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“I AM THE ALGORITHM”: INTEGRATING ALGORITHMIC LITERACY LESSONS INTO
MIDDLE SCHOOL DIGITAL CITIZENSHIP CURRICULUM
MA Thesis

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Abstract

**“I am the Algorithm”: Integrating Algorithmic Literacy Lessons into Middle School Digital
Citizenship Curriculum**

Despite the increasing influence of algorithms on online life, there are very few digital citizenship modules that teach students how algorithms function. This study piloted a module, created by Digital Moment and the Raspberry Pi Foundation, on social media recommendation algorithms to two Grade 6 classes. The purpose of the pilot was to obtain qualitative evidence of whether students were able to make links between user choices and decisions online and broader digital citizenship concepts. The results of this thesis show that unless algorithms are holistically integrated into digital citizenship curricula in an interdisciplinary manner, the ability for students to make larger conceptual links remains limited.

Keywords: digital citizenship, algorithmic literacy, digital literacy, online platforms, social media, curriculum design, Connectivism, constructivism, platform theory

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1. Introduction

“The medium is the Message.” (McLuhan, 1964, p. 1)

“The pipe is more important than the content within the pipe.” (Siemens, 2005, p. 6)

There are a multitude of definitions of what a digital citizen is and how they should behave in online spaces. The Council of Europe, for example, defines digital citizenship as “the capacity to participate actively, continuously and responsibly in communities online and offline, through **competent and positive engagement with digital technologies**” (emphasis present in the original text; “Digital Citizenship Education”, n.d.). “Positive engagement” can be seen as positioning the individual as a responsible citizen in their online identities. As well, the ability to actively participate in online spaces translates to the offline; the two worlds are not discrete entities but entangled and perhaps a bit messy. In a similar vein, Media Smarts, Canada’s Centre for Digital Media Literacy, defines digital citizenship as “the ability to navigate our digital environments in a way that’s safe and responsible and to actively and respectfully engage in these spaces” (“What is Digital Citizenship?”, n.d.). Much like the Council of Europe definition, Media Smarts places the emphasis on the notion of responsibility, positivity, and active engagement. The DQ Institute, a digital literacy think tank based in the US and Singapore, uses the term “digital intelligence” or DQ, in the place of digital citizenship: DQ is defined as: “a comprehensive set of technical, cognitive, meta-cognitive, and socio-emotional competencies that are grounded in universal moral values and that enable individuals to face the challenges and harness the opportunities of digital life” (“Digital Literacy”, n.d.). Humanist values aside, this definition, much like the previous two emphasises the competencies needed to use technology in contemporary life. For students, the focus is on how to use technology in a responsible manner and in ways that will contribute positively to the mental well-being of themselves as well as others they communicate with online. Furthermore, these competencies are key to student success in school and in careers after they graduate.

However, these definitions, and the digital citizenship curricula and standards they impact, fail to address the underlying programming logics of how digital tools and platforms function and the role these logics play in determining what individuals see and do in online spaces. This gap in digital citizenship curricula can be attributed to, in my view, the primary

focus on soft skills, digital empathy, and surface level knowledge of how technology functions, particularly from an algorithmic perspective. In this thesis I examine the theoretical and practical gaps in how popular digital citizenship curricula are constructed and taught and discuss a pilot project that I engaged in at my place of work, Leipzig International School (LIS) in Leipzig, Germany. This project involved testing an algorithmic literacy module with two Grade 6 classes as a part of our school's digital citizenship curriculum. Furthermore, I review the most common digital citizenship curricula and frameworks to see whether they address algorithmic literacy, and if so, how it is incorporated into teaching materials and learning activities. This project also represents a starting point for the digital citizenship curricular review that I am conducting in my position at LIS. As technology continues to impact how students learn in and outside the classroom, the need to create effective lesson plans that teach students what algorithms are and how they affect the way they learn online has become increasingly important. As I elaborate later in this thesis, technology has shifted the way that students learn to a model where knowledge is decentralised, learning is ongoing and informal, and the functions of digital spaces are often more important than the content they provide.

This thesis is structured in the following manner: first, I provide an elaboration on the terms “digital citizenship,” “digital citizen,” “digital literacy,” “algorithmic literacy,” and “data literacy.” These terms are frequently used in educational technology literature and are central to the topics covered in this thesis. Second, I link the concept of digital citizenship to the educational theory of Connectivism, which emerged in the early 2000s in the context of the development of Web 2.0, or the “participatory” web (DiNucci, 1999). It is my contention that a focus on democratic participation in online spaces, as emphasised in both Connectivism and digital citizenship, has not kept pace with rapid developments in the centralisation, monetisation, and “enshittification” (Doctorow, 2025) of large sectors of the Internet. These forces have reshaped how learning networks and nodes of knowledge production are accessed, privileging those who are able to pay or those who are able to evade Internet censorship with tools like VPNs. Algorithmic literacy, as a concept and a learning strategy, can bridge this gap and provide students with both the knowledge and the tools to actively shape their online learning experiences more effectively.

Furthermore, I examine digital citizenship curricula and frameworks from organisations such as Common Sense Media, the UK Council for Internet Safety, Media Smarts, the DQ

Institute, the European Union Digital Competence Framework for Citizens (DigComp), and International Society for Technology in Education (ISTE) Standards for Digital Citizenship, to examine whether they include content on algorithmic literacy. Finally, I outline the pilot study done as a part of this thesis, where I taught a module on social media recommendation algorithms to two Grade 6 classes at my school. This module was created by Digital Moment, a Canadian charity, in conjunction with the Raspberry Pi Foundation, a UK-based charity that promotes computer science education.

