Disinformation Literacy:

Undergraduate Students' Perspectives on Emergent Skills and Implications for Disinformation Pedagogy

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Abstract:

This course impact study explores students' views on the importance of Disinformation Literacy (DL) at the undergraduate level at a Canadian university, the challenges of developing DL, and the best approach to develop it. Two surveys were administered during a Disinformation and Media course in a Communication Department: the first focused on eliciting the cohorts' viewpoints on DL, and the second focused on the impact of the course on their prior views on disinformation in media. Findings shed light on the change in participants' conceptual understanding of disinformation as they challenge their pre-existing perceptions through investigating real-life disinformation cases of their choice. Students developed disinformation detection competencies, using fact-finding tools mapped out over a series of scaffolded assignments. We recommend giving DL pedagogy importance in the undergraduate curricula by considering it a co-literacy of, rather than a sub-literacy, subject matter, or theme within, ML and MIL.

***Keywords*:**   Disinformation Literacy, Media Literacy, Impact of Disinformation Literacy, Students' Perspectives on Disinformation Literacy, Critical Information/Media Literacy

Introduction

In this study, we focus on the importance and impact of Disinformation Literacy (DL) at the undergraduate university level. To understand DL and how it connects with and differs from other, more well-researched literacies, let us first consider the definition of disinformation and other related terms. While fake news refers to verifiably false news articles that intentionally mislead readers (Allcott & Gentzkow, 2017), pollute information (Wardle & Derakshan, 2017), manipulate the media (Warwick & Lewis, 2017), and create information warfare (Khaldarova & Pantti, 2016), Ireton and Posetti (2018) define disinformation as the "deliberate (often orchestrated) attempts to confuse or manipulate people through delivering dishonest information to them", while misinformation misleads through creating and disseminating false information without deliberately intending to do so (p. 1). Malinformation, on the other hand, is confidential information that is intentionally changed and disseminated for corporate or personal gain (Staats, 2021). Regardless of the type of false information, the danger is in how malicious actors deliberately orchestrate such information and how digital platforms and technologies reinforce and help spread it (Dame Adjin-Tettey, 2022, pp. 2-3). There is also the factor of human error, when even well-intentioned, competent journalists make mistakes due to deadlines stress, untruthful or misleading sources, or competitive pressure (Mecklin, 2021, p. 113).

Disinformation and the need to help the public separate fact from falsehood is not a new concept. Historically, one of the first institutional efforts in this regard was managed by the Institute for Propaganda Analysis (IPA) which promoted what they called Propaganda Literacy (PL) to tackle the rising nationalism before and during World War II (1937–1942). These efforts were supported by educators, research scholars, and editors. The institute promoted studies of the channels and methods through which public opinion were influenced, published a monthly newsletter and leaflets with analyses of propagandistic rhetoric, promoted the creation of study groups to develop Critical Thinking (CL) in public schools, and raised nationwide awareness of their work. However, by early 1942, it was overcome by financial struggles due to social and political pressures as it was considered "un-American" at a time of war (Fondren, 2021, pp. 258-259). Discontinuing efforts, such as those by the IPA, only fostered an environment for more propaganda in the subsequent decades.

There is no doubt that the onus of protecting citizens, especially the younger generations, is becoming greater than ever, especially with advancements in digital technology and information sharing platforms. The responsibility to fight disinformation falls not only on journalists and other media professionals, whom we rely on to present factual and verifiable information, but it also lies with the audiences and consumers of the information in all its forms, be that textual, visual, numerical, etc. Audiences are responsible for assessing the accuracy of and validity of the information they consume and comparing it with other information sources for cross-reference. In order to tackle disinformation in this constantly changing media environment, we must update our Information Literacy (IL) skills and not solely depend on censorship but educate both journalists and media professionals, on the one hand, and audiences, on the other. Audiences need to understand news information, the ever-changing communication processes, and be critical consumers of all types of media (Dimitrova, 2022, p. 365). There is not much scholarship on DL for journalists, media professionals, or audiences or the challenges of providing DL to these players. According to Lewandovsky et al. (2012), Marshal (2017), and

O'Connor and Weatherall (2019), people tend to choose information that reinforces their world views and are influenced by algorithms and groups that corroborate their views, which stimulates polarization (Brisola & Doyle, 2019, p. 283). This brings to light the importance of DL early on in citizens' lives.

Some of the most successful DL programs have been created through joint efforts between practitioners, journalists, teachers and course designers. Frau-Meigs (2022) states that the rise of disinformation has brought journalism and Media Information Literacy (MIL) closer. The former, which presents an organized chain of news through investigative techniques (Bradshaw, 2018), and the latter, which helps audiences engage with information and media critically (Carlsson, 2019), share a common interest in fostering freedom of expression. While journalists belong in commercial establishments that have self-regulatory standards, MIL specialists are situated in civil society organizations which focus on education and interact with schools (pp. 912-913). In this respect, Mecklin (2021) states that collaborative work between journalists and educators are crucial to the success of MIL projects. For example, Alan Miller, a Pulitzer Prize-winning investigative reporter for the Los Angeles Times, founded a non-profit project, the News Literacy Project, with a virtual classroom in 2008 called Checkology to help schoolchildren navigate online information. Miller worked with an educator to create a board and a curriculum and launched the platform in a middle school in Williamsburg in Brooklyn before moving to a high school in Manhattan. The original curriculum was a drop-in unit that fits in subjects on the First Amendment, the press, the government, social studies, history, journalism, and English in middle schools and high schools. The online classroom includes interactive lessons led by digital media experts and journalists who help students learn how to recognize credible information, find reliable sources, and identify, dismiss, and debunk fake information. It also provides resources and newsletters on chosen, debunked examples of contemporary issues, such as viral rumors, conspiracy theories, and hoaxes. Students have been taught to think like journalists to empower them and make them responsible and credible in the age of information where everybody is their content creator, editor, and publisher (Mecklin, 2021, pp. 111-113).

Another example of a successful program is FactBar Edu's MIL tools which have been created though the collaboration of journalists, fact-checking experts, pedagogues, and media specialists for Finish primary schools though to empower pupils with critical thinking and information literacy skills. FactBar Edu (2018) argues that for critical thinking to be internalized, pupils need to see this skill as a set of simple, universal rules which can be used in any context. The core aim of these fact-checking, critical thinking tools is to "support and increase responsible participation on digital channels". The pedagogical advantages of fostering these skills are many; for example, they encourage systematic and careful thinking, attentiveness, a connection to current, social events, the recognition and reflection on claims, perspectives, and reasoning, data analysis and searches, source criticism, emotional control, and the development of verbal and argumentative thinking. Henley (2020) argues that the success of this Finish project derives from the fact that these tools have been made so simple, structured, and intuitive that everyone from politicians to primary school pupils are able to use them to spot disinformation, which has earned Finland the title of "Europe's most resistant nation to fake news" (pp. 11-12). Similar DL programs have not been found in the Canadian context, but Media Literacy (ML) initiatives, such as those by Media Smarts are raising awareness of how to spot

lies online and providing useful resources to 'Break the Fake' through workshops, lesson plans, fact-checking tips, and posters (MediaSmarts.ca, n.d.).

This brings to the forefront two main questions: 1) what constitutes literacy skills or competencies in DL programs, and 2) are ML and DL synonymous with one another? For years, DL has been developed as a sub-literacy or theme in secondary and undergraduate level literacy programs, mostly within ML or MIL courses; there are no dedicated courses to study it as an independent or co-literacy of ML or MIL. However, one could argue that DL skills are higher-level competencies than those developed in ML or MIL programs as they include journalistic and fact-finding skills, which elevate the kind of competencies developed to a skill set closer to those in Critical Information Literacy (CIL) or New Media Literacy (NML), bearing a more serious political, social, and economic responsibility to fight and stop the dissemination of disinformation. Nevertheless, such a description only scratches the surface of what DL competencies entail and the benefits of including DL courses as independent pedagogical entities to those that promote other ML and MIL literacies in undergraduate or even school curricula, without undermining the importance of the latter two literacies or making DL training too advanced, such as the incorporation of topic modelling methodology into the training. Understanding the subtle differences between these literacies is paramount to building DL programs fitting for different cohort ages and contexts.

