Seeking socially just information: Exploring adult learners' knowledge application for critical algorithmic literacy

by

Catherine (Catie) Carlson

B.A., Kent State University, 2012
M.L.I.S., Kent State University, 2014
M.Ed., Tiffin University, 2017

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of their requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Educational Leadership
College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2025

Abstract

This research acknowledged the power, influence, and biases that information discovery algorithms hold. Information discovery occurs as we interact with online platforms that feed us information whether they are passive (e.g. social media scroll) or active (e.g. search results). Because information shapes thought processes and beliefs, the power, influence, and biases of these algorithms impact social justice movements. Using hermeneutic phenomenology, this research examined adult learners' understanding of information discovery algorithms through their application of critical algorithmic literacy to inform future critical pedagogy methods. The findings identify 14 categories aligned with the research's four research questions and provide insights into how critical algorithmic literacy can improve for adult learners in educational settings. Key implications for practitioners based on this research include improving source evaluation teachings, integrating content creation into information literacy development, and a lack of mention of libraries within the conversation.

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Approved by:

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Chapter 1 - Introduction

Scrolling through her phone over the weekend, social media reminded Mary that Easter was fast approaching. There was an ad about Easter basket toys for kids that popped up in her feed. Being the first Easter that her daughter could start to understand the holiday, this was a welcomed reminder, and she immediately started searching and shopping to ensure her items would arrive on time. A few hours later when Mary was preparing her weekly grocery visit, she checked the store's virtual coupons. For what felt like the hundredth time in recent memory, the store wanted Mary to use a baby formula coupon. She sighed. Her baby had been off formula for months and she really wished the store would offer coupons for on-the-go toddler snacks instead. In both these scenarios, an algorithm prompted each of these interactions: the social media scrolling, the advertising, the shopping experience, the searching experience, and the coupon offerings. Some of the information Mary received was about things she wanted (e.g., a relevant reminder and ad), some was not (e.g., the formula coupon), and some were unnoticed. Among the information that went unnoticed was the information missing from the results retrieved, such as a local merchant's holiday sale, whose online presence is still limited, or the post from a friend with whom she had not interacted with digitally in some time. They both ended up too far down in the results for Mary to even find them despite the store's superior holiday selection or her interest in that friend's life.

Algorithms have an increasing impact on everyday life, including in the information-seeking behaviors of adults. Gardner (2019) defines an algorithm as "a set of instructions or rules used by a computer to perform a specific task such as organizing search results by relevance" (p.321). Algorithms also shape what ambient information, including advertising, propaganda, memes, and digital news we encounter (Head et al., 2020). The information people interact with

every day has reverberating impacts on policy, education, politics, activism, and more. Additionally, the algorithms dictating what information people may be exposed to can have inherent problems that further inequities throughout society. However, the user's desires are the basis of the information found in conjunction with the algorithm behind the curtain. Additionally, these discovery algorithms are increasingly being merged with artificial intelligence (AI) to enhance the information finding experience by providing a synthesis of some of its top sources. Therefore, it is worth exploring what adults know about these algorithms that impact the information they see and influence their decision-making, particularly when seeking a more socially just world.

Background

Algorithms have influence (Aiken, 2016; Beer, 2017; Boguslaw, 1965; Latzer & Festic, 2019; Souto-Otero & Beneito-Montagut, 2013). However, many have noted that these algorithms are imperfect reflections of an imperfect society (e.g. Noble, 2018b). This section will define what algorithms are and discuss the role of critical algorithmic studies (CAS) in establishing the imperfect ubiquity of the tool. This information will lead to a conversation about information finding habits through various literacies such as information literacy, digital literacy, and algorithmic literacy as well as the connection to adult learners in these domains. These domains are stand ins for setting a foundation in developing algorithmic literacy. The connection between all of them will later be established in the theoretical framework for this research.

Algorithms and Critical Perspectives

Algorithms are logic that help to organize our world and dictate our information discovery process (Kitchin, 2017; Marshall, 2018; Willson, 2017). “Today, algorithms curate everyday online content by prioritizing, classifying, associating, and filtering information”

(Eslami et al., 2015, p. 153). They have a chokehold on daily operations and information feeds to the extent of some declaring that we are in an era of algorithmic governance (Eslami et al., 2015; Kitchin, 2017). The algorithm uses logic to execute commands and its execution will "search, collate, sort, categorise, group, match, analyse, profile, model, simulate, visualise and regulate people, processes and places" (Kitchin, 2017, p. 18) based on a set of values determined by the algorithm's creator. These values will vary by algorithm but are built on the shoulders of other technology like AI, machine learning (ML), and big data. Generally, algorithms are based on past user behavior and big data that lead to the ranking of the presented information in an effort to influence current and future user behaviors and to appease the algorithm's funding model (Aiken, 2016).

When it comes to user behavior, the algorithm behaves in a way that will best benefit the user, improve user interfaces, and increase revenues. However, it is worth noting what benefits the user is subjective and varies by individual (Aiken, 2016; J. N. Cohen, 2018; Gillespie, 2016; Granka, 2010; Reidsma, 2019; Shin, 2020). In discovery, this means big data and ML try to predict the best result for that user, and AI could try to synthesize those results for an answer (Brogan, 2016; Gillespie, 2016; Lindh & Nolin, 2016; Zou, 2016). Data, however, is socially constructed in its interpretation resulting in biases (Aiken, 2016; Birhane, 2021; Broussard, 2018; Marshall, 2018; Pasquale, 2015; Peña Gangadharan & Niklas, 2019; Zou, 2016). Therefore, these biases also influence the ranking system of results, making it highly influential on the user.

Because algorithms have become so ubiquitous, they hold an immense amount of power (J. Anderson & Rainie, 2018; Kitchin, 2017; Reidsma, 2019). With power comes hefty influences on how society operates (Aiken, 2016; Beer, 2017; Boguslaw, 1965; Latzer & Festic,

2019; Souto-Otero & Beneito-Montagut, 2013). This power comes forward through the credibility given to search algorithms and how search algorithms apply ranking, indexing, and taxonomy practices. This credibility is often referred to as automation bias, an over-reliance and trust in automated systems to produce a correct result (Logg et al., 2019; van Dis et al., 2023). This bias extends to how we find information, with research indicating there is user trust that results found are accurate, objective, and neutral, which in turn gives the algorithm enormous power (Araujo et al., 2020; Beer, 2017; Carmi & Yates, 2020; Ekström, 2013; Gillespie, 2014, 2016; Kulshrestha et al., 2019; Logg et al., 2019; Reidsma, 2019). Indexing, ranking, and taxonomy on these platforms therefore hold a lot of power and influence on society, especially considering how much credibility is given to the results (Beer, 2017; Lewandowski, 2017).

Algorithms and AI actively shape our lives, and society changes habits based on their effects (J. Anderson & Rainie, 2018; Shin & Park, 2019; Wellner & Rothman, 2020). Algorithms and information discovery platforms are adding AI to speed up the information discovery process. At best, AI should augment human skills and inform decisions, but it will not solve human nature (J. Anderson & Rainie, 2018; Broussard, 2018; Hoffmann, 2019). Therefore, it perpetuates societal problems, and sometimes it will create new problems (Pasquale, 2015). These problems arise out of the fact that the algorithms cannot be neutral facilitators of information as they are reflections of society and culture (Kitchin, 2017; Ochigame & Ye, 2021; Stanford University, 2016; UNESCO, 2022). This evidence comes through CAS.

Through CAS, there have been many examples of how bias has played out in search algorithms from facial recognition in images, search autosuggestions, advertising results, search results, and chatbot answers (Al-Abbas et al., 2020; Baker & Potts, 2013; Buolamwini & Gebru, 2018; Cadwalladr, 2016; Keyes, 2018; Mac, 2021; Noble, 2013; Reidsma, 2019; Shivaram,

2023; Sweeney, 2013; Zou, 2016). These biases will perpetuate stereotypes or disenfranchise folks "while obscuring these harms under the false belief that such systems are 'neutral'" (J. Anderson & Rainie, 2018, p. 28; Archambault, 2022; Bains, 2020; Noble, 2013; UNESCO, 2022). They can also target people by leveraging a lack of privacy or big data (Campos-Castillo & Laestadius, 2020; Couric et al., 2021; Rosenberg et al., 2018). Often the approach to fixing these problems found via CAS is to suppress the example result (Reidsma, 2019; Wellner & Rothman, 2020; Xiang, 2022). This act also plays into ethics in the field.

Ethics is multifaceted. It can be examined through the lens of politization or privacy. It can examine the creators or regulators. To function in their intended way, algorithms collect and use massive amounts of data about users (Cohen, 2018; Pasquale, 2015; Zuboff, 2019). This collection and use are sometimes understood, and sometimes not (Thompson & Warzel, 2019; Withorn, 2023). It can also be invasive and 'weird' (Gardner, 2019; Thompson & Warzel, 2019), which concerns scholars about the ethics of privacy and its importance in society (Archambault, 2022; Zuboff, 2021). Considering the biases that already exist in the information discovery, many also remain leery about how that data will be used (Cagle, 2016; Miller, 2016; Monzer et al., 2020; Pasquale, 2015; Peña Gangadharan & Niklas, 2019; Shaw & Shaw, 2016). However, for as many privacy protections as there are for algorithmic creators to maintain their competitive edge, the same is not true for the user's privacy (Pasquale, 2015; Zuboff, 2019). The data collected through these invasive means can also have wide ranging impacts that influence the information seen, particularly for political means (Lewis & McCormick, 2018; Mowshowitz & Kawaguchi, 2002; Reidsma, 2019; Rosenberg et al., 2018). These issues help establish the need for critical algorithmic literacy (CAL).

Related Literacies

Because this research focuses on algorithms within information behavior, understanding information literacy and research habits sets an important stage for why algorithmic literacy is imperative. This connection is why some researchers have made algorithmic literacy a subset of information literacy (Archambault, 2022; Head et al., 2020). The algorithm comes into effect because many first-year college students believe that Google is a sufficient search tool and that accessibility of materials from there equates to quality (Hinchliffe et al., 2018). Often when searching for information, users will click on the top results regardless of its relevance to their need, though, information-need relevance is increasingly becoming more important to the user in their evaluation and source selection (Schultheiß et al., 2018). Meanwhile, adult students' self-perceptions may degrade the confidence that enables them to be successful in information literacy (Clark, 2014). Even when students may demonstrate information literacy development in the classroom, their application of it in their personal lives may not reflect this learning (Head et al., 2019).

Digital literacy has a range of definitions that incorporate elements of information literacy, media literacy, and computer literacy (Bawden, 2001; Gilster, 1997; Jacobson et al., 2019; Tinmaz et al., 2022). These definitions typically include fluency in hypertext navigation, technology use, and critical thinking (Bawden, 2001; Gilster, 1997; Jacobson et al., 2019; Ribble, 2012; Tinmaz et al., 2022). It can also apply to emerging technologies like the internet of things, cloud computing, and big data (Tinmaz et al., 2022). These fluencies have an influence on our digital habits that impact how technology works in our everyday lives (Jacobson et al., 2019; Tinmaz et al., 2022). Because we tend to use information seeking algorithms in a digital context, digital literacy provides a foundation for navigating that digital space.

Demographics studied by researchers in relation to digital literacy include age, experience, gender, education, and socioeconomics. The results of these studies are inconclusive - some found a relationship between demographic characteristics and digital literacy while others did not. One example of these mixed results is in gender, which sometimes relates closely to digital literacy skills and sometimes not (Hatlevik et al., 2018; Inan Karagul et al., 2021). However, other demographic characteristics, including education and socioeconomics, demonstrate a more consistent relationship. Socioeconomics and education often impact a user's access to technology, which often predicts the level of digital literacy a person has. The more socioeconomic means and education a user has, the more access to the technology they have, and the higher their digital literacy becomes (M. Anderson & Perrin, 2017; Hatlevik et al., 2018). This connection is unsurprising based on the experience research (or research related to experience using technology), and the connection between education leading to better socioeconomic means.

Experience with technology is also often tied to digital literacy. Experience is often a good predictor of digital literacy skills (Hatlevik et al., 2018). Sometimes age and experience can become conflated such as when terms like "digital native" are used (Prensky, 2001). Technologies are often associated with younger demographics that help shape this assumption (Bawden, 2001). In recent years, technology adoption by older demographics has climbed (M. Anderson & Perrin, 2017), but their slower adoption could have also fed this assumption. However, age has not proved to be a strong predictor of digital literacy, and digital literacy skills are more often tied to education (M. Anderson & Perrin, 2017; Inan Karagul et al., 2021). With education being such a strong predictor of digital literacy, its inclusion in that process is vital to provide the experience and expertise needed to develop that literacy skill.

Algorithmic Literacy

Algorithms are inseparable from our information landscape. They provide a central mechanism for connecting communication and information discovery. Algorithmic literacy does not have a widely accepted definition, but for this study's purpose it will be an overarching awareness of the algorithm's influence on results and behavior and acting accordingly (Alvarado & Waern, 2018; J. Anderson & Rainie, 2018; Baer, 2021; Cotter & Reisdorf, 2020; Fouquaert & Mechant, 2022). When someone is algorithmically literate, they will analyze the underlying information structure and evaluate the information presented rather than falling into the immediate sense of credibility (Archambault, 2022; Luke & Kapitzke, 1999; Mackey & Jacobson, 2011). Withorn (2023) provides an excellent example of an AI algorithmic analysis by explaining what the AI missed in the results presentation. These analysis skills would be used when encountering information discovery platforms.

There are mixed results varying by platform on how much users know about the algorithm they are using, but a common theme is a threshold of less than 50% awareness about how an algorithm works on social media platforms (Eslami et al., 2015, 2016; Proferes, 2017). It does seem that the more users interact on the platform, the more skills they develop, but it is inconclusive if just interaction improves skills (Archambault, 2022; Proferes, 2017; Reisdorf & Blank, 2021). To have this interaction experience, access to the internet is essential, but the good news is that access is becoming more widespread with all demographics (Aiken, 2016; M. Anderson & Perrin, 2017). Like digital literacy, socioeconomic background seems to be the best predictor of knowledge about algorithms (Carmi & Yates, 2020; Cotter & Reisdorf, 2020; Lu, 2020; Reisdorf & Blank, 2021). Studies of college students show they could use more knowledge development for information discovery using algorithms (Archambault, 2022; Head, 2016;

Powers, 2017). The mix of demographics from past studies shows that thus far, there needs to be more education for everyone on how algorithms influence our information finding.

The theoretical framework of my research used metaliteracy and critical information literacy (CIL), which helps learners to understand how power influences information flows, because of algorithmic literacy's established relation to information literacy and digital literacy. These concepts then help focus on this study's interest: Critical algorithmic literacy (CAL). CAL is about power. While algorithmic literacy ensures users understand how they receive their information results, CAL is acknowledging the 'wicked problem' of algorithms through power they hold and inequities they further that are embedded in CAS and empowering users to make information decisions (J. Anderson & Rainie, 2018; L. Anderson, 2024; Archambault, 2022; Cech, 2021; Doctorow, 2023; Fisher, 2023; Sork, 2019). It demonstrates how "more and more, the oppressors are using science and technology as unquestionably powerful instruments for their purpose: the maintenance of oppressive order through manipulation and repression" (Freire, 2000, p. 60). These connections are why the theoretical framework grounds and led this study to critical algorithmic literacy.

Theoretical Framework

The theoretical perspective is "the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria" (Crotty, 1998, p. 3). It provides the grounding and structure that new research can connect to the previous (Kivunja, 2018; Varpio et al., 2020). This research used the perspectives of CIL and metaliteracy to provide structure to inform the data collection, data findings, and data interpretations. It helped contextualize how the research was conducted and why it was needed.

These theoretical constructs became the foundation for CAL for this study. They served as disruptions in the information cycle where personalized results in information behavior build algorithmic trust because they reflect what the user wants. The algorithmic trust leads a user to see results with socially unjust information that also allow these ideas to be perpetuated by their found supporting evidence. Information consumption and information discovery are interdependent and cyclical (Fisher, 2022). This cycle has been pointed to as a motivation in more than one mass shooting event (J. N. Cohen, 2018; Hersher, 2017; Katz & Padilla, 2024). In this theoretical framework, metaliteracy and CIL provide potential disruptors that empower social change to occur. Metaliteracy helped interrupt the trust process in results while CIL disrupts the "evidence" and algorithmic trust. This study then hoped to establish the baseline of understanding in adult learners to determine the need of learner empowerment in CAL. This framework and relationship will be further elaborated on in Chapter 2.

Metaliteracy

Researchers have classified algorithmic literacy as a subset of information literacy (Archambault, 2022; Head et al., 2020). They have also tied it to media literacy and digital literacy (Dogruel, 2021). The multi-literacy nature of algorithmic literacy makes the case for the use of metaliteracy. Metaliteracy looks at the intersectionality of the many existing literacies: information literacy, media literacy, digital literacy, cyber fluency, information fluency, and visual literacy (Mackey & Jacobson, 2014). These can be competing competencies, but the interactive nature of today's internet deems them all as critical activities for production and participation in information. Within metaliteracy, Mackey and Jacobson (2014) offer four goals: evaluating, acting ethically online, participating in online environments, and connecting learning to life. These goals develop the metaliterate learner characteristics: collaborative, participatory,

reflective, civic-minded, adaptive, open, productive, and informed (Mackey & Jacobson, 2019). These actions and characteristics take the various literacies and ask participants to be active in their online environments in ethical and responsible ways.

Due to the interdependence of literacies, each literacy must be known to understand metaliteracy, but information literacy is the primary approach (Mackey & Jacobson, 2011). Information literacy consists of integrated abilities that reflect a person's competence to discover information, understand information production and value, and create new information in ethical ways (Association of College & Research Libraries [ACRL], 2015). In addition, digital literacy plays an important role because of the medium that metaliteracy requests participation in learning: digitally. Digital literacy has overlap with information literacy but specifically deals with critical thinking and the ability to perform tasks within a digital environment (Mackey & Jacobson, 2011). Because not all information discovery happens in a digital environment, the two literacies remain distinct. The common ground between each is growing as more information discovery occurs in the digital context.

Metaliteracy, however, withholds one critical literacy that has become prevalent since its publication: Algorithmic literacy. Neither information literacy, digital literacy nor metaliteracy explicitly name algorithmic literacy or its competencies; however, the literacies are closely tied together. Algorithms in particular work within metaliteracy because of their use in sharing information and the user's participation to generate personalized experiences. To then appreciate how they present information takes a critical eye.

Critical Information Literacy

Critical information literacy examines how information and information professionals aid in oppression, acknowledges power structures in information and the lack of neutrality in

information, and considers social justice in its pedagogical practices (L. Anderson, 2024; Bains, 2020; N. A. Cooke et al., 2016; Drabinski & Tewell, 2019; Elmborg, 2006; Freire & Macedo, 1987; Rapchak, 2021; Saunders, 2017; Tewell, 2015, 2018). It "takes into consideration the social, political, economic, and corporate systems that have power and influence over information production, dissemination, access, and consumption" (Gregory & Higgins, 2013, p. ix). Critical information literacy stems from critical pedagogy and therefore, critical theory. Critical pedagogy seeks to bring forward the critical consciousness that challenges the hegemonic society through education that roots itself in humanity (Freire, 1985, 2000). Within CIL this means "developing a critical consciousness about information, learning to ask questions about the library's (and the academy's) role in structuring and presenting a single, knowledgeable reality" (Elmborg, 2006, p. 198). Overall, the critical consciousness is "illuminating omissions, distortions, and falsities in current thinking" (Brookfield, 2002, p. 271). In developing the critical consciousness, learners will begin to ask questions and take action (L. Anderson, 2024; Elmborg, 2006). The intent is for students to become active agents that ask and act on critical questions in the presentation of information (Archambault, 2022; Drabinski & Tewell, 2019; Elmborg, 2006; Rapchak, 2021; Tewell, 2015, 2016; Torrell, 2020). When it comes to algorithms, this will mean examining how the algorithm's hegemonic and capitalistic nature contribute to information finding that help define CAL. These connections are why CAL provided the theoretical framework grounding for this study.

Problem Statement

Critical algorithmic studies offer deep insight on how algorithms manifest problems from and throughout society (Archambault, 2022; Shaw & Shaw, 2016; Woodruff et al., 2018). Without algorithmic literacy, "there will be a class of people who can use algorithms and a class

used by algorithms" (Rainie & Anderson, 2017, p. 75). There are studies gathering expert opinions on (critical) algorithmic literacy and those from college students or people of high privilege (Archambault, 2022; Cotter, 2020; Hargittai et al., 2020; Head et al., 2020). There are also quantitative studies establishing algorithmic literacy (Cotter & Reisdorf, 2020). However, there is little understanding of adult learner conceptions of algorithms from a qualitative lens to determine the starting place algorithmic literacy education. That starting place is an essential piece of developing the critical consciousness through critical pedagogical lens, one of the foundations of critical information literacy (Freire, 1985, 2000; Freire et al., 2004). The baseline can be somewhat dependent on demographic information such as education and socioeconomic background to predict who needs to improve their algorithmic literacy (Cotter & Reisdorf, 2020). This study aimed to investigate the CAL of adult learners by examining their understanding of algorithmic influence within their information retrieval and discovery behavior.

Research Purpose

This phenomenological research study examined the phenomenon of the participant's relationships with algorithms regarding social and ethical considerations encountered in their information seeking behavior. By examining this phenomenon, it allowed for understanding in adult learners' application of CAL within their information finding behavior.

Research Questions

The overall research question for the study was: How do adult learners make sense of their information finding experience? Specifically, the sub-questions were:

1. What knowledge constructions do adult learners have of algorithms that filter and shape news and information they encounter daily?

2. What coping mechanisms do adult learners have in dealing with algorithms in their information behavior?
3. How has access to information and communication technologies changed adult learners' knowledge building processes within algorithms?
4. How do adult learners examine societal issues in navigating algorithms to locate information?

Research Design

This study used hermeneutical phenomenology to guide its qualitative inquiry. Phenomenology is a type of qualitative research that looks to understand the meaning-making and significance of human experience within a specific phenomenon (Van Manen, 2014, 2016). Hermeneutical is interpretive phenomenology (Beck, 2020). In hermeneutical phenomenology, past knowledge and experiences blend with the new to form the hermeneutic circle of interpretation (Gadamer, 1998). The hermeneutical phenomenological researcher wants to understand the human relationship with the phenomena while contextualizing it in their interpretation (Gadamer, 1998; Van Manen, 2014). Hermeneutics allow us "to make expressly conscious what separates us as well as what brings us together" (Gadamer, 1975, p. 315). It provides the context that allows communication to begin and move critical conversations forward. In this study, that context was seeking to understand CAL applications, which included social and ethical considerations brought forth from CAS, of adult learners in their information finding behavior.

To conduct this research, participants who were over the age of 24 and enrolled in classes at the University of X were contacted via email regarding their interest and consent in participating in the research. Once completed, I scheduled a time to meet based on their

responses. Those interviews were held within one week of their consent form whenever possible. The participant then received a calendar invitation. The day before the interview, they received a reminder email about the interview. To encourage participation throughout the study, the study offered a $25 Amazon gift card, which resulted in 5 participants.

Research data was collected through interviewing and journaling. Hermeneutical phenomenology includes the researcher in the analysis process through their self-reflections and removing the bracketing process that attempts to sever the researcher from research (Bevan, 2014; Bynum & Varpio, 2018; Laverty, 2003). Because of this methodological need, I used a research journal throughout the process. The research journal during data collection allowed for the tracking of interpretive ideas to retrieve later (Moules et al., 2015). Interviewing for hermeneutical phenomenology serves to gather that human-lived experience and to develop a shared meaning of the experience with the interviewee (Ajjawi & Higgs, 2007; Van Manen, 2016). This study was conducted through 1-hour online interviews over Zoom, which was consistent to other algorithmic qualitative studies (e.g. Archambault, 2022). During each interview, closed captioning was enabled to allow for faster transcription. This research used the semi-structured approach to interviewing. The semi-structured approach used a mix of more and less structured questions to allow flexibility but maintain some consistency between participants (Merriam & Tisdell, 2015). The mix of flexibility and structure also aligned well with phenomenology by adapting to the phenomena and experience, but was practical while meeting its purpose (Bevan, 2014; Moules et al., 2015; Suddick et al., 2020).

Data analysis was then done through NVivo 14 in an iterative, cyclical process to allow looking at the parts and the whole of the data (Bazeley, 2021; Bhattacharya, 2017; Merriam & Tisdell, 2015; Moules et al., 2015; Suddick et al., 2020). This process allowed for the

hermeneutical facet of the design for "the multiple stages of interpretation that allow patterns to emerge, the discussion of how interpretations arise from the data, and the interpretive process itself are seen as critical" (Laverty, 2003, p. 31). Prior to beginning this process, I answered my interview questions for myself as part of my journaling, which helped with my background acknowledgement in hermeneutical analysis (Alsaigh & Coyne, 2021; Bazeley, 2021; Bynum & Varpio, 2018). Then, I reviewed the data using parroting to familiarize myself with the whole of the data. I then completed multiple readings of the transcripts including dwelling on the data (Dibley et al., 2020). The first official phase of coding used open coding. This phase was typically looking for descriptive, process, or evaluation coding. In moving to stage two of coding, codes will be evaluated based on the research questions, research purpose, and phenomenon of this study to ensure focus (Bazeley, 2021; Merriam & Tisdell, 2015; Van Manen, 2014).