2. Research Questions

The main research question in this thesis is: what impact do algorithmic literacy lessons have on middle school students and their understanding about social media? Further research questions include: how do digital citizenship curricula and frameworks address how algorithms function and the impact they have on user experiences online? Is algorithmic knowledge embedded in a holistic, cross-curricular way, or are algorithms “siloed” to Information and Communication Technology (ICT) and Computer Science subjects? How has educational literature attempted to theorise online learning and decentralised networks of knowledge? What recommendations can be made for integrating algorithmic literacy lessons into middle school curricula?

3. Definitions

Several key concepts define how individuals use the Internet and interpret what they see online; these include digital citizenship and digital citizen, digital literacy, algorithmic literacy, and data literacy. In the following section, I define each of these terms and how they will be employed within this thesis. Digital citizenship, as defined in the opening on this thesis, reflects user behaviour in online spaces. Core to digital citizenship as a concept is an ethical responsibility of users to each other when interacting online. Most major digital citizenship curricula focus on proper versus improper behaviour online as well as lessons on digital wellness. Furthermore, digital safety and security are integrated into digital citizenship lessons, teaching students everything from how to create passwords to ways to identify spam and digital scams (Common Sense Media, n.d.). Digital citizenship is often conflated with another set of core competencies: digital literacy skills.

Digital literacy refers to the critical thinking skills that allow individuals to read and write in various digital media, maintain virtual professional and social relationships, and be critical of information they encounter online (CEDEFOP, n.d.). In education, digital literacy skills often

focus on things such as identifying proper news sources, properly citing sources when completing assignments, and being able to discern whether a source of information is trustworthy or not.

Algorithmic literacy is often linked to artificial intelligence, in particular the ways that AI is embedded in online systems, such as recommendation algorithms on social media platforms. AI algorithms have the power to shape what users see based on what they click on, view, and share, and has negative effects such as creating “filter bubbles,” where AI curates content tailored to a user, bias in the kinds of information that users see, as well as breaches in data privacy by online trackers (Cox, 2024). The concept is a relatively new addition to digital citizenship curricula, with only a handful of examples of unit plans and activities currently existing in wide circulation. Unlike digital citizenship or digital literacy, algorithmic literacy focuses on how online systems and platforms function, their affordances, and how that actively shapes user experience.

Furthermore, due to the “black box” nature of proprietary algorithms (Pasquale, 2015), users are never able to analyse how these algorithms function in practicality, but to only see algorithmic effects in the information that becomes readily available to them. Finally, data literacy refers to the ability to collect, evaluate, interpret and use data for specific purposes. Data literacy also involves the competencies where individuals can sift through “an overabundance of data and information and to make informed decisions” based on their findings (Schüller, 2020, p. 11). These key concepts represent important competencies for students to have when engaging in any form of online learning.

4. Theory: Connectivism

In response to the myriad technical changes that accompanied the wide-spread adoption of the Internet in the early 2000s, Connectivism emerged as a theory to explain how such technologies mediate learning, particularly in distributed, online spaces. Early theories of Connectivism can be attributed to George Siemens and Stephen Downes. For Siemens (2005), innovations in technology were accompanied by changes in the way that people entered the economy. In previous generations, people would go to school and then find a job in a single workplace, where they would work until retirement. However, this was no longer the case. Instead of having a single career, people were more likely to have a variety of different jobs in unrelated fields. Education was becoming more informal, learning was life-long and continuous, technology had an impact on how individuals learn, and the production and renewal of knowledge was accelerating. Connectivism as a theory was meant to map out how these changes impacted

education and to point to ways that online, decentralised learning spaces would be instrumental in this new learning paradigm (Siemens, 2005). According to Siemens, knowledge production did not necessarily lie in the cognitive capacities of the individual, but through the ability of the individual to navigate networks of information on the Internet, and to pull together disparate forms of information and data to synthesise knowledge. One of the key claims of Connectivism was that many of the cognitive processes that previously burdened the individual were now offloaded to technology (Siemens, 2005).

For Siemens, technology influenced knowledge acquisition in a way that made this process non-linear and one of the key cognitive tasks in online spaces is pattern recognition and synthesis. He theorised that competence in any task is derived from linking disparate pieces of information and that “the student’s challenge is to recognize the patterns which appear to be hidden” (2005, p. 3). He proposed the following principles for Connectivist theory: learning and knowledge lay in a diversity of opinions, learning was connected to the ability to navigate specialised nodes of information within online networks, networks and connections needed to be nurtured and maintained, knowledge is ever-changing and in need of constant update, and the key skills for the Connectivist student is the ability to link together diverse fields of knowledge (Siemens, 2005).

Connectivism, according to Downes, is a theory that explains how “distributed knowledge” is encountered across networks (2005, "Distribution"). Downes places distributed knowledge alongside qualitative and quantitative knowledge, stating that it is connective, with the links between points of knowledge as being interactive and not merely structural. Knowledge encompasses more than knowledge itself, including the processes of perceiving and comprehending the connections between points of knowledge. In Downes view, knowledge of the world is not inherent in the world itself but is interpretive; in effect, what we “know” about the world is a combination of sense data and the way that data is mapped onto the synapses of the brain. Downes refers to this distributive, connective knowledge through pattern recognition and the notion of “emergence”. Emergence, as he explains, is a property that is exhibited only through connection. He gives the example of the “wave” produced by dominoes when they fall. This is not an inherent quality found within each domino but is produced in the sequence of them falling. We observe and interpret the emergent pattern of the “wave” as they fall. He notes “our understanding of the existence of connections, and the nature of the networks they form, is

something we bring to the table, an interpretation of what we think is salient” (Downes, 2005, "Physicality"). Downes describes that the properties of a distributed entity do not exist in a single or sole location, and when taking this further and applying it to knowledge, the centre or locus of meaning-making is distributed across the field of knowledge being interpreted, in the emergent pattern we observe. The connections we see or the perceptions we have are contextual, based on what we observe during any moment of emergence.