The aim of this paper is to study the impact of a DL course, which a sample of students in a Communication Department at a Canadian university took in Fall of 2021. Our purpose is to gauge the success of such DL pedagogy at the undergraduate level, independent of ML and MIL pedagogy, in helping students understand, find, and combat disinformation. We highlight the need to develop an understanding of what disinformation detection competencies are and stress the need to give DL independent space in the curricula of all levels of education, not simply provide it as content or special themes under ML or MIL courses.

Literature Review

The literature provides many definitions and classifications of literacy skills and the type recommended by age group and field of study. In addition to CL which is "an evolving, multi-dimensional process of layered reading comprehension, contextual analysis, and honest reflection", Wilson (2021) lists "software literacy, quantitative literacy, historical literacy, civic literacy, media literacy, academic literacy, and rhetorical literacy" (p. 182). Each of these literacies carries a specific purpose and relevant skill sets; therefore, to understand where DL connects with these and showcase the need to consider it equally important to these skills, rather than a sub-skill of ML, and to map out the list of skills developed under some of these literacy types. We will consider below the connection and interrelation between ML, MIL, CIL, and NML skills in comparison to DL.

Aufderheide's (1993) Aspen Institute's Report of the National Leadership Conference on Media Literacy defines ML as: "the ability of a citizen to access, analyze, and produce information for specific outcomes". More recently, the National Association of Media Literacy Education (NAMLE) build their definition of ML on more traditional literacies, such as writing and reading, and add the words "evaluate, create, and act" to its definition, making ML "the

ability to ACCESS, ANALYZE, EVALUATE, CREATE, and ACT" through all means of communication (NAMLE, n.d.). This definition stresses the importance of ML's function to empowers people to be "critical thinkers and makers, effective communicators and active citizens" (Christ, 2020, p. 155). We can argue that the above skills seem to have been largely built on the principles of Bloom et al.'s (1956) Taxonomy of the Cognitive Domain which listed six levels of cognitive skills, namely, Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Iowa State University Center for Excellence in Learning and Teaching (n.d.), gives the revised version of Bloom's taxonomy, one which Anderson et al. (2001) created to reflect the changes in learning patterns since Bloom's Taxonomy was first published. The new taxonomy offers "more outcome-focused modern education objectives" and uses active verbs rather than nouns as labels for the different knowledge levels. Another significant change is the introduction of 'Create' as the highest level, making the revised list of levels: Remember, Understand, Apply, Analyze, Evaluate and Create. This new list shares "Analyze, Evaluate and Create" with NAMLE's abovementioned ML skills, but "Understand and Apply" from the revised Bloom Taxonomy can be deemed as sub-skills of "Analyze and Act" from the NAMLE list, respectively.

Scholars, educators, and practitioners see the connection between ML and DL differently; some consider the two synonymous; for example, Popescu (2020) states that ML is lacking in many societies, and lack of awareness of the methods used for and the product of disinformation is not helping people crosscheck the information they consume. Therefore, ML and media awareness skills are needed to develop an understanding of how disinformation is generated, how to differentiate between fake and real news, and how to fight disinformation (pp. 104-105). Other scholars, like Mary Kate Lonergan, an eighth-grade social studies teacher at Eagle Hill Middle School in Manlius, NY, who calls for an updating of the definition of literacy, stresses the importance of ML's benefits to empower young students to question media biases as well as their own personal biases. Cyndy Scheibe, executive director of Project Look Sharp, a media literacy organization based at Ithaca College, NY, which has been developing ML lessons and resources for over 20 years, emphasize the need to see ML as a pedagogy rather than a content area and to start ML early and at every grade level to help develop critical thinking skills (Kletter, 2020, pp. 39-40). The latter two views concentrate on early education and consider ML a macro-literacy under which DL is promoted. In this regard, we could argue that in early levels of education, ML programs can successfully serve the purpose of developing initial DL skills. However, this could imply the need to consider DL as a separate pedagogy, especially for advanced levels such as high school and undergraduate levels, one that is not connected to a content area.

Considering the connection between MIL and CIL, the UNESCO suggests that MIL is the answer to disinformation. The UNESCO (n.d.) maintains that MIL helps users learn how to wisely contribute to online and offline discussions through developing an ability to authenticate information and to properly engage with media to "promote equality, intercultural and interreligious dialogue, peace, freedom of expression, and access to information". MIL education is evolving with the expansion of media and information platforms. It is no longer restricted to the ability to read, analyze visual communication, speak, and write as was emphasized by early research such as (Ruben, 1997). Therefore, MIL is "an imperative" to tackle the effects of fake news, disinformation, and misinformation (Dame Adjin-Tettey, 2022, pp. 6-7). Brisola and

Doyle (2019) highlight the importance of MIL, reporting the UNESCO's (n.d.) recognition of the main role of information and freedom of expression in our daily lives and the work of MIL education which empowers users with the skills to understand the functions of information providers and media to critically evaluate content to make informed decisions about what they consume and produce, which helps mitigate some of the damages of disinformation. Nevertheless, they argue that CIL is more of a political stance than a concept; therefore, it cannot be an exact synonym of MIL. CIL teachers, researchers or practitioners do more than core MIL training, they "arise consciousness, stimulate emancipation and fight naturalized injustices"; they focus on the students' interests and personal experiences to engage them with what matters to them and showcase different information contexts (pp. 283-284).

Theoretically speaking, DL is closer to CIL pedagogy than any other. Brisola and Doyle (2019) believe, is a necessary investment to create critical citizens who seek and manage complex facts to identify biases in what they consume and resist disinformation. Considering that socially constructed information includes political, economic, and cultural conditions, the critical engagement with information that CIL fosters allow people to "cooperate in the collective construction of knowledge" and fight injustice when applicable. They state that, "If the purpose of disinformation is to drown people in news, critical information literacy is to help them survive the informational tsunami" (p. 284). As for NML competencies, Hameleers (2022) cites Kahne et al. (2012) emphasizing the importance of NML for young citizens to help them assess the quality and truthfulness of the information they consume online as NML creates literate consumers who understand the process of producing political information, how it is consumed, and how information is interpreted based on personal biases and beliefs. NML approaches can help to stimulate more critical skills by warning consumers about the negative impact of deceptive information (Clayton et al., 2019; Tully et al., 2020) (p. 113). The above shows that CIL skills are close to those developed in NML, which makes DL skills more parallel and aligned with CIL and NML than ML and MIL.

Research on these literacies has yielded many insights and possible effects on DL pedagogy, in terms of the best methods to help students develop disinformation competencies, and didactics, in terms of how educators approach teaching DL. The effect of one literacy on the other is inevitable. Hameleers (2022) maintains that there is little empirical research on the effectiveness of ML interventions as forms of corrective information, but in a study of the effects of NML interventions and fact-checkers in response to political misinformation in the US and Netherlands, Hameleers found that rather than depending on ML interventions alone, a combination of such interventions with support from factcheckers to refute falsehoods is the most effective way to separate the truths from the lies and lower issues in agreement in both countries (p. 123). As for MIL, Frau-Meigs (2022) argues that fact-checking and news literacy have created an effect on the fields of journalism and of MIL. Some of the risks this has caused are: MIL is reduced to news literacy, digital journalism is reduced to fact-checking, and the disinformation discourse is minimizing the emphasis on information (p. 912). Frau-Meigs also states that journalists must forge a renewed, evidence-based, and transparent 'information contract' with their audiences. This contract must be revised with the 'sharing contract' established by social media. On the other hand, MIL practitioners must use both contracts in their training in order to mitigate both the trust and digital divides. Therefore, a three-branched

transliteracy approach is fostered in which knowledge about media, documents and data is taught in MIL programs as a core subject in the curriculum (pp. 918-919).

There has also been discussion on the frequency of providing literacy interventions. In a study by Dame Adjin-Tettey (2022), an experimental group was offered one MIL training session to study its effect on their ability to identify disinformation, fake news, misinformation, and sharing intentions in comparison to a control group. It was found that of the 187 participants, more in the experimental group were able to find the fake information and were less likely to share it as compared to the control group. Dame Adjin-Tettey finds that the correlation between the increase of MIL training and the decrease in the sharing of fake news suggests the need to incorporate MIL in mainstream education and recommends that such programs be continuously revised and inclusive of people with no formal education (pp. 1-2). Also, Frau-Meigs (2022) reports that a positive impact of media literacy interventions has been found to correlate with the number of sessions (Nygren et al. 2021; Scheibenzuber, Hofer, & Nistor 2021) (p. 916). In discussions at a Westminster Forum event on March 31st, 2022, which looked at how ML can be improved and fake news controlled, the consensus was to focus on providing more educational programs since regulation of online sources cannot help the public manage information disorder (McDougall, 2022, para. 9).

