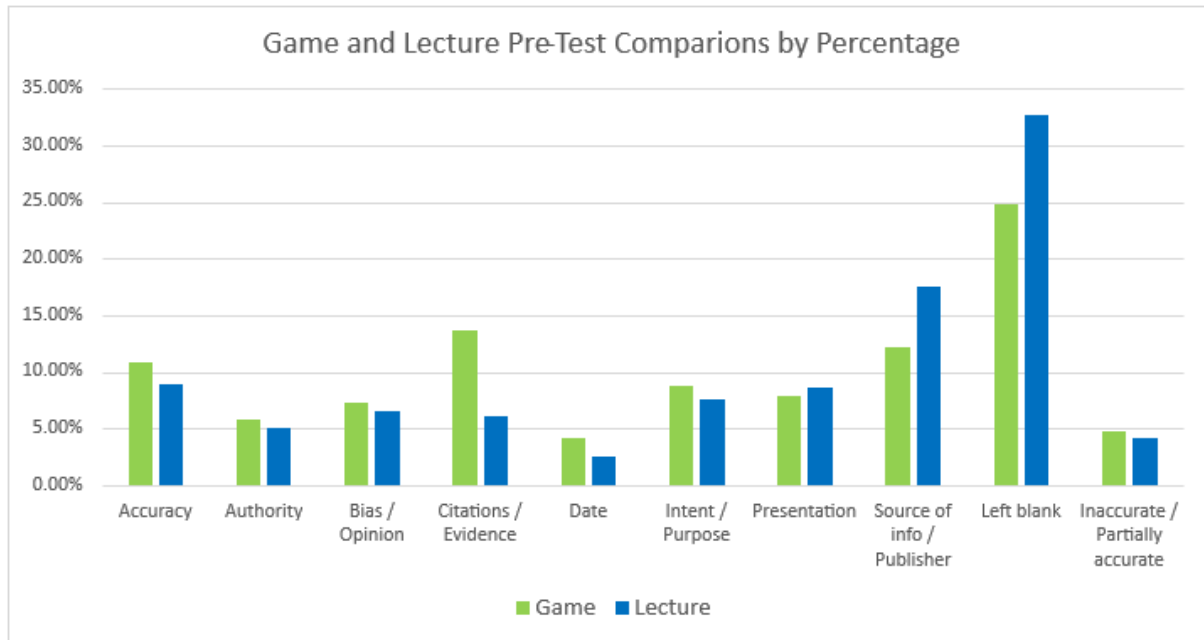


Fig 3

Comparisons between the post-tests from the game and lecture groups also showed some similar trends, although the changes were more dramatic among the game players. These are displayed in Figure 4, “Game and Lecture Post-Test Comparisons by Percentage.” Again, responses falling into the Accuracy, Bias / Opinion, and Presentation categories dropped between the pre- and post-tests for students who heard the lecture. Responses categorized under Authority, Citations / Evidence, Date, and Intent / Purpose went up. Although the percentage change was smaller among the lecture group, the general trends paralleled the game group in all those categories. Responses regarding the Source of Information / Publisher dropped among the lecture group, but went up among the game players, making it the only category trend that went in opposite directions.