Finally, Downes notes that for any network to thrive, diversity is key. He references the concept of “scale-free” networks, where the distribution of connections between nodes is in equilibrium. He explains that this type of network “forms through a dynamic process where the presence of one entity leads others to connect to it” (Downes, 2005, “Power Laws and Inequalities”). The danger lies in extreme power distributions that can disrupt networks. These distributions are characterised by specific nodes becoming highly connected, starving smaller nodes of connections. This imbalance causes those highly connected nodes to become reference points at a much higher frequency or rate than smaller ones. To take a concrete example, one can look at the way specific websites such as Google are highly connected and thus create a power imbalance within the ecosystem of the Internet. They also have an undue amount of influence on how individuals search for and locate information, whereas smaller sites with fewer connections are referenced less. When thinking through Downes and Siemens conception of knowledge production as the navigation of networks and the act of pattern recognition, extreme imbalances between nodes have a direct impact on how knowledge is produced by the individual, “reduc[ing] diversity and reduc[ing] interactivity” (Downes, 2005, “Knowing Networks”).

So, how does Connectivism apply to technology, and in particular, the Internet, and education? While Downes’ work is more abstract than Siemens, Connectivism can be summed up by: decentralised/dispersed information existing in diverse nodes in a network; knowledge as the ability to see patterns and pull together and interpret information; interpretation as subjective and time-bound; knowledge as continually changing; and, cognitive processes may now reside elsewhere than in the individual’s mind. This distribution of knowledge and thought processes can be characterised as “distributed cognition” (Dron and Anderson, 49), or the individual is no longer the sole participant in a thought process. This can be exhibited in Downes focus on the possibilities of Massive Online Open Courses (MOOCs). Goldie (2016) notes that these courses are characterised by teachers who either act as facilitators or are absent entirely, with students

interacting through a variety of tools, such as message boards, wikis, blogs, and via social media, among others. Downes himself distinguished between two types of MOOCs: xMOOCS, which are extensions (hence the x) of already existing university classes, and cMOOCs which are Connectivist in nature. cMOOCs look like online communities as opposed to classes, where the main purpose is communication and collaboration amongst large numbers of students (Downes, 2015). However, these courses have not been without their critics, many of whom have criticised Connectivism for a variety of reasons.

4.1 Critiques of Connectivism

From the perspective of this thesis, Connectivism is useful for the understanding of the way that individuals navigate diverse networks, collecting information from different, dispersed nodes, and recognising specific patterns that concretise into what we could consider to be knowledge. The abstract nature of Connectivism lends itself well to a more theoretical understanding of how one uses the Internet, and how knowledge acquisition in online spaces is a non-linear process. However, Connectivism fails to account for learning that is not discretely online, but that straddles the boundaries between virtual and in person, such as the use of technology and apps within a school classroom. Its focus on MOOCs and online learning spaces ignores how learning can exist both in the physical classroom and the virtual world simultaneously, with learning shifting back and forth as the lesson requires it to do so.

Several other critiques have been levelled at the theory. It has been accused of not being that dissimilar to previous theories that have come before (Verhagen, 2006; Goldie, 2016; Yates, 2022). Connectivism is quite similar to Constructivism with its focus on experiential and enquiry-based learning, life-long learning, and teacher as facilitator (Kop and Hill, 2008). Other researchers have focused on MOOCs, stating that there is a lack of empirical evidence for the efficacy of these courses (Goldie, 2016). Furthermore, the limited presence or absence of a teacher can be confusing and disorienting for students. The participatory nature of MOOCs is not given sufficient teacher support to sustain peer relationships, while there is a lack of evidence for the efficacy of some social media tools that are used in the learning process (Loizzo and Ertmer, 2016). This lack of evidence extends to the theory itself, with the criticism that it lacks any empirical studies to back up claims made (Mackness, 2011). The contention that learning may take place outside of the individual and lie within networks and technology has similarly been criticised for the lack of explanation as to how this learning occurs (Goldie, 2016), and the

conflation of human and non-human cognitive processes (Verhagen, 2006; Hinton, 2023; Langridge, 2023).

One critique of Connectivism that is not represented in any of the literature reviewed for this thesis is that it is utopian in thinking. There is a supposition that within online spaces, specifically those that are either dedicated to knowledge production or are spaces of informal learning, all users bring the best of intentions. It is also assumed that the information being collected is neutral and that patterns observed are positive forms of knowledge production. Connectivism takes the view that the Internet enables knowledge creation and knowledge sharing through open platforms, democratised virtual spaces, and equal access regardless of physical location, but the reality we currently face is considerably different. Rather, online spaces have shifted towards being more atomised, with users' experiences mediated by algorithmic flows from website to website. In this process, user data is collected and monetised under coercive, unfair circumstances in a form of "data dispossession" (Thatcher and Dalton, 2022). Furthermore, search engine results can easily be manipulated through search engine optimisation (SEO) (Montti, 2023; Landymore, 2023). For example, a student might be doing a report on a topic such as amphibians of Germany and the search results they see, particularly on the first page of a search engine result, could be skewed towards sponsors and spammers.