Kletter (2020) lists a few program examples which offer ML and digital literacy resources that are in high demand due to the infodemic we are facing. Checklists, such as the CRAAP test which requires students to consider a source's currency, relevance, authority, accuracy, and purpose, are no longer deemed sufficient to tackle the complexities of the information being circulated and consumed online. A better example is the MediaWise's Teen Fact-Checking Network (TFCN) program in which teenagers develop their ML skills through critical analysis and fact-checking of claims on social media and news sites then share videos of themselves conducting the fact-checking steps on social media to teach others how to differentiate fact from fiction. The training and editorial videos content are overseen by MediaWise staff, who focus on developing the kind of fact-checking skills which journalists use in their investigative work. MediaWise partnered with young adult author John Green whose "Crash Course", free YouTube DL lessons focus on reading laterally, search engines processes, social media feeds, and evaluating evidence. MediaWise and the Stanford History Education Group (SHEG) released a free curriculum called Civic Online Reasoning (COR) in 2019 based on methods used by professional fact-checkers. It encouraged students to evaluate information through three questions, asking about the source behind the information, the evidence to prove it, and what other sources say about it. Students are advised to use lateral reading, to check the trustworthiness of the information they find on one website by looking through other websites for the same information, and reverse image search, to evaluate and find the origins of the photos they see online (pp. 38-41).

One of the studies at the SHEG was conducted by McGrew et al. (2017) who administered 56 tasks to middle, high school, and college students in 12 states between 2015-2016. Three competencies of civic online reasonings were measured: identifying the source behind the information, evaluating the evidence presented, and investigating what is said by other sources. Analysis of 7,804 responses reveal 'troubling' findings. For example, 70% of 200 high school students chose eye-catching information rather than considering the purpose and

source of each item, 82% of middle school students failed to identify sponsored content, more than 40% of 201 middle school students reported trusting and willingness to use a comment posted on a news article about healthcare in a research paper, and out of 58 college students and 95 advanced placement U.S. history students, 6% of college students and 9% of high school students were able to identify the backers of a news article. The researches recommend: a) teaching students to read laterally, like fact checkers, by leaving unfamiliar cites immediately and opening new tabs to leverage the strength of what is written on other cites, b) helping students practice 'click restraint' to take time selecting search results, including the URLs and text that accompany the results, before clicking on a result, and c) teaching students how to use Wikipedia like fact checkers, such as investigating the 'Talk' next to the 'Article' and skipping the text to navigate the references to look for more credible sources (pp. 5-9).

Kohnen et al. (2020) investigate the effect of a curricular strategy intervention on the lateral reading of eight graders to evaluate websites' credibility. Following the intervention, they found that students were more likely to leave a given webpage and investigate a source before making a judgment about its credibility. Students also developed a preference for credible sources, but a few needed more support assessing a deceptive website. Findings echoed McGrew's (2020) study, suggesting that lateral reading to investigate online sources could be taught through short interventions. In her study, McGrew found that not all the 90% of the participants who attempted to read laterally after the intervention were able to use the strategy effectively. Therefore, Kohnen et al. conclude that while strategy, skill-based information literacy holds promise, it must be supported with foundational knowledge about the kinds of sources online, a deeper understanding of the Internet's ecosystem, and how it is structured in order recognize the types of sources and websites' purposes (p. 73). Kiili et al. (2021) emphasize the importance of 'sourcing' as a practice to help students attend to and evaluate the information, they find online to consider what and who to believe before making decisions (p. 1).

Kletter (2020) reports that Mike Caulfield, digital literacy researcher and director of blended and networked learning at Washington State University Vancouver, developed a ML method known as SIFT which takes a similar approach to SHEG. It comprises of four "moves" which encourages the consumers to: 'Stop' before reading a source to ask themselves whether they have enough information about the source, 'Investigate' the source to check for expertise, reliability and agenda and purpose behind sharing the information, 'Find' trusted and credible sources, and 'Trace' the claims to their original source to corroborate whether the version of the information being consumed has been accurately presents (pp. 38-41). The above initiatives share common ground in terms of the competencies they help promote; nevertheless, there are some slight differences in approach.

Based on the above, we can conclude that the DL competencies and the process of debunking any given disinformation case requires the knowledge levels described for all four literacies, ML, MIL, CIL, and NML, not merely the former two; therefore, DL needs its own space in the curricula, not limited to themes covered within ML and MIL courses across a few classes. Some of the main macro-skills included in DL, without mapping out the sub-skills they entail, are: a) access to credible resources, fact-checking tools, software, and original sources to validate information, b) analysis of content and discourse, c) evaluation of sources, credibility, authenticity and agendas, d) application of appropriate methods to study disinformation cases,

and f) creation of connections or content to educate other users about the debunked cases. DL is closer to CIL and NML than ML or MIL as the journalistic skills, students' interest, and the political and social angels involved in DL, combined with the goal of active involvement in the fight against fake news, gives DL an added layer of citizen responsibility and ownership. In this study, we attempt to find some answers from the learners themselves to understand how we can make DL both pedagogically and didactically feasible, i.e. both learner-centered and teacher-centered.

Methods

In this study, 19 students registered in a Disinformation and Media course at a Canadian university in Fall 2021 were surveyed twice, once around the middle of the term and another at the end of the course, to collect their views on the importance, challenges, preferred method of studying disinformation in media, and the impact the course had on them. Most of the participants were third and fourth-year students in the Communication Studies Degree Program, and the rest were from various humanities and social sciences disciplines. The rationale behind conducting this panel survey is to study the impact of a 13-week disinformation course on the participants' views on disinformation and media consumption and their views on the effectiveness of the assignments and material planned in the course. The aim of the course was to help students develop both disinformation and media literacy through exploring the spread of disruptive information, whether it be disinformation or misinformation, in mass and social media. Students learned how to use fact checking tools, conduct primary research on disinformation, and practice discourse and content analysis in this field. Students also studied the effects of disruptive information on their personal lives as well as local, national, and international communities to develop a filter for truth and safely navigate information on mass or social media, unlearn or correct existing biases, avoid being influenced by the rumors and conspiracy theories in the media, and learn how to stop and report disinformation. The students were required to do the following assignments: a) student-led seminars/webinars to showcase understanding of a problem within the field, b) a reflection essay on a peer's seminar/webinar, c) an case study investigation board to showcase, through a presentation, a disinformation case, including its verified origin and the impact on the parties involved, d) an reflection essay on their own essays, supported by relevant references, e) debates, and a term paper to investigate, through primary and secondary research, a relevant topic inspired by the assignments above. The course outcomes expected that upon successful completion of this course, students would have:

1. Investigated disinformation and its impact on society, culture, or international relations through primary research, including codebooks and surveys, and secondary research.
2. Compared the ways in which disinformation is constructed and disseminated in media.
3. Identified real-life examples of disinformation versus misinformation.
4. Studied the origin of a disinformation case and the chain effects it has produced.
5. Used fact-checking tools to correct and stop the spread of disinformation.
6. Debated and presented on disinformation in media, using theory and works published in academic journals and government websites.
7. Constructed a deeper understanding of how their personal lives are impacted by disinformation.
8. Developed media literacy skills to support their everyday communication and work ethic.

The course design aligns with some of the skills practiced in Miller's virtual classroom, Checkology (described by Mecklin, 2021, above). For example, to achieve most of the outcomes above, students needed to practice thinking like journalists to recognize credible information, find reliable sources, and identify, dismiss and debunk fake information, such as viral rumors, conspiracy theories, and hoaxes. In addition, the assignments and outcomes bear similarities to the literacies practiced in Finish model described by FactBar Edu (2018) above in that students were required to use critical thinking skills to make connections between events, recognize and reflect on claims, analyze data, conduct online searches, and develop argumentative thinking. The content themes in these assignments were based on students' preference; students studied a selection of required readings to see how topic modelling and codebooks are used to investigate different disinformation cases and the impact of disinformation overall. They were trained on and encouraged to use codebooks in their investigations for their term papers since they are easier to manage than other disinformation methodology. The students picked their assignment themes, depending on personal experience with the disinformation cases or interest in the topics. However, regardless of whether the content was political, social, economic, or health related, the competencies trained and used in the assignments aligned with the ML outlined by Aufderheide (1993) and NAMLE (n.d.) as cited by Christ's (2020). For example, the ability to access, analyze, evaluate, create, and act were core competencies required to complete all these assignments. In addition, they aligned with MIL and CIL through authenticating disinformation cases in the media. Both MIL and CIL training helped students trace the disinformation cases back to their original source(s), either through using online tools, such as snopes.com, or finding credible sources that have done parts of the investigation for them. In this effect, students invested time in studying cases that interested them without being restricted to one context, tool, or source, which is what Brisola and Doyle (2019, pp. 283-284) maintain as a strength of CIL. This also suggests that DL includes a combination of ML, MIL, and CIL.