Limitations

This research had several limitations within its hermeneutic phenomenological design:

1. With hermeneutics, interpretation will always be subjective (Bhattacharya, 2017).
2. Those enrolled in higher education already have a level of educational privilege that may increase their algorithmic understandings.
3. While socioeconomic status is a common predictor of digital and algorithmic literacy, it is not controlled in this study. Participants will be adult learners, and education can frequently be an indicator of socioeconomic status. However, other factors (marriage, previous degrees, etc.) could influence it.
4. Participants in the study were not randomly selected and participation in the study was voluntary relying on participants self-reporting.

5. Because algorithms lack a shared definition or have a finite example to draw from for memory, participants referred to different algorithm types when discussing their experiences.
6. Interviews were in an online setting, which most likely matches the participant's educational modality (though it may not be). Comfortability with online learning may give these participants a higher level of digital literacy and potentially algorithmic literacy.

Researcher Background

Self-awareness is a necessary piece of hermeneutical phenomenology in order to incorporate pieces of the researcher's history into the new truths uncovered (Gadamer, 1998; Moules et al., 2015). I approached this work with a career in academic libraries and as a graduate student. There are some power dynamics at play being a faculty member at the institution where the participants took classes. I gained access to the participants' information to solicit participation in the study because of my position as faculty at University of X. Because of these factors, there were ethical and methodological considerations that I address in Chapter 3.

Study Significance

This study was significant because it added to the emerging research examining algorithmic literacy. Algorithmic literacy still lacks a concrete definition with many versions available (Cotter, 2020; Cotter & Reisdorf, 2020; Dogruel, 2021; Head et al., 2020; Ridley & Pawlick-Potts, 2021), but there are strong ties to both digital and information literacy (Archambault, 2022; Tinmaz et al., 2022). These literacies have been well explored within the literature and have interdependence based on the theory of metaliteracy (Mackey & Jacobson, 2011). This study is unique within the literature based upon its participant focus, which was adult

learners, when other studies have primarily focused on first-year students or emerging adults in higher education (Head et al., 2020; Merriam & Bierema, 2014; Swart, 2021). It also used qualitative means to gather in-depth information on participant understandings of algorithms rather than quantitative analysis that is common in algorithmic literacy analysis (Cotter & Reisdorf, 2020). The study was also significant because it acknowledged past research that notes gaps in socioeconomic backgrounds in digital and algorithmic literacy and incorporated it in the research design (Cotter & Reisdorf, 2020; Hargittai et al., 2020). Lastly, as the world grappled with the explosion of AI, including in the information discovery process, algorithms will continue to hold significance. That significance is wrapped in how Mary earlier in the chapter consistently encountered an algorithm in the background of her active and passive information discovery. The results of this study can help move forward education in CAL.

Definitions

There are a few terms that should be clarified to ensure understanding of the context and the study:

- **Adult learners** are non-traditional students of higher education, which is often students over the age of 24, but the National Center for Education Statistics [NCES] (n.d.) acknowledges that the quantitative attribute is often a "surrogate variable." Adult learners are different than traditional college age students in that they "add the role of student onto their other often full-time roles as caretaker, worker and citizen" (Merriam & Bierema, 2014, p. 12). This study focused on undergraduate adult learners.
- **Algorithmic literacy**, or algorithmic knowledge or algorithmic awareness, is an overarching awareness of the algorithm's influence on results and behavior and acting accordingly (Alvarado & Waern, 2018; J. Anderson & Rainie, 2018; Baer, 2021; Cotter

& Reisdorf, 2020; Fouquaert & Mechant, 2022). This research argued it should be included in metaliteracy.

- **Algorithms** are "a set of instructions or rules used by a computer to perform a specific task such as organizing search results by relevance" (Gardner, 2019, p. 321). This research looked at algorithms concerning information behavior and discovery.
- **Critical algorithmic literacy** (CAL) empowers people to examine, acknowledge, and act how the hegemonic and capitalistic nature of algorithms contribute to information finding. CAL focuses on the people learning, while CAS focus on the algorithms themselves.
- **Critical algorithmic studies** (CAS) examine social aspects of how our mediated lives allow us to gain and lose connectedness through technology (Archambault, 2022; Shaw & Shaw, 2016). It "articulates the increasing influence of algorithms in society and largely focuses on understanding algorithms as an object of social concern" (Woodruff et al., 2018, p. 2).
- **Critical information literacy** (CIL) examines how information and information professionals aid in oppression, acknowledges power structures in information and the lack of neutrality in information, and considers social justice in its pedagogical practices (L. Anderson, 2024; Bains, 2020; N. A. Cooke et al., 2016; Drabinski & Tewell, 2019; Elmborg, 2006; Freire & Macedo, 1987; Rapchak, 2021; Saunders, 2017; Tewell, 2015, 2018).
- **Digital literacy** is one of literacies included in the umbrella of metaliteracy. It has overlap with information literacy but specifically deals with critical thinking and the ability to perform tasks within a digital environment (Mackey & Jacobson, 2011).

- **Information behavior** occurs through "activities a person may engage in when identifying his or her own needs for information, searching for such information in any way, and using or transferring that information" (Wilson, 1999, p. 249). This definition describes actions performed by adults when interacting with algorithms for information.
- **Information literacy** is one of literacies included in the umbrella of metaliteracy. It consists of integrated abilities that reflect a person's competence to discover information, understand information production and value, and create new information in ethical ways (ACRL, 2015).
- **Metaliteracy** "challenges the notion that any one literacy type, independent of all others, is the only way to address radical changes in dynamic information settings" (Mackey & Jacobson, 2014, p. 66). The original literacies included were information literacy, media literacy, digital literacy, cyber fluency, information fluency, and visual literacy (Mackey & Jacobson, 2014).

Chapter Summary

This chapter sought to outline what an algorithm is and how it influences everyday life for the better but perhaps does not benefit society with its information retrieval and discovery. Examples highlight how algorithms perpetuate unconscious bias in dominant social groups. Algorithmic literacy is emerging, but becoming clearer in the research, including in its ties to digital and information literacy and therefore, metaliteracy. The research examined the critical algorithmic literacy of adult learners by using synchronous, online, semi-structured interviews. Results were analyzed with a hermeneutical phenomenological lens to enable educators and information professionals to build critical algorithmic literacy curriculums that enable students to

seek information that comes from many perspectives removing a barrier for social change. The research results contribute to the emerging research in algorithmic literacy.

Chapter 2 - Literature Review

This chapter establishes the theoretical framework and outlining of relevant literature that lays the foundation for my research. Four primary areas covered in this chapter begin with an overview of algorithms and CAS to establish a problem need and phenomena. Then, there is an overview of the guiding theories of the research: Metaliteracy and CIL. Within metaliteracy, there is an exploration of research in relevant components such as digital literacy, information literacy, and algorithmic literacy. CIL provides more insight into its theoretical foundations in hegemony and critical consciousness through critical pedagogy and critical theory. Throughout each of these sections, there are references to adult learners, who were the subjects in the study, and particular platforms that were popular in informal information discovery, such as Google, Facebook, YouTube, and TikTok. Whenever possible, parallels are drawn to generative AI systems, which were an emerging form of not just information discovery, but also information synthesis. Finally, this framework allowed for an exploration of CAL. Combined, these components provided the framework and background for the research conducted.

Algorithms

To begin, there needs to be an understanding of the tool in use to create this research's phenomenon: Algorithms. Here there is an exploration of the definition of an algorithm and some of the technical aspects that dictate them during information discovery. Once these factors are understood, there is a discussion of the root of CAL: CAS. This study focuses on CAL, which is how we as humans critically interact with algorithms, while CAS are looking critically at the algorithms and their impact outside human interaction.

Algorithms are logic (Kitchin, 2017; Marshall, 2018; Willson, 2017). They are step-by-step instructions on what should happen when performing a task (Brogan, 2016; Diakopoulos,

2015; Fouquaert & Mechant, 2022; Gardner, 2019; Kitchin, 2017). In a simplistic regard, algorithms could be compared to a recipe (Broussard, 2018; Kitchin, 2017; Rice, 2020). These recipes are what enable the ease of information delivery on platforms like Google, Facebook, etc. by broadly applying user information to the algorithm and its perceived relationships (Association for Computing Machinery & US Public Policy Council (USACM), 2017; Gillespie, 2016; Granka, 2010). These algorithms are now very complex in that "curate, select and present information," and rely on ML to rewrite how they work (Brogan, 2016; Doctorow, 2023; Eslami et al., 2016, p. 2371; Willson, 2017). Those determinations are made based upon values inserted by humans into the decision-making process (Gillespie, 2016). These values void any pretense of objectivity or impartiality of the algorithm in transmitting information (Kitchin, 2017); however, as will be discussed later in the CAS section of the chapter, this reality is not how people tend to perceive the information. While the algorithm executes its commands, its execution is based on how it will "search, collate, sort, categorise, group, match, analyse, profile, model, simulate, visualise and regulate people, processes and places" (Kitchin, 2017, p. 18). How and what information is dependent on the algorithm though, and that today's algorithm is built on the shoulders of other technology like AI, ML, and big data.

These technologies contain jargon that can seem at times magical to everyday users, but it is the next wave in computing (Brogan, 2016; Garrett et al., 2020; Jillson, 2021). As the world enters Web 4.0, intelligent web services will leverage AI and big data to create a more personalized experience (Bishtawi & Zhou, 2024). AI uses mathematical predictions for results that use algorithms to perform cognitive tasks; and big data "is less about data that is big than it is about a capacity to search, aggregate, and cross-reference large data sets" (Boyd & Crawford, 2012, p. 663; Broussard, 2018; UNESCO, 2022). An example of the new wave of information

finding is in large language models, such as ChatGPT, that create writing based on massive text data (van Dis et al., 2023). This type of information discovery is emerging as colleges grapple with its implications, but in information finding, the principles mostly remain the same, especially as creators work through their flaws (e.g. hallucinations).

While Web 4.0 is emerging, the discovery of information through algorithms on platforms remains pervasive with many different roles and problems associated with it (Bishtawi & Zhou, 2024). Algorithms dictate so much of society's every day that they have become ubiquitous to communications (Kulshrestha et al., 2019; UNESCO, 2022; Willson, 2017). "Today, algorithms curate everyday online content by prioritizing, classifying, associating, and filtering information" (Eslami et al., 2015, p. 153). The chokehold they have on daily operations and information feeds has a lot of power to where some express that we are in an era of algorithmic governance (Eslami et al., 2015; Kitchin, 2017). An information algorithm can be helpful when looking into facts (e.g. the capital city of Ohio) but can struggle to answer complex research problems where there is no right answer and the platform is built to pursue user satisfaction (Ekström, 2013; Gillespie, 2016). While the impact of these algorithms in information finding have a micro-effect in day-to-day activities, those nudges of thought might add up (Archambault, 2022). Those nudges of thought are then significant given the problems found through CAS.

Those nudges manifest through how the algorithm presents the information to the user. For instance, a social media newsfeed presents through an algorithm and users become increasingly dependent on it to receive news (Head et al., 2019). In a way, algorithms through newsfeeds and news recommender systems have become the new editor of media consumption; however this mechanism has meant a very personalized experience that cannot be encountered

twice and may not be in the best interest of information – just within the interest of the user (DeVito, 2017; Granka, 2010; Reidsma, 2019; Shin, 2020). That example is within the open web, though, and there are more controlled encounters with information seeking, such as within libraries. Libraries provide a more stable environment than the open web due to their different revenue sources and end user license agreements (Reidsma, 2019). Even so, Reidsma (2019) found similar problems in library licensed systems that CAS exposes on the open web.

Algorithms and AI actively shape our lives and society changes habits based on their effects (J. Anderson & Rainie, 2018; Shin & Park, 2019; Wellner & Rothman, 2020). AI is being added in algorithms and information discovery to speed up the process. Instead of having to sort through results, users can ask direct questions for answers (Bishtawi & Zhou, 2024). An example of this would be Google SGE or the AI in Lexis+ or Ex Libris products ("Ex Libris Launches a Beta Program of AI-Powered Library Research Assistants," 2024; Legal Research Queen, 2023; Withorn, 2023). AI can also be used to extract data, extract key points from literature reviews, or identify keywords in the research process (Bishtawi & Zhou, 2024). These tools can surely help speed up some of the information discovery process but remain limited as they are still not humans who are able to critically assess process and results.

At best, AI should augment human skills and inform decisions, but it will not overcome human nature (J. Anderson & Rainie, 2018; Broussard, 2018; Hoffmann, 2019). Therefore, it perpetuates societal problems outside it, and sometimes it will create new problems from the algorithm (Pasquale, 2015). These problems arise out of the fact that the algorithms cannot be neutral facilitators of information as they are reflections of society and culture (Kitchin, 2017; Ochigame & Ye, 2021; Stanford University, 2016; UNESCO, 2022). Experts have concerns about how they have biases, encourage certain behaviors, and further disenfranchise others based

on power (J. Anderson & Rainie, 2018; Kitchin, 2017). These concerns are further amplified because the technologies are becoming increasingly embedded in our education and business practices (Reidsma, 2019; Stanford University, 2016; van Dis et al., 2023). Because of these concerns, there are conversations about how algorithms interact with the law (*Algorithms and Amplification: How Social Media Platforms' Design Choices Shape Our Discourse and Our Minds*, 2021; Burrell, 2016; Marshall, 2018). Many of these conversations and revelations come out of CAS.

To understand how some of these problems arise, a basic understanding of how the algorithm works helps. As previously mentioned, the algorithm is like a recipe with a series of operations, and in that process, the computer is forced to make some binary choices when presenting information (Boguslaw, 1965). These choices are based on past user behavior and big data which lead to the ranking of the presented information in an effort to influence current and future user behaviors and to appease the algorithm's funding model (Aiken, 2016). When it comes to user behavior, the algorithm behaves in a way that will best benefit the user (which is subjective and varies by user), improve user interfaces, and increases revenues (Aiken, 2016; J. N. Cohen, 2018; Gillespie, 2016; Granka, 2010; Reidsma, 2019; Shin, 2020). The user behavior may be based on behavior on the platform or outside of it sourced from tracking applications (J. N. Cohen, 2018). All these mechanisms continue to contribute to the existing big data on the user.

Big data results from the silent collection of data as we interact and use digital systems, and it is defined by velocity, volume, and scope that go outside standard sampling (Archambault, 2022; J. N. Cohen, 2018). Machine learning is then used to identify data patterns to predict what users may want to see; however, sometime nuances can be lost in the big data predictions

(Birhane, 2021; Broussard, 2018). In discovery, this means that big data and ML try to predict the best result for that particular user, and AI could try to synthesize those results for an answer (Brogan, 2016; Gillespie, 2016; Lindh & Nolin, 2016; Zou, 2016). Data, however, is socially constructed in its interpretation resulting in biases (Aiken, 2016; Birhane, 2021; Broussard, 2018; Marshall, 2018; Pasquale, 2015; Peña Gangadharan & Niklas, 2019; Zou, 2016). It also then influences the ranking system of results, making the biases highly influential to the user.

Information discovery platforms, like search engines and social media, employ complex ranking systems to decide what content users see. Kulshrestha et al. (2019) highlight that the goal is to provide relevant information, but impartiality is not guaranteed. This process is multifaceted. First, a vast pool of data is filtered to identify items related to the user's query (Lewis & McCormick, 2018). Then, ranking algorithms take center stage, considering factors like user engagement, content quality, and even platform priorities (DeVito, 2017; Gallagher, 2017). Notably, search engines like Google leverage factors beyond simple keyword matching (Dean, 2023; Gillespie, 2014; Graham, 2017; Granka, 2010). Built within many of these systems are also recommender systems that construct and influence user's experience while information finding and serving a dynamic editorial role (Granka, 2010; Shin, 2020). These ranking and recommendation systems also have funding systems that need to be considered when evaluating results.

When it comes to information discovery systems, users often think of them as just that: information discovery systems. For instance, Google is often associated with their search tool so strongly that their brand has become synonymous with the verb "to search" on the open web. However, their funding model comes from advertising revenue, which is similar to many other open web discovery systems (but unlike library discovery systems) (Aiken, 2016; Graham, 2017;

Noble, 2018a; Reidsma, 2019). The targeting for these advertising systems have become more tailored as more data is fed into their governing systems, but it has also changed the way that media presents on the web by encouraging clickbait and sensationalism (Aiken, 2016; Graham, 2017). Some argue the confusion of a technology company and an advertising company is an intentional misnomer to avoid regulation (Lindh & Nolin, 2016; Reidsma, 2019; Zuboff, 2021). A lack of accountability is a common subject discussed more in CAS.

Critical Algorithmic Studies

With algorithms so enshrined in all parts of modern life, critical lenses were bound to occur. Critical algorithmic studies examine social aspects of how our mediated lives allow us to gain and lose connectedness through technology (Archambault, 2022; Shaw & Shaw, 2016). It "articulates the increasing influence of algorithms in society and largely focuses on understanding algorithms as an object of social concern" (Woodruff et al., 2018, p. 2). There are those who support the use of algorithms, but those who are frustrated. Through CAS come the concepts of fairness, accountability, transparence, and ethics (FATE) (Archambault, 2022; Shin & Park, 2019). FATE concepts have been thoroughly examined in the literature through knowledge challenges, power and influence, and bias and ethics. These findings in algorithms ground this study by establishing a problem and phenomena worth studying.

Ultimately, CAS arose because so much of life has become mediated and governed by algorithms and supporting technologies, and there is a lot most users don't understand about them (J. Anderson & Rainie, 2018; Brogan, 2016). Therefore, journalists, social researchers, and educators have been working together to figure out how to expose and educate about the effects (Boyd & Crawford, 2012; Burrell, 2016; Diakopoulos, 2015; Gillespie, 2014; Sork, 2019). The results have been the FATE concepts, which emerged from bias findings and resulted in industry

action, but has its criticism for subjectivity (Archambault, 2022; Peña Gangadharan & Niklas, 2019; Shin & Park, 2019). Subjectivity is a particular concern when it comes to fairness (Bennet & Keyes, 2020; Birhane, 2021; Candelon et al., 2021; Peña Gangadharan & Niklas, 2019; Pierson, 2018; Shin & Park, 2019; Woodruff et al., 2018). Further discussion in CAS related to this point can be found in the next sections related to power & influence and bias & ethics. Transparency discussions, which relate to the trustworthiness and explainability of an algorithm, can be found in the knowledge challenges section (Bogina et al., 2022; UNESCO, 2022). Meanwhile, accountability relates to responsibility, education, and regulation, which is discussed more in each of the three sections (Shin & Park, 2019; UNESCO, 2022). Many of these concepts have an interdependence and intersectionality that unify CAS but also make it challenging to discuss.

Knowledge Challenges

A consistent conversation in CAS is the difficulty of studying algorithms. One challenge comes from the lack of transparency that stems from the black box that their creators hold and create them (Diakopoulos, 2015; Logg et al., 2019; Rainie & Anderson, 2017; Shin & Park, 2019). This black box has created a disassociation between the creators and the product that reduces accountability of the problems found through CAS (Gillespie, 2016; Jones, 2021; Noble, 2018a; Pasquale, 2015). Additionally, because the black box allows changes to happen to the algorithm unseen by users, studying and replicating studies on the algorithm are difficult if not impossible (Gillespie, 2014). Through CAS, there are also many examples of various information platforms exemplifying these knowledge challenges. Each of these areas (transparency, accountability, and replicability) will be further discussed.

The aforementioned black box is a metaphor that equates the recording that these systems do similar to those on transportation systems and the veil that mystifies how inputs become outputs (Pande, 2018; Pasquale, 2015; Shin & Park, 2019). How algorithms work often carries opacity with little understanding from outsiders of the logic (Burrell, 2016; Diakopoulos, 2015; Logg et al., 2019; Rainie & Anderson, 2017). This practice exists to maintain digital security, prevent scammers, and ensure a competitive advantage for for-profit companies (Burrell, 2016; DeVito, 2017; Diakopoulos, 2015; Gillespie, 2014; Pasquale, 2015). The problem is that it creates "information asymmetry" and "can be considered deceptive" (Diakopoulos, 2015, p. 403; Eslami et al., 2019, p. 3). These practices have resulted in issues such as lawsuits against some platforms (Eslami et al., 2019). Some argue that creating greater transparency in systems will improve user and business practices; while others argue that the black box is no different than the human mind (Bogina et al., 2022; Brown et al., 2021; Diakopoulos & Koliska, 2017; Eslami et al., 2019, 2019; Pande, 2018; Rieder et al., 2018; Xiang, 2022). Overall, the black box and transparency are just one piece of the wicked problems found in CAS (Diakopoulos, 2015; Reidsma, 2019; Shin & Park, 2019; Sork, 2019). The desire to open the box also means bringing accountability to the product and producers.

There has been a growing disconnect between what the algorithm produces and who produces the algorithm (Beer, 2017; J. N. Cohen, 2018; Gillespie, 2016; Marshall, 2018; Noble, 2018a; Pasquale, 2015). In some ways, companies encourage this distinction by saying they will not manipulate the results in an algorithm, despite that, sometimes, they do anyway (Ekström, 2013; Lewandowski, 2017; Pasquale, 2015; Reidsma, 2019). There is a reason for this disassociation, which is due to the subjectivity and big question of what values the product reflects that could impact the producer's bottom line (Baker & Potts, 2013; Beer, 2017;

Cadwalladr, 2016; Cleverley, 2017; Gillespie, 2014). However, these reasons also are why the practice continues, which is because it can help fuel engagement of the users on the platform (*Algorithms and Amplification: How Social Media Platforms' Design Choices Shape Our Discourse and Our Minds*, 2021). For this reason, it is tricky to (self)regulate (*Algorithms and Amplification: How Social Media Platforms' Design Choices Shape Our Discourse and Our Minds*, 2021; Cech, 2021; Reidsma, 2019), but not tricky for producers to control outside researchers. The black box becomes particularly irksome for journalists and researchers who may encounter problems from terms of service to unstable environments due to the personalization and updates (Beer, 2017; Couric et al., 2021; DeVito, 2017; Gillespie, 2016; Ochigame & Ye, 2021; Reidsma, 2019). This ability to prevent this inquiry is just the beginning of understanding the power and influence of these tools.

Power & Influence

Because algorithms have become so ubiquitous, they hold an immense amount of power (J. Anderson & Rainie, 2018; Kitchin, 2017; Reidsma, 2019). With power comes hefty influences on how society operates (Aiken, 2016; Beer, 2017; Boguslaw, 1965; Latzer & Festic, 2019; Souto-Otero & Beneito-Montagut, 2013). This power comes forward through the credibility given to search algorithms and how search algorithms apply ranking, indexing, and taxonomy practices. Influence comes forward through how the algorithms impact user behavior. However, the business application of the algorithm may influence how it behaves through its revenue streams. It is also impossible to ignore the monopolistic hold of Google on public search engines, which comes with a high level of power and influence inherent in monopolies. Each of these areas (credibility, indexing, ranking, taxonomy, credibility, revenue, behavior, and monopolies) are discussed further.

Anti-trust laws have long existed within the United States to ensure there is a competitive market that aids consumers and laborers. Despite that, one company's name has become synonymous with searching on the open web: Google. Their market control in searching, advertising revenue, and open web stems from their monetary and data wealth is well documented and confirmed in court (Boyd & Crawford, 2012; Couric et al., 2021; Doctorow, 2023; Lindh & Nolin, 2016; Noble, 2018a; Pasquale, 2015; Souto-Otero & Beneito-Montagut, 2013; The Associated Press, 2024). With that level of power, there becomes questions of how and why results appear as they do to the point of legal considerations (Cadwalladr, 2016; Cleverley, 2017; Lewandowski, 2017; Noble, 2013; Pasquale, 2015; Reidsma, 2019; Zuboff, 2021). The knowledge that Google, and other open platforms, are advertising revenue funded adds to these questions, especially given the impacts they've had on journalistic information practices (Faix, 2018; Noble, 2018a; Pasquale, 2015). The questions are fair except when the company flexes this power to make political points to avoid regulation (Allyn, 2024). Therefore, a lot of information discovery power will stem from conversations about Google; however, there are generalities that can be made about other information discovery platforms.

One of those generalities is the power of credibility we give to these information discovery systems and other automated-decision making systems. This credibility is often referred to as automation bias, where there is an over-reliance and trust in automated systems to produce a correct result (Logg et al., 2019; van Dis et al., 2023). This bias extends to how we find information with research indicating there is trust that results found are accurate, objective, and neutral, which in turn gives the algorithm and its creators enormous power (Araujo et al., 2020; Beer, 2017; Carmi & Yates, 2020; Ekström, 2013; Gillespie, 2014, 2016; Kulshrestha et al., 2019; Logg et al., 2019; Reidsma, 2019). An example can be found in the recent Lexis+ AI

that uses search terms to highlight terms on search results and advertises it in finding "superior results faster." However, it also admits the results may not be seminal or the most important, but rather only highlighting important passages (Legal Research Queen, 2023). AI discovery in other tools can also present distorted facts, misinformation, or hallucinations (van Dis et al., 2023). The results presentation (e.g. where in the list they appear) in information discovery often reflects societal bias, creator values, or platform revenues (Araujo et al., 2020; Cleverley, 2017; DeVito, 2017; Kulshrestha et al., 2019; Schultheiß et al., 2018; Zuboff, 2021). This presentation is heavily impacted by the power these platforms have in the ranking, indexing, and taxonomy used.