In the intervening years since Connectivism was first theorised, ownership over the indexing and distribution of knowledge on the Internet has concentrated in the hands of a few major companies, with platforms "enshittifying" or becoming progressively worse for both users and advertisers (Doctorow, 2025). For example, there are only a handful of major webpage indexes, such as Google, Microsoft Bing, Yandex, and Baidu, and they control how most search engines locate information on the Internet (Rieder, 2020; Martens, 2023). One might shift to a privacy-focused search engine like DuckDuckGo, but the primary underlying web index it draws from is Bing ("Where do DuckDuckGo search results come from?", 2026). Furthermore, Connectivism does not take into account informal or "accidental" learning that takes place on platforms and on apps that were not meant for education. Social media feeds, and the proprietary algorithms that determine what posts individual users see, are often places where knowledge of traditional subjects such as science are encountered (Lundgren, Crippin, and Bex, 2020). Social media is also not immune from propaganda, fake accounts, bots, and the spread of misinformation (Rogers and Niederer, 2020).

Finally, Connectivism fails to address the underlying code logics of digital spaces and how they function. Rather, the websites, forums, chat rooms, message boards, and learning management systems that make up Connectivist learning are figured as empty “containers” in which learning takes place. The underlying structure for an online space, such as its’ code, its’ design, its’ structure, its’ algorithms, is rarely considered. In the context of this thesis, Connectivism is useful for its’ conception of knowledge as decentralised and distributed across nodes. As illustrated in the research questions presented earlier, my research is concerned with how students do research online, synthesise what they find, and see the “emergence” or patterns in knowledge and interpret it, and how this can be linked to the ways algorithms shape the information presented to them. However, while Connectivism has influenced the theoretical direction of this study, particularly related to online, networked knowledge, it does not account for the pedagogical aspects of teaching middle school students about digital citizenship. As discussed in the results section of this thesis, there are a number of competing models of digital citizenship that address digital competencies from online identities, safety, security, and media literacy. Furthermore, as I discovered when interviewing one of the individuals responsible for developing the module at the centre of this study, the module does not belong to a larger curriculum. Rather it was developed alongside one other module, which demonstrates using algorithms to model flood predictions, and does not represent a larger revision of digital citizenship content (C. Glenn, interview with G. Mirenzi, April 18, 2025). These theoretical and pedagogical gaps are returned to in the conclusion of this thesis.

5. Methods

This study consists of two main parts: an analysis of the most prominent digital citizenship curricula to find gaps in their instructional material related to algorithmic literacy and the pilot of a social media recommendation algorithm module. Frameworks and curricula are addressed separately as the standards contained in frameworks, such as the International Society for Technology in Education Student Standards, inform the inclusion of specific student competencies in curricula. In the results section, I look at whether:

- i) Algorithmic literacy is included in content, objectives, or in the case of frameworks, competencies.
- ii) If algorithmic literacy is included, how is it included and whether it includes online platforms.

In the discussion section of this thesis, I give a short critique of the ways that algorithms are included or excluded. This is not meant to be an exhaustive analysis of digital citizenship curricula and frameworks, but to illustrate how algorithms are included and whether it is at a purely conceptual or a technical level. Other questions of how digital citizenship is taught, related to provincial, state, and national standards, as well as political considerations, are out of scope for this study, though an important area for future study.

The second part of this study consisted of a pilot test of a module on social media recommendation algorithms created by Digital Moment and the Raspberry Pi Foundation. This module is set for public release in May 2026, and the piloting phase of the module took place in the month prior to release. The pilot testing took place in two Grade 6 Pastoral classes as a part of a unit entitled “Our Digital Lives.” This unit, taught during regular Pastoral periods, focuses on many of the main themes of digital citizenship curricula: students’ online identities, online safety, and common scams, and the unit is based on content from Common Sense Media, adapted for our school environment. This grade was chosen for the pilot because of the suggested age range for the social media recommendation algorithms module and because I teach ICT to some of the students involved. Prior to the pilot, I conducted a structured interview with Grace Mirenzi, an educational and community developer with Digital Moment. Mirenzi was one of the developers responsible for the module and the interview gave context to the module’s development and goals. Interview questions can be found in Appendix I and answers from the interview have been included in the discussion section of this thesis. The pilot was accompanied by a pre- and post-module survey, which showed the initial knowledge of the students surveyed, and the knowledge they had acquired during the module.

5.1 Sample Size

The sample size for this study was to be sixty Grade 6 students, three classes, but had to be reduced to 40 students, two classes, given the time constraints for the module pilot and local holidays. The remaining 20 students were taught the pilot module after this study concluded. Furthermore, the module targets students aged 9 to 12, and could be undertaken in Grade 5 and 7 classrooms, time permitting.

5.2 Ethics

The design of the study and the tools used during the study (see Appendix II) are compliant with the General Data Protection Regulation (GDPR, or DSGVO in German) and Artificial

Intelligence Act of the European Union, German *Bundesdatenschutzgesetz* (BDSG, or Federal Data Protection Act), and *Datenschutz in der Schule* (Data Protection in Schools) of the State of Saxony, the jurisdictional location of the study. Links to the relevant legislation can be found in Appendix III. Given the age of students participating in this study, 11 to 12 years old, a letter and consent form were drafted and distributed to parents (see Appendices IV and V), with consent obtained for all students in the study. Parents were able to withdraw consent at any time and were given the opportunity to review the lesson material that was presented in class. Student responses to the pre- and post-module survey were kept anonymous. The subject in which the study was conducted, Grade 6 Pastoral, is meant for student reflection only and is not graded, so the survey had no impact on student performance or final marks.