The participants were invited to give their views on the importance, challenges, preferred method, and impact of studying disinformation in media at the university level. While not the goal of the survey, it was anticipated that their views would be based on ideas from the syllabus and that they would voluntarily critique it. We explored the efficacy of the didactics used in the course through low-risk questions designed to encourage the participants to embed their voices into the course to improve it for future terms. As far as the researcher's positionality and values are concerned, the researcher set out to investigated students' feedback on their course to see the value of DL from their points of view. Holmes (2020) cites Savin-Baden and Major's (2013) three primary ways in which researchers can identify their positionality, namely, locating themselves about the subject, the participants, and the research context and process; Holmes adds a fourth component which he identifies as time or 'soul searching' (pp. 3-4). Therefore, the researcher's positionality was made clear to the students through the research description in the consent form, requesting feedback for the purpose of improving the course and understanding the importance, challenges, preferred method, and impact of a DL course such as the one in which they were surveyed could have at the university level. The fact that two surveys were conducted were explained to gage growth in perspective on the part of the participants in addition to showcasing the importance of a long-term reflection. The participants were made aware of the study consisting of two surveys through the consent form in the first survey.

The aim of the course the participants took with the investigator is to help students develop disinformation and media literacy through exploring the spread of disruptive information, whether it be disinformation or misinformation, in mass and social media. Students learned how to use fact checking tools, such as Snopes, created codebooks to conduct primary research on disinformation, learned about the principles of topic modelling to study disinformation, and practiced discourse and content analysis in this field. Students also studied the effects of disruptive information on their personal lives as well as local, national, and international communities to develop a filter for truth, safely navigate information on mass or social media, unlearn or correct existing biases, avoid being passively influenced by the rumors and conspiracy theories in the media, and learn how to stop and report disinformation. Students compared the ways in which disinformation is constructed and disseminated in media, identified real-life examples of disinformation and misinformation, created analyses of disinformation case studies and their chain effects, assessed ways of fact-checking and correcting disinformation, debated and presented on disinformation in media base on facts published in high-index academic journals and government websites, and constructed a deeper understanding of how their personal lives have been impacted by disinformation. They conducted seminars, created investigation boards of case studies, wrote reflective essays, and conducted primary research for their term papers. Basic theoretical frameworks were provided to help them achieve an understanding of their chosen case studies, for example, the difference between content and discourse analysis, the semantics of disinformation versus misinformation and message intent, how disinformation, misinformation, propaganda, and fake news spread, conformity to disinformation, types of disinformation, and disinformation spreaders.

In order to minimize the potential of undue influence of the instructor-researcher, an opt-in recruitment technique was used, and the recruitment instrument was posted together with a Survey Monkey link to the surveys on the course's site. This ensured that the students could opt into participating in the study after reading about it rather than directly receiving information about the study from the instructor-researcher, who merely invited the students to read the study section on the course page and respond as they wished, stressing the fact that data collection is anonymous and that the researcher would not be able to trace who opted in or out. The researcher was not in the classroom when the students read the study and took the surveys. The study summary included a rationale and a consent form as a first item on both questionnaires, after which the questions were listed. In addition, a request for consent to quote the participants in this study was made. As far as the length of time each survey took, six-ten minutes were estimated for each, including the open-ended questions, and participants were able to skip questions if they wished to. The participants were made aware that there was no direct benefit or risk in taking part in this study. None of the assignments or information the students produced in the course was used for this study.

Research ethics approval to conduct this study was granted September 2021. The first survey was made available in week seven of the course, from October 27th to November 1st, 2021, to collect the participants' views on DL. The participants were asked to give feedback on the following: 1) whether they had taken a DL course before, 2) how important they thought DL courses were at the university level from a range of Very Important to Undecided, 3) what challenges they were facing in the course up to that point, 4) what they thought was the best method to develop DL at the university level, 5) what their favorite assignment was at that point

in the course and why, and 6) what the most challenging assignment in the course was up to that point, and why they thought it was so. The second survey was made available in week thirteen of the course on December 1st to December 7th, 2021, to study the impact of the DL course on the participants' views on the topic. The participants were asked to give feedback on the following: 1) whether they had filled in the first survey, 2) how important they thought DL courses were at the university level, 3) what challenges they faced while studying DL, 4) what impact did the course have on their views about disinformation, 5) what their favorite assignment was and why, 6) what the most challenging assignment was and why, and 7) what advice they would give professors who teach DL at the university level, including the kind of methods (approaches) and activities they suggest be used in DL courses. Out of the 19 students invited to participate in the study, 17 students filled in the first survey, and only 14 students filled in the second survey. All 14 respondents to the second survey confirmed through the consent form of that survey that they had filled in the first.
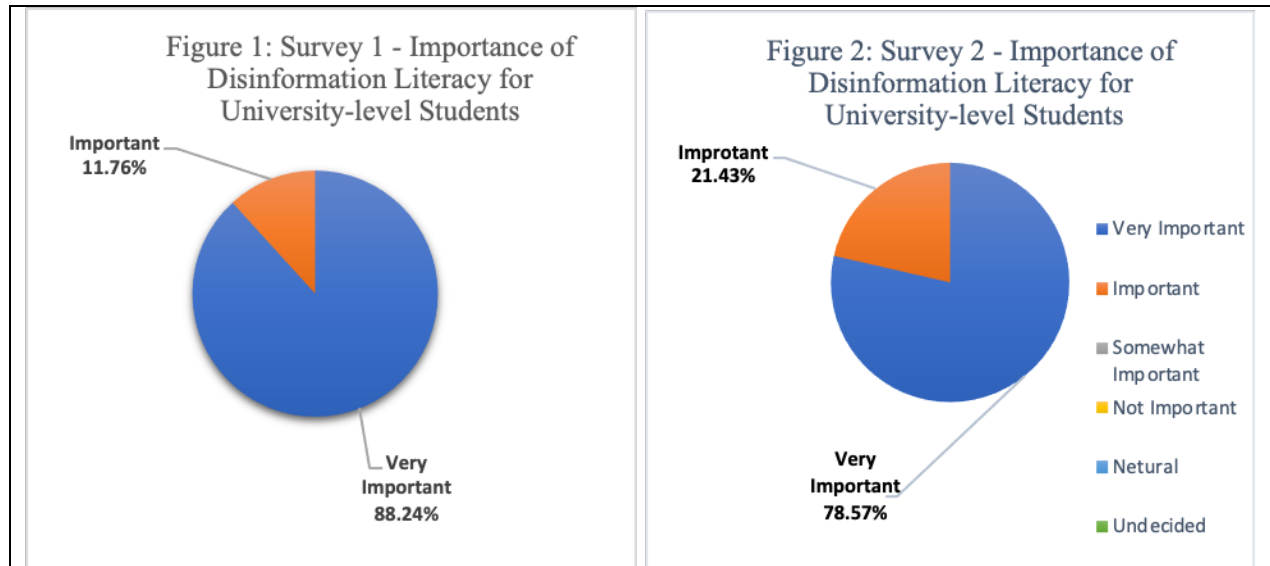
Findings

Experience with Disinformation Literacy

To answer the first question on the first survey, the participants were advised to provide a brief description of any DL courses or any courses which covered disinformation as a theme or content they had taken before the one they were taking with the researcher; they were asked to skip the question if they had never taken a DL or related course. Four participants responded, two of whom confirmed that they had not taken such courses before, and the other two stated that they have some knowledge on the topic; one of the participants said they had received 'informal' training without giving much detail, while the other said that they had taken an Understanding News course with another instructor where they had explored 'fake news and disruptive information within news outlets' as a theme or subtopic in that course. The latter student was at a slight advantage as they had some content foundation to support them. However, we have considered that foundational content, not part of DL pedagogy, as the student had not consulted fact-checking tools or conducted content and discourse analysis in that earlier course, nor had they provided a cumulative investigation of a specific disinformation case study, including the origins and effects of the case, which is what the researcher introduced the student to. It is safe to conclude that most of the sample, 94.1% of the responses (n = 16) out of the 17 participants who answered this first survey, say that they had not taken a DL course or covered topics within disinformation in any course before.