Indexing, ranking, and taxonomy of these platforms hold a lot of power and influence on society, especially when considering how much credibility is given to the results (Beer, 2017; Lewandowski, 2017). Taxonomy is one example of power at play in language due to how we use it to classify and categorize knowledge in information discovery that has a history of evolution as societal norms and expectations change while still never reaching perfection. This power can be seen in the vocabularies used and in the hierarchies formed that can also reinforce bias and exclusions (Altman, 2021; Bains, 2020; Block, 2020; Cleverley, 2017; Diakopoulos, 2015; Drabinski, 2013; Noble, 2018a). Indexing and filtering is then what is deemed important enough to be included in search processes through a gatekeeping process (Bozdag, 2013; DeVito, 2017; Diakopoulos, 2015; Gillespie, 2014). Power becomes apparent in what is part of the index, how frequently the index is reviewed, and how those judgements are made or updated, which can be subjective and contextual (Gillespie, 2014; Noble, 2018a; Reidsma, 2019; Souto-Otero & Beneito-Montagut, 2013). Ranking then determines where a result appears in the display, which can have high effects in visibility and credibility, but relevance ranking is subjective and has an

entire field dedicated to manipulating it on the open web (e.g. search engine optimization) and bot actors working to manipulate users' results (Beer, 2017; DeVito, 2017; Diakopoulos, 2015; Lewandowski, 2017; Orabi et al., 2020; Rieder et al., 2018; Souto-Otero & Beneito-Montagut, 2013). These forces work together to determine what information presents and how it presents that in turn influence a user's knowledge access.

Lastly, the presentation of these results influences our behavior to create desired outcomes, and our beliefs based upon what information we discover in the process. Influence is a form a power (Cope, 2010). One key feature of information discovery today is personalization, which filters information based on characteristics and past preferences that can in turn influence user behaviors (Bozdag, 2013; Cotter & Reisdorf, 2020; Gillespie, 2014; Jones, 2021; Lewandowski, 2017; Miller, 2016; Souto-Otero & Beneito-Montagut, 2013). It also influences what a person knows and can create a filter bubble that isolates but interests the user while also giving a one-of-kind experience (Feldman, 2015; González-Bailón et al., 2023; Monzer et al., 2020; Pariser, 2011; Pasquale, 2015; Sweeney, 2013). When seeking information, these personalizations can leave a user in a potential trap for confirmation bias where the information provided was predicted to match their information desires (González-Bailón et al., 2023; Miller, 2016; Monzer et al., 2020; Nyhan et al., 2023; Thurman et al., 2019). The relationship between the algorithm and user interactions can then lead to trending or suggested content that perpetuates malicious ideas, such as racism and fake news, that some will interact with differently to argue against without an algorithmic boost (Bozdag, 2013; Burrell, 2016; Eslami et al., 2016; Reidsma, 2019; Zuboff, 2021). However, if unaware of the algorithm, it can result in emotions about people in their life or react in a way that encourages the algorithm's behavior counter to the user's wants (Eslami et al., 2015; Guess et al., 2023). This cycle of information

discovery and interaction enables the technology to have tremendous power not only over what information it offers but how it influences your interactions with it.

Bias & Ethics

Through CAS, there are now countless examples of how technology and algorithms further discriminate against historically marginalized groups. One common source of scrutiny for this discrimination is often found to be from the creators of the algorithms. Another is the (lack of) ethics surrounding use. In some cases, producers try to use ethics in lieu of formal regulation, but algorithms lack the understanding of nuance that humans can have resulting in many of these issues. Algorithms have also been used for political gain. These scenarios are examples of how bias and ethics are at play in algorithms and will be discussed further throughout this section.

Firstly, though, it is important to define bias and ethics and how it relates to algorithms. A bias in computer programs is when it…

> systematically and unfairly discriminate[s] against certain individuals or groups of individuals in favor of others. A system discriminates unfairly if it denies an opportunity or a good or if it assigns an undesirable outcome to an individual or group of individuals on grounds that are unreasonable or inappropriate. (Friedman & Nissenbaum, 1996, p. 332)

Within a search algorithm, this presents through assumptions in the algorithm that can look like mirroring human biases in search suggestions or through training images on a certain population (Baer, 2021; Lewandowski, 2017). It can also be the inclusion or exclusion of retrieval or index materials (Mowshowitz & Kawaguchi, 2002). On the other hand, ethics in the field often deal with how the producers impact issues such as the digital divide, privacy, and nondiscrimination

(UNESCO, 2022). Bias and ethics are frequently discussed because of the power and influence algorithms hold, but also because there seems little recourse due to the knowledge challenges.

Through CAS, there have been many examples of how bias has played out in search algorithms from facial recognition in images, search autosuggestions, advertising results, search results, and chatbot answers (Al-Abbas et al., 2020; Baker & Potts, 2013; Buolamwini & Gebru, 2018; Cadwalladr, 2016; Keyes, 2018; Mac, 2021; Noble, 2013; Reidsma, 2019; Shivaram, 2023; Sweeney, 2013; Zou, 2016). These biases will perpetuate stereotypes or disenfranchise folks "while obscuring these harms under the false belief that such systems are 'neutral'" (J. Anderson & Rainie, 2018, p. 28; Archambault, 2022; Bains, 2020; Noble, 2013; UNESCO, 2022). They can also target people by leveraging privacy or big data (Campos-Castillo & Laestadius, 2020; Couric et al., 2021; Rosenberg et al., 2018). Often the approach to fixing these problems is to suppress the example result (Reidsma, 2019; Wellner & Rothman, 2020; Xiang, 2022). This act also plays into ethics in the field.

Ethics is multifaceted. It can be examined through the lens of politization or privacy. It can examine creators and regulators. In order to function in their intended way, algorithms collect and use massive amounts of data about users (J. N. Cohen, 2018; Pasquale, 2015; Zuboff, 2019). This collection and use is sometimes understood, and sometimes not (Thompson & Warzel, 2019; Withorn, 2023). It can also be invasive and 'weird' (Gardner, 2019; Thompson & Warzel, 2019), which concerns scholars about the ethics of privacy and its importance in society (Archambault, 2022; Zuboff, 2021). Considering the biases that already exist in the information discovery, many also remain leery about how that data will be used (Cagle, 2016; Miller, 2016; Monzer et al., 2020; Pasquale, 2015; Peña Gangadharan & Niklas, 2019; Shaw & Shaw, 2016). However, for as much privacy protection as there are for algorithmic creators to maintain their

competitive edge, the same is not true for the user's privacy (Pasquale, 2015; Zuboff, 2019). The data collected through these invasive means can also have wide ranging impacts that influence the information seen, particularly for political means (Lewis & McCormick, 2018; Mowshowitz & Kawaguchi, 2002; Reidsma, 2019; Rosenberg et al., 2018). Therefore, producers rely on a code of ethics more than regulation.

Within the companies that produce these technologies, there may be tools (such as checklists or audits) to try to enforce ethical decisions that attempt to avoid these CAS issues, however these ethics are not in the culture at work or in education (Brown et al., 2021; Chen, 2017; Garrett et al., 2020; Madaio et al., 2020; Metcalf et al., 2019). A key example of this cultural prominence is that the Association for Computing Machinery, "the most powerful professional association in computing," did not have a code of ethics until after 2016 (Association for Computing Machinery & US Public Policy Council (USACM), 2017; Broussard, 2018, p. 145). There are also difficulties such as the contextual nature of ethics added to a lack of diversity within the creator field (Birhane, 2021; Broussard, 2018; Brown et al., 2021; Burton et al., 2018; DeVito, 2017; Pessach & Shmueli, 2020; Shin & Park, 2019). These complexities do not disappear with regulation, but regulation does enable outside bodies to ensure the accountability that is missing as was previously discussed.

Metaliteracy

Literacy at one time was only the ability to read or write. It is still the simplest definition for literacy (Bawden, 2001). Over time its definition has expanded to take the idea of ability and understanding in any given domain (Luke & Kapitzke, 1999). There are now many domains that define literacy such as information literacy, media literacy, digital literacy, computer literacy, and more. Each literacy works towards not only a unique definition but also measurements in

proficiency in the name of teaching and learning (Bawden, 2001; Elmborg, 2006). These literacies live independently of each other; however, in the age of the internet, they became entwined. This entanglement brought forward a new literacy: Metaliteracy.

Metaliteracy creates connections amongst different literacies while focusing on emerging technologies to enable a more participatory information environment through metacognitive exercises (Mackey & Jacobson, 2014). In essence, it "challenges the notion that any one literacy type, independent of all others, is the only way to address radical changes in dynamic information settings" (Mackey & Jacobson, 2014, p. 66). For this research, algorithms are an emerging technology that will be integrated within metaliteracy. They are also the backdrop in discovery that instigates a dynamic information setting. Information literacy has always been central in metaliteracy, but metaliteracy also builds stronger connections between digital literacy and information literacy (Mackey & Jacobson, 2011). These two literacies have been closely related for quite some time due to their interdependence in the information age (Bawden, 2001). All three (digital literacy, information literacy, and algorithmic literacy) will be explored in depth later. However, there are additional literacies defined within metaliteracy.

Within the metaliteracy framework, the other related literacies discussed include cyberliteracy, media literacy, visual literacy, mobile literacy, and health literacy (Mackey & Jacobson, 2014). Each of these related literacies share characteristics to information literacy showing information literacy as a foundation (Mackey & Jacobson, 2014). Algorithmic literacy is not a literacy that has been directly connected to metaliteracy by its founders. However, their framework provides an invitation for such an inclusion. Because algorithmic literacy has been tied many times over to literacies directly entwined in metaliteracy, the inclusion makes sense (e.g. Archambault, 2022; Head et al., 2020). It also connects well because of the participation by

the user and data from the user feeding the algorithmic outputs, which was discussed earlier in the chapter. These components of algorithmic literacy builds can tie to the collaborate, participate, and share pieces of metaliteracy that distinguish it further from information literacy (Mackey & Jacobson, 2014). Within this framework, metaliteracy allows the use of multiple literacies needed in algorithmic literacy while also positioning it within framework itself.

This literacy interdependence works because it negates a skills-based approach to learning (Mackey & Jacobson, 2014). Instead, it focuses on metacognition and relating information literacy to whatever needed literacy is most needed (Mackey & Jacobson, 2011, 2014). This reframing of information literacy intends to capture the needs in the 21st century media by centering critical thinking and collaboration as well as knowledge production (not just its consumption) (Mackey & Jacobson, 2011, 2014). This repositioning is needed because of these shifts in information and media since the emergence of web 2.0 technologies (Mackey & Jacobson, 2011). It creates a "unified construct that supports the acquisition, production, and sharing of knowledge in collaborative online communities" (Mackey & Jacobson, 2011, p. 62). By diminishing the theoretical differences between literacies, metaliteracy makes it easier to address the many calls to improve literacy in the different domains while enabling media disruption (Association of College & Research Libraries [ACRL], 1989; N. Cooke, 2020; Mackey & Jacobson, 2011). These disruptions are similar to those that have been called for in CAS.

Digital Literacy

As previously mentioned, digital literacy is one of the core components of metaliteracy. It also is closely related to algorithmic literacy when it comes to information seeking behavior. Digital literacy has a range of definitions that incorporate pieces of information literacy, media

literacy, and computer literacy (Bawden, 2001; Gilster, 1997; Jacobson et al., 2019; Tinmaz et al., 2022). In this sense, its inclusion in metaliteracy aligns well as it continues the interdependence of literacies. These definitions typically include fluency in hypertext navigation, technology use, and critical thinking (Bawden, 2001; Gilster, 1997; Jacobson et al., 2019; Ribble, 2012; Tinmaz et al., 2022). It can also apply to emerging technologies like the internet of things, cloud computing, and big data (Tinmaz et al., 2022). These fluencies have an impact on our digital habits that impact how technology works in our everyday lives (Jacobson et al., 2019; Tinmaz et al., 2022). As we commonly use information-seeking algorithms in a digital context, digital literacy provides a foundation for navigating that digital space.

Digital spaces are becoming more ubiquitous in everyday life as well, which is why digital literacy is often related to digital citizenship. Digital citizenship will take the components of digital literacy and apply them to the user's behavior in digital spaces (Al-Zahrani, 2015). Arguably, digital literacy and digital citizenship could be interchangeable. The primary difference between them is the integration of attitude into citizenship (Al-Zahrani, 2015). Attitudes and perceptions have supporting evidence that they impact digital citizenship and therefore, arguably digital literacy (Al-Zahrani, 2015). However, there are many other factors, such as demographics that have supporting evidence in its impact of digital literacy.

Demographics studied by researchers in relation to digital literacy include age, experience, gender, education, and socioeconomics. These studies can have mixed results sometimes indicating a relationship, and sometimes not. One example is in gender, which sometimes relates closely to digital literacy skills and sometimes not (Hatlevik et al., 2018; Inan Karagul et al., 2021). However, other demographics are more consistent in demonstrating a relationship, such as education and socioeconomics. Socioeconomics and education often impact

users access to technology and are often a factor in predicting the level of digital literacy. The more socioeconomic means and education a user has, the more access to the technology they have and the higher their digital literacy becomes (M. Anderson & Perrin, 2017; Hatlevik et al., 2018). This connection is unsurprising based on the experience research, discussed soon, and the connection between education leading to better socioeconomic means.

Experience with the technology is also often tied to digital literacy. Experience is often a good predictor of digital literacy skills (Hatlevik et al., 2018). Sometime age and experience can become conflated such as with terms like "digital native" (Prensky, 2001). Technologies are often associated with younger demographics that help shape this assumption (Bawden, 2001). In recent years, technology adoption by older demographics has climbed (M. Anderson & Perrin, 2017), but the slower adoption could have also fed this assumption. However, age has not proved to be a strong predictor of digital literacy and, in various age bands, digital literacy skills are more often tied to education (M. Anderson & Perrin, 2017; Inan Karagul et al., 2021). With education being such a strong predictor of digital literacy, its inclusion in the learning process is vital to provide the experience and expertise needed to develop that literacy skill.

Within education for digital literacy, these differences can create alternative path in approach because it means that digital inequities don't necessarily come from skills, but also from "access, usage, and self-perceptions" (Tinmaz et al., 2022, p. 1). These factors also could have had a greater impact during the COVID-19 pandemic when there was a greater reliance on these technologies (Tinmaz et al., 2022). However, even earlier adult learning had many spaces that required digital literacy such as social media, discussion boards, and MOOCs (E. E. Bennett & McWhorter, 2021). These technologies required digital literacy pre-skills to be successful in adult learning (E. E. Bennett & McWhorter, 2021). However, in some ways to measure digital

literacy, such as the assessment Online Reading Comprehension Ability (ORCA), there is an emphasis on information evaluation (McGrew et al., 2018), which is more reflective of information literacy skills.

Information Literacy

In the last 40 years, information literacy has grown in research volume and has changed how it is theoretically defined (ACRL, 1989, 2000, 2015; Bawden, 2001). A simple explanation of information literacy is "an understanding of information and how it works" that is then applied to information-use sense-making and use-rationale (Badke, 2011, p. 130; Bawden, 2001). Because so much information is in digital spaces now, its overlap with areas like digital literacy can become confusing; and hence, metaliteracy (Bawden, 2001; Mackey & Jacobson, 2011). A more nuanced definition of information literacy can be found from the ACRL (2015) with its six frames. These frames and definitions can be found in Table 2.1.

Table 2.1 Frames and Definitions from the ACRL Framework

Frame	**Definition**
Authority is constructed and contextual	Authority shifts based on information needs and context
Information creation as process	Delivery method of information provides different perspectives
Information has value	Information is a commodity that has legal and socioeconomic connections
Research as inquiry	Research is an iterative process
Scholarship as conversation	New ideas and perspectives are generated through discourse
Searching as strategic exploration	Finding information is nonlinear and iterative

Each of these frames have knowledge practices and dispositions associated with them, and the theoretical grounding of ACRL (2015) is within metaliteracy as well. This metaliteracy grounding in information literacy means information literacy "bypassed technical concerns to

focus on the production and organization of information itself, while recognizing that these demands were heavily inflected by the changing landscape of digital media" (Nichols & Stornaiuolo, 2019, p. 16). Information literacy's grounding allows for its connections to algorithmic literacy because of algorithmic impacts on the digital landscape. This definition has not always been the case, though.

As previously stated, information literacy has changed in its theoretical conception. At one time, rather than having a framework, information literacy used standards that did primarily focus solely on skill development rather than metacognition (ACRL, 2000, 2015; Mackey & Jacobson, 2014). While there was an acknowledgement that information literacy went beyond skills by stating "information literate people are those who have learned how to learn" (ACRL, 1989, para. 3), the previous Standards were skills based and focused on learning on information organization (ACRL 1989, 2000). However, as more information moved online, there was a realization that learning about the library and organization was less central and information discovery was not as linear (Luke & Kapitzke, 1999). Eventually, there was a move to replace the Standards with the Framework, which was a partial reaction to criticism made in CIL (discussed later) and a pathway to allow students more agency in knowledge creation (Archambault, 2022; ACRL, 2015). This transition to the Framework allowed information literacy to better take on its role in education.

In most traditional education programs, there is an expectation for students to find and integrate research into papers (Clark, 2014). For this reason, information literacy development has found correlation in academic achievement and critical thinking (Archambault, 2022). It is also why it has been included in many accrediting agency's competencies for students (Archambault, 2022). To become information literate, students need to be ready for the slow

process of research, know how to find information that is (or is not) online, and use diverse knowledge discovery resources while going beyond the immediate response presented on the first page/first search (Badke, 2011; Head et al., 2013). The latter part is especially important regarding algorithmic literacy. They then need to synthesize the large amount of information they will surely discover (Head et al., 2013). However, there are areas where students regularly struggle to develop these skills.

For instance, first-year college students have common assumptions in information literacy that will hinder their knowledge development such as Google being sufficient, easy to find information is the best quality, and that there is one answer to a question (Hinchliffe et al., 2018). Meanwhile, adult students' self-perceptions may degrade their confidence that enable them to be successful in information literacy (Clark, 2014). Even when students may demonstrate information literacy development in the classroom, their application of it in their personal lives may be different (Head et al., 2019). In part, this difference could be divergence of how most students discover information in their personal lives (via social media) versus how they are taught to find, evaluate, and use information in courses (via library databases) (Head et al., 2019). When outside of courses, many students feel overwhelmed and struggle with information literacy skills (Head et al., 2019) and to address these problems, many students develop their own coping or learning strategies.

There were three primary ways that students seemed to learn new information or develop information literacy skills: online search, trial and error, or human interaction. Many will use an online search engine to solve an information problem (Head et al., 2013). In that process, students will use trial and error to find information sources, tools, and keywords (Diehm & Lupton, 2012). This process will be iterative building on prior knowledge and students will learn

by doing (Diehm & Lupton, 2012). Lastly, this knowledge may be found from others, which may be co-workers, teachers, librarians, or peers (Diehm & Lupton, 2012; Head et al., 2013). However, adult students may have past negative experiences with service areas that could assist them and might prevent them from using this resource (Clark, 2014). Similar to general adult learning principles, these students also struggle with time and stress from their daily lives that impact their ability to develop information literacy (Clark, 2014; Knowles et al., 2015). However, adults also may be less likely to be able to access resources (e.g. computer or internet for students; familiar databases for workers) to aid them in this development (Clark, 2014; Head, 2016). It then becomes a matter of finding a way to incorporate teaching and learning strategies in higher education to help students and the future workforce they will become.

There have been challenges in integrating information literacy holistically in higher education curriculum. Because it is important to have it persistent throughout the curriculum for student success, there has been significant disdain by some librarians on the consistent use of one-shot instruction (Badke, 2011; Clark, 2014; Cook, 2022). In one-shot instruction, there is typically a remedial approach to learning information literacy that can then be enhanced by having a session related to an upcoming assignment (Archambault, 2022; Badke, 2011; Cook, 2022). Criticisms often stem from educators, administrators, and policy makers trying to grasp information literacy's importance in integration and librarians' failure to integrate information literacy within literature outside information studies (Badke, 2011). However, one-shot instruction does encompass a wide range of variables in the literature and empirically seems to demonstrate some impact on student learning (Cook, 2022). Despite this, there are still some areas that lack appropriate information literacy instruction.

Education seems to be failing student information literacy development when it comes to its application outside of the academy. Examples of these would be in news information and workplace information. For instance, employers express an interest in information literacy concepts in new graduates. However, college graduates in the workforce found the research asked of them was different in terms of scope and predictability compared to their experience in college (Head et al., 2013). The disconnect between what students learn in the classroom related to research is also evident in news consumption, where they struggle to stay informed (Head, 2016). To combat these disconnects, hands on activities outside of academic practices could strengthen these skills (Diehm & Lupton, 2012). Such activities could help strengthen the practical, real-life applications of information literacy.

Source Evaluation

Throughout the Framework, metaliteracy, and its composing literacy, source evaluation is a central concept (ACRL, 2015; Mackey & Jacobson, 2011). "Although the Internet has the potential to democratize access to information, it puts enormous responsibility on individuals to evaluate the reliability of information" (McGrew et al., 2018, p. 165). This concept is also critical when it comes to algorithmic literacy because the user needs to evaluate not just the material presented by the algorithm, but why the algorithm presents this information. Because of this crucial component, this research will discuss source evaluation but will focus it within information literacy for brevity.

For a decade or more, there has been a discussion of fake news, which emphasizes the importance of source evaluation as most people do not seek to spread it (Wang & Fussell, 2020). Contributing factors to fake news include social media (i.e. the algorithm), how journalistic practices have had to adapt to meet the algorithm for its own revenue, and our human inclination

to give into confirmation bias (J. N. Cohen, 2018; Faix, 2018; Miller, 2016; Stapleton, 2019; Wineburg et al., 2016). Now, there are new technologies, such as AI, that have a great potential for building off past information discovery processes by making them easier for the user to find answers while still continuing these past problems (Withorn, 2023). To add to the issue, the most prevalent source evaluation methods do not work well on the modern web (McGrew et al., 2018; Wineburg et al., 2020). Therefore, there has been an increase of questioning platforms in how they assist in the discovery and evaluation process (*Algorithms and Amplification: How Social Media Platforms' Design Choices Shape Our Discourse and Our Minds*, 2021). With this attention on the algorithm's accountability, the source evaluation can also come through the user's algorithmic literacy.

Algorithmic Literacy

As a reminder, algorithmic literacy is not explicitly named in metaliteracy. However, the theory is based on the interdependence of different literacies in today's information world. Algorithms are now inseparable from our information landscape, and there is "a pressing need for learners—and, in the larger context, all citizens—to understand how information reaches them in new forms and is mediated through ever-changing platforms and online sources" (Jacobson et al., 2019, p. 2). Without action, "there will be a class of people who can use algorithms and a class used by algorithms" (Rainie & Anderson, 2017, p. 75). Algorithmic literacy does not have a widely accepted definition, but for this study's purpose it was an overarching awareness of the algorithm's influence on results and behavior and acting accordingly (Alvarado & Waern, 2018; J. Anderson & Rainie, 2018; Baer, 2021; Cotter & Reisdorf, 2020; Fouquaert & Mechant, 2022). When someone is algorithmically literate, they will analyze the underlying information structure and evaluate the information presented rather

than falling into the immediate sense of credibility (Archambault, 2022; Luke & Kapitzke, 1999; Mackey & Jacobson, 2011). Withorn (2023) provides an excellent example of an AI algorithmic analysis by explaining what the AI missed in the results presentation. These skills would be used when encountering information discovery platforms.

Social media studies provide a depth of research investigating user skills in navigating the algorithm. There are mixed results varying by platform on how much users know about the algorithm when using them, but a common theme is a threshold of less than 50% awareness (Eslami et al., 2015, 2016; Proferes, 2017). It does seem the more users interact on the platform, the more skills they develop, but it is inconclusive (Archambault, 2022; Proferes, 2017; Reisdorf & Blank, 2021). To have this experience, access to internet is essential, but the good news is that it is becoming more widespread with demographics still an important factor in access (Aiken, 2016; M. Anderson & Perrin, 2017). These demographics carry into use of online tools and algorithmic knowledge. Socioeconomic background continues to be the best predictor (Carmi & Yates, 2020; Cotter & Reisdorf, 2020; Lu, 2020; Reisdorf & Blank, 2021). Studies around college students show they could use more knowledge development for information discovery using algorithms (Archambault, 2022; Head, 2016; Powers, 2017), which leaves the opportunity for teaching and learning.

Educators are starting to take note of the need to incorporate some algorithmic literacy learning in their classrooms with activities that include experiential learning, contextualization, and writing for algorithms (Gallagher, 2017; Gardner, 2019; G'Sell, 2024; McKee & Blair, 2007). This response is needed because it is unrealistic to think folks understand these intuitively and it is a skill needed by the future workforce (J. Anderson & Rainie, 2018; Archambault, 2022; Powers, 2017). These skills become woven into existing lessons related to information literacy in

the metaliteracy framework. These missing components also provide rationale for why establishing a base for adult learner's understanding of algorithms is important to jump start the curriculum. The connection of algorithmic literacy to metaliteracy allows the demographic relevance from digital and information literacy to justify the population, which will have less education, less exposure to the technology (i.e. they did not grow up with it) and could have a lower socioeconomic status due to their lack of education.