5.3 Module Pilot Testing

The module was given over four consecutive weeks during weekly Pastoral lessons. Due to time constraints, we also used two Form periods, which are normally reserved for Form tutor and student interaction.¹ There were gaps of two to three days between each lesson, based on class schedules and weekends. Each lesson began with a brief introduction to the topic and the content, followed by free student exploration. Time was given for group discussion; the determination for when group discussion was appropriate was based on the teacher listening guide that accompanies lesson one. During each lesson, student activity was recorded using the lesson rubric by the study author (see Data Collection for further details).

5.4 Pre- and Post-Module Surveys

Pre- and post-module surveys (Appendix VI) were created to determine student knowledge of algorithms and how social media feeds work. These surveys were based on the content in the three lessons of the social media algorithms module and were created by the study author with feedback from the module's instructional designer and one of the Grade 6 Form tutors. Questions were written to be open-ended, direct, easy to understand, and free from jargon. The survey data was collected using anonymous Google Forms distributed via a short URL generated by Google and posted to Google Classroom.

¹ Note: at LIS, form tutors, which are similar to homeroom teachers, are class teachers for both Pastoral and Form lessons.

5.5 The Module, Lessons, and Platforms

The social media algorithms module consists of three lessons entitled “The Attention Machine,” “Engagement Bait & Attention,” and “Make Your Own Engagement Bait!” The first two lessons consisted of student free exploration of Somekone, a platform developed by Finnish researchers as part of the Generation AI education project. All lessons included slide presentations, reflection questions, listening rubrics, and class activities created by Digital Moment and the Raspberry Pi Foundation (see Appendix VII). Lesson One opened with a short discussion about what students already know about social media, including frequently used terms such as “feed,” “app,” “platform,” and “like,” among others. Students were briefly introduced to the Somekone platform and then given roughly 20 minutes to explore on their own. A listening rubric was employed by the study author to capture some of the observations made by students during exploration. At the end of the exploration period, students were then shown the backend of the platform, where the “social network” that was created during the activity could be visualised (see Appendix VIII, Figures 6 and 7). The lesson concluded with a brief introduction to the content for Lesson Two.

Lesson Two began with a brief re-introduction to the topic, including setting expectations for what students should do, and that there are no right or wrong answers. The goal for the exploration was to see what patterns begin to emerge on Somekone. Like in the first lesson, students were given 20 minutes to explore the platform, and observations were recorded again by the author using the listening rubric. Once the exploration period was over, a short lesson on engagement bait was given. This content sign-posted the activities for the final lesson. Lesson Three concluded the module with a task on engagement bait. First, we reviewed what students had learned in previous lessons, touching on the various types of engagement bait. Then, the main task for the lesson, creating posters of “bait,” was introduced to students, who were then given 20 minutes to work on their posters. Once the task was completed, students took turns presenting their work to the class and students guessed what type of bait each poster represented. The posters were sorted based on their type. Finally, the module ended with a review of how user actions affect what they see online, as opposed to emotions, beliefs, or thoughts.

Somekone

Somekone is a “social media simulator” that demonstrates to students how their actions on social media, via interactions using various icons, shape what content is recommended to them and how recommendations change over time. As the platform’s creators describe, Somekone “resembles

the feed of familiar social media image platforms, while making visible the processes that usually remain hidden” (“Somekone: The Social Media Machine,” n.d.). To begin the simulation, the instructor visits the Somekone portal and creates a new session, where they choose the type of content to be displayed to users: the generic content provided by the platform, safe content (for young audiences), or user-selected content. During the second lesson, new content that featured various types of bait was “injected” into the system as a prompt for the students to see what had changed from the first lesson. A “join” code is generated, and users are then directed to the Somekone user URL to join using the code.

Users are presented with a simple visual interface and tools (images can be found in Appendix VIII). The tools are:

- i) Image Feed: a simple, scrolling feed of images, with icons to “like,” comment on, and share each image. User interactions with the images using these icons affect the algorithm that recommends future images in the feed.
- ii) Your Data: a visual representation of user interactions with each image, including whether an image was seen and the amount of engagement with the image, such as time spent on the image, likes, comments, and shares.
- iii) Your Profile: a visual representation of user engagement including a word cloud of tags related to images engaged with and user preferences, likes, shares, and comments.
- iv) Your Recommendations: a feed of recommended images based on user engagement, and data that explains why images are recommended.
- v) Share with others: a QR code and link to share user profiles with others.

After the simulation is complete, the instructor can display a web of interactions to users, illustrating how their engagement intersected with the engagement of other users. Individual users can be selected to illustrate their personal connections, user data, log data, engagement, and recommendations.

5.6 Data Collection

The pre- and post-module survey data were collected via Google Forms and analysed in two separate Google Sheets documents. The pre-module survey was conducted several days prior to the first lesson while the post-module survey was conducted two to three days after the final lesson. Students were given twenty minutes to complete the survey and were allowed to ask for clarifications if they thought any of the questions were unclear. Participant observation was also a

key component of the first two lessons of the module. The study author used a rubric based on a “Notice”, “Describe,” and “Interpret” model to observe how students interacted with and understood Someone (see Appendix VII). These observations were based on what students said as they interacted with the interface:

- Notice: students notice patterns in what they are seeing but cannot explain them.
- Describe: student describe what is changing over time as they interact with the platform.
- Interpret: students explain why there were patterns in what they saw, through descriptions of how their actions were linked to changes in the platform.

Participant observations were collated based on class and lesson (see Appendix IX). The class names are anonymised in the thesis results.