Importance of Disinformation Literacy

With respect to the importance the participants gave to DL courses at the university level, as shown in Figure 1 which is from the first survey at the early stages of the course, 88.24% (n = 15) of the 17 participants who answered this survey consider such courses Very Important as opposed to 11.76% (n = 2) who consider them Important. At that early stage of the course, this is considered an interesting finding since despite the new content and theory, the participants still considered the course of importance for university-level students, which supports the benefit and need for such courses. The results to the same question were slightly different in the second survey (see Figure 2 below), which was conducted at the end of the course. Of the 14

respondents to this survey, 78.57% (n = 11) consider DL courses Very Important as opposed to 21.43% (n = 3) who consider them Important. It is important to note that the number of participants in the second survey was fewer by 3 participants from those in the first survey; this could explain the shift in numbers; however, the fact that the participants still chose to keep the level of importance high at the end of the course indicates that the students did not lose interest in the course and still find it important.

Figure 1: Survey 1 - Importance of Disinformation Literacy for University-level Students

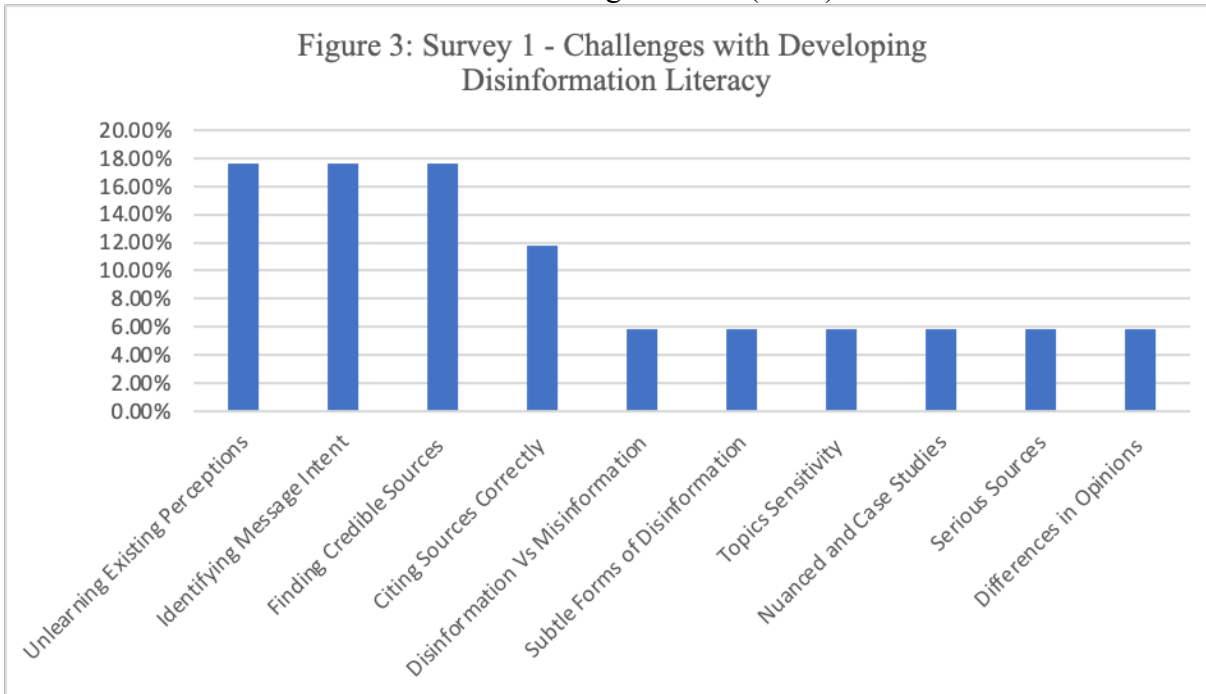Figure 2: Survey 2 - Importance of Disinformation Literacy for University-level Students

Challenges with Developing Disinformation Literacy

17 open-ended responses were gathered in the first survey on the challenges of studying DL in the course. As seen in Figure 3 below, the biggest three challenges given were: 1) unlearning existing perceptions, 2) identifying the intent behind a message and the kind of disinformation it is, and 3) finding credible sources to prove the disinformation, each of which took 17.64% of the responses (n = 3) to this question. Quoting a few of the participants can showcase how new and eye-opening the concepts of the course were to them; one participant said, "Having to unlearn things that I have been conditioned to believe has been challenging," Another participant argued that "It is hard to know what is true and what's not true. Two other participants seemed to appreciate the challenges; and another said, "The course has opened up my eyes to all of the disinformation I encounter daily. It has helped me analyze headlines/stories and taught me not to take information online at face value," and another said, "I believe it has opened my eyes to how gullible i have been in the past." In addition, 11.76% of the total responses (n = 2) gave citing sources correctly as a challenge. This is understandable as most of the sources we seek to validate information in the context of disinformation are not academic; for example, we may resort to watching an interview with a police officer or a politician to verify the information. This is a new type of research and fact-finding process for most students.
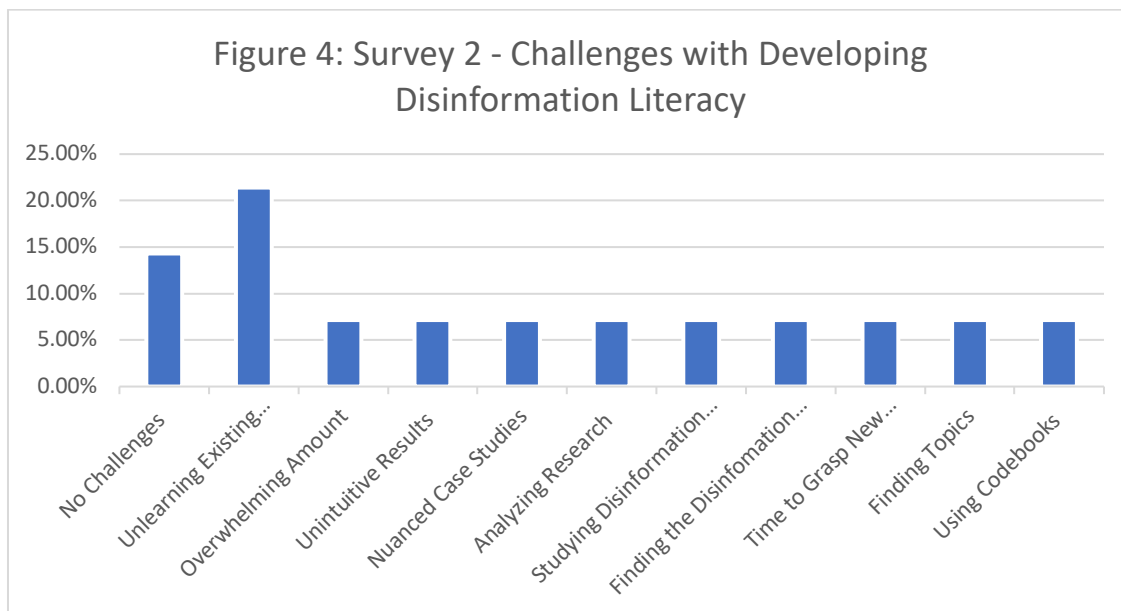
Also, other equally reported challenges are: 1) distinguishing between the terms disinformation and misinformation, 2) understanding the subtle forms of disinformation, 3) the sensitivity of the topics discussed, 4) dealing with nuanced and complicated case studies, 5)

tackling difficult and serious sources, and 6) the differences found in opinions and perspectives, each of which accounts for 5.88% of the challenges shared (n = 1).