Critical Information Literacy

Critical information literacy (CIL) "takes into consideration the social, political, economic, and corporate systems that have power and influence over information production, dissemination, access, and consumption" (Gregory & Higgins, 2013, p. ix). It examines how information and information professionals aid in oppression, acknowledges power structures and the lack of neutrality in information, and considers social justice in its pedagogical practices (L. Anderson, 2024; Bains, 2020; N. A. Cooke et al., 2016; Drabinski & Tewell, 2019; Elmborg, 2006; Freire & Macedo, 1987; Rapchak, 2021; Saunders, 2017; Tewell, 2015, 2018). This means rendering the invisible visible in the information process, including the hegemonic and capitalistic nature of information (L. Anderson, 2024; N. A. Cooke, 2021; Elmborg, 2006; Leung, 2022; McLaren, 2009; Saunders, 2017). The intent is for students to become active agents that ask and act on critical questions in the presentation of information (Archambault, 2022; Drabinski & Tewell, 2019; Elmborg, 2006; Rapchak, 2021; Tewell, 2015, 2016; Torrell, 2020). When it comes to algorithms, this action will mean examining how these hegemonic and capitalistic natures contribute to information finding and help define critical algorithmic literacy later.

While information literacy today is positioned within ACRL's *Framework for information literacy for higher education*, CIL arose out of its predecessor, the Standards (ACRL, 2015; Saunders, 2017). To some librarians, the standards did not do enough to address the human right of access to information and a way for learners to evaluate the information system itself (Elmborg, 2006; Tewell, 2015). The introduction of the *Framework* helped in some ways, but it is more passive and embedded in the frame "Authority is constructed and contextual" to address CIL (Leung, 2022; Saunders, 2017; Tewell, 2015). Therefore, CIL allows for the explicit connection between information and social justice. It looks for the development of critical consciousness and the acknowledgement of hegemony in the evaluation of information (Elmborg, 2006; Freire, 1973).

As noted in CAS, algorithms allow certain biases to prevail, and the power and influence of algorithms allows for its persistence. This result is due to hegemonic practices that present the information as objective because they reflect the hegemonic culture (Cotter & Reisdorf, 2020; Ju & Stewart, 2019; Ochigame & Ye, 2021). "Hegemony is always in operations; certain ideas, values, and social practices prevail over others" (McLaren, 2009, p. 68). Gamsci's journals, written while imprisoned, began the concept of hegemony and the subaltern (Green, 2002; Martin, 2023). These concepts touch on the dominating class and those subject to the dominating (the subaltern), which were then identified as slaves, peasants, religious groups, women, different races, and the proletariat (Green, 2002). These subaltern groups vary in their subjugation and are not necessarily oppositional to the dominate class (McLaren, 2009). Hegemony prevails to protect power through coercion, and that coercion prevails through the hegemony (Green, 2002). Within CIL, this relationship is a central concept in understanding how information can be part of the coercion of power because "struggles over power are, indeed,

struggles over the control of information and interpretation" (Luke, 2012, p. 5). Through CIL and understanding of hegemony, the aim becomes developing a critical consciousness through critical pedagogy.

Critical information literacy stems from critical pedagogy and therefore, critical theory. Critical pedagogy brings forward the critical consciousness that challenges the hegemonic society through an education system that roots itself in humanity (Freire, 1985, 2000). This rooting in humanity is to ensure the realization that the oppressed can just as easily become the oppressor and to ensure the education system does not treat the oppressed as "unfortunates" (Freire, 2000, p. 54; Freire et al., 2004; McLaren, 2009). To reach critical consciousness, it is important to start where the learner is rather than where the educator wants them to be, which is why finding that starting place is so important (Freire et al., 2004). Within CIL this means "developing a critical consciousness about information, learning to ask questions about the library's (and the academy's) role in structuring and presenting a single, knowledgeable reality" (Elmborg, 2006, p. 198). Overall, the critical consciousness develops by "illuminating omissions, distortions, and falsities in current thinking" (Brookfield, 2002, p. 271). In developing the critical consciousness, questions will be asked and action will be taken (L. Anderson, 2024; Elmborg, 2006). In this research, these questions will surround how or why an algorithm presents information and taking actions to influence that presentation.

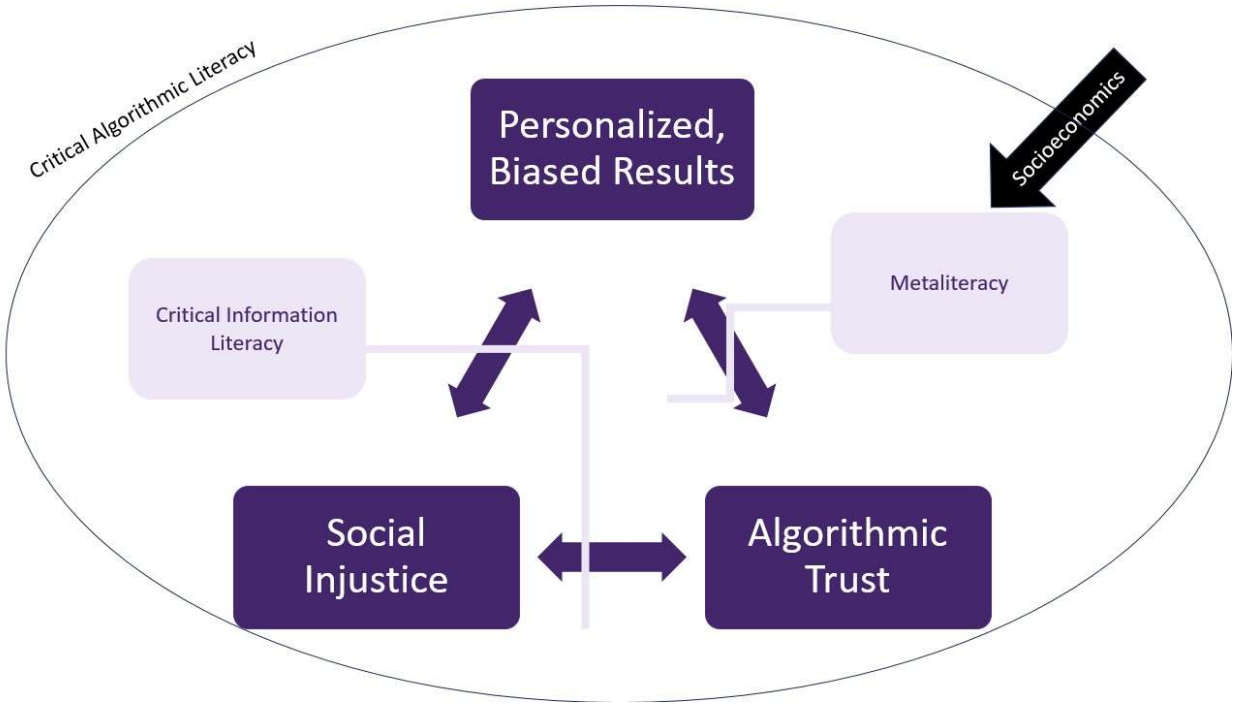
One way to examine and apply the development of any critical literacy is through the Critical Literacies Advancement Model (CLAM) (Robinson, 2020, 2021). Within CLAM, Robinson (2020) illustrates how critical theory feeds critical literacy which leads into literacy categories, including digital literacy and information literacy, similar to the metaliteracy framework. These categories lead to practical skills that result in positive social change

(Robinson, 2020). When it comes to using CLAM with adults, it provides them structured opportunities "to examine widely accepted values and beliefs" (Robinson & Stojanović, 2022, p. 5), such as the hegemonic presentation of information through algorithms. Therefore, while CIL helps frame the problem of this study, CLAM provides a rationale for the need, which is to bring forth positive social change through critical ideology.

Critical Algorithmic Literacy

Thus far, there has been a shared understanding of algorithms in information finding. With that came CAS to establish the problem that exists worth studying further. Algorithmic literacy has an established place nested under metaliteracy. Critical information literacy then helps learners understand how power influences information flows. These concepts have built up understanding to focus of this study: Critical algorithmic literacy. Critical algorithmic literacy is about power. While algorithmic literacy ensures users understand how they receive their information results, critical algorithmic literacy is acknowledging the 'wicked problem' of algorithms through the power they hold and inequities they further that were discussed in CAS and empowering users to make information decisions (J. Anderson & Rainie, 2018; L. Anderson, 2024; Archambault, 2022; Cech, 2021; Doctorow, 2023; Fisher, 2023; Sork, 2019). It demonstrates how "more and more, the oppressors are using science and technology unquestionably powerful instruments for their purpose: the maintenance of oppressive order through manipulation and repression" (Freire, 2000, p. 60). These connections are why critical algorithmic literacy provides the theoretical framework grounding for this study.

Figure 2.1 Critical Algorithmic Literacy as a Theoretical Framework



Critical algorithmic literacy then grounds the conceptual framework for this study as illustrated in **Error! Reference source not found.Error! Reference source not found.**. In this figure, it shows how you can begin with personalized and biased results that users trust (algorithmic results). These have an interdependent relationship as shown in the intersectionality in CAS. The algorithmic trust and the results lead a user to see socially unjust results that also allow these ideas to be perpetuated by found supporting information. The information consumption and the information discovery are interdependent and cyclical (Fisher, 2022). This cycle has been pointed to for leading into more than one mass shooting event (J. N. Cohen, 2018; Hersher, 2017; Katz & Padilla, 2024). In this theoretical framework, metaliteracy and CIL provide potential disruptors that empower social change to occur. Metaliteracy helps interrupt the trust process in results while CIL disrupts the "evidence" and algorithmic trust. Past research has shown how socioeconomics influences the natural development of these literacies. This

study hoped to establish the baseline of understanding in adult learners to determine the need of empowerment in critical algorithmic literacy.

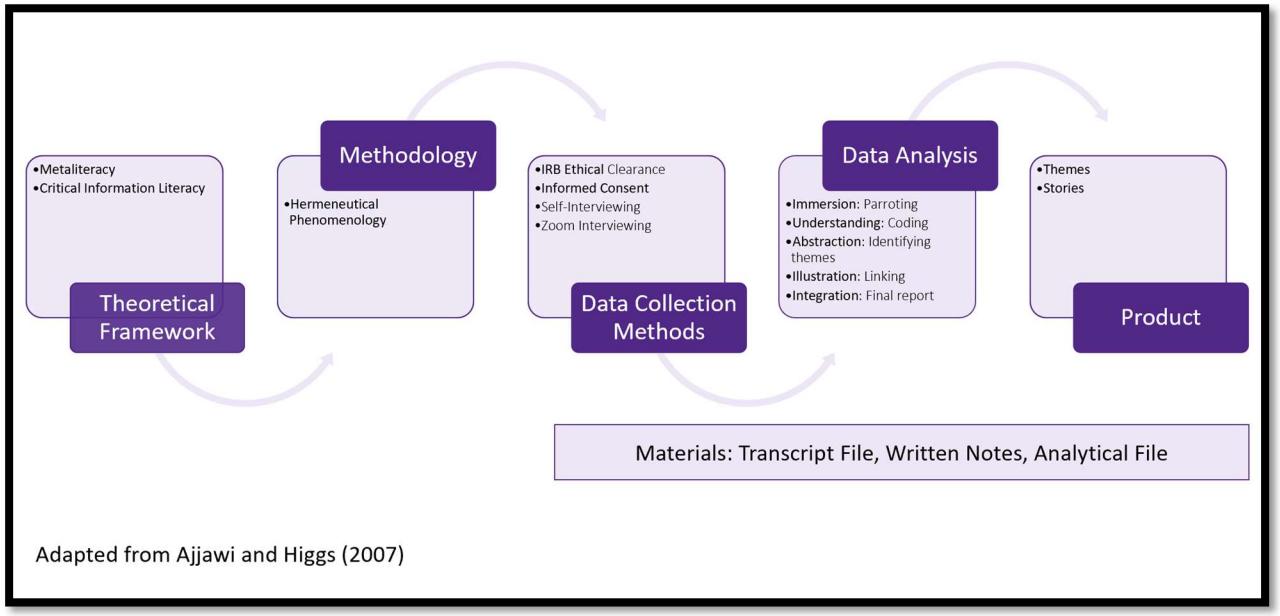
Chapter Summary

This chapter established the theoretical framework for this study. It established a problem by defining algorithms through CAS. The study was then grounded through the theory of metaliteracy and CIL to guide CAS. Throughout the past literature discussions, key components of the study were highlighted throughout including information about adult learners, demographics, and AI. This information then guided the methodology outlined in Chapter 3.

Chapter 3 - Methodology

This chapter describes the research methodology and design for this study. It begins by reiterating the purpose of the research and the research questions shared in previous chapters. It then provides ontology and epistemology setting for the research. An overview of the hermeneutical phenomenology methodology then follows. Then, there is a discussion about research subjectivity and positionality before digging into the research procedures, ethics, data management, and data analysis. Figure 3.1 summarizes the outline of these components for this research, which was adapted from a figure presented by Ajjawi and Higgs (2007). Its intention is to allow for critical pedagogy approaches in future teachings, which is possible through the hermeneutic approach that lacks neutrality by seeking moral good (Moules et al., 2015).

Figure 3.1 Overview of Adopted Research Approach



Research Purpose

This phenomenological research study examined the phenomenon of the participant's relationships with algorithms regarding social and ethical considerations encountered in their

information seeking behavior. By examining this phenomenon, it allowed for understanding in adult learners' application of CAL within their information finding behavior.

Research Questions

The overall research question for the study was: How do adult learners make sense of their information finding experience? Specifically, the sub-questions were:

1. What knowledge constructions do adult learners have of algorithms that filter and shape news and information they encounter daily?
2. What coping mechanisms do adult learners have in dealing with algorithms in their information behavior?
3. How has access to information and communication technologies changed adult learners' knowledge building processes within algorithms?
4. How do adult learners examine societal issues in navigating algorithms to locate information?

Ontology and Epistemology

Ontology examines the nature of reality, while epistemology defines how you can examine reality. Crotty (1998) demonstrates how epistemology informs the theoretical perspectives which informs the methodology which informs the methods. Critical inquiry provided the foundation of this research, which looks at individual behavior not as the problem but the symptom of institutions and structures that formed them (Crotty, 1998). Critical inquiry as epistemology also helped to ground the theoretical perspectives discussed in Chapter 2 of metaliteracy and critical information literacy. This research used critical inquiry because the information finding process is not due to the person, but due to the systems previously discussed. This research wanted to understand how much of the system is understood by participants.

Previous chapters established a critical examination of the information discovery platforms, which under a constructivist lens allow "people construct their own meanings based on their interactions with the world" (Bhattacharya, 2017, p. 11). This lens is very similar to how the algorithm presents information to users as well. An algorithm is built off positive approaches that ignore the social construction of meaning valued more in other disciplines outside of computer science (Bhattacharya, 2017; Cotter, 2020). The foundation of an algorithm is in quantitative, data-driven, best assumptions that tend to ignore nuance and human values (Broussard, 2018; Cotter, 2020). The problem in this research questioned how adult learners recognize the friction between the algorithmic paradigms (positivist and constructivism) and how a critical inquiry into that friction can lead to a dialogue to shepherd the changes needed to political and information systems. To achieve this examination, qualitative inquiry was needed for the research paradigm.

Qualitative Inquiry

There are two types of research: Quantitative and qualitative. Quantitative research will seek to understand patterns and make predictions that are generalizable (Bhattacharya, 2017). This is how many algorithms come to be. It is also how literacy skills can be measured (e.g. Al-Zahrani, 2015; Cotter & Reisdorf, 2020; Kulshrestha et al., 2019). Qualitative research, on the other hand, examines the human experience outside of numbers (Bhattacharya, 2017). Rather than try to quantify or predict, qualitative research seeks to understand, interrogate, or deconstruct (Bhattacharya, 2017).

Hermeneutical Phenomenology

This study used hermeneutical phenomenology to guide its qualitative inquiry. Phenomenology is a type of qualitative research as it looks to understand the meaning-making

and significance of human experience within a specific phenomenon (Van Manen, 2014, 2016). It seeks to capture the pre-reflective, human-lived experience (Van Manen, 2014). The pre-reflective experience is the everyday experience as we "experience it or become conscious of it – before we think, conceptualize, abstract, or theorize it" (Van Manen, 2014, p. 65). There are two main types of phenomenology: descriptive and interpretive (Beck, 2020). There are different philosophies within these types that define the methodology. Hermeneutical is a form of interpretive phenomenology (Beck, 2020). "Hermeneutics is the theory of interpretation of text" (Bazeley, 2021, p. 312). In hermeneutical phenomenology, past knowledge and experiences blend with the new to form the hermeneutic circle of interpretation (Gadamer, 1998). The hermeneutical phenomenological researcher wants to understand the human relationship with the phenomena while contextualizing it in their interpretation (Gadamer, 1998; Van Manen, 2014). This study sought to understand critical algorithmic literacy applications, which included social and ethical considerations brought forth from CAS, of adult learners in their information finding behavior.

In phenomenology, the lived experience "is the starting point and the end point" of the research (Van Manen, 2016, p. 36). It examines a phenomena that can be any human experience through life seeking deeper understanding in meaning within them (Van Manen, 2014, 2016). Because the lived experience is unique to each individual, phenomenology does not lend itself to generalizations (Van Manen, 2016). To ensure each lived experience can be truly about the experience, the method expects researchers to suspend their judgement and experience in order to get to the essence (Merriam & Tisdell, 2015; Scharff, 2023; Van Manen, 2014, 2016). However, in hermeneutical phenomenology, the researcher's experiences are a part of the analysis through their self-awareness (Ajjawi & Higgs, 2007; Bynum & Varpio, 2018; Gadamer,

1998; Moules et al., 2015; Scharff, 2023). To achieve this, Lauterbach (2018) offers a four-phase model of the phenomenological process: turning to the nature of lived experience, the existential investigation, phenomenological reflection, and phenomenological writing. The first phase, turning to the nature of lived experience, is the phase that introduces the reader to the phenomena, ensures there is a phenomenological question, and states assumptions and positionalities that are unique to phenomenology (Lauterbach, 2018). For this study, the phenomenon was available through the literature review in chapter two and in the research purpose. The research questions became phenomenological because they examined the human experience in applying CAS in information finding. The other phases are discussed in later sections of the chapter as they become more relevant.

Hermeneutics allows meaning creation to come out of the lived experience of the participants with the assumption their perceived reality is what is most important (Kvale & Brinkmann, 2015; Sloan & Bowe, 2014). Hermeneutic phenomenology allows for the interpretation of language by an observer (Moules et al., 2015; Sloan & Bowe, 2014). It is "recommended to the researcher to interpret the meanings found in relation to phenomena" (Sloan & Bowe, 2014, p. 1295). This definition contrasts with descriptive, which seeks to define the thing in relation to the experience and believes the participant can remove themselves from their lived experience (Sloan & Bowe, 2014). The intent is for understanding context and uncovering experience, not explanation (Bynum & Varpio, 2018; Laverty, 2003; Moules et al., 2015). Hermeneutics allow us "to make expressly conscious what separates us as well as what brings us together" (Gadamer, 1975, p. 315). It provides the context that allows communication to begin and move critical conversations forward.

Because the algorithm can differ in its definition by the user and their expertise, to ask the participant to remove themselves would be impossible (Seaver, 2017). In addition, their experience is unique to them, requiring them to be active within the process of the phenomenon (Feldman, 2015; González-Bailón et al., 2023; Monzer et al., 2020; Pariser, 2011; Pasquale, 2015; Sweeney, 2013). This approach will juxtapose the assumed user objectivity in the phenomenon with a very subjective research methodology in order to provide insight into the world we live (Alsaigh & Coyne, 2021; Bynum & Varpio, 2018; Logg et al., 2019; Moules et al., 2015; van Dis et al., 2023).

Researcher Subjectivity & Positionality

The hermeneutical approach acknowledges the impossibility of trying to remove oneself from the research process and embraces it as part of the process contributing to the research quality (Bevan, 2014; Bynum & Varpio, 2018; Gadamer, 1998; Laverty, 2003). Self-awareness is a necessary piece of hermeneutical phenomenology in order to incorporate pieces of the researchers history into the new truths uncovered (Gadamer, 1998; Moules et al., 2015). Incorporating this self-awareness also allows for relational ethical considerations, which "involve an ethical self-consciousness in which researchers are mindful of their character, actions, and consequences on others" (Tracy, 2010, p. 847). This section addresses the positionality and subjectivity that I brought to the research for the purposes of ethics and methodology.

As an academic librarian, I had professional and personal context for this study. Algorithms have always been a part of the information retrieval and discovery process. My career has granted me the opportunity to work with novices and experts in their fields to find information sources for their research problems. In either instance, there are those that feel confident in their ability to navigate information landscapes but who do not acknowledge the

power needed or the privilege it is to access information. As information discovery has become more passive through digital network connections, suggested content, and personalized results, there have been challenges and opportunities for information professionals. The opportunities come from some confidence to be justified as it has become easier to locate desired materials. However, the challenges have come through some of this research's background information. These challenges presented me with a sense of frustration that I acknowledge in wanting to empower people with access to information and ensuring that social justice can continue to move forward.

There might be some power dynamics at play being a faculty member at the institution where the participants take classes. They would see this in the email address used to solicit their participation and they would note it in my signature line. I had to ensure they understood that it had no role or judgement in their participation. To do this task, the interview protocol (found in CHAPTER 1 - Chapter 1 -Appendix A -) included language to acknowledge my positionality in relation to membership and assure the nature of the relationship for the study. A sub-point of this relation is acknowledging the bias I may have harbored based on my experiences working with adults in information finding, which could impact the relationships in the research process (American Educational Research Association, 2009; Tracy, 2010). To combat these relational ethics considerations, I disclosed my positionality with students but also noted how my perceived power had no influence on their classroom success or their use of the library. This disclosure also related to procedural ethics.

Approaching this research came with acknowledging the power privilege I had and that I came to this research as an outsider (Johnson-Bailey, 2003). I was not an adult learner in higher education as an undergraduate student. I was a faculty member at one of the institutions with a

background in information architecture. I also came from a socio-economic background that allowed me to access a computer before I could read. The research was motivated by the harm done to historically marginalized groups that the researcher cannot identify as in many respects. Because of that, members who are aware of these issues may not have be comfortable discussing them. Despite this outsider and privileged perspective, the research methodology allowed me to use the details of my background to contextualize the interpretation of findings (Merriam & Tisdell, 2015).

Research Procedures

Prior to any research activity, the research proposal underwent review from the institutional review board (IRB) of the research sites: Kansas State University and University of X (which is a pseudonym for participant privacy). These reviews ensured the procedural ethics of the research. Procedural ethics are "dictated as universally necessary by larger organizations, institutions or governing bodies" (Tracy, 2010, p. 847). Once approved by both boards with equivalent information, participant recruitment began.

Research Sites

Participants were recruited from the University of X. The University of X was an urban, R1 institution located in the Midwest United States. They served nearly 30,000 undergraduate students in 2023. During that time, the undergraduate population was 50% male and 50% female. About 71% of undergraduates were white, and only about 10% were adult learners (National Center for Educational Statistics [NCES], 2023). With these statistics, it means there are approximately 3,000 potential participants from the University of X.

The research site selection used convenience sampling. Convenience sampling occurs because of the ease of access and inexpensive to access participants (Tracy, 2013). The

institution was a site where the researcher already had a relationship, which was previously discussed in the Research Subjectivity & Positionality section of this chapter.

Participant Selection

Participant selection used purposeful sampling. Purposeful sampling is when researchers "purposefully choose data that fits the parameters of the project's research questions, goals, and purposes" (Tracy, 2013, p. 134). Purposeful sampling occurred prior to sending a call for participants at the research sites by ensuring the call for participants only went to those who were eligible for the study. This call for participation was sent via email to those at the research site who were currently enrolled in undergraduate classes and who were over the age of 24. The age and current enrollment parameters met the adult learner criteria in the research purpose and questions as defined by NCES (n.d.). No other criteria were needed in identifying potential participants for the study and to meet the purposeful sampling criteria. To gain access to these potential participants, the researcher worked with the institutional research departments to create a query of students that met these criteria to obtain their contact email. The retrieved email addresses were then sent a recruitment email.

Because the purposeful sampling began at the solicitation for participants, their interest in participation began with their consent. Those interested completed the informed consent form. The form included details for the participants on scheduling their first interview. Once completed, I scheduled a time based on their responses with an intent to get enough participants to achieve saturation (Frechette et al., 2020). Those interviews were within one week of their consent form completion whenever possible. The participant then received a calendar invitation with the Zoom link. The day before the interview, they received a reminder email about the interview. To encourage participation throughout the study, the study offered a $25 Amazon gift

card, which resulted in 5 participants. The small sample size was not a limitation of the study as it enabled the research to highlight "the lived experience and context in as much depth as possible" (Frechette et al., 2020, p. 6). Therefore, the small sample size was a feature of the selected methodology.