5.7 Data Analysis

The pre-module survey data was analysed to provide a baseline for student knowledge of social media and algorithms, while the post-module survey was evaluated to see if students made connections between the content of the module and algorithms as a concept. Analysis of the data was conducted using a combination of qualitative thematic analysis (Braun and Clarke, 2006) and Biggs’ and Collis’ SOLO taxonomy (1982) and does not quantify the number of “correct” or “incorrect” answers. Rather, the themes that arose in the data point to how students understand social media before and after the module. The qualitative thematic analysis involved hand coding student responses, which were then grouped together. A number of themes emerged, which are the basis for the discussion section of this thesis. Furthermore, I incorporate SOLO (Structure of an Observed Learning Outcome) Taxonomy (Biggs and Collis, 1982) to gauge anticipated student learning. SOLO Taxonomy was structured in a way to describe the differences between surface and deep learning observed in student. It consists of five levels:

1. Pre-structural: student has no prior knowledge.
2. Uni-structural: understanding is disconnected, limited.
3. Multi-structural: understanding is connected to several aspects of a topic.
4. Relational: deeper understanding, can make connections between different concepts related to a topic.
5. Extended abstract: can make connections between different concepts and transfer that knowledge to unrelated tasks.

In the context of this study, the limited scope of the module makes it difficult to ascertain knowledge beyond the first three levels of the taxonomy. As well, given that this is the sole module that the students will receive on algorithms, it was not expected that they will make conceptual links to other academic subject areas. As is elaborated on in the thesis discussion, a more holistic integration of algorithmic literacy into a broad variety of subject areas may possibly enable much deeper student learning. Finally, student experiences during the module have been taken into account in the results and discussion section. Here I take my observations of how the students interacted with the Somekone software and their response to module content to elaborate ways in which the module can be improved. Questions that I kept in mind when teaching the module included:

- i) Were any interface elements in Somekone unclear?
- ii) Did students interact with all elements of the simulation, or did they only focus on certain elements?
- iii) Were students using vocabulary that accurately described design elements (e.g., feed, profile, recommendations)?
- iv) What kinds of questions did the students ask the teacher? What kind of questions did students ask each other?
- v) What things did they observe about the simulation, in particular their user profiles and user data?

The pre- and post-module surveys and listening observations taken together provide the basis for a series of recommendations on how algorithmic literacy can be incorporated into digital citizenship curricula and feedback to Digital Moment on suggested improvements to the module.

6. Results

6.1 A Brief Review of Digital Citizenship Frameworks and Curricula

The following chart outlines the different curricula and frameworks that are used in Grade 6 Digital Citizenship lessons in several English-speaking jurisdictions. I have selected both frameworks and curricula as the standards and competencies in frameworks often inform the learning objectives and outcomes of curricular modules. A more thorough analysis, which is beyond the scope of this thesis, would consider non-English curricula and frameworks, such as the *Cadre de référence de la compétence numérique* of the Canadian province of Québec. Of

note: the DigComp 3.0 framework, discussed below, is available in multiple European languages and has been adapted into different national contexts.

Frameworks

Framework (Jurisdiction)	References to Algorithmic Literacy	Framework Competencies
Computer Science Teachers Association K-12 Standards (US)	Yes.	There are 57 separate competencies related to algorithms, though they focus on the creation and implementation of algorithms as part of Computer Science lessons.
DigComp 3.0 (EU) - is not specifically designed for schools	Yes.	Similar to the CSTA standards, DigComp refers to algorithms solely within Computational Thinking and Programming, which is one sub-area of the Content Creation competency area. Algorithms are absent in all other competencies.
DQ Competencies (DQ Institute, US/Singapore)	Indirectly.	Algorithms are not referenced by name, but related concepts such as AI, media literacy, computational skills, and digital security are present.
Education for a Connected World (Council for Internet Safety, UK)	Indirectly.	The framework's section on managing information online refers to competencies students should have, such as being able to do basic keyword searches online, but does not explain that these searches are tied to algorithms. Furthermore, another competency is tied to explaining how search ranking works. This is impractical as search engine rankings are tied to

		recommendation algorithms and are influenced by things such as sponsored search rankings (advertisements) and search engine optimisation (SEO) strategies to boost rankings. The framework also makes reference to concepts such as influence and persuasion online, touching on key components of engagement bait, but does not name the concept.
International Society for Technology in Education Student Standards (US) - does not differentiate between grade levels	Yes.	Under the Algorithmic Thinking sub-competency of Computational Thinker. Does not appear in related competencies such as Digital Citizen or Innovative Designer, where algorithmic literacy would also be applicable.

Curricula

Curriculum (Jurisdiction)	Inclusion of Algorithmic Literacy Content	Module Content
The Algorithm & Data Literacy Project	Yes.	The <i>raison d'être</i> for the project is to “raise awareness and educate kids about the presence of algorithms and how they influence our digital experiences” (The Algorithm and & Data Literacy Project, n.d.). Note: this project is co-coordinated by Digital Moment, who created the module piloted in this study. The project’s website features white papers, teacher recommendations, several

		modules, and content that can be used in the classroom, though it is limited in scope/amount of content available for educators.
Common Sense Media (US)	Yes, in three modules.	Modules focus on AI literacy, filter bubbles, and viral content online. Lessons do not include any technical demonstrations of how algorithms work aside from short explainer videos.
Discovery Education (US)	Indirectly.	Focus on generative AI literacy, including what AI is, how to use AI responsibly, how AI algorithms induce user engagement, and the impact that AI has on society and the environment.
Media Smarts' Digital Media Literacy Framework, Grades 4-6 (Canada)	Indirectly.	Algorithms are not named, but concepts related to algorithms are included, including data mining, amplification of online content, and social media use. Note: the Grade 7-12 framework includes a single module on curating digital news feeds by “training” algorithms to display diverse sources of factual news and could be worked into a variety of classes and subjects.