Figure 3: Survey 1 - Challenges with Developing Disinformation Literacy

In the second survey, which was conducted at the end of the course, 14 responses were collected on the challenges of studying disinformation in the course the participants took with the researcher (see Figure 4 below). No challenges were reported by 14.28% of the responses (n = 2) which might indicate that as the course developed, these participants were able to overcome some of the challenges they faced at the beginning of the course. However, 21.42% (n = 3) of the participants reported that unlearning existing perceptions was still a common challenge for them. One participant wrote, "It was difficult to unlearn things I had absorbed throughout my life. It was also challenging to question my line of thinking in the moment when seeing potentially disruptive information." Another participant said, "It makes you think critically whenever you see something on social media or on the news." And another participant mentioned, "Have to accept the fact that our perception on subjects is different and it is essential to calm ourselves when triggered topic were brought up." This means that the course engaged students with critical reflection and new learning about the attitudes or dispositions required to make sense of disinformation.

On the other hand, other equally important challenges at this point in the course were: 1) the "overwhelming amount" of disinformation found, 2) the unintuitive results that could be found, 3) dealing with the "very different and nuanced" case studies, which required different ways to detect disinformation, 4) analyzing research to get to the root of the disinformation, 5) finding out what case is disinformation and studying the impact of it, not just the reason behind it, 6) finding the original source of the disinformation, 7) the time it took to understand the new concepts, 8) finding topics, and 9) using codebooks to do research on disinformation was "confusing but still interesting." Each of these amounted to 7.14% (n = 1) of the reported challenges in this survey.

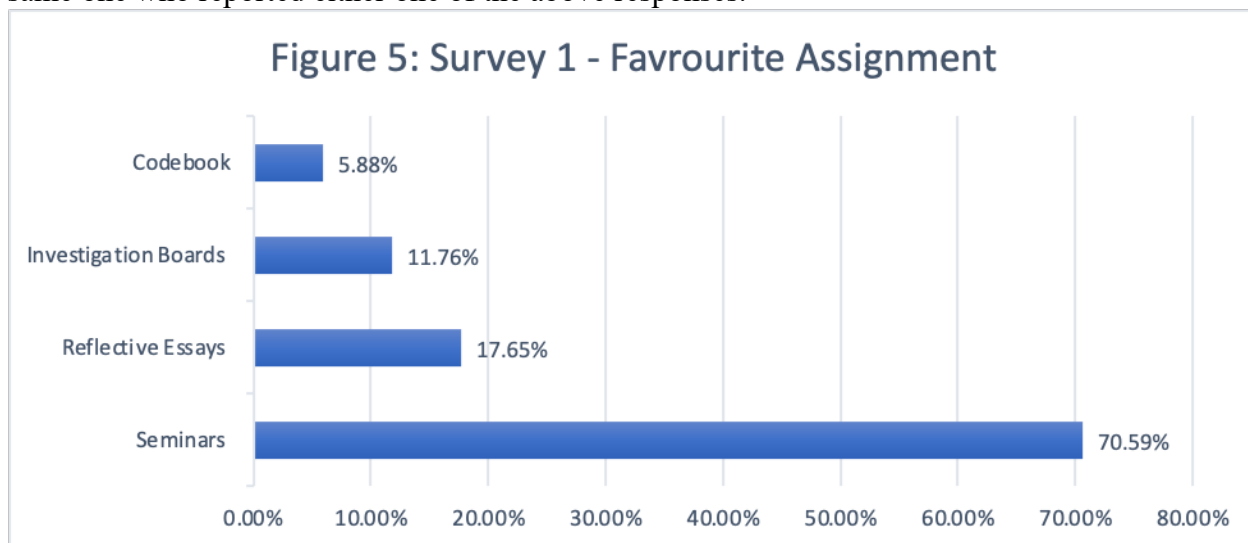Figure 4: Survey 2 - Challenges with Developing Disinformation Literacy

When comparing Figures 3 and 4, we find that while two participants were able to overcome their challenges, 85.71% (n = 12) of the 14 participants who filled in the second survey still faced some challenges. Unlearning existing misconceptions remained a major hurdle for some, and sources and research were also persisting issues; however, the type of difficulties they reported in the second survey reflect a deeper level of critical thinking than those reported in the first survey. For example, while most of the challenges reported in the first survey concerned understanding the intent behind messages to categorize them, finding credible sources to prove disinformation, and citing the sources to prove the disinformation, the new challenges at the end of the course were dealing with and exploring the underlying, nuanced results of the impact of the huge amount of disinformation spread throughout the media. These are not surprising results, considering that they were collected at the end of the course, after the participants had done primary research to find the root causes and impact of the disinformation cases they chose. We can safely say that the fact that the students remain overwhelmed by the scale and scope of the disinformation problem in contemporary life points again to the importance of developing DL pedagogies in the curricula.
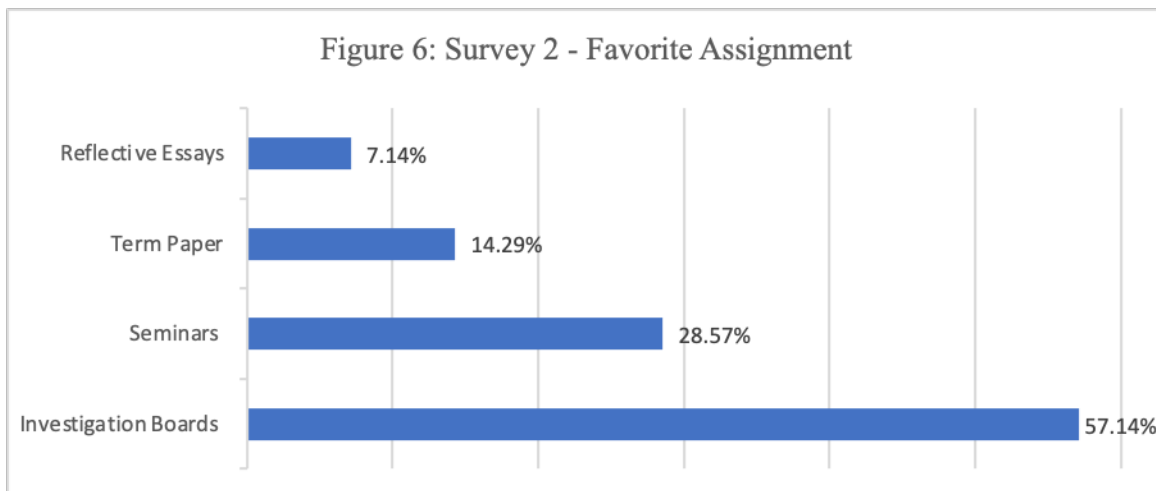
Favorite Assignment in the Disinformation Literacy Course

When asked about their favorite assignment at the early stage of their course with the researcher, 70.58% (n = 12) of the 17 responses chose seminars (see Figure 5 below). The participants gave relatively similar explanations as to why they chose this assignment; they reported enjoying the freedom to choose their own disinformation topics and appreciated the challenge and benefits of having to present them in a way that others can understand and appreciate. For example, participants wrote, "it made me understand misinformation best. Having to do a bunch of research and frame it in a way so others understand helps my learning," "It gave me a chance to look at a subject I feel strongly about and find how much disinformation there is online about it," and "I not only learned about my topic in depth but also discovered many others from the other students. I was pushed to research and question my preexisting beliefs about specific topics." The second most favorite assignment was the critical reflective essays, reported by 17.64% of the

responses (n = 3). They were required to write this, using one of their peer's seminars as the discussion point. The participants gave similar explanations to why they liked it, mostly reporting that they enjoyed the deep-level, critical thinking it required which added to their ability to express their own opinions about their peers' seminar topics. For example, one participant said, "I enjoyed being able to reflect upon myself and how I viewed my classmates' work in congruence with the effects of disinformation." Furthermore, 11.76% of the responses (n = 2) went to the case study investigation boards and their follow-up essays for which the students had to trace back a disinformation case to the source and showcase the impact of the case in the form of a investigation poster, much like those done by detectives on crimes, then write a reflective essay on their findings. It is worth noting that one participant gave two favorite assignment responses, namely, seminars and the investigation board. Finally, 5.88% (n = 1) of the responses reported that the codebook exercise which was done on fake moon landing memes was their favorite assignment. As mentioned in the previous section, codebooks were found to be "confusing but still interesting"; this shows that teaching undergraduate students how to use codebooks to conduct primary research in the field of disinformation could be a valuable exercise. At the end of the course, one student in the cohort chose a codebook to conduct their research for their term paper; however, we have no means to verify whether this student was the same one who reported either one of the above responses.