The use of incentives has positive and ethical considerations. On the one hand, incentives are commonly used to increase participation. Initial attempts at this research resulted in no interest, which led to the decision to add them. Ethically though, incentives need to be unattached to a dependency relationship, high risk research, or aversion to principles (Grant & Sugarman, 2004). The use of incentives in educational research is ethical as long as it is not excessive, inappropriate, or influences the results in some way (American Educational Research Association, 2011). The incentive offering was not attached to any result other than the participant being one of the 10 who completed interviews, and therefore, meeting the ethics criteria.

Participant Demographics

As previously stated, there were 5 participants in this study who will be referred to under pseudonyms: Wario, Rosalina, Mario, Luigi, and Daisy. A quick summary of these participants and their demographics can be found in Table 3.1. All participants were expecting to graduate from their program within a year of the interviews.

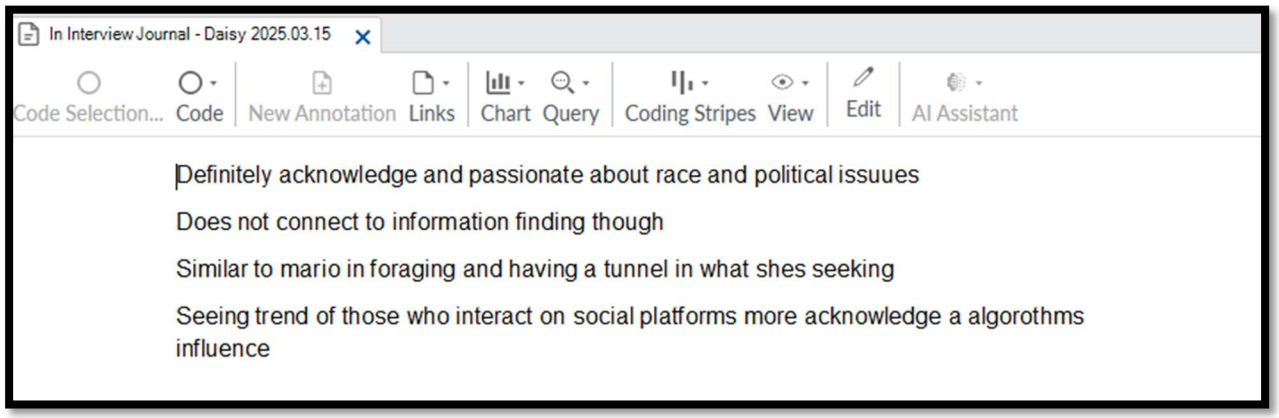
Table 3.1 Participant Demographics

Pseudonym	Age	Program of Study	Pronouns	Current Profession
Wario	42	Psychology	He/Him	Engineer / Content Creator
Rosalina	27	Medical Imaging	She/Her	Healthcare
Mario	68	Social Work	He/Him	Former Professor
Luigi	48	Interdisciplinary Studies	They/Them	Educator/Writer/Content Creator
Daisy	42	Interdisciplinary Studies	She/Her	Healthcare

Data Collection Method

This research collected data through interviewing and journaling. When using phenomenology, there is no strict technique to follow in order to be flexible for the phenomena of interest (Bynum & Varpio, 2018; Sloan & Bowe, 2014; Van Manen, 2014). Van Manen (2014) makes clear "the phenomenological method cannot be fitted to a rule book, an interpretive schema, a set of steps, or a systematic set of procedures" (p.29). Despite that, to achieve the human-lived experience and phenomenological research generally uses interviews in its methodology (Ajjawi & Higgs, 2007; Bevan, 2014; Moules et al., 2015; Van Manen, 2016). Additionally, hermeneutical phenomenology includes the researcher in the analysis process through their self-reflections and removing the bracketing process (Bevan, 2014; Bynum & Varpio, 2018; Laverty, 2003). This inclusion of the researcher makes the findings a co-creation between the researcher and the participants (Laverty, 2003). Because of this methodological need, I used a research journal throughout the process. An example of this journal can be seen in Figure 3.2. The research journal during data collection allowed for the tracking of interpretive ideas to retrieve later on (Moules et al., 2015). Those journaling ideas were included during the data analysis process.

Figure 3.2 Research Journaling Example



As mentioned, phenomenology tends to lend itself to interviews for data collection (Ajjawi & Higgs, 2007; Bevan, 2014; Moules et al., 2015; Van Manen, 2016). Interviews are best used in research "when we cannot observe behavior, feelings, or how people interpret the world around. It is also necessary to interview when we are interested in past events that are impossible to replicate" (Merriam & Tisdell, 2015, p. 108). With phenomenology, it is looking at how people interpret the world, and, for the purposes of this research, it will be drawing on their past experiences interacting with algorithms. Therefore, interviews then become the most appropriate method.

Interviews have been used in other phenomenological or education studies (e.g. Archambault, 2022; Diehm & Lupton, 2012; Lauterbach, 2018; Wang & Fussell, 2020). Interviewing for hermeneutical phenomenology serves to gather that human-lived experience and to develop a shared meaning of the experience with the interviewee (Ajjawi & Higgs, 2007; Van Manen, 2016). These methodological understandings guided the methodology for this study. Earlier this chapter introduced Lauterbach's (2018) four phase model of the phenomenological process. The interview process is the second part of Lauterbach's (2018) phenomenological process model where the data is generated by using personal experience, literature, and participant experimental descriptions (i.e. their interview). This study was conducted online, via interviews over Zoom, which was consistent to other algorithmic qualitative studies (e.g. Archambault, 2022). While the interview modality may have had drawbacks such as the potentiality of participant distraction, lack of access to technology/expertise, and less observable non-verbal data (Tracy, 2013), it allowed for the accommodation of those who may be enrolled in courses at different institutions or in online courses while living around the world. It accommodated the methodological need to record the session to capture available verbal and

nonverbal data while allowing the participant to quickly and easily forget about the recording for natural reactions (Merriam & Tisdell, 2015; Moules et al., 2015).

This research used the semi-structured approach to interviewing. The semi-structured approach uses a mix of more and less structured questions to allow flexibility but maintain some consistency between participants (Merriam & Tisdell, 2015). The mix of flexibility and structure also aligns well with phenomenology by adapting to the phenomena and experience but is still practical while meeting its purpose (Bevan, 2014; Moules et al., 2015; Suddick et al., 2020). Brinkmann and Kvale (2015) offered 12 components to semi-structured interviews. These aspects help the researcher bring the phenomenon forward through the interviewing process and are embedded throughout the research procedures. Most importantly, phenomenology allows the lived experience to come forward through these aspects, which the interviewing process can most effectively achieve.

Appendix A - provides the details of how the interview practices played out with the details of the 1-hour interview process structure. How these pieces aligned with the project research questions and theoretical framework are available in Appendix B - . Following the initial interview, follow-up interviews then occurred as needed to reach clarity in the study and participant responses.

Research Quality

To make research worthwhile to the researcher and to those using the research, it needs to contain quality. Tracy (2010) provides eight markers that generally make up excellent qualitative research. Some of these markers become evident throughout the body of the work and results rather than through a few exemplary sentences in the methods. Those markers include a worthy topic, rich rigor, significant contribution, and meaningful coherence (Tracy, 2010). Outside of

those markers the others, sincerity, credibility, resonance, and ethics (Tracy, 2010), require direct evidence in their contribution in the methods.

Sincerity is characterized by self-reflexivity and transparency in challenges (Tracy, 2010). Self-reflexivity is a cornerstone of phenomenological qualitative inquiry (Van Manen, 2014). With self-reflexivity, it also grants authority to have a more informed understanding of approach (Gadamer, 1998). Therefore, the data analysis plan to come later in the chapter includes space for researcher memos (Bazeley, 2021; Bynum & Varpio, 2018). The journaling in the data collection methods and memo-ing in analysis added to the transparency by documenting the progression of thoughts and interpretations (Bazeley, 2021). Interpretations were based on the researcher by being routed in my experiences, knowledge, and feelings (Alsaigh & Coyne, 2021; Bynum & Varpio, 2018; Moules et al., 2015). Because the data had encountered many rounds of interpretation, the writing also went through rounds writing and rewriting to connect understanding and phenomena (M. Z. Cohen et al., 2000). The methods also included details about the researcher's positionality in the work.

Credibility and resonance can be found in chapter 4 findings. The findings include thick, rich description and evocative representation, which is the single most important factor for quality data representation within the methodology (Tracy, 2010; Van Manen, 2014). These descriptions tie to the phenomena and illuminate the experience through deliberate and purposeful exaggeration (Bevan, 2014, 2014; Bynum & Varpio, 2018; Moules et al., 2015). Counter examples in the phenomena also helped expose the experience further and not be solely rooted in the researcher's interpretation (Alsaigh & Coyne, 2021; Moules et al., 2015). This thick, rich description was integrated into thematic findings based on the codes and categories from analysis (Bazeley, 2021; Saldaña, 2021). These themes were tied to phenomena that the

research questions sought to understand (Bazeley, 2021; Moules et al., 2015). This process was the illumination and illustration of the phenomena phase and the integration phase of data analysis (Ajjawi & Higgs, 2007). The descriptions provided within the themes gave examples of the contextualized experiences, rather than the participants who provided them (Moules et al., 2015).

Other methods of credibility and resonance, such as member checking or transferability, do not complement phenomenological inquiry (Moules et al., 2015; Van Manen, 2014). This incompatibility is why Van Manen (2014) reminds readers that high quality phenomenological research does not have findings. Instead, "one must evaluate it by meeting with it, going through it, encountering it, suffering it, consuming it, and, as well, being consumed by it" (Van Manen, 2014, p. 355). Van Manen's (2014) standards of quality research do align with Tracy (2010), particularly in credibility and resonance. For example, Tracy (2010) uses thick description as one way to reach credibility and descriptive richness is one of the six markers for Van Manen (2014) for a quality phenomenological study. As such, findings demand from many sources to include thick description as they help demonstrate the findings come from somewhere (Moules et al., 2015).

Finally, within ethics, Tracy (2010) includes a variety of types of ethics. This study had extensive procedural ethics with two institutional review board reviews, which included the review of situational ethics. For relational and exiting ethics, this study included the opportunity for follow up interviews with participants.

Data Management

Data management and analysis lead to the final product of the research, which "highlight the experience under exploration as close as possible to how it was lived by the participant, while

noting the interactions and overlapping horizons between researcher and participant" (Alsaigh & Coyne, 2021, p. 6). For data management, the institution was with Kansas State University. Recordings of the interviews were held on the institutional Zoom account requiring multi-factor authentication to sign in until transcription is complete. During the interview, I attempted to use the participant's given name as little as possible while the recording was on to protect privacy in the transcription. Transcription was primarily done using automatic closed captioning in the Zoom recording, but the researcher provided minor edits for clarity and the participant's name was transitioned to a pseudonym in the saved transcript. The saved transcript was stored on the institution's OneDrive requiring multi-factor authentication for at least three years, which allowed for IRB compliance and ensure an extra copy of the data to exist should anything happen during analysis (Merriam & Tisdell, 2015). The Zoom recordings were then deleted. The transcripts were then analyzed using the qualitative data management and analysis software, NVivo Version 14, where the researcher used conduction coding, sorting/categorizing, and querying of the data (Tracy, 2013). The researcher's journals and memos were transcribed and transitioned in the same manner (Merriam & Tisdell, 2015). The Microsoft Form for participation and consent Excel file was also hosted on the institution's OneDrive.

Data Analysis

Once the data had been collected, transcribed, and stored, it was prepped and it was time for data analysis through the continued use of NVivo 14 (Merriam & Tisdell, 2015). This research used inductive and deductive analysis, and their uses will be discussed throughout this data analysis section. Inductive analysis "assumes that the researcher is not starting the data analysis with any kind of preestablishes testable hypothesis about the data" and is best used at the beginning of analysis (Bhattacharya, 2017, p. 150; Merriam & Tisdell, 2015). As the process

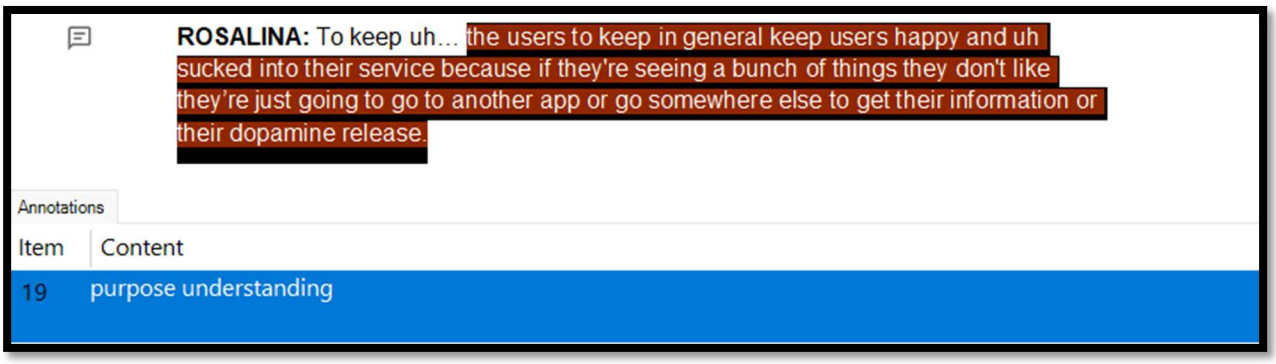
progresses, the analysis becomes more deductive by using the found evidence in categories (Merriam & Tisdell, 2015). Deductive analysis "use[s] various forms of a priori theory to examine meanings, processes, and narratives of individual and relational phenomena" (Fife & Gossner, 2024, p. 1). In hermeneutic phenomenology, data analysis has no linear path that is easy to understand (Dibley et al., 2020). It is an iterative, cyclical process that looks at the parts and the whole of the data (Bazeley, 2021; Bhattacharya, 2017; Merriam & Tisdell, 2015; Moules et al., 2015; Suddick et al., 2020). "Hermeneutic phenomenological data analysis is instead a journey through 'things which need to be thought about' in the spirit of the underpinning philosophy" (Dibley et al., 2020, p. 118). Therefore, analysis can be messy and takes many iterations before producing the final interpretive representation.

Prior to beginning data collection, I ensured I answered my interview questions for myself as part of my journaling, which helped my background acknowledgement in hermeneutical analysis (Alsaigh & Coyne, 2021; Bazeley, 2021; Bynum & Varpio, 2018; Dibley et al., 2020). This process allowed for the hermeneutical facet of the design with "the multiple stages of interpretation that allow patterns to emerge, the discussion of how interpretations arise from the data, and the interpretive process itself are seen as critical" (Laverty, 2003, p. 31). It prepared me for the analysis process by understanding how I brought myself into each interview (Dibley et al., 2020). In hermeneutic phenomenology, data analysis begins passively during the data collection process as the research develops vague notions of meaning through the act (M. Z. Cohen et al., 2000). These vague notions are formed through my past experiences, highlighting the importance of this step.

To begin the active analysis process, the transcript was read in its entirety. This helped gain a sense of the interview in its entirety (Bazeley, 2021). Parroting, or reading the transcript

out loud to myself, was done since most of the transcription was completed by Zoom's closed captioning and thus removing some of the intimate knowledge from doing it entirely myself (Alsaigh & Coyne, 2021; Merriam & Tisdell, 2015). Then, a closer read of the transcript was done by examining every section and sentence to finding meaning, that included reflections and seeking connections and comparisons (Alsaigh & Coyne, 2021; Bazeley, 2021; Dibley et al., 2020). During the readings, reflections, connections, and comparisons were documented through a memo in the transcript (Merriam & Tisdell, 2015), as evidenced in Figure 3.3. When possible, these were linked to observations, relevant text, other data, or other notes (Bazeley, 2021). Memos also included interpretive summaries and early themes identified through the initial read through (Dibley et al., 2020). These steps are some of the early stages of the inductive analysis that occurred. These steps also align with Ajjawi and Higg's (2007) first stage of data analysis, immersion in the data. Immersion will also come through dwelling on the data. After completing the first read through and the line-by-line read through of the transcript, there was another reading. That reading led to dwelling. Dwelling was through a reflective period of at least two days to see if new ideas percolated from remunerating on the data (Dibley et al., 2020).

Figure 3.3 Example of transcript memo-ing



After immersion and dwelling, I was more prepared to identify what was relevant and what was not to the phenomena within the data (M. Z. Cohen et al., 2000). It was then time to

begin coding for thematic analysis using open coding. This was again a line-by-line read of the transcript (M. Z. Cohen et al., 2000). Coding continued the iterative process, because it was unlikely I would get it right the first time (Saldaña, 2021). This likelihood was because the process was meant to inspire further analysis (Bazeley, 2021; Saldaña, 2021). Therefore, there were at least two stages of coding: an exploratory stage and a more organized one (Bazeley, 2021; Saldaña, 2021).

During the exploratory stage, the analysis used open coding as it will be open to anything (Merriam & Tisdell, 2015; Saldaña, 2021; Tracy, 2013), and is an inductive analysis process. This open coding was the understanding phase of data analysis looking for participant constructs focusing on activities and processes (Ajjawi & Higgs, 2007; Tracy, 2013). This phase was mostly looking for descriptive, process, or evaluation coding during open coding. Descriptions of these coding methods can be found in Table 3.2(Saldaña, 2021). Their use was with the intent to make it easier to retrieve data in the future (Merriam & Tisdell, 2015). This analysis was looking for associations that strengthen the phenomena rather than trying to match a theme in order to fulfill the hermeneutic interpretation (Moules et al., 2015).The exploratory stage helped get to that secondary stage where codes can connect to categories that may connect to themes at the end of analysis (Bazeley, 2021; Saldaña, 2021).

Table 3.2 Coding Methods Descriptions

Coding Method	**Description**
Descriptive coding	These codes are topic driven codes similar to hashtags that summarize an idea. Anticipate they will help in knowledge building.
Process coding	These codes are action codes that often end in -ing verbs. Anticipate they will help in coping strategies and navigation.
Evaluation coding	These codes assign judgements. Anticipate they will help in connecting to the research paradigm.

In moving to stage two of coding, codes were evaluated based on the research questions, research purpose, and phenomenon of this study to ensure focus (Bazeley, 2021; Merriam & Tisdell, 2015; Van Manen, 2014), and began the deductive analysis process. This was the abstraction phase of data analysis that began research constructs in trying to group together notes and codes into categories (Ajjawi & Higgs, 2007; Merriam & Tisdell, 2015). If in the process I determined the want for sub-codes, these would only appear in one branch and would not go more than two levels deep. These measures prevented overlapping codes (that should have their own branch) and over analysis (Bazeley, 2021). Additionally, during the re-reading and coding process, text was broken down into small components where possible, but I avoided fracturing the data to where it was decontextualized (Bazeley, 2021; Tracy, 2013). This helped the essence remain intact for phenomenology as well (Van Manen, 2014, 2016). The theme creation process was the synthesis and theme development phase of data analysis (Ajjawi & Higgs, 2007). The results of which are in Chapter 4.

As interviews and coding progressed, further revision to the codes was possible, which required recoding previously coded transcripts (Bazeley, 2021). With the evolving nature of the codes, memos were used to document how the code occurred, ideas for comparison, circumstances where it was used, and other relevant information that will be used in analysis and theory building (Bazeley, 2021). Additionally, a code book in the software was used to maintain descriptions of used codes, which also helped with the (re)organization process of codes in the iterative process (Bazeley, 2021; Merriam & Tisdell, 2015; Saldaña, 2021; Tracy, 2013). The evolution of the codebook was just another documentation method that could be included in research reflections. For example, the category for determining how to meet information needed

under coping mechanisms had been three separate codes during the process but eventually became just one.

Researcher Reflections

As a reminder, hermeneutical phenomenology includes the researcher in the analysis process through their self-reflections and removing the bracketing process (Bevan, 2014; Bynum & Varpio, 2018; Laverty, 2003). This inclusion of the researcher makes the findings a co-creation between the researcher and the participants (Laverty, 2003). Because of this methodological need, I used a research journal throughout the process, and during analysis, I also used analytical memos. The research journal during data collection allowed for the tracking of interpretive ideas to retrieve later (Moules et al., 2015). Analytical memos are the reflections and refractions that happen during the coding process can then be used during the write up process (Bazeley, 2021). These memos helped prevent premature conclusions or lost ideas by having a place to park them while also following the audit history of codes in creating the story (Bazeley, 2021; Moules et al., 2015). To not forget these ideas, the memos included not just the idea or the learning, but also what sparked it (Bazeley, 2021; Moules et al., 2015). When practicing this technique, they were recorded as soon as possible while they were fresh in the mind (Bazeley, 2021). These materials became part of the analysis process by becoming part of the whole rather than basing the whole off the parts.

Chapter Summary

This chapter outlined the methods for this research study on adult learners' algorithmic literacy. The research came from a constructivist paradigm. Its perspectives came from hermeneutics and critical theory, while its frameworks were from metaliteracy and critical information literacy. The chapter provided details on the who, where, and how of this research

with considerations to positionality and ethics focusing on the use of hermeneutic phenomenology as its methods. It then discussed the what of the research regarding the data collected and its analysis.

Chapter 4 - Findings

This chapter describes the participants included in the study and the findings that emerged from our interactions.

Research Overview

The purpose of this phenomenological research study was to examine the phenomenon of the participant's relationships with algorithms regarding social and ethical considerations encountered in their information seeking behavior to understand adult learners' application of CAL within their information finding behavior. It used semi-structured interviews over Zoom with 5 participants who were enrolled in an undergraduate program at the University of X over the age of 24. Each participant had one interview with the researcher that culminated in approximately 204 minutes of transcripts. These transcripts were then put into NVivo 14 and analyzed using an iterative, cyclical process that looked at the parts and the whole of the data (Bazeley, 2021; Bhattacharya, 2017; Merriam & Tisdell, 2015; Moules et al., 2015; Suddick et al., 2020).

To remain focused on the research questions, the codes began very broadly by aligning the transcript ideas to the research questions only. Through the various readings and dwelling, the 4 broad codes that aligned with the research questions became narrower in focus.

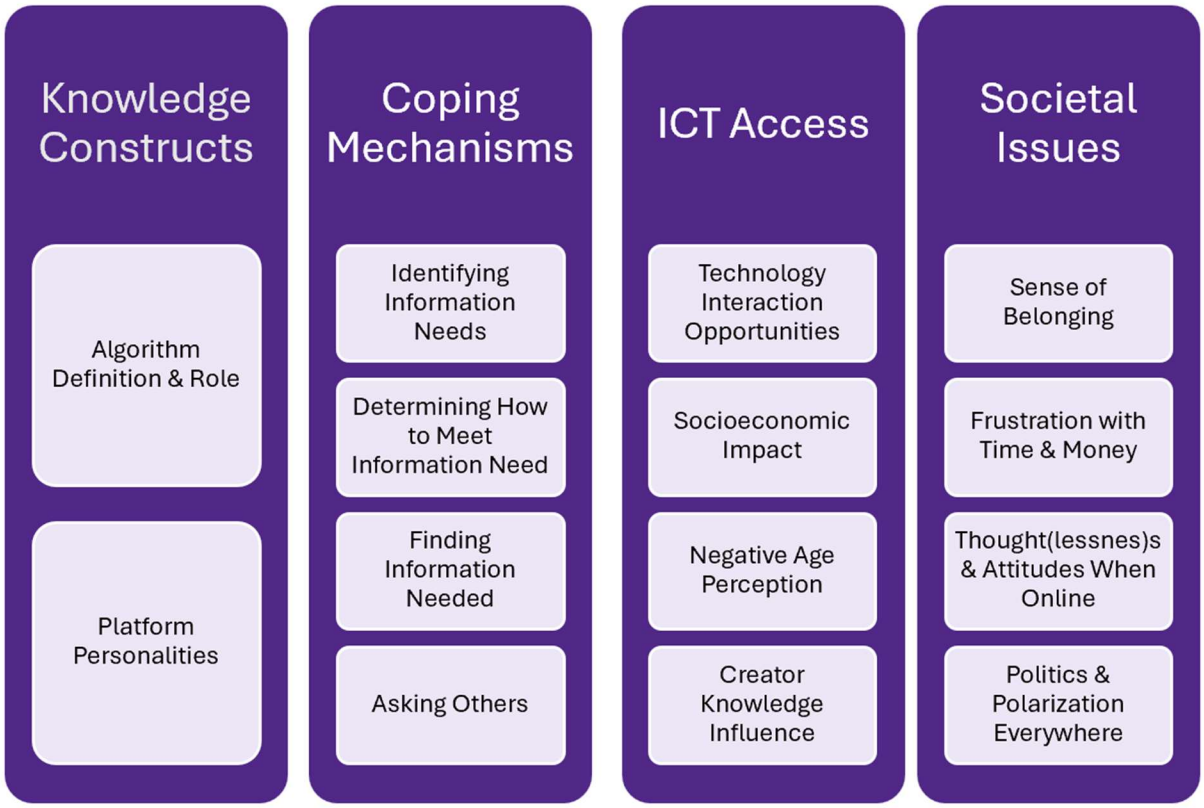
Research Questions & Identified Categories

The overall research question for the study was: How do adult learners make sense of their information finding experience? Specifically, the sub-questions were:

1. What knowledge constructions do adult learners have of algorithms that filter and shape news and information they encounter daily?
2. What coping mechanisms do adult learners have in dealing with algorithms in their information behavior?
3. How has access to information and communication technologies changed adult learners' knowledge building processes within algorithms?
4. How do adult learners examine societal issues in navigating algorithms to locate information?