6.2 Pre- and Post-Module Survey: A Comparison

The pre-module survey was conducted in a class block prior to the beginning of the module and given to all students involved in the study, so there were several days between the survey and the module content. The post-module survey was conducted after the social media algorithms module was given to a respective class. The following tables outline the pre- and post-module survey

responses, highlighting some of the major themes found in the data collected. Note: I did not edit the responses for grammar and punctuation only correcting a few noticeable spelling mistakes.

Survey Question One: *“What is a digital citizen?”*

Pre-Module Responses	Post-Module Responses
One-third of students were unfamiliar with the term “digital citizen” Many responses focused on what a digital citizen does: • “a person who goes on the Internet” • “being a member of something online.” Linked the term to social media: • “a person that uses social media a lot” • “having your own account on social media” Several students linked digital citizenship with identity: • “a digital citizen is someone who is part of the online digital world” • “basically anyone that uses the online space as a home in a way and the online community has its own rules” • “a digital citizen is what you do online/who you are online” • “a person who exists online” One student linked it to online impersonation:	Internet • “[everything] you do online” • “its a person online with their own accounts and gmail and stuff” Online activity: • “Someone who has a digital footprint” Conflation with social media: • “A person using social media.” • “a person that is a lot on social media and always on her/his phone” The link to the concept of a citizen was raised: • “a citizen but digitalized.” • “a citizen but on a platform or app.” • “an online citizen.”

• “I don't know but I think it's a person who is pretending [they're] someone else on a social media.”	
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Survey Question Two: “What is social media? Can you give an example of a social media app?”

Pre-Module Responses	Post-Module Responses
Defining social media by what a user can do on the platform: • “social media is something like instagram where people post stuff for others to look at” • “social media is an online platform or app made to share or view content like tick tock” • “social media is an app where you can communicate with other people” Social media as connected to identity: • “social media is like a city everybody can look at you're house (profile) what you post, the bigger the house the more people are visiting it and you get more likes and get bigger or smaller after time. instagram, facebook, tik Tok...” Social media platforms mentioned by name: • YouTube • Instagram • TikTok	Focus on defining social media: • “Social media is a place where we can be entertained for example with YouTube.” • “YouTube is a online platforms and applications that allow users to create, share content, and interact with virtual communities.” What you can do on social media • “Social media is a [platform] where people can post video and other posts” • “It is a platform we people can go on and wacth videos for example YouTube our social media.” • “Social media is an app or a website where you can post, comment and express yourself. An app could be instagram.” Social media's effect on users: • “social media is an addictive stream of posts, tik tok”

• WhatsApp • LinkedIn (one response)	
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Survey Question Three: What do you like about social media? What do you not like about social media?

Pre-Module Responses	Post-Module Responses
Entertainment value: • “I like that it is entertaining and fun to use. I don't like that if you are watching videos and consuming it too much then it becomes tricky to start doing other tasks.” • “It is fun to watch and some stuff are really nice to watch. i dont like that there are sometimes when i check comments on videos (not mine) there are weirdos.” Introversion • “so, i overall like social media, cuz its way easier to make friends that irl, so even though ur an introvert irl, u can still have many friends online. theres not much that i dont like about social media, but maybe that people like to sexualize people or maybe catfish others, but u can easily avoid it if [you're] not an idiot.”	Connection and overconsumption: • “I like the fact that social media can connect you to others and also the fact that it can open up new perspectives but I don't like overconsumption content and Internet cults.” Dangers of being online: • “I like social media to watch or maybe like play things, but I don't like how they take your personal info” • “I like that we can talk with friends and watch stuff what I don't like is that people can hack can take information about you and do something that is not good.” • “I like the videos, I don't like the predators.” Data privacy:

Connection “I like that you can communicate with others and maybe call people who don't live near you. I don't like the cyberbullying on social media or how addicting it can be.” Data privacy: “I dont like how there are people who hunt your data (address, personal info like birth date, where you live, house number, etc)”	“i like that you can watch whatever you want. i dont like thats apps track everything you do.” Social media addiction: “I like that it is sometimes helpful because it has tutorials.What i dont like is that its [addicting]” “i like that there is [interesting] things and funny and i dont like that it makes you addicted”
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Survey Question Four: What is an algorithm?

Pre-Module Responses	Post-Module Responses
Lack of knowledge Algorithms as instructions “a list of rules to follow in order to complete a task or solve a problem” “an algorithm is a precise, step-by-step set of instructions or rules followed to solve a specific problem or accomplish a task” Algorithms as recommendations: “an algorithm is when you watch something the algorithm will recommend more stuff like that” “if	Algorithms as math: “it's like a mathematical equation, where when I watch something similar things will show up because of the algorithm” “it's a mathematical sequence that is trying to figure out things about you like on youtube the algorithm will try to figure out what videos you like and it will show you more of that” Algorithms and recommendations: “algorithm is you watch something and then it shows you more of these things you are watching”

you watched or see something and it shows you more like that” “...if you watch this we recommend this, if you buy this then you might like this” “so if you like a video [or] comment under it or something like that the algorithm will give similar things to that video” Algorithms as math: “a mathematical equation that makes stuff happen”	“an algorithm is a machine that detects what you do and gives you content you like” “an algorithm is something that looks at what you do or look at the most” Instructions: “step-by-step set of instructions or rules followed to solve a specific problem” “It is a step-by-step rule followed to solve a problem. That people use to see your interests (kind of)”
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Survey Question Five: What things on social media get your attention? Why?