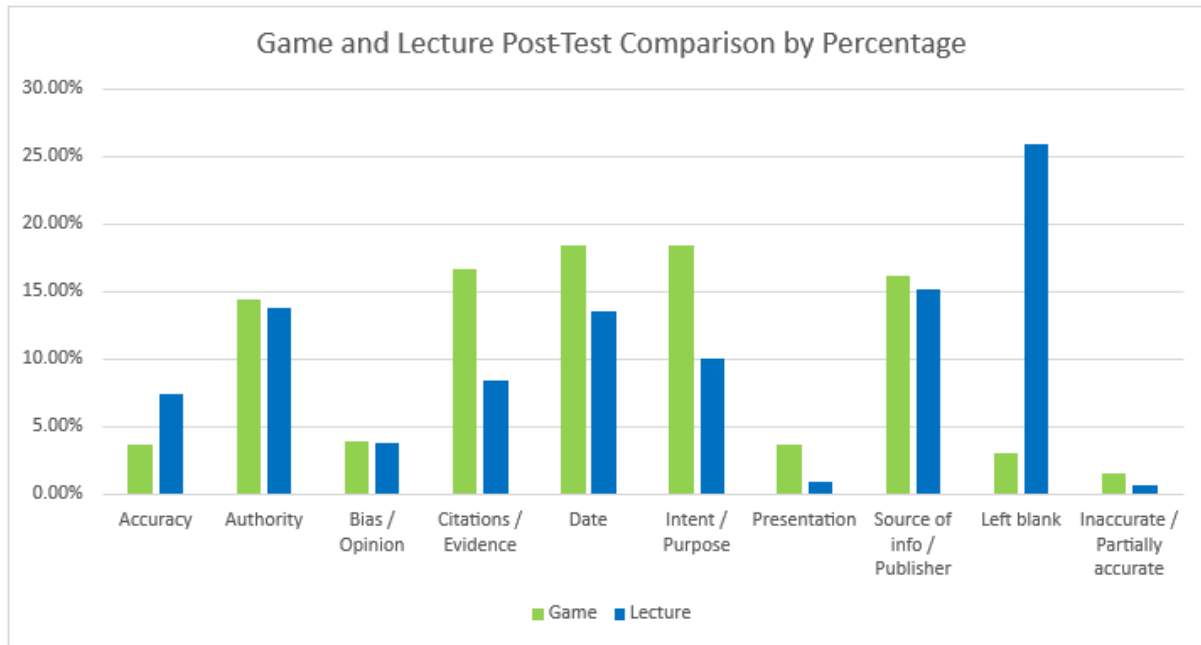


Fig 4

The most distinct variation in the post-test occurred in the answers left blank. The blank responses from the game group dropped from 282 to 32 total, a 21.6% change. However, the lecture group went from 155 blanks to 111, a much smaller 7.1% drop. The rate of students remaining in class was the same across both groups. Eight of the 95 students hearing the lecture either left or opted not to take the post-test, which is the same ~8% drop as the game group. Thus, the students in the game group were far more likely to supply five separate indicators of how to judge reliability or identify mis/disinformation on the post-test.

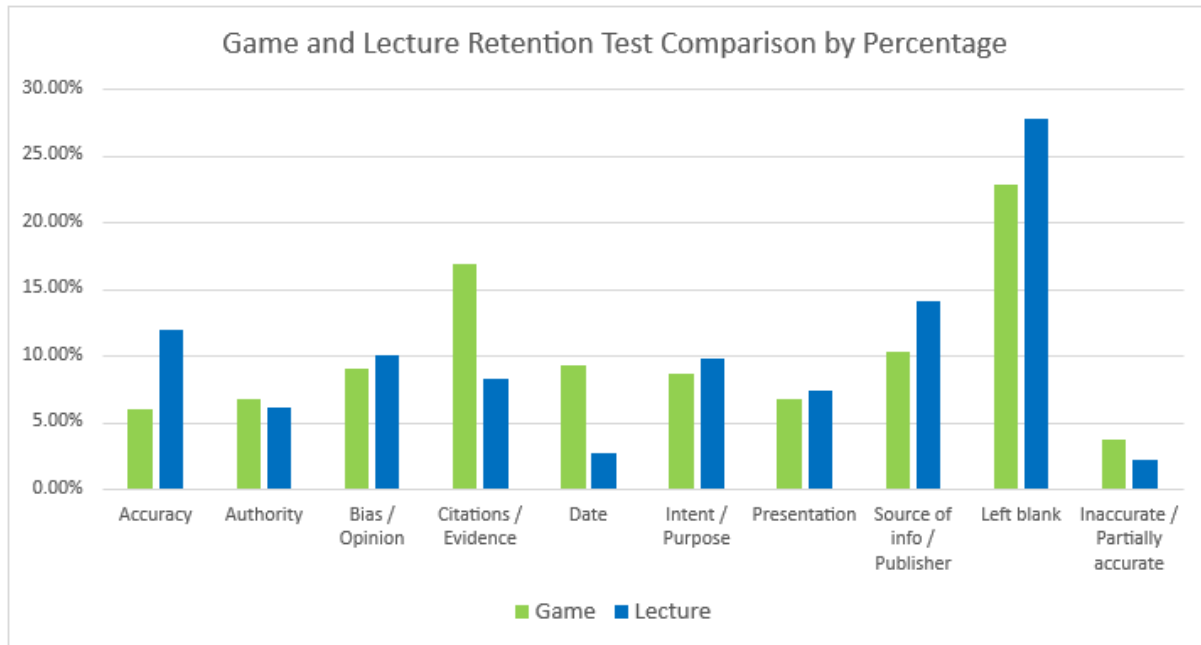


Fig 5

The retention test results from the lecture group largely paralleled the pre-test results, as seen in Figure 5, “Game and Lecture Retention Test Comparison by Percentage.” However, the lecture group did not show even the minor gains in categories like Date and Citations / Evidence that the game group demonstrated. The lecture retention test shows no significant change from the pre-test.