Each question had its own identified categories that emerged from the data and resulted in an overall theme for the question. These categories and question alignment can be found in Figure 4.1Figure 4.1.

Figure 4.1 Research Question and Category Alignment



Knowledge Constructs

The first sub question asked what knowledge constructions do adult learners have of algorithms that filter and shape news and information they encounter daily. Based on the transcript data, two categories emerged: algorithm definition & role and platform personalities. Algorithm definition & roles looked at the participants who mentioned an algorithm in their interview unprompted and how much they knew. Platform personalities emerged from the way that participants described different platforms and the behavior they noted from others while within them. From these categories, the resulting theme was that frequent users of diverse platforms had more complex understandings of algorithmically driven information finding platforms.

Algorithm Definition & Role

A large focus of the literature review for this study focused on algorithms within the basis of the information finding process. Of the five participants, three of them acknowledged the presence of an algorithm in their information experience. Their confidence in conveying what that algorithm does was mixed. The content creators, Wario & Luigi, were more confident in how they described an algorithm and its role. Luigi described the algorithm as

> A proprietary set of instructions on that platform that so that the platform can make decisions about what it will show you based on the activity you are doing on the site. So, if you are watching something or liking something or interacting with a certain kind of thing that that can that the algorithm can then like take what you're doing and bring you more of that so that you hang around on the site more.

While Wario described it as

> A mathematical equation designed to give you different outputs based on input. And I would say like, so let's say, for example, you have a generic feed, right, of just of inputs of, you know, X, Y, Z. And you find out that you really like Y. Boy, every time you see Y, you you click Y. You either go up or down. It doesn't matter. Any interaction with Y says that this is more important. So now the algorithm is going to be like, okay, well, we're going to deprioritize X and we're going to deprioritize Z. And we're going to give you, we're going to really prioritize Y. And then as you go Y and Y, eventually as you get into Y, you get more and more specific to where you can have, oh, there's y prime, Y subscript one, y subscript two, Y superscript three, whatever, any number of variations and permutations that y has.

Rosalina was not as confident but was aware of its presence. When asked about what it is, her response was “honestly, girl, I barely know exactly what it is. Myself it's uh It's something in the internet.” Eventually she was able to describe it as something “that tracks what you like and gives you information that is comfy to you.” These variations in confidence and detail also link with the amount of time each participant described themselves as spending using online information platforms.

Despite the variations in confidence from these participants, they all acknowledged the role of money with the algorithm. Wario goes into the most detail by describing it as

> I'm happy and I spend time on it and it's a great holistic experience where I get to talk to my friends and have a great time and see things I like. That the company's idea is that the more you can tailor my feed to interact with it, the more that I'm on there and you can sell that time to advertisers be like, hey, we have 18 billion minutes of view time from the whole world every every day. So, this is what our ad rates are.

However, Luigi also shares how the platform “wants to detect what you like and what you are into and give you more of that so that you are spending more time engaging um on their platform.” Rosalina also highlights in her conversation about the algorithm that “everything's all money.” These are further highlighted in the participants’ societal issues in the theme of time & money.

Neither Mario nor Daisy mentioned an algorithm throughout their interviews. This avoidance of the topic was highlighted within their information coping mechanisms as well, where the theme of asking others became prevalent in their information finding behavior, which will be discussed later.

Platform Personalities

The data collection method for this study did not include any specificity in the information platforms participants could reflect upon. Because of this broad option, participants often hopped between platforms in their descriptions and described the different ways they interacted with them and how they saw other users’ behavior play out. This distinction between platforms was particularly true when referring to social information platforms (i.e. social media). These distinctions became important when considering the coping mechanisms and societal issues. The more a participant engaged in one platform with a distinct personality, the more frequently the participant would bring up that item as a concern or alter their own behavior in response.

For example, participants brought up X’s (formerly known as Twitter) use of negative content. Rosalina described her experience on X as “not safe for work” and often left because it was “not my for you page.” She even compared it to other platforms such as Facebook. “I've noticed that there's kind of trends with different social medias. So, like everybody on Facebook

is really hateful and super negative. And then if you thought Facebook was bad, it's 9,000 times worse on Twitter." Luigi did not specify negative content on X but described their use of social media as community building and shared that "I find that those are not as those sites are not as good at um at at delivering content that that I'm interested in seeing or content that's relevant to what I'm doing or thinking." Wario, on the other hand, goes into more detail,

> It's one of the reasons why Twitter is the way it is. It prioritizes negative engagement. So, it'll show you things that are intentionally outrageous in order to drive numbers because people love to correct each other, especially behind the shield of anonymity.

Suggested content pages on video platforms like Instagram, TikTok, and YouTube were also mentioned by many participants. These participants were the same ones who were able to describe an algorithm and exercised techniques to ensure those pages were curated (discussed later in coping mechanisms intention). In this way, these chosen platforms become tailored to their personalities based on their preferences. Luigi described it as the algorithm's "responsiveness" to behavior and when it does, "the algorithm it has found me out. It knows." Because of this response, "Instagram really is good at knowing what I'm interested in checking out. Um so I get I get a pretty well curated feed on Instagram of things that I'm interested in," Luigi expanded. Rosalina discussed how she felt and what she did with content discovered on such pages with

> It definitely came across my for you page […] , but I don't think it was somebody that I follow, though I'm sure at the moment. I probably sent it to somebody like, yeah, this is it, girls. They're understanding us.

This suggested content is something that these users liked and engaged with knowing they're not a part of their followed content.

However, not all participants felt the same all the time. For example, Wario was unimpressed with suggested content. He shared,

> There's nothing that I would say that is there. I've tried to tailor my feeds as best I can and I still end up getting all of these lovely little ads talking about, you know, any number of what I would consider hateful topics.

Additionally, neither Mario nor Daisy talked in depth about their social media interactions, which limited the ability to describe their personalities. Daisy limited her use to sharing activity to Facebook but admitted to not "actually looking back to see if anybody paid attention to what I shared and I don't really check up on it." Mario meanwhile was more active in his use of Facebook but did not describe the use of any other social media, which would limit a comparison of platforms like the other participants.

Coping Mechanisms

Coping mechanism categories looked to answer the second research sub question: What coping mechanisms do adult learners have in dealing with algorithms in their information behavior? The categories identified included identifying information needs, determining how to meet information need, finding information needed, and asking others. The identifying information needs category looks at how participants think about what their information need is beforehand. Determining how to meet information need primarily looks at how participants did intentional acts to meet, continue, or avoid their information needs. Finding information needed looks at search, find, and evaluation techniques that participants expressed throughout their interview. Finally, the category of asking others emerged when participants needed an outside hand to solve an information need. The resulting theme from these categories became that those

who acknowledge an algorithm had more complex ways of finding information online, while those who did not acknowledge it, looked elsewhere for answers more often.

Identifying Information Needs

To cope with the amount of information or the algorithm's effect in information finding, participants seemed to set their minds to what the task at hand presented. As Daisy shared, "because this one was for a homework question, our quiz question, I was very narrow minded about it" referring to how she selected the type of source she selected to use. Others described their evaluation processes, such as Mario and Luigi. Mario described trying to find information about an ache and pain online. When it came the results, he said it's "hard to sift through, but you can usually get to like WebMd or National Institute of Health," which described looking and trusting some material over others. Meanwhile, Luigi tried to explain what would prompt them to seek out new information because it felt fake:

> Any kind of news reporting where the answer is too simple and clean cut that always raises a sort of flag for me. Like if you're distilling a complicated world or national issue into it is just this is this is the sole reason and that's that doesn't fly for me. Like, the world's really complicated. These issues are really complicated.

Their description matches a mistrust that many participants shared (and discussed later in societal issues), but it also hints at the importance of nuance.

Nuance in this context is the participant's acknowledgement that there are not simple answers to complicated questions and that it takes context and analysis to reach those conclusions. This was evident when Rosalina described finding data to support online claims. She wanted clarification on the type of procedure done on women and why as those could have impacted of the results and claims made from the results. Wario had a similar situation when he

examined someone else's claims. In that example, he was able to debunk the claim with nuance. Through the nuance, he was able share with another how "Cyanide is in apples, in the seeds specifically, but it's not a lethal amount. It also doesn't mean that the apples are poisonous. So, we can have water in waste material, but it's not water itself is not waste material." He also used nuance when approaching his evaluation method:

> But I try to try to I keep three razors in my back pocket: Hitchens', Occam's, Hanlon's. That extraordinary claims asserted without evidence can be dismissed as such. Occam's razor: That which answers the most and assumes the least is usually the most correct. And then, of course, Hanlon's Razor: Never grant to malice what you can give to stupidity, meaning most people aren't evil. They're just either lazy or incompetent. And using those tripartite lenses, I can kind of cut through what at least what I see and kind of cut through some bullshit. And there's another little thing I learned when I was doing broadcasting work and people being false positive and all types of uh let's say aphorisms. Uh I would say if there's a financial incentive to not understand something, it won't be understood. So, using those four things in combination tends, I think, to help me cut more towards the center of an issue.

However, nuance wasn't for all. Daisy described really enjoying a book because

> It's just statistics, like it's just facts and um laws and the years that the laws are passed and how it affects certain people as opposed to others, but it's all statistics and like facts. It's not subjective really at all.

This comment did not acknowledge how statistics can say whatever you want with the right presentation.

Often when referring to approach, education came up as a reason for thinking a certain way. Wario felt that "one of the benefits to being an engineer is that I've learned to research at least a little bit and so I can kind of learn to filter things." Meanwhile, Rosalina described how "But the STEM major in me doesn't let that happen [trust a source without outside verification]. So, I had to go and try to look for that news myself." She also described looking for and interpreting peer-reviewed articles in her process, which is likely something she learned through her STEM education.

This type of approach, the mindset of mistrust and looking for nuance, was mostly unique to those that had actively acknowledged engagements with algorithmic impressions, such as with Wario, Luigi and Rosalina. The approach of those who did not acknowledge the algorithm, such as with Mario and Daisy, was much narrower and focused, and relied on others, which will be discussed later in the coping mechanisms.

Determining How to Meet Information Need

To receive the kind of information they desired, most participants described some intentional interactions to encourage the platform's behavior. Rosalina said she was "trying to control my algorithm." To do this, she said,

> If I see something that I like, I will watch that video all the way to the end. Give it a little like, a little thumbs up. Go to that creator's thing. If their stuff is the same, I'll also like watch another one of their videos or like follow their account and then follow their account. In my brain, I don't know that this is actually how it works. The algorithm's like okay this is something that she likes.

Luigi described it as,

> I have been conscious of finding something on TikTok and engaging with it specifically like being like, oh, cool, I hope I'll see you again or like thinking, yep, I'll see you soon, um, because I've engaged with your thing. So yeah, see you in a couple of minutes.

Wario's experience, is much of the same by sharing "normally what will happen is as I talk to people and engage with that particular content, I'll have more of that recommended to me." Rosalina even described trying to keep her algorithm more neutral (relating to politics). She shared, "I also try to flip my algorithm so it doesn't keep me in one place because I don't want to be I like to see things from different perspectives." These descriptions paint a picture of choosing content to interact with to see more (or less) of the same content.

Participants also described trying to curate their content to best meet their needs. Rosalina and Mario both described subscribing to specific news outlets to receive their information. Even Daisy described using settings to try to tailor her content, but with less success. She said "I checked a bunch of boxes. I remember that, but uh then when I found the things that I was interested in, I never went back to uncheck boxes." Luigi on the other hand uses a specific app to help curate and evaluate their news intake.

> You can like narrow things down by topic that you're interested in knowing about. […] It will look at what you are reading and what you're kind of interested in and show you things that you are missing. News kind of stories that call it your blind spot um and it'll just take sort of big news stories and show you who's reporting on it and where they sort of fall on a political bias scale that they have. It gives you an idea of like whether mostly right or left leaning organizations are reporting about this and it'll show you examples of how they are reporting about it.

These descriptions show how participants found the information they wanted through specific, intentional interactions or curation. However, sometimes intention is used just as much in avoiding or filtering unwanted content.

Many participants tried to avoid certain content, specifically mentioning news and AI responses to queries. When it came to the news, there seemed to be exacerbation with politics and polarization as discussed later in the societal issues. When asked about news, Luigi said with a laugh that they "try to avoid a lot of it." Rosalina said on the topic "Matter of fact, there's like almost no news on my algorithm." She said, "I don't really want to see anything political when I'm having my funny meme time." Wario discussed being constantly presented a "contrarian worldview" to his own, and how he'll try to remove it with "Block, mute. Really, that's about it because that's all the tools that I have." These are actions to avoid information that participants do not want to see, and act intentionally to do so, but some are unavoidable as they're built in, such as the AI.

While it was never asked in the interview, more than one participant brought up AI appearing in search results and immediately discarding them. "The AI generated stuff was instantly out [thumb pointing out] uh like, you're out. Um, not paying attention to you" was how Luigi described. Daisy also shared "I scrolled down quite a bit. Because the first responses were artificial intelligence responses and um It was just showing the first few sentences of it," implying she wanted context about the information the AI supplied. Wario did contextualize AI more than others within his description of the algorithm, "And then you eventually end up into this, ideally this very niche, perfectly tailored environment. And that's aided in a lot of cases now by what they consider artificial intelligence. In order to help predict things." His description also demonstrated more trust in what AI can do, but because of his responses to algorithm supplied

content (described earlier in algorithmic roles of knowledge constructs), perhaps he still does not like them either.

Finding Information Needed

To find the information the participants desired, in addition to their approach and intention, many expressed search, find, and evaluation strategies to locate it. Often, this meant searching for information seen on social platforms elsewhere or repeating searches. As Mario described it,

> I'm kind of used to it because, you know. When I was doing research, you know, the key was always find the right keywords and usually like when you find the right words or the right phrase, you can get the motherload, but it takes a while.

For Mario, that meant trying a few different keywords when he was learning more about becoming a social worker. Luigi described three different search attempts to find more information on a historical society for a class project:

> So the first search was I was too broad. I had, I just sort of looked for like broad information to see if I might find. I think my assumption was there might be some web home already for this. For what I was looking for and that would just sort of come up if I searched the organization. So, mine was too broad at first. I think it took like three different [three fingers up] search prompts to get to where I found that.

This multi-search strategy to locate the desired information worked for some but not for others. Daisy expressed deep frustration in not being able to locate more information about halal restaurants in the area. "I've searched the same thing multiple times before, but I don't know that I found a new way to say halal restaurants in [city name redacted] or halal restaurants near and then put in my zip code," she shared, also saying "And that just usually doesn't pan out at all.

[laughs] So I don't know." These examples that participants gave when intentionally searching for information, but often they also brought up stumbling upon information and searching for more.

These examples often happened when participants were on a social information platform where someone shared information. They would just want to learn more outside of that shared source. Rosalina shared,

> I'll be, you know, sometimes you're like, I just want a little more information or like, I like that one specifically. So I'm going to either… go look at more fun stuff relating specifically to that or if it's more like question based, then I'll go start looking into it.

Luigi would do much of the same,

> Um Like I'll maybe grab the headline or grab like the basic idea of the story and just search that and see if I'm finding other places that are all that are sharing a similar story or reporting on the same set of facts and then like checking it out. Does this fact match this set of facts? That is also like a useful way to kind of combat bias too, because different places are going to report on things and contextualize them in different ways. So, uh this set of do these set of facts match up and are there different ways that people are kind of like looking at those sets of facts and uh But yeah, like I'll just, I'll search for other versions of the same story and see how much of the facts are lining up.

Overall, they [Luigi] were trying to

> look for like consistency across multiple platforms before if I'm, if I'm If something feels like too like if something feels fake, if or fake or potentially some part of it feels like that, that just doesn't add up to me, then I'll try to find some corroboration from another site.

In these examples, both participants found information on one information platform to search for it in another to learn more about the issue at hand.

Whether the finding strategy was prompted because of information found or desired, participants also frequently described a scroll and select process once a search was initiated. This strategy is in complement to the approach many took when taking on an information finding task. For example, Daisy said "And I scrolled down, probably passing like three or four options before what was in my face was the answer I was looking for because I had been pretty specific in what I typed in the search and I just wanted it to give me an answer that reflected the um parameters that I put in the search." Wario had a nearly identical description with "Like, no, it was like, it was like three or four down." Rosalina mention how she "clicked on a couple pages" to find the one she wanted. Mario mentioned how this behavior is in response to the amount of information received:

> But in recent years, of course, it's flipped. The problem is too much information. Right. So, when I was researching in doing the evaluation research. The problem wasn't trying to find something. It was trying to sift through everything that you have.

Therefore, the strategy is to evaluate results options while browsing.

Evaluation seemed to be based on matching the input, such as Daisy's above description. However, sometimes it was just looking for a trusted source, which was however the participant defined it. In the approach section of coping mechanisms, a quote from Mario highlighted how he looked for a source like NIH. Wario did something similar in his evaluation methods as well. "Because I asked, I think I Googled like, is cyobalamine made from human waste? And then like the first like four searches where things were like, no, no, no, this is a myth. Then NIH had a study." Mario went further into his evaluation methods later as to why:

> I mean, it looks like I should look for government sites university sites. Okay. Or sites with uh from organizations I know something about you know I know um like National Mental Health Association. Um Or like New York Times, Washington Post, Wall Street Journal. You know.

Rosalina had slightly different criteria when evaluating. “I started looking at making sure that the websites end in ORG so I can actually find where their sources are.” However, she also mentioned trying to find unbiased source frequently as well. “I’ll go, okay, let me do a little bit more research like go look into it a little bit more and I’ll try to find websites that Or… news companies that aren’t so biased like CNN or Fox News.” Therefore, they all had some evaluation process in selecting a source with some commonalities but demonstrate the nuance of source evaluation depending on individual need.

Asking Others

Seeking outside help emerged as a common theme for participants when it came to information finding. This theme was especially prominent for the participants who did not acknowledge the presence of an algorithm in their information finding during the interviews. This avoidance of the algorithm in explaining their finding methods made the theme stand out from a strategy coping mechanism discussed in the earlier theme where participants tried to work around or with the algorithm. The use of asking others circumvents acknowledgement of the algorithm’s influence. For example, Daisy provided two scenarios where her online search failed but she ultimately ended up asking a person to answer the question. One where she was unable to find a local Ramadan calendar and asked her chaplain, and the second when she struggled to find a halal restaurant. She ended up passing a local restaurant:

> So I went inside and I asked them if they serve halal and they do. And then also in [city name redacted], there's a restaurant called Taranga, where I go to them because I know they serve halal food. Um and then um so there's so it's word of mouth and randomly passing places that I found the answers.

She also repeatedly mentioned how she relied on her father's expertise when it came to computers. Mario also mentioned how

> The other thing that I'll do is um call people. You know, because I sometimes rather than doing a search, I know somebody, um, another professor or some student former student um who's really into a certain area. I'll call them up or send them an email and say, hey, what do you know about this? [laughs] And they can help you sort through the BS, you know or give you the right direction. So, I do have that a lot.

Mario also would ask people online for help through his social networks. "People I knew who had kids about the same age or older ask them about good places to go and um Or, you know, did your kid ever do this? And what did you do about it? Stuff like that." Therefore, these participants would often look at others they know to help them answer their questions. However, not all participants felt this way. Rosalina expressly said, "There's like maybe one professor that I would believe wholeheartedly without Googling it." Everyone else Rosalina would not trust but would look for an outside source.

For the participants that did like asking others, they didn't always have to be people they knew. Sometimes they would ask an information platform to help them make a decision. Mario really enjoyed movies, and streaming platforms became a topic of conversation to try to see if an algorithm would come up. He shared,

> I do rely on suggestions sometimes. You know, because they just look interesting you know, but again, what I usually do is um if they suggest a movie to me, I'll go Google it. See what it's about and then even look for like um again um New York Times movie reviews, you know.

Daisy, who was much the same but with an audio book platform, said in response to looking for suggestions on the platform,

> I wouldn't know because I don't look at them. I go there with a purpose. Like I'll be listening to NPR and if there's an interview with somebody and they have a book that I'm interested in, then I add it to my wish list.

In both these scenarios, the participants used an already trusted source to help them decide or select something on their algorithmically driven platform. This method of information finding is what Mario described as

> foraging theory. It took the idea that people forage for information the same way animals forage for food you know. And I found that really useful and thought kind of that's always kind of in the back of my head kind of I mean, I just kind of think that way when I think so you know I get an idea that I need something or want something and then you go forage for it, right? Usually through the internet, but not always, you know.

In these examples, the participants have a specific information need and they seem to ignore anything outside of that need. This becomes a coping mechanism for handling the amount of information available to them particularly when they don't acknowledge how that information got there through an algorithm.

ICT Access

ICT access categories look to answer the third research sub question: How has access to information and communication technologies changed adult learners' knowledge building processes within algorithms? The categories that emerged were technology interaction opportunities, socioeconomic impact, negative age perception, and creator knowledge influence. Technology interaction opportunities looks at how much technology participants were able to describe in their day-to-day life, including at work. Socioeconomic influence examines how participants described their childhoods comparatively. Negative age perception emerged from how participants described the use of technology in relation to age. Creator knowledge influence emerged from the unique way that creators described their algorithmic experience. These categories resulted in a demonstration that while socioeconomics may impact knowledge building process, it is still the depth of use that influences it the most.

Technology Interaction Opportunities

All participants discussed various technologies that they used every day and while growing up. None of them ever mentioned feeling as though they were limited by access to technology, especially today. As Daisy said, "Now there are so many screens in the house that I might run out of fingers." Mario shared, "I use my computer every day, absolutely. Um every day, all day, you know pretty much." Luigi then discussed how this access dominated both their time at work and in their school life. "I mean, a lot of my work is online. So, we're talking like three or four hours a day where I'm doing some kind of work online. Between classes, it's maybe even more than that." The participants never expressed that they were limited by access or by means to technology. Based on these responses, this eliminated the likelihood of access being a barrier in building knowledge constructions related to algorithms.

Using technology at work was something that all participants could again share. None would just say their work did not involve the use of technology. Luigi shared,

> My last nonprofit job, I ran programs for uh a human services agency, particularly a food bank for the community. So, um yeah, I was always kind of like searching for I was always tasked with searching for like new ways to locate uh vendors for us to use to make our work better.

Mario did a different kind of research using technology,

> As a professor and a researcher, we use a researcher we use statistical software. I, use, I started out using SPSS1 version one. I don't know if you do quantitative analyses or not. Now they're up to like version 27 or something like that. But uh I've used that and used some other, you know, structural equation modeling softwares. So, we use that all the time.

Daisy also had very specific use for technology,

> They keep um the clinical lab index is where I go on the internet to see um the sodium test what the minimum. For a culture, uh, for someone who weighs this much, for specifically for [name redacted] hospital because their equipment is calibrated. So, I have to make sure I'm I can't just search Ecosia or Google.

Wario's use of technology was very technical and specialized. He described, "So, I would use, uh, spectrum analyzers, frequency counters, oscilloscopes, multimeters. Uh, I would use soldering irons. I would literally, one of my last jobs where I was the junior engineer there, um, I would do all the fabrication." Rosalia described a mix of field specialized software and information finding at her job:

> After we got into the new system, yeah, [laughs] because nothing transferred over from the old patients. So, every single patient that came in I'll go all into the old system. Go look up all of their stuff. And then go hand type it into the new system, which I'm sure there's a much more efficient way to do that, but I digress. But that's probably the most we do outside of like looking up, um, a good pharmacy for somebody.

Each of the participants, therefore, interacted with technology but the connection to information finding or specialty focus varied. These examples again point to the elimination of the likelihood that access was a barrier in building knowledge constructions related to algorithms.

Socioeconomic Impact

The literature review showed that socioeconomics tended to be the best potential predictor for knowledge building because of their everyday access and exposure to the technologies. Therefore, when examining the data, clues for this status were actively looked for in transcripts. These clues were mostly found in the recollections of childhood access to technology, which was always relative to when the participant was a child. For instance, Mario was the oldest participant in the study. He shared,

> Growing up, I, we're talking the 70s then, right? 60s and 70s. So, there was really just television radio you know we had a stereo um So daily, you watch TV. And um you know play your stereo, play your albums, your vinyl albums.

This response is very different from Rosalina, who was the youngest participant. "I had a Game Boy. [laughs] And a Game Boy SP, namely advanced SP. Home phone. Dial up. Yahoo Messenger." In Rosalina's response she is not just sharing the technology she used but how it evolved over time, such as with Gameboy, which would indicate a means to evolve with technology rapidly.

Some participants were explicit in what their socioeconomic status was growing up. For instance, Daisy shared "So, my parents are contributing members of society. The bank still took the house that I was a home birth in. My brothers were home births in." Comparatively, Daisy, Wario, and Luigi all grew up within the same period by age. However, Wario and Luigi discussed television, game consoles and the internet coming into their homes as children. Wario said, "I used, um, we had obviously telephone, television, um, family computer. Uh, I had a video game console. Um, that was about it." Meanwhile, Luigi shared, "it was basically like just television, and I guess like like radio was like the technology that we had. We didn't have access to the internet until I was almost out of school entirely." However, Daisy was different. She still mentions a computer and gaming consoles, but her focus was elsewhere. She shared,

> So we grew up with, um, the paper had the holes, the perforated edges around the and so that we have that printer where you could print like banners and stuff or, um, so we had a desktop and a printer. And [pause] um technology, I remember when our grandparents sent us um a Sega and my brothers would play with that.