Figure 5: Survey 1 - Favrourite Assignment

In the second survey (see Figure 6 below), the results were slightly different. The case study investigation boards and their follow-up essays took 57.14% (n = 8) of the 14 responses to the survey, followed by 28.57% (n = 4) for seminars, 14.28% (n = 2) for the term paper, and 7.14% (n = 1) for the reflective essay.

Figure 6: Survey 2 - Favorite Assignment

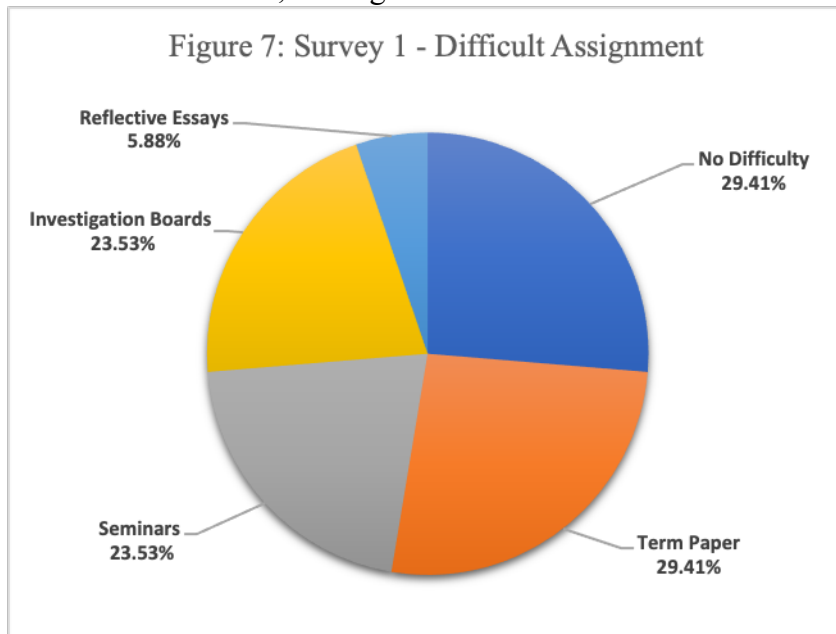|	
Reflective Essays	7.14%
Term Paper	14.29%
Seminars	28.57%
Investigation Boards	57.14%

In the second survey, one participant listed two assignments instead of one, namely, the investigation boards and the seminars. Some of the reasons given by the participants to why they enjoyed the investigation boards highlighted the uniqueness of the assignment; one participant said, "I also found it to be a refreshing assignment compared to the many identical paper assignments we seem to get across our many classes.", and another mentioned, "Mapping out the facts and sources was very helpful in seeing the bigger picture." As for why they chose the term paper, two participants reported that the new methodology they were presented with in the course, namely, the codebooks in addition to having the freedom to conduct surveys or interviews to collect data, allowed them to test their own hypotheses and experiment with new tools for research.

These findings are different in many ways to those reported in the first survey for the same question item. Participants' views regarding their favorite assignment shifted from seminars, which is what they reported in the first survey in week seven, to the investigation boards case study and follow-up reflective essays at the end of the course. The newness and visual nature of the investigation boards seemed to have played a role in changing the students' perspectives, as shown in the sample responses above. The reason could be the fact that the former were more hands-on and less theoretical; seminars provided the students in the course the basis to explore theory and research done by others, so it is understandable that they were favored earlier in the course when the material was still new, while investigation boards allowed students to use the theory for a practical purpose to trace a disinformation case of their own choice, which gave them the freedom to fact check their own perspectives and learn about those presented by their peers. The term paper also seemed to have sparked interest in further research on the participants' exciting beliefs. That, together with their interest in reflective essays, shows the participants' desire for critical thinking and fact checking, which is a good indication that the course outcomes were relevant and achievable.
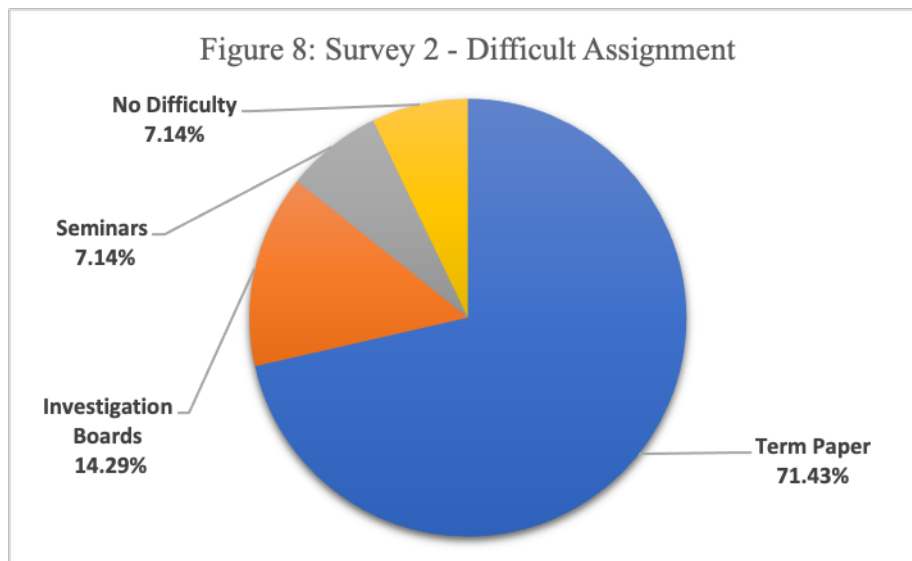
Most Difficult Assignment in the Disinformation Literacy Course

Although the question posed to the participants required one answer and an explanation, some volunteered more than one assignment option. In the first survey, which was conducted early in the course, the 17 participants reported the following: 29.41% (n = 5) reported that they did not

find anything difficult at that point of the course, which is encouraging and could show that even though the course was new to most of the cohort, its layout and expectations were well planned. Another 29.41% anticipated, since it was due at the end of the term, that the term paper would be a challenge to plan for; one participant said, "To succeed in this assignment is definitely much harder but at the same time very rewarding." Also, 23.52% (n = 4) chose the seminars mostly due to the analysis they include and the anxiety to present in front of the class, and another 23.52% gave the case study investigation boards because of the amount of research they require, and as one participant reported, they are "so new to disinformation literacy." Finally, 5.88% (n = 1) of the reported difficult assignments was the reflective essays; unfortunately, the explanation to why this was chosen was not clear; see Figure 7 below.

Figure 7: Survey 1 - Difficult Assignment

In the second survey, which was conducted at the end of the course, there was a clear shift towards the term paper (see Figure 8 below). Out of the 14 responses given, 71.42% (n = 10) found the term paper to be the most challenging assignment in the course mostly due to the primary research required within the context of DL, which is understandable. One participant said, "I am not used to conducting a survey and narrating it." Case study investigation boards were reported by 14.28% of the responses (n = 2) as the most difficult assignment in the course; one participant reported that it was hard to structure. One of the responses, equaling 7.14% of the responses, said that the seminar was the most difficult as it, "almost felt like a term project", and another participant reported to not have any issues with the course. The term paper was discussed multiple times throughout the course, but the newness of the subject matter might have made it a challenge for most students.

Figure 8: Survey 2 - Difficult Assignment

The Impact of the Disinformation Literacy Course

In the second survey, the participants were asked to reflect on the impact of the course they took with the researcher on their views of disinformation. Their answers were positive and encouraging, which highlighted the relevance and timeliness of this course for the cohort. 14 responses were given to this item. Developing a deeper awareness of the prevalence of disinformation in the media was reported by 42.86% of the participants (n = 6). One participant said, "I didn't realize how in depth the topic goes, and I feel more aware of disinformation and able to identify it." Another said, "Before taking this course, I would be aware on some of the disinformation I was faced with in my day-to-day life but finishing this course it has made me more aware that disinformation is all around me." Also, 28.6% (n = 4) of the participants agreed that the course helped understand the real danger and impact of disinformation. A participant said, "I learnt a lot more about disinformation, where people influences are the most dangerous thing as it shapes your opinion, or indirectly change your opinion without you really knowing." Another said, "Disinformation literacy is a skill that I didn't know I needed before this class. This course has truly highlighted how vital it is to navigate our society, especially with the popularity of digital media." Two participants, 14.3% of the responses, reported developing stronger critical skills; one said, "it has helped me look at things more critically and question things i see online at first glance.; and another said, "This course allowed me to critically analyze information presented on social media and question the legitimacy of the information." Another 14.3% reported changes in their media consumption practices; one reported that the course gave them "More reason to be reluctant to trust anything.", and another stated, "I have since grown wary of disinformation through many shapes and forms. This has not only cultivated my media literacy but also change the way i consume online news." These findings showcase the positive growth and change in perspective that happened throughout and as a result of taking the course.