In addition to the better results on the post-test and retention test, direct student feedback to the game also showed positive engagement. Along with asking for five indicators of mis/disinformation or an unreliable source, the game’s post-test allowed students to offer comments, feedback, or suggestions. About half the students provided no answer, and another 41 wrote some variant of “N/A.” Fifteen students provided useful suggestions for improvement by proposing additional source types, such as videos or Reddit forums, or offering alternatives to the QR code answer system. In six total negative comments, two students disliked the werewolf theme, one found the activity too political, and the other three felt they did not receive adequate

instructions. However, 39 students offered positive feedback, indicating they enjoyed the activity and found it useful. Their comments included, “It was fun and something different from what we usually learn,” “Maybe more classes should implement this,” and “I enjoyed it and learned more about misinformation.”

## **Discussion**

The pre, post, and retention test results show considerably better student engagement and better learning outcomes with the game, which supports the overall hypothesis. The gamified instructional session enabled active learning, and more students were more confident in supplying accurate indicators of an online source’s reliability compared to those who only heard the lecture. Although there is not sufficient evidence to definitively conclude that the fictional element increased engagement compared to using real world examples, the results suggest that idea has merit. The number of students who openly enjoyed the game was also six and a half times higher than the number who disliked it. As with any method of instruction or presentation, gamification may not work for everyone. However, the results of this case study along with the other studies referenced in the Literature Review indicate that most students like and benefit from the gamified approach. The retention tests suggest that one-shot games are more effective than one-shot lectures, although neither may be the most effective long-term teaching tool. The lecture retention test showed no significant change from the pre-test, whereas the game-playing group showed somewhat higher retention rates. Although better ways to embed the gamification and fictional elements may exist, they appeared to increase engagement and learning despite only being used in a single class session.

The details of student responses proved instructive as well. Some shifts in response categories may indicate that students tailored their answers to mis and disinformation indicators explicitly mentioned in the game or lecture. The pre-tests for both garnered multiple responses related to poor spelling or clickbait-style headlines. However, neither the game nor lecture directly addressed those considerations, so students may have altered their answers to reflect concepts specially mentioned during that class period. This likely accounts for the drop in the categories of Presentation and Bias / Opinion and corresponding increase in Authority and Intent, particularly in the game group. Multiple fictional sources were manipulative or sought to profit, and those heavily influenced the post-test answers.

Some students also provided more specific or nuanced post-test responses that fit better into other categories. Many who wrote “opinion” in the pre-test seemed to switch to a response regarding an author’s credentials. For example, one student wrote in the post-test, “Is the writer a reliable person? Or are they... just someone with an opinion?” Although the word opinion was included, this response was categorized under Authority since the answer focused on the hypothetical writer’s credentials. Many of the pre-test answers indicated an inclination toward instinct over specific indicators, such as “suspicious,” “seems ridiculous,” or “too good to be true.” Based on the post-test results, these responses largely shifted to evaluations of authority and the source of the information itself. The students playing the game often had the tools to discern the correct answers, but they may not have realized that at first, or been able to name and classify the indicators of unreliability. Creating an environment where they could work together to determine the correct answers followed by a debrief that explained the methods and concepts more formally made the game an effective teaching tool.

Similarly, the one major divergence in answers between the game and lecture post-tests may be explained by which elements were more memorable. The Source of Information / Publisher category saw a post-test increase among the game group and a decrease in the lecture group. The lecture addressed publisher reliability and how to determine the source of a claim, but students playing the game had to grapple with that consideration much more tangibly. Likely all the students involved in both groups were previously told not to listen to “fake news” or unreliable sources, but looking for indicators of unreliability in a completely new context seemed to make that category more significant for the game group.

Notably, the idea that .org, .edu, and .gov websites are inherently reliable while .com cannot be trusted proved persistent across both groups. Despite being addressed in the game and the lecture, the inaccurate post-test responses still focused on website domain. Given that many reliable news sites are a .com domain, that .org is virtually meaningless, and that other domains are beginning to proliferate, this gap is worth addressing among undergraduate students. Although the game did not focus on this point, an overreliance on the inherent accuracy of information from .edu and .gov sites is another potential concern (Hackstadt & Adams, 2022, p. 27). Librarians and professors could reconsider how to present information about website domains whether they use the gamification model or not.