The printer access came up again for her when discussing technology today. That printer was important to her, and no other participant found this technology significant to mention. This difference may be because the gaming console that Mario and Luigi could reference was not actually in Daisy's home, but rather her grandparents'. Because Daisy has acknowledged that she did not have a lot of means growing up, the printer may have been a point of pride in her home and offered a different level of engagement with technology than a gaming console would in using technology.

Negative Age Perceptions

Because age was not significant in the literature it was not something that was actively examined in the data, unlike socioeconomics. Despite that, participants continuously referenced age when referencing technology. Usually that reference was not in a way that inspired confidence in those with age using technology. For example, Rosalina made the offhanded comment, “I could just be getting old and not being very good at doing Google searches all of a sudden [laughs].” Her comment alluded to a lack of ability from those older to find information. Luigi shared, “My dad in particular was very like technology resistant. He thought all that was sort of the the, um, he didn't trust it at all.” Sometimes that lack of confidence was not so much about the older person’s technological ability but rather the information they found online. Rosalina discussed how her father repeated information on public health, and “I’m like ah I don't think so. And yeah, that was totally 100% made up.” Wario was also combative with a reference to a parent regarding information. “When I grew up, my father is a very religious fundamentalist. So, we talk about evolution as a theory. And I'm like, okay, do you mean hypothesis?” These participants seemed to exhibit a lack of confidence in an older generation finding information online.

The exceptions to this were with Daisy and Mario. Mario was again the eldest participant, and he mentioned his age a lot throughout the interview. However, it was never in reference to his confidence in technology or information finding, but rather as a comparative value for how things have changed:

> As an older person I mean, at one time, like when I was in graduate school the problem was the task was to find information. So, you had to go look in journals, you know, look

> in the library find books. Order books, you know, and pay for them. And, uh, but in recent years, of course. Its flipped.

As mentioned before with Daisy, she relied heavily on her father for technological advice. She also talked about his expertise in working with it as a career "my father was in the Air Force. He like helped build like computers as we know them" For these participants, a negative age perception in relation to technology or online information finding did not seem to exist.

Creator Knowledge Influence

The literature did say that use was the best predictor of knowledge, and that depth of knowledge became clear when talking with the content creators, Luigi and Wario. Wario introduced himself as "I'm a YouTuber and streamer when I'm not at university." He said, "If I'm not searching, I'm creating," when referring to his time spent online. Luigi reflected on how much time they spent online:

> It is where my work happens. Um, it is where most of my school my schooling happens now. I've taken mostly asynchronous classes. A large part of this chunk of my academic life has happened online. Um, so, I, my writing work all happens is like I use the internet to sort of like make all my writing work happen.

Because of this time that they spend on platforms, they were able to share different insights into platforms as both users and creators.

> Wario was able to share specific things he's done to try to improve his content.
>
> We do a nice thumbnail. I got a buddy of mine in Ireland who makes excellent thumbnails for me. […] And then, you know, I'll try to tailor certain things with, um, I'll look at, for example, we recently had a world first race for a new event in World of Warcraft. So, when, so, if I were to have done a video on that, I would have looked at the

> trends and then tried to figure out the best title for a video and you know tailor a thumbnail to try to get it to get the most exposure. Um And, you know, you have to do that when you're trying to uh make a little bit of money on YouTube.

Luigi was a little bit different. They said, “I'm not that kind of intense creator. So, uh I just like cross my fingers and hope for the best.” Despite that, Luigi was able to equally make commentary as a creator in how algorithms influence information.

> Like I do appreciate that if I stumble across some kind of content on one of these platforms that I do enjoy and engage with then it is more likely that I will see something like it or see more from that creator. Um, that is nice for me as a person using it and as someone who makes content too. Uh, I'm glad that's happening. I'm glad that's happening on the other side.

Meanwhile, Wario was able to cite best practices for metrics and make suggestions during the interview process to improve microphone function. These examples were not suggested by other participants who were not content creators.

Societal Issues

The final categories look to answer the last research sub question: How do adult learners examine societal issues in navigating algorithms to locate information? The categories themes include sense of belonging, frustration with time & money, thought(lessnes)s & attitudes when online, and politics & polarization everywhere. Sense of belonging looks at how participants found community by interacting in online platforms through algorithms. Frustration with time & money examines how participants acknowledge their time sunk into these platforms and how the platforms benefit from their time with money. Thought(lessnes)s & attitudes when online describes how participants feel others think and behave on algorithmic platforms. Politics &

polarization everywhere looks at how participants describe the impact and pull of politics in their online information. The result of these categories shows that while participants appreciate some aspects of algorithmic information finding, such as to encounter joy, there are areas where they have deep frustration and would like to see better from others.

Sense of Belonging

While many of the themes from the participants were more issue-based, there was a more positive theme that emerged from them in their sense making in information finding: community. Many used these algorithmically driven information spaces to find and build communities. Luigi shared how this sense of community helped them realize aspects about themselves.

> I came out as asexual at 41 because of the internet, because of Tumblr specifically. So just hanging out on Tumblr and, um, in sort of like engaging in queer content on Tumblr brought queer content to me about asexuality, which uh was how I was like, oh. Oh, wait, that describes me. So, the way I understand myself as a person now is a direct result of hanging out on the internet and, uh, engaging with content and consuming content on the internet.

Luigi also shared how the internet created a safe space for them as a child. “I used the internet mostly for that. Like it sure was a fun place to hang out, but it was also a safe place to meet another gay person. Um, instead of like going out into going out to a bar or something which was more dangerous at the time for a young person in the south, in the deep south, at that time.” Similarly, though perhaps not as personal, Wario shared how he used these to connect with others within his hobby.

> I'm a huge fan of World of Warcraft. I like to talk to people who play the game and we have fun. We're like, oh, yeah, you did the thing. You killed the boss. You got the

> weapon. You got the thing. Yay. New happy stuff. Or, oh, this, yeah, this new season's kind of rough. Okay, well, we can get through it, or we can, you know, and even if it's not positive, it's just stuff talking about the game, like, hey, we're talking about this individual mechanic that's very niche.

He also takes it a step further in his creator content where he described using

> video games as a vector for discussion. So, I'll give you an example. I play a lot of World of Warcraft. Uh I'll hold for the mourning of my social life. And now that that's been done, uh, what will happen is I'll be talking, I'll be playing a game with talking with people. And then I'll have questions asked and I do like to do something called live learning. So, I pull up the Google search results and everything on the stream. So that people can see what I'm looking at so that if they say that like, oh, well, you're looking at a biased source. I'm like, okay, well. Let's see. Let's evaluate the quality of our sources and the best way to do education, at least that I've found, is to not confront people with it, but to get them to do it themselves and then they learn

Rosalina described how seeing others she knows helps her feel better.

> I see other people doing really well with themselves, happy about the moves that they're making and how they're changing the world and then it within my small world puts other people that do the same thing that I do or like the things that I do. And I get to see those people, um, grow up and do good things. So, that's another good part of it, though, because I don't know how well I'd be doing without social media either if I didn't see other people that were like me succeeding when they didn't think that they could in the first place.

Even Mario, was able to share how he likes “to keep track of I have family all over the place, so I do Facebook to, uh, keep touch with my family, and then, um, also, I've got old friends that I keep track of through Facebook.” These participants used these mediums to connect with others.

Because of this sense of joy or community, all expressed positive feelings towards these platforms. Luigi shared how “is it is [chuckle] rather responsive to um to like me liking or going to search out things, um, uh, So, like I see my community of other queer educators.” While not all of Rosalina’s platforms are the same, she appreciates the positive ones, when “every other social media is like, oh, I love you guys. Look at you, queen. Yes.” In this sense, they appreciate how the algorithm has given them the information to provide them with joy and community.

Frustration with Time & Money

While joy was certainly part of the information finding experience, it is not a perfect world. Because of that, many acknowledged how they would spend (too) much time on these platforms and how money for those platforms was behind that. Almost every participant shared spending multiple hours per day online in some fashion. The only exception to this was Daisy who measured her time spent online per week, “Maybe [pause] 20 hours a week. I feel like I'm making that number up.” For the others who did measure per day, they often felt that perhaps they spent too much time online.

Luigi shared

> I mean, like 18-year-old me would be like, how long are you what are you doing on the internet? Yeah. Now the internet is like, uh, I don't know. I can't imagine. I don't know what I would do if I was off the grid or if I was like disconnected from internet spaces.

They went further too, to say, “I don't I don't know what I would do without access to the internet, uh, these days. I would just sort of like, I guess, sit in a chair and stare at the wall. [Laughs] That'd be it.” Rosalina described

> it was getting to the point where I would be like, all right, let me, you know, I'll get up later and I'll study and I'll do what I need to do. But let me just sit here and rot for a second. And I would sit there for like five hours. You'd be like, oh my God, it's noon and I haven't done anything yet. I've just been laying in bed this whole time.

Her awareness of the issue went so far as

> So I delete all of my social media during the semester when I'm doing stuff like physics or chemistry. I don't have time to be. I don't have time for it. But I did just redownload Instagram recently just cause I could see all the notifications popping up like in my email from all the people sending me stuff.

So, even when she tried to remove the temptation to focus on schoolwork, she was tempted into redownloading the apps in the middle of the semester.

This desire to spend time there but knowing it was too much time created frustration for them. Rosalina shared how

> You know, you're just like totally soaked into your phone and you're so immersed in whatever videos that you're watching. Um, and you don't find something that you really want to continue looking at and you just keep going. I, uh, I'll totally forget that like I'm sitting in a room on the couch or like in my bed and I'll just be like I like look up at the room later and I'm like, oh, yeah.

Luigi shared how

> Sometimes when I kind of fall like when I fall down a TikTok rabbit hole of kind of the same kind of content over and over again. It's, I'm frustrated with myself for falling for it. And, um, also, um, that like, it's narrowing the scope of what I'm checking out. So, who am I missing if I'm watching the same content creator 17 times on TikTok in a short chunk of time?

Rosalina described it as "a good thing because I enjoy it, but it's a double-sided coin because it's also a bad thing because it can take from you the same way." She expanded later saying "Someday I'm literally going to die someday, and my grandkids are going to be like, what did you do with your life? And like, I would rather die than my answer be, well, I spent 42 years watching TikTok videos." They know they're there too much and they know why, but they're still there.

The participants who acknowledged algorithms were aware of why they kept coming back. They were able to say what their purpose was for in the system. Rosalina described it as form of "brainwashing" and

> It's almost like… a drug. No, it probably is because you're getting addicted to like some kind of serotonin, dopamine. Kind of immediate release where you can immediately kind of leave and then enjoy like something funny or something that you relate to,

because the app wants

> to keep in general keep users happy and uh sucked into their service because if they're seeing a bunch of things they don't like they're just going to go to another app or go somewhere else to get their information or their dopamine release.

She expanded by saying "they're doing exactly what you want them to do, which is to watch videos or pay money to get rid of the ads on the videos." Therefore, there was an awareness of

the role of money in algorithms, and this acknowledgement of capitalism came out in other ways as well.

Throughout the interviews, participants discussed the importance of money in their information finding platforms and in their lives. Luigi demonstrated this by discussing advertisements while viewing content,

> And because within inside the inside what your feed is, you're going to get a lot of ads too, just like like The TikTok shop ads and all of those things. So, if it can provide you with content that you want, you may see things where you will spend money through the app. You may. You'll see advertising, which is good for them, and, uh, it'll keep you around.

Rosalina pointed it out similarly, “From the… company perspective, they're doing exactly what you want them to do, which is to watch videos or pay money to get rid of the ads on the videos. Um , which I think is… really all they care about.” Wario did the same,

> They default to the for you, which has ads embedded and a wide variety of interests designed to keep you on the platform. Because again, they make money the more you scroll on the platform. The more things you link, the more ad revenue they can sell.

Mario also discussed sponsored content appearing in his search results,

> The other thing, the thing that surprised me about that search that was annoying was a new one of the first things that comes up is alcohol treatment programs. I'm checking typing in. And, so, I get all these results from all these rehab centers that are sponsored you know what I mean?

So, the participants seemed to have an understanding that these platforms are making money from advertisements and sponsored content.

With this acknowledgement, there were some who expressed frustration with the system. Rosalina said, “They [the platforms] don't care about the people, you know, at least I don't think so.” She elaborated further by sharing, “Because although plenty of companies have the, everybody has like their core beliefs at every single company, and it is typically always ‘people first,’ ‘patients first,’ ‘customers first.’ Um, but everything's all money. It's all money related.” Daisy expressed similarly, but in a broad sense and not necessarily related to information platforms, “I'm like trying not to rail consistently against this capitalistic system.” However, this comment was more likely related to her frustration with her socioeconomic status, discussed earlier. Wario on the other hand expressed frustration with other factors that had money as a motivator, such as, “There’ll always be a couple of extra things recommended to me. Some of them are wildly out of scope for what I’m talking about, or in some cases, just plagiarism.” He also discussed friction between his values and leadership,

> I'm not a fan of Elon Musk. I think he's a Nazi. I don't think, I don't say he's a Nazi because he's an aggressive, over-the-top aggressive type A personality. I mean, I think he's a Nazi because of the beliefs he held, the things he espouses, and the actions that he takes. So, I'm not a huge fan of him and his leadership personally. That being said, Twitter right now is somewhat of a, um, digital public square. So, to voluntarily remove myself from that puts the advocacy that I would do at a disadvantage, and I do not voluntarily secede fights at all.

However, not all participants recognized the friction of money in their information discovery.

While Daisy expressed frustration with finding information online and capitalistic systems, she never verbalized a connection between them.

> I'm assuming that if [pause] I would have to do a study like if in America or on the whole planet Earth. Um, people search for halal restaurants and like near them, and [pause] I would expect like to get some results. I almost feel like searching right now just to see if this is my memory failing me. And I, and, I do get results but from my memory from not getting results. Because I feel like if I searched chicken restaurants near me or restaurants near me or maybe if I search vegan restaurants or vegetarian restaurants I know, um, that this Indian restaurant down the street pops up when I search for vegetarian. So, I feel like I get some results with other things. Whereas, I feel like I get next to no results with this thing.

Her lack of confidence in using technology came out further in this way with "I don't know. It just makes me wonder like who's in charge of um of building that [ability to find halal restaurants in [city name redacted] out, but I'm not a programmer." Her responses also demonstrated a lack of knowledge of information systems.

Thought(lessnes)s & Attitudes When Online

With the idea of capitalism and money motivations in mind, many participants also discussed how fake news and sensationalism had become so prevalent in information finding, which had resulted in a lot of mistrust by them. As Luigi said, "I'm not like afraid of being led wildly astray by the internet because I'm always I'm very deeply skeptical of, I'm just deeply skeptical of the internet most of the time." Rosalina echoed this sentiment, "Yeah, I don't trust anything about the news either." This mistrust may come from, as Wario said, "you can put on a very slick show full of lies and so it's very high production value, very low quality, uh, or very low quality and honest." Luigi also pointed to the internet being a place easy to manipulate by sharing,

> I recognize that the internet is, all internet platforms are inherently very easy to manipulate and there's a lot of opportunity for those platforms to not quite tell you the whole truth and that you have to be really vigilant about how you are consuming information in those places.

It is likely why when Wario recounted a story with a co-worker he shared, "Somebody told me what it was, but and I remember him telling me like, 'oh, you trust Google?' No, not any more than anything else." In this story, Wario was able to point to source he did trust (NIH), but he assumed the trust Google question came from the assumption that they were up to nefarious manipulation of information. Repeatedly, participants brought up finding information that was untrue or sensationalized that's led them to mistrust a lot of information they find.

Rosalina used Facebook as a common culprit in seeing this fake news by sharing, "Because everybody always blindly, especially on Twitter too, people blindly repost things that they automatically assume that it's true because it's coming from like a company or somebody that they trust and it is almost always wrong." Mario also shared similar experiences on Facebook by sharing "I have found things in the past, um, that turned out to just be totally false you know. I mean, someone's just you know putting out propaganda." He also noted how sometimes those sources will go out of their way to try to trick you,

> There are a lot of sites out there that um have, they've named their sites something that's close to a credible site. You know what I mean? So, it's not the New York Times. It would be something like, I don't know, the New Times. You know what I mean? Like that. So, if you're not careful, you know, you can see something, pay a post on Facebook. You can see the source, but if you read it too quickly. It's not the source you think it is. You know? It's something else.

Luigi also shared how “And yeah, like misinformation is just very concerning to me now. Like, you know, the people are sharing all sorts of sort of wild stories with no basis in fact.” Wario discussed how there is an internet law, Brandolini's law, that enabled this engagement with such content,

> The point is, I'll give it the amount of energy it takes to refute BS is significantly, exponentially greater than the amount needed to generate it. And there's a whole level of, of tactic among trolls for either engagement or nefarious purposes or any number of things to tie people down in the process of debate.

The ‘BS’, according to participants, goes beyond just that of fake, but to that of sensational.

Luigi, in particular, described sensational news by saying

> Those are places where people are sharing a lot of news stories, and, um, particularly the more, uh, I don’t say sensational, but the the, the news stories that freak people out, that’s where I’m finding them in those places because they’re getting shared rather.

Wario also talked about these stories and a lack of trust to them, “I tend not to trust that because I know that Breitbart has a history of antagonism and essentially what we'll call yellow journalism at best.” Luigi pointed to the rationale of those stories existing because

> Mainstream outlets don’t feel so mainstream anymore. Um, you know, I think like, particularly like, the New York Times or the Washington Post, where it is very clear that that, um, there, there, there, that, that there are ideas operating behind the scenes to direct the reporting in specific ways.

With this erosion of fact to be misled or to sensationalize, there is a concern about the erosion of truth. Wario described,

> There will be people who will dead tell me that the sky is green. It's like, well, the sky is blue. Well, that's just your opinion, man. It's like, okay, well is knowledge so loose a topic that I can leave out my front door or leave out a second story window in my apartment as opposed to the front door of the apartment building and not fall.

It's because of this that many wondered how much thought others put into the information they shared with others.

As Wario shared, "people claim things all the time," which why "I don't know if it's a fact. It's a claim. Right? I think it would be more accurate because fact implies some level of truth." His comment showed a level of distrust in what people say that Rosalina echoed. She shared,

> Typically, when it comes to stuff like that, I'll end up hearing word of mouth more about it or I will end up seeing something funky on the internet where it's like, yep, the egg prices, the tariffs, and then I'll go, okay, let me do a little bit more research.

Her comment also harkens back to the comments made in coping mechanisms about wanting to find outside information but because of this level of distrust. Wario attributed this attitude to the "very deliberate amount of time during some depressive episodes figuring out where I stand out on basically everything that's important to me," which he does not feel other people do. He said, "I think a lot of people live unexamined lives," and shared a summary example of interaction with others where he tries to aid in "deliberate" thought processes of improving situations. This lack of thoughtfulness in content could also be contributing to the negative content so many participants commented on in interviews.

In the platform personalities section of knowledge constructs, negativity on certain platforms over others was already noted by some participants. However, negativity generally was something that came up. Rosalina shared this observation and how it impacted her.

> I see more negative things on the internet than I see positive things. So, I don't ever wake up and you know hop on whatever, whichever algorithm I choose and see like, oh, um a little… A 15-year-old saved a three-year-old from getting jumped by a flock of geese like it's just like I'll hop on and it's like 36-year-old man married to a woman, tried to molest her daughter who is six, or like, you know, something like that and it just, uh, I've learned to be more closed off, more protective of myself, my family and the way I choose to live but it is also good in a motivational way though too. I don't feel complacent.

Wario also described what it can be like to scroll and how he wishes things were a little different.

> It's still at least nicer than seeing, oh God, more hate, more hate, more hate, more hate, more hate, more hate. And, you know, maybe it's the dirty utopian in me, but it's like, we can do better. I know we can do better. We saw the moon. We were like, hey, we should go there. We figured out whole new branches of technology, including little old ladies. Wiring, pulling seamstresses, pulling copper for solid core memory and then we went to the moon. We could figure it out. We don't have to be limited by hate. And sometimes, well, you don't live up to my expectations.

Referring back to the creator knowledge shown in ICT access earlier, Wario also shared how he's seen this negativity impact his own metrics.

> People are like, oh, you should do more positive content. Okay, I do. Nobody watches it. But one of my biggest things I ever did was like this is the biggest cash grab game I've

ever seen, and it got like metrics through the roof. Like I made a bunch of money on that video, and it was negative, and it, it was 100% me tearing something down.

This again could tie back to the idea of money. There is more negative content because that's what people engage with more, regardless of what they say they want.

Politics & Polarization Everywhere

The acts of thought(lessnes)s and attitudes also can be tied closely to how many participants brought up political issues they care about and the polarization of these issues they see. Politics came up generally when participants discussed their platforms. For example, Daisy uses Ecosia for searching "because they plant trees with the proceeds of their uh advertising. So, that's my search engine of choice." Wario also talked about how politics factored into his platform considerations, remembering his comments about Elon Musk. Specific political issues that came up throughout the interviews included issues around LGBTQ+ communities as well as discrimination and racism.

Wario used trans issues an example throughout his interview. Some examples from the conversation were "see something about libs of TikTok talking about trans people destroying America, let's say. It's pretty easy to pull that headline from them. Uh, I see that, I'm like, ugh. Go away. Stop being hateful," and "when it comes to stuff that actually listens to reaction, it's usually like, oh yeah, now Texas passed law to make being trans a felony. Oh, well, that's real anti-freedom." Luigi also commented on this political issue as well with, "The New York Times specifically like the way that they reported on trans issues um in the last couple of years. To me, like shocking. And that's clearly there is there's an agenda and a bias behind that." In these examples, Wario and Luigi were commenting on the types of information they'll see online and how they react to that content.

Daisy, on the other hand, commented frequently discrimination and racism in life and online. She discussed discrimination against her religion at school and work. “I don't want them using my picture because they're like touting diversity at [school name redacted], whereas they're changing the syllabus to say no head wraps,” was one example. Another was “At [name redacted] hospital, although I'm having um religious issues there,” which was her place of work. Another example was in medicine.

> The nurse was looking at my vaccination records and she sees all the dates of my vaccinations and she's still at the end decided that maybe I had filled out the wrong form. Maybe I was an international student and to ask me if I was an international student. And I wanted to say like, why are you going to call ICE? And I've had encounters with ICE and it's not pleasant. Um so my learning experiences have been fraught with like racism.

She also was willing to talk at length about the need rationale for racial reparations. While she was able to quickly identify these as problems in life, when they occurred online, her lack of confidence with technology translated into the same. Her example online finding information, again, was centered on finding halal restaurants with great frustration.

> So, maybe things that I'm looking for are things that the computer engine like needs the restaurants to advertise and maybe people are not advertising it because they are afraid of scaring other people away. So, they would rather depend on word of mouth. I don't know whose fault it is. But it makes it difficult for me.

Rather than consider systemic problems in her difficulty finding the information as she has in life, she displays uncertainty at the cause. “I suspect the websites are not listing the word Halal and that if they did than the search engines would pick up on that and feed it back to me, even though I'm not a computer programmer or whatever [laughs].” While perhaps she could not find

systemic rationales for search results, she could with online information by calling out polarization in news.

In particular, Daisy called out NPR for not covering certain topics in politics. “And I feel like NPR was just only focused on Republicans and Democrats, and they would even use language such as the two parties or people's two choices like very, you know, boxy language. And so, I'm disappointed with NPR.” She went on to say

> That's my gut is they their corporate headquarters is corporate and no matter how um independent or how many times they say that they're independent. They are actually still [pause] trying to [pause] Maybe pay the rent and keep the lights on and they feel like pandering to, because I feel like it's pandering to only talk about the two parties.

The idea of information falling on two sides of the spectrum came up in many ways with participants throughout interviews.

Most often these references were about ways to mitigate this problem by avoidance, as discussed in coping mechanisms with strategies, but sometimes the participants were leaning into the polarization as it met their information preferences. Rosalina was the most outspoken about trying to avoid news due to polarization.

> I get emails every day from like WLWT just to kind of get the lowdown. Generally, it's not political which is what I want. [giggles] Just because I don't need to get angry at six in the morning for no reason,

she shared. She went on to explain her avoidance more with

> I don't trust anything about the news either. People are like, yeah, it's Donald Trump. He's the reason for the rising egg prices, or yep, Biden is the reason that gas was $18 a gallon

or just like stuff like that. I try not to be one side over the other. I try to look at things from an outside perspective.

Because of this desire, she also discussed "try[ing] to flip my algorithm" when it starts leaning more one way or another. Luigi also tried to mitigate polarized news. When asked about what made news feel fake, he alluded to this polarization with "It always raises a red flag when an organization is continually partisan in their reporting like that is uh that would raise a red flag for me as well that would sort of feel like that's fake." The polarization of information has both caused distrust and avoidance from the participants.