Best Approach to Developing Disinformation Literacy
In the first survey in week seven, 16 out of 17 participants provided feedback on what they believed the best approach to develop DL are at the university level. This feedback enforced the benefits of the activities, readings and tools that were already in the course syllabus and on the

course page, e.g. studying case studies to distinguish disinformation from misinformation, tracing the original source of information online, studying the impact of disinformation, conducting primary research on disinformation, presenting seminars, roundtable discussions and debates, and providing examples of real disinformation cases that have been proven by experts as disinformation. One participant emphasized the need to develop DL at a lower undergraduate university level, arguing that it is "relevant to the younger generation in university". These are promising findings as they suggest that the course content aligned with what the students' expectations and needs.

Another approach 18.75% of the responses (n = 3) suggested is providing more and regular opportunities to attend workshops on disinformation prevention. During the course, the researcher invited two guest speakers who conducted an online workshop as part of a series on "How to Prevent an Infodemic!" The series was launched by the Saskatchewan RCMP's Crime Prevention/Crime Reduction Unit and the National Security Enforcement Section to increase community awareness and help participants identify and respond to online disinformation and misinformation, hate speech and other hate crimes, radicalization to violence and foreign actor risk. The workshop was presented by a civilian member and community program officer of the RCMP in Saskatchewan with over 20 years of experience in social service and criminal justice, which helped initiate and develop the workshop series project, together with an RCMP constable of 12 years with background in organized crime, public engagement, terrorism awareness and countering radicalization to violence. One of the three participants who commended the use of workshops suggesting that such short, informational sessions need to be available to "every student at the very least", not only as part of the one course. Another participant reiterated this, focusing on the value of the RCMP workshop to, "educate students as we usually fall prey to disinformation due to overindulgence on social media." The third participant commented that the RCMP workshop was both effective and informative and may help others understand the danger of disinformation.

Finally, when asked for advice for professors who teach DL at the university level, including the methods and activities suggested for DL courses, 13 participants responded with seven overlapping recommendations. Encouraging students to build their assignments on disinformation cases that interest them, whether be political, social, etc., and share these in class to educate their peers on disinformation within different contexts was suggested by 38.46% of the participants (n = 5), and 23.1% of the points (n = 3) suggest showcasing current trends, disinformation cases in the media, and new research throughout the term to create interest in different topics. Another 23.1% (n = 3) suggest facilitating discussions and debates throughout the course to share points of view and experiences with disinformation, and another 23.1% (n = 3) highlight the benefit of creating participatory, hands-on activities to help students apply the literacies to their daily lives. Also, 15.38% of the responses (n = 2) suggest planning a few small, low-risk assignments throughout the term, and an additional 15.38% (n = 2) emphasize the need to start developing DL early on in lower, undergraduate levels and continue the training to 4th year (n = 2). Although not required, 23.1% of the participants (n = 3) added that they liked the course the researcher had built and think it provides effective DL training.

Despite the suggestion of workshops and seminars to develop DL in the first survey, the second survey highlights the need for long-term sessions to provide relevant contexts,

methodology, tools, practice, case study analyses, and examples. This change in perspective reflects the cumulation of learning reached at the end of the course since the participants see the value of workshops and seminars on one hand and full DL courses on the other, which aligns with the benefit of more than one training session to develop literacy, see Frau-Meigs (2022, p. 916).

Conclusion and Recommendations

To understand the importance of DL courses, we must consider the danger of disinformation and how much information is being consumed, altered, and shared by users of all walks of life on topics they may have little to no knowledge about. While CL and ML have historically been focused on educating youth in schools to be critically aware of media messages, the advancements of digital technologies have left a gap in these literacies. The need for fact-checking skills to counter the every-growing threat of disinformation in media brings to light the question of whether ML courses give enough attention to fact checking and whether DL should continue to exist as a content component under ML and MIL courses rather than taking its own space as a pedagogy with its own curricula in schools, colleges, and undergraduate university level.

Disinformation detection competencies are very specific and carry a more critical purpose of inquiry than ML and MIL. We argue that it is more beneficial to teach DL as an independent (or at least co-dependent) co-literacy to ML and MIL rather than a sub-skill, micro-literacy, sub-literacy, or a content component within the two latter literacies. As one of the participants mentioned, they had received 'informal' training on how to spot disinformation in a media course, and another participant maintained that they had explored 'fake news and disruptive information within news outlets' in an Understanding News course with another instructor. However, the researcher's experience teaching the cohort to which the participants of this study belong indicate that they did not know any of the online fact checking tools, nor did they know the steps to identify, analyze, verify, or create content to debunk disinformation cases.

The participants in this investigation deemed DL an important field of study to develop at the undergraduate level, and the two surveys showed that they remained satisfied with how the course was taught despite reporting challenges while developing DL. At the early stage of the course, the biggest challenges reported were unlearning existing biases, judging message intent and finding credible sources; in the second survey at the end of the course, the latter two challenges were slightly mitigated while the former was still somewhat an issue. New challenges were reported in the second survey, but the participants mentioned some of them as interesting; for example, while conducting the research into the case studies, finding sources, and using codebooks was reported challenges.

In the first survey, the participants reported that their favorite assignment was the seminars, while at the end of the course they reported that the investigation boards were their favorite. These two assignments were scaffolded and seemed to have helped the students in the course develop a good sense of what disinformation is and how to talk about it. They studied and presented on a specific angle of disinformation in media in the seminars then used what they learned to narrow down their investigation and create an investigation board on a case study of

their choice, which required them to map out their chosen disinformation case through images, information, and data. This aligns with what other educators have found when it comes to the use of infographics; for instance, Laflen et al.'s (2021) found the use of these assignments useful and practical to teach effective and ethical data management especially when they are scaffolded, which was the case in this course for their investigative board (pp. 34-58). This also reflects the participants' growth throughout the course, especially that they were asked to tie all their work to topics that interest them, which is what Brisola and Doyle (2019) suggest engaging students (pp. 283-284). Designing useful, practical, and engaging assignments is not easy, and most are time consuming to develop throughout the course, but the value of such assignments in a course such as this outweigh many challenges.

As for the difficulty level of the assignments the participants reflected on, they repeated some of the assignments they deemed interesting, e.g., the investigative boards, seminars, and the term paper. It seems that there was a good balance between keeping the students interested and the new subject matter they had to learn, including the methodology of tracing fake news and disinformation. It is interesting that the participants did not report having issues with online fact-checking tools, such as Snopes.com among others, which they used in their investigations. The participants suggested teaching DL at all levels of education though courses, workshops, and seminars, including participatory activities to challenge students' biases and support them as they investigate, debate, present and write about real-life, diverse case studies that interest them.

This course impact study provides encouraging results; however, further research is needed to define the subskills of DL to establish an effective disinformation detection competencies checklist for different levels of education, from elementary to undergraduate university level. Use of the available fact-checking tools and free online resources, such as the limited, but useful list provided by MediaSmarts.ca, as well as collaboration between educators and practitioners in Canada, much like what is done in Finland, is needed. DL needs to be given space in elementary, secondary, and university level curricula, not as a content piece, developed under ML or MIL courses, but as an independent pedagogy to give students more time to digest, investigate, and research what interests them. One-time workshops, seminars, and lectures with a focus on DL are effective yet cannot sustain continued learning in this field to develop learners' ability to regularly question the media they consume and foster a healthy understanding of freedom of expression, one that is not used as a pretext for posting and spreading disinformation. To develop a filter for truth and automatic, fact-checking mindsets, we need DL pedagogy to be included at all levels of learning.

Finally, we acknowledge that this study has a few limitations, some of which include the need for a DL taxonomy mapping that could be tested and used by educators interested in making a case to teach DL as a co-literacy rather than a sub-literacy or content under ML and MIL courses. We recommend creating such a taxonomy to encourage educators in the secondary and pre-secondary level to see the possible alignments in these literacies and implement more focused DL training.

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