### **Challenges and Next Steps**

Based on other studies of gamified inoculation against misinformation, the werewolf game would be more effective with longer term play and greater repetition. The drop in retention correlated with the findings of other researchers, so that element clearly must be addressed (Lewandowsky & van der Linden, 2021, p. 36). A longer-form approach more akin to a multi-

session role playing game would likely be more effective (Micallef et al., 2021, p. 16). Such a set up may require an opt-out possibility for students who do not wish to engage in gamified learning. Adding multiple game sessions with additional source types or expanding the game to allow greater exploration of the fictional sources may help to cement students' understanding of both the more obvious indicators, such as consistent poor grammar, and more subtle attempts at emotional manipulation.

Accordingly, the researcher would like to run a follow-up case study expanding the game beyond the one-shot and gauging its effectiveness compared to the results shown here. A semester-long werewolf hunt is unorthodox but has great potential. Anecdotally, several professors have expressed greater interest in a more in-depth study after seeing the game successfully completed in their classes. Developing a fully electronic version would provide increased flexibility, allowing the addition of more audio-visual elements and creating a way for remote students to play. It would also allow students to practice following links to evaluate the fictional sources used.

Changes in assessment such as having students practice with real world mis and disinformation after playing the game could be easier in an electronic format and might provide more precise insights. In addition, future studies could benefit from a direct before and after comparison of students' answers in a way that does not compromise their anonymity. That would determine more clearly if individuals are indeed becoming more specific and nuanced in recognizing and naming indicators of reliability. Adding in other researchers and working with different student populations could expand the study by providing additional and more robust data. Now that the game exists and is shown to be a useful teaching tool, it will be easier to use it in multiple undergraduate classes, make adaptations or expansions, or create a version more



easily deployed to a wider audience or different schools. Collaborating with others developing similar gamified inoculation activities would expand the game's reach and potentially save instructors time and effort in original development.

## **Conclusion**

This case study demonstrates that gamified, fiction-based media literacy instruction is more effective than a lecture in improving student engagement and learning, and it can help "inoculate" undergraduate student against mis and disinformation. Thus, the game offers an effective solution to the initial problem of undergraduate student engagement during library instruction sessions on information and media literacy. Consistent assessment and refinement of this method will ensure its adaptability to the ever-evolving problems posed by mis and disinformation. Incorporating repetition of the content throughout the semester would likely improve student outcomes since retention levels were lower than ideal. Nevertheless, this study was certainly a small victory in pushing the limits of all-too-common one-shot teaching as a librarian's only contact with a class, and the overwhelming challenge of addressing rampant online misinformation. The data gathered from this first run of the game offers a better starting point to argue for increased time or closer collaboration between librarians and professors in the classroom setting. It also offers support to other studies regarding the broader effectiveness of using gamified inoculation theory in university instruction.

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## Appendix – Code Book

Primary Categories	Subcategories & Definitions					
<b>Accuracy</b>	False claims (including deep fakes)	Internal consistency - source contradicts itself	External verification - claim (not) confirmed by outside sources	Spin - Info deliberately presented in a way that alters interpretation	Debunked by fact checkers	Known conspiracy theories and/or lies
<b>Authority</b>	Author's credentials (not) shown or demonstrated	Author or source of claim is (not) known and verifiable	Author has (no) experience / education / background in this field			
<b>Bias / Opinion</b>	Clear and unjustified preference for one side of a story	Overt political stance	Opinions presented without evidence or backing	Student wrote "bias" or "opinion"		
<b>Citations / Evidence</b>	Citations (not) included	Evidence for claims (not) included	Incorrect / inaccurate citations	Citations from questionable sources		
<b>Date</b>	Outdated	Date (not) included	Misrepresented date (e.g. old photo with new claim)			
<b>Intent / Purpose</b>	Emotionally, politically, or financially manipulative	Inflammatory - Attempt to generate fear or anger	Attempt to profit or sell	Clickbait - Attempt to generate ad revenue by views	Broad, divisive claims	
<b>Presentation</b>	Intrusive or irrelevant ads present	Poor spelling or grammar	Broken links	Low security websites - (e.g. http vs. https)	Generally off-putting in appearance	Poor graphics
<b>Source of Info / Publisher</b>	Domain type - .org, .com, .gov etc.	Social media, wikis, or blogs	Known sources of disinformation	Satire sites	Sites mimicking more legitimate sources	Peer reviewed articles / academic resources
<b>Other</b>	Anything else					