While Rosalina and Luigi made efforts to mitigate polarization, other participants discussed a preference for this algorithmic lean. When discussing his news preferences, Mario said "It's quite mother jones they're very left-leaning but they're very, I think, they're very valid." He acknowledged the polarized nature of his news, but it gave it more credibility to him. Wario also acknowledged that the polarized feeds that agree with him make him happier. "Like if anything would be there is I am a huge fan of more progressive style policies, content, creators, people, because that's who I am as a person. So, when my feed gets tailored to that, I'm much happier." Because Wario acknowledged many times he gets information contrarian than his beliefs in his feed, this happiness from something he does agree with may be expected.

Chapter Summary

This chapter reviewed the findings for the research question: How do adult learners make sense of their information finding experience? The research had 5 participants that were undergraduate students at the University of X who ranged in age from 27 to 68. The 14 thematic findings were grouped based upon the research sub questions. Participants shared a range of

experiences in using online platforms and understandings of algorithmic influence in that interaction.

Chapter 5 - Discussion

The purpose of this research was to examine the phenomenon of the participant's relationships with algorithms regarding social and ethical considerations encountered in their information seeking behavior. This chapter provides a brief overview of the research and findings, interpretation of findings, implications, and ideas for future research.

Research Overview

The overall research question for the study was: How do adult learners make sense of their information finding experience? Specifically, the sub-questions were:

1. What knowledge constructions do adult learners have of algorithms that filter and shape news and information they encounter daily?
2. What coping mechanisms do adult learners have in dealing with algorithms in their information behavior?
3. How has access to information and communication technologies changed adult learners' knowledge building processes within algorithms?
4. How do adult learners examine societal issues in navigating algorithms to locate information?

The data was collected using semi-structured interviews over Zoom with 5 participants who were enrolled in an undergraduate program at the University of X over the age of 24. These transcripts were then put into NVivo 14 and analyzed using an iterative, cyclical process that looked at the parts and the whole of the data (Bazeley, 2021; Bhattacharya, 2017; Merriam & Tisdell, 2015; Moules et al., 2015; Suddick et al., 2020). The analysis results became 14 thematic findings that aligned with the 4 research sub-questions.

Interpretation of Findings

The interpretation of findings includes several key ideas: exposure leads to knowledge construction, unconcerned with privacy, nuance is important, education changes self-perception in source evaluation, desire for shared responsibility in information finding, and critical consciousness development. Each of these interpretations is further explained in the proceeding sections

Exposure Leads to Knowledge Construction

This study defined algorithmic literacy as an overarching awareness of the algorithm's influence on results and behavior and acting accordingly (Alvarado & Waern, 2018; J. Anderson & Rainie, 2018; Baer, 2021; Cotter & Reisdorf, 2020; Fouquaert & Mechant, 2022). To begin to achieve this within this study, participants needed to acknowledge the presence of an algorithm organically through their answers to the questions. Three of the participants did this within their interviews: Wario, Luigi, and Rosalina. These participants also used far richer descriptions in how they interacted with online platforms in information finding. They were active participants on more than one platform as demonstrated through their descriptions, and they used the platforms (for better or worse) to meet information wants and needs. This activity level and their descriptions align with past research shared in Chapter 2 that indicated the more users interact on the platform, the more skills they develop (Archambault, 2022; Reisdorf & Blank, 2021). There were participants (i.e. Mario and Daisy) that did not describe rich online experiences. Instead of embracing the serendipity that comes with algorithmic information finding, they used the platforms for specific purposes and attempted to exercise a narrow focus in their information finding.

Because of the connection between use and knowledge construction, this research also further supported the idea that content creation helps improve algorithmic literacy. Wario and Luigi were both content creators, and throughout their interviews they showed more awareness of the algorithm and its function than others. Wario was able to provide the most detailed definition of an algorithm over the others. He also talked more about how different content he created led to differences in content views because of the algorithm. While Luigi was less detailed and admitted they weren't the kind of content creator that tried to increase views, they showed more confidence in defining the algorithm than Rosalina, who knew of the algorithm but lacked that confidence in what it was. Likely Rosalina's high use of algorithmically driven platforms provided her with the experience that Mario and Daisy did not have, which resulted in their lack of acknowledgement of the algorithm's influence.

Unconcerned with Privacy

Chapter 2 contained past research in CAS discussing how algorithms were invasive and 'weird' (Gardner, 2019; Thompson & Warzel, 2019). This concerned scholars in regard to privacy, data use ethics, and biases (Archambault, 2022; Cagle, 2016; Miller, 2016; Monzer et al., 2020; Pasquale, 2015; Peña Gangadharan & Niklas, 2019; Shaw & Shaw, 2016). However, the participants of this research who recognized the algorithm instead expressed appreciation for the algorithm. For example, there was Luigi's description of the algorithm's "responsiveness" to their behavior. Their comment of "the algorithm it has found me out. It knows" was in a tone of definite appreciation, and not of weariness that matched those of scholars in CAS. Many of the others who acknowledged the algorithm carried similar attitudes that mostly stem from the sense of belonging theme discussed in findings, such as Wario's connecting to those who share his hobby or Rosalina being able to find new aspirations through content or past connections. None

of the participants described an invasive nature to the algorithm's work. They more anticipated it, expecting it to do that, which is likely why Rosalina, Wario, and Luigi described performing certain actions to get their desired results from it.

Nuance is Important

The thematic findings within the coping mechanisms seemed to align with the primary ways that students seemed to learn new information or develop information literacy skills mentioned in Chapter 2: online search, trial and error, or human interaction (Clark, 2014; Diehm & Lupton, 2012; Head, 2016; Head et al., 2013). Online search was a focus of the research so that is throughout all responses. Trial and error were particularly seen within the strategy theme of coping mechanisms where participants described using many searches to find their information and using scroll and select to find sources. All the participants described in some way how they would try many different searches to find desired content and would flip through different results before they would select a source to review. Some even described using searching to verify information by using the trial and error method. Additionally, human interaction was seen within the asking others theme of coping mechanisms, which was mostly used by this research's participants who did not acknowledge an algorithm, Mario and Daisy. They both described asking others to help solve an information problem rather than solely sticking to online information. It was interesting too that some participants, like Rosalina, preferred to avoid human interaction and trusted their online information sources more than people in their life, which could be a result of automation bias mentioned in Chapter 2 (Logg et al., 2019; van Dis et al., 2023).

Within coping mechanisms, the findings also saw the importance of nuance for participants when approaching information. This finding was important because nuance was

identified as a missing component from information discovery assisted by machine learning from Chapter 2 (Aiken, 2016; Birhane, 2021; Broussard, 2018; Marshall, 2018; Pasquale, 2015; Peña Gangadharan & Niklas, 2019; Zou, 2016). Participants in this study mostly described nuance when evaluating their sources, and not necessarily the overall results list displayed or the platform. The acknowledgment of nuance is a definite positive step for source evaluation that was criticized for its current practices in the research, but it still does not address how platforms in regard to how they assist in the discovery and evaluation process and how users then interpret that (*Algorithms and Amplification: How Social Media Platforms' Design Choices Shape Our Discourse and Our Minds*, 2021; McGrew et al., 2018; Wineburg et al., 2020). The participants did not express consideration in how their information results may be different for them because of the algorithm or based on platform. Instead, they seemed to have relied on the trial and error method to see how it changes things, which raises a question of whether they would notice or question if they continued to find the same information regardless. This approach from the participants does not seem to apply the concepts of capitalism, hegemony, or power when receiving the results lists. This gap leaves room for educators to further enhance their source evaluation teaching.

Education Changes Self-Perception in Source Evaluation

Within ICT findings, there were two areas that seemed to connect to the research beyond the content creator knowledge contributing to knowledge construction, which was previously discussed. First was the idea that education contributes to the ability to navigate information finding. Within the findings, there was a key statement from Rosalina where she shared "But the STEM major in me doesn't let that happen [trust a source without outside verification]." Her comment indicated an influence on how education enables her to navigate information. Past

research shared in Chapter 2 indicated that education is a stronger predictor of digital literacy skills (M. Anderson & Perrin, 2017; Hatlevik et al., 2018). Rosalina's comment indicates that there is some qualitative indication that education provides confidence for these skills as well. The second connection was within age perception. Experience seems to be the strongest indicator for developing algorithmic skills in the literature and this study (as previously discussed), but past research from Chapter 2 also indicated that experience can sometimes be conflated with age (M. Anderson & Perrin, 2017; Bawden, 2001; Inan Karagul et al., 2021; Prensky, 2001). This perception seems to continue with the casual comments made by several participants regarding those who were older than them, and often those of older relatives. The most notable was with Rosalina who connected bad with Google searches to getting old, but Wario and Luigi also made negative comments regarding information related to their parents. While the parental comments could be related to familial relations, they could also be that conflation between age and experience when working online.

Disconnect Between Words & Actions

Within societal issues, there was a connection between time & money, thought(lessnes)s & attitudes, and politics & polarization. CAS from Chapter 2 showed how platforms may encourage a disconnect between themselves and their algorithm to avoid questions of values and to increase engagement within the platform (*Algorithms and Amplification: How Social Media Platforms' Design Choices Shape Our Discourse and Our Minds*, 2021; Baker & Potts, 2013; Beer, 2017; Cadwalladr, 2016; Cleverley, 2017; J. N. Cohen, 2018; Gillespie, 2014; Marshall, 2018; Noble, 2018a; Pasquale, 2015). The literature also showed that this rationale is why it is tricky to (self)regulate, and this hardship was seen with the research's participants (*Algorithms and Amplification: How Social Media Platforms' Design Choices Shape Our Discourse and Our*

Minds, 2021; Cech, 2021; Reidsma, 2019). This inability to self-regulate could explain why there seemed to be a disconnect between words and actions for this study's participants when interacting with online platforms. Rosalina's double-sided coin analogy in the time & money section highlights that friction. Participants were aware of how much time they spent on the platforms and would easily become frustrated with themselves for it happening. The friction also became apparent in the theme thought(lessnes)s & attitudes and in politics & polarization.

Within thought(lessnes)s & attitudes, participants would discuss negativity existing on the platforms, yet they continued to use them. Wario was an example of this when discussing his use of X (formerly Twitter). Additionally, participants referenced the frustration of seeing others share information they thought to be fake or sensational. However, it was always others they referenced, and they never referred to themselves as being part of the population that contributes to this. This study made no attempt to investigate if participants were contributing to this behavior, but standard reasoning would suggest that an "everyone but me" sensemaking is usually not the case. If it is everyone, it is usually you too, at least to some degree. In addition, participants routinely made mention of content curation to avoid certain content, most often news or political issues particularly to those that they disagree, which could likely result in a filter bubble that underexposes them to outside thought (Pariser, 2011). By trying to protect their sense of belonging and to avoid an overload of negative content, participants could be part of the very problem they want to avoid.

Desire for Shared Responsibility in Information Finding

In looking at how the various themes overlap, there also seems to be some underlying desire from the participants to not be the only ones responsible in their sense making and placing some of the responsibility on those that deliver it, the information platform providers and their

algorithms. As McGrew et al. (2018) stated, “Although the Internet has the potential to democratize access to information, it puts enormous responsibility on individuals to evaluate the reliability of information” (p. 165). The participants’ desire can be found in their exasperation when it came to news and avoiding it. The quote from Luigi discussing how certain stories exist just to “freak people out” are only encouraged by creators and algorithmically driven platforms to benefit the bottom line. Particularly when user mindfulness while interacting with the platforms could be improved, as demonstrated by the disconnect in their words and actions, the platforms could also take some responsibility. Without the platforms taking a piece of that responsibility, it would be comparable to saying that users don’t need regulation in their food or medications because they could research it themselves to make safe decisions. It doesn’t have to be one or the other on whose responsibility it is, but rather a “yes, and.” By doing so, it would enable platforms to enhance aspects that participants really enjoyed, such as the sense of belonging.

Despite this interpretation, it is worth noting that very few of the participants expressed an outright desire for this shared responsibility (with the exception being Wario). However, within their various responses there was a thread stemming from their exasperation in being the only one taking action. If using the CLAM model from Chapter 2 (Robinson & Stojanović, 2022), the next step would be to take them out of the practical skills they’re already using in avoiding algorithmically driven information and move into informed behaviors and actions that can lead to that desired change.

Critical Consciousness Development

This study specifically wanted to examine critical algorithmic literacy of the participants. Through the literature, the research established critical algorithmic literacy from metaliteracy and

critical information literacy. To accomplish this, Chapter 2 established participants would have needed to show a critical consciousness with an acknowledgement of hegemony and capitalism in information (L. Anderson, 2024; N. A. Cooke, 2021; Elmborg, 2006; Freire, 1973; Leung, 2022; McLaren, 2009; Saunders, 2017). They also would need to have strong metaliteracy skills. Metaliteracy skills were easier to establish for critical algorithmic literacy because once a participant acknowledged an algorithm organically within their interview, they established some foundational knowledge for algorithmic literacy, which is entangled in metaliteracy. The critical piece of critical algorithmic literacy becomes harder to untangle in the results.

Based on the findings, there is the need for the development of critical consciousness. In developing critical consciousness, questions will be asked, and action will be taken (L. Anderson, 2024; Elmborg, 2006). Some participants did mention specific actions they took online, such as Daisy choosing a specific search engine that aligned with her causes. However, some participants would acknowledge misalignment of values on platforms but continue to use it, such as Wario who would not back down from a fight. The critical consciousness also means acknowledging capitalism and hegemony in information. Most participants could readily acknowledge capitalism in their online platforms, but as shared earlier, it often did little to impact their use, usually to their chagrin. However, no one seemed overly concerned over how that capitalism leveraged a loss of privacy to perform such actions. Hegemony was similar to taking action where some could see how their information feeds were sharing 'hateful' content (e.g. Wario), however, others, like Daisy, were not able to hint at the idea that biases identified in CAS could be a reason for their struggle in searching for information (Al-Abbas et al., 2020; Baker & Potts, 2013; Buolamwini & Gebru, 2018; Cadwalladr, 2016; Keyes, 2018; Mac, 2021; Noble, 2013; Reidsma, 2019; Shivaram, 2023; Sweeney, 2013; Zou, 2016). Based on this

interpretation, it seems like there is a development of the critical consciousness for the participants, but there is more that can be done regarding critical algorithmic literacy.

When it came to politics & polarization, the idea of taking action came into play as it did with time & money which was discussed earlier, except that these participants were much more willing to take action with these issues. The action looked different based on the participant. Wario indicated that he was willing to open dialogue with those who had different views than him. Luigi used a specific app to try to find balance in the news they received, and Rosalina tried to limit the amount of news she ever saw on her feeds. While these actions all have very different results, they do demonstrate the participants acknowledging a critical problem and taking action. Finally, in shared responsibility, it builds off that in politics & polarization in that the interpretations find applied critical consciousness.

Implications for Practice

There are three key implications from practices that can be taken from these research interpretations. First, educators should improve source evaluation methods. Second, content creation could play an important role in developing information literacy skills; and finally, libraries were missing from this conversation entirely.

Improve Source Evaluation Methods

Based on these findings and interpretations, it then becomes a question of so what. What can educators do with this research? A primary takeaway for educators can be in information evaluation. Evaluation methods described by participants were heavily reliant on known entities or based on an alignment with the participant's own beliefs. While some participants discussed looking for additional information to support found claims, not all of them did. Because participants did indicate that they rely on their education as a means of knowing how to evaluate

and interpret information, it is only more crucial to ensure that students can use complex information evaluation methods in complex information ecosystems.

A key example of applying this idea would be a recommendation to further focus evaluation methods such as SIFT. SIFT is an acronym for stop, investigate the source, find better coverage, and trace to the original context (Caulfield, 2019). SIFT uses lateral reading, which has become a more recommended way for reviewing sources online (Caulfield, 2019; Wineburg et al., 2020). Participants in this study did describe lateral reading quiet often, such as when Luigi shared "I'll maybe grab the headline or grab like the basic idea of the story and just search that and see if I'm finding other places that are all that are sharing a similar story." However, once participants began the process of lateral reading, their evaluation methods tended to fall back principles often found in the CRAAP (Currency, Authority, Accuracy, and Purpose) test that do not tend to work on the modern web (Wineburg et al., 2020). This fall back was demonstrated through the participants continually relying on domains and organizations they were already familiar with to aid in the evaluation process.

Content Creation for Information Literacy

The findings that supported the content creation helped develop algorithmic literacy can also be incorporated into curriculum. Assignments that focus not just on content creation but the analysis of how to improve content's reach may help students develop their algorithmic literacy skills. While this is likely taught of self-taught to those who would do content creation as a career or hobby like Wario and Luigi, it also could help anyone who finds content online understand how and why content reached them, even if it may be through a folk theory (DeVito, 2021). These understandings of how information reaches us enable further critical analysis of the information we receive that influences our world perception.

Libraries Missing from Conversation

In addition, at no point in any interview did the use of a library or print resource come up with any participant. This exclusion is an important note for librarian educators, but it also leaves out a wealth of information that could be behind a paywall or unavailable online during the lateral reading process. An example of how this missing information can make a big impact is with searching about the use of asbestos on the set of *The Wizard of Oz* (Caulfield, 2025). In this example, traditional searches for lateral reading make it very difficult to find the likely truth, but the use of an AI tool with proper prompting helped guide the user to the likely truth. That example, however, creates a distinct contrast to how the participants in this study wanted AI in their information finding experience. While some participants in this study had more knowledge about AI than others, none of them expressed a use or reliance on the tool while seeking information. Because of the scope of this study, no further questions were asked of these participants as to why that was the case. However, it could be connected to the negative reactions that people generally have towards AI, particularly when they lack AI literacy (Alessandro et al., 2025). As these tools further advance to remove these negative connotations and likely become further embedded in everyday life, educators will want to find ways to develop student AI literacy to help them in the information finding process while addressing the limitations of using AI in information finding. Librarians could also help bridge the gap between the information that cannot be found through online lateral reading and distrust in AI.

Future Research Recommendations

Chapter 1 offered some insights into the initial limitations of this study that future research could adjust for more insight. Some key recommendations based on these limitations and the experience from the research would be in adjusting the limitations related to the

algorithmic definition and interview setting could result in new insights. Throughout the interviews, the lack of definition made it difficult for analysis because participants would often bounce between platforms, which made comparison unequitable. An example is with Daisy who stated she used a specific search platform that was uncommon with others. This difference often left the question of whether Daisy's struggles were due to her algorithmic literacy or due to the platform she experienced. Another way to further study this would be to adjust the interview protocol so that when participants do not mention an algorithm in any way, there is a stronger method for investigating this exclusion while also not prompting the participant into using the word. Interviews with Daisy and Mario proved to be more difficult because of this unforeseen limitation in the research procedure.

Future research will also likely want to build on the questions related to the use of AI in information finding and how education shapes self-perception in information finding abilities. These ideas stem from the findings where participants often ignored AI results immediately and how they often felt their education influenced their ability to evaluate information better than others. Investigating these findings further could help advance AI tools, decision-making in libraries for turning on database AI tools, and AI literacy education. They could also help shape how we teach others about source evaluation and the impact it has in a student's future. Additionally, because of the friction noted between wants and actions, further studies could examine the role of mindfulness during the online experience or how participants contribute or fight against thoughtless and negative content found online.

Research Conclusion

This research helps contribute to the literature within the framework of metaliteracy and critical information literacy. It provides a qualitative look into adult learner application of critical

algorithmic literacy within their information finding behavior. Through this research, information finding behavior of these participants provided examples of how AI is influencing information. It provided context for how some adult learners are aware of algorithmic influence in their information finding, while others do not. This context helped answer how knowledge constructs were formed, how they coped either way, how technology access influenced their skills development, and what related issues were on their mind. Based on the findings, interpretations included the ideas that exposure leads to knowledge construction, unconcerned with privacy, nuance is important, education changes self-perception in source evaluation, desire for shared responsibility in information finding, and critical consciousness development. Because of these interpretations, there were three implications for practice rooted in source evaluation, content creation, and libraries. These implications can help guide practitioners prepare adult learners in the future for critical algorithmic literacy.

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Appendix A - Interview Protocol

Note: Due to the semi-structured nature of the interviews, not all the sub-interview questions listed below occurred with each participant. The questions served as a guide to help conversation continue throughout the interview process.

[Begin Recording]

Thank you so much for agreeing to meet with me for this hour about this research. As a reminder, I am Catie Carlson and a doctoral student conducting research at Kansas State University. I am also a librarian at the University of X. None these factors will this interaction have any bearing on any of our potential future interactions. Additionally, you have consented to participate in this recorded interview, but you are welcome to drop out at any time with no repercussions.

I want to honor our time constraints today. Therefore, while I encourage you to elaborate on your answers to my questions, there may be times when I redirect so that we may be sure to cover all the issues within the hour. To make this time as productive as possible, please know:

1. There are no wrong answers.
2. Please don't hold back.
3. Feel free to share all your opinions and experiences – positive or negative, neutral, or politically charged.
4. You have assured confidentiality. I will not be using your name in the research or sharing it with others.

Today, my role will be to listen and ask questions (not judge or assess), but this will be a conversation. So, before we begin, *are there any questions I can answer for you?*

To get started, please share a little about yourself.

1. How old are you?
2. What are you studying? How long until you expect to graduate?
3. What pronouns would you like me to use in the study?

Alright, now let's shift into what I am studying:

4. Let's start with one of your experiences with how you've gotten online information in the past few weeks. How often do you visit an online search engine or social media sites (like YouTube, Facebook, or TikTok)? How much time in a week would you say you spend on these sites?
5. Can you give me a recent example of finding new information? What happened?

    a. How did you encounter it? Did you search for it; was it someone you follow; or was it promoted/suggest?
        i. If you searched for it, how was the information quality of the answer that you received? Did anything about the search results surprise you or make you wonder how those results rose to the top?
        ii. Were there certain criteria that made you think the platform was including/excluding the information?
    b. How would you describe the quality of the information (e.g. credible and unbiased)?
        i. What attempts did you make to find better information?
    c. Do you find news or does news find you through social media and other feeds? If you do, what happened when you got news from a social media platform, like TikTok and Facebook during the past couple of weeks?
        i. How would you rate the quality of the news that you got? Did it seem credible and unbiased?
        ii. Would you say that the news that you got reflected a particular political orientation, were mainstream, or were they a mix?
6. Is there an example where these online platforms have seemed to match your interests really well? How about when they've gotten your interests really wrong? What happened?
    a. How do you think it matches your interests like that? How do you know?
        i. If an algorithm is mentioned,
            1. How would you describe the algorithm to someone who didn't know anything about it?
            2. What is the purpose of the algorithm?
            3. What do you think these platforms would say the purpose of the algorithm is?
            4. Do you think the algorithm successfully fulfills its purpose? Why/why not?
    b. What do you like or not like about these platforms that match your interest and collect data about your likes and dislikes?
        i. Do these concerns worry you, or are they helpful with filtering ALL the info that's out there?
    c. Which do you prefer: for it to match your interests and needs or not?
        i. Why?
        ii. How do you try to ensure that outcome?
    d. Have you ever felt that what you see online has been affected by who you are, what you've done, read, watched, or wanted to buy? If so, does this concern you and in what ways?
7. Describe the kinds of technology available in your household growing up that you used daily.
    a. How does that compare to now?

    b. What kinds of technology do you use at your current or past places of employment? Were you completing information finding tasks at those jobs?
8. Is there anything else that came to mind while I asked these questions that you would like to share or ask?

To remind you what is coming: I will be transcribing this recording and begin to analyze it. Once the transcription is complete, I will delete this recording. I would like to schedule a follow up interview in about 3 weeks' time. This interview will be for clarification questions from today. Would this be okay? When would be a good time?
If you have any concerns about this interview or research, please don't hesitate to reach out to the IRB chair Lisa Rubin or the research PI Haijun Kang whose contact information I will place in the Zoom chat for you now should you want it. Chat Message: Dr. Kang, hjkang@k-state.edu | Lisa Rubin, (785) 532-3224

Appendix B - Interview Alignment Chart

This chart helps to align the research questions and interview questions. Appendix B - 1

Research Questions	Interview Questions
What knowledge constructions do adult learners have of algorithms that filter and shape news and information they encounter daily?	Can you give me a recent example of finding new information? What happened?
	How did you encounter it? Did you search for it; was it someone you follow; or was it promoted/suggest?
	How do you think it matches your interests like that? How do you know?
What coping mechanisms do adult learners have in dealing with algorithms in their information behavior?	Is there an example where these online platforms have seemed to match your interests really well? How about when they've gotten your interests really wrong? What happened?
	What do you like or not like about these platforms that match your interest and collect data about your likes and dislike s?
	Which do you prefer: for it to match your interests and needs or not?
How has access to information and communication technologies changed adult learners' knowledge building processes within algorithms?	Let's start with one of your experiences with how you've gotten online information in the past few weeks. How often do you visit an online search engine or social media sites (like YouTube, Facebook, or Tik Tok)? How much time in a week would you say you spend on these sites?
	Describe the kinds of technology available in your household growing up that you used daily.
	How does that compare to now?
	What kinds of technology do you use at your current or past places of employment? Were you completing information finding tasks at those jobs?
How do adult learners examine societal issues in navigating algorithms to locate information?	How would you describe the quality of the information (e.g. credible and unbiased)?
	Do you find news or does news find you through social media and other feeds? If you do, what happened when you got news from a social media platform, like Tik Tok and Facebook during the past couple of weeks?
	Have you ever felt that what you see online has been affected by who you are, what you've done, read, watched, or wanted to buy? If so, does this concern you and in what ways?