Pre-Module Responses	Post-Module Responses
types of content, such as cats, football, video games, food, trends, foreign countries, and humourous situations Aesthetics and attention: “Well the thing is I know how to get attention for example. A good title, thumbnail, and cuts between a video and subtitles to keep more attention for the viewer.” Social media feed:	Advertisement/monetisation: “So you spend more time on the app and then the company gets more money” “Advertisements in Videos on Youtube, so I buy the product they did the advertisement for, and they get money.” Entertainment value: “Entertaining and funny content because it amuses me.” “games, minecraft and funny stuff”

• “Tiktok videos because when you scroll you never really know what your gonna see next and that's interesting.” Emotions: • Many of the responses linked to emotions, interest, and excitement, with qualifier words such as “entertaining,” “important,” “interesting,” “funny,” and “chill.”	Tutorials: • “Basketball videos because they help me improve.”
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Survey Question Six: How does social media show you content?

Pre-Module Responses	Post-Module Responses
Linking algorithms to content they saw: • “With algorithms It constantly gives you content to watch endless and endless” and “Through the algorithm by what I like watching.” Due to algorithm: • “With algorithms It constantly gives you content to watch endless and endless.” • “Through the algorithm by what I like watching” Recommendations: • “it just shows you what you like” to “through the videos i searched for or	Algorithms: • “algorithms” • “It uses the algorithm to determine content for you based on what you have engaged in” • “use automated, personalized algorithms to curate” Tracking: • “When I log in they track what I watch so they can show me similar content.” User engagement:

liked in the past” and “by knowing what you have previously seen,” highlighting how past actions have an impact on what they see in the present.	• “by recording and seeing how much and what you look at and that’s how they make want to be longer online” • “they look at which video we watch longest and then it shows us the similar content.”
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Survey Question Seven: How does social media know what to show you next?

Pre-Module Responses	Post-Module Responses
Linking user actions to recommendations, search history: • “because if you search for example a football video they will recommend you a other football video” • “it takes the recommended stuff you like and put it in the website for you too see it” • “They see your history.” Algorithms: • “With the algorithm and the things i watch and like” • “because of the algorithm” • “from algorithms” Demographic information: • “They follow the subjects of the videos or podcasts that you watch, and then they think what kind of age you might	Engagement: • “If I like or comment on something it will think that I like those types of videos and it will show me more of that type.” • “use complex, automated systems” • “through the algorithm it knows what you look at the most.” • “they see what you see and how long and then they continue showing you these things you are watching.” User history: • “Based on your history. I think, right?” • “They track your history on social media” Cookies:

have and then they think of subjects that people your age watch about and then they sometimes spy on you.”	• “when you accept cookies they have access to your data but also what you watch .” Algorithms: • “through the algorithm its knows what you look at the most.”
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Survey Question Eight: What are some of the things that social media posts do to get your attention?

Pre-Module Responses	Post-Module Responses
Many of the answers focused on the things they saw in social media content, such as animals, humorous situations, video games, food, and football: • “the content like a crazy bike stunt or a really funny video that makes me laugh” • “Fun straight forward direct content that gets your attention.” • “Videos with catching starts or shocking content” • “food and like funny videos about dogs or cats” Aesthetics: • “They either have a specific eye-catching layout or the first few words are a sort of hook such as ‘did you know??’.”	Engagement bait: • “They usually use something called click bait pretty often when they put something like “teachers hate this hack!! Always get straight A’s!” On the caption to make you click on it.” • “bait engagement bait rage bait etc.” Viral content: • “by putting viral content online, which people see over and over again—until they eventually get one for themselves.” Advertisements and tracking: • “Advertisements, tracks for example what I searched before to show me advertisements so I would buy something”

• “They have a big title and a cool thumbnail photo.” • “Uses literary techniques, like alliteration”	Aesthetics: • “They are colorful and have catching titles.” Things they like to watch: • “funny stuff” • “cat videos” • “make up”
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7. Discussion

7.1 Frameworks and Curricula

One of the main issues that I have located within the frameworks and curricula listed in this thesis is that the concept of algorithmic literacy is rarely addressed directly. An exception to this is the Computer Science Teachers’ Association K-12 standards. There are 57 competencies related to algorithms but taught within Computer Science where students learn how to create algorithms. This contrasts with Digital Citizenship content, which is often framed as being interdisciplinary, and where algorithms are only partially referenced or tangentially mentioned. What is included are lessons on things such as safe social media use, online research skills, and AI literacy, which all involve algorithms, but how algorithms function is not discussed. For example, Common Sense Media has three modules that reference algorithms: “AI Algorithms: How Well Do They Know You?”, “Filter Bubble Trouble,” and “Invisible Audiences.” The modules are aimed at Grade 8, 12, and Grade 5 respectively, so they do not directly build on one another. Within the modules, videos give short explainers of key concepts and students respond to prompts. However, they do not leverage some of the online tools that exist, such as Somekone, which can visualise *how* algorithms do what they do. This is consistent across the curricular content that I located for this study: there is a focus on what algorithms are, not how they do what they do. Furthermore, much of the content focuses on AI literacy, rather than algorithmic literacy, which are not the same but often conflated. AI literacy in this context focuses on teaching students how to properly use generative AI while maintaining a critical lens on the content it produces, though

certain tools exist that allow users to create large language models, such as Generation AI's Little Language Model,² illustrating the backend of generative AI.

The social media algorithms module piloted in this study is somewhat unique in that its' primary purpose is to illustrate how algorithms work using an online platform, rather than through simple explainer videos and reflection questions, like in Common Sense Media's case. This is not to say that there is a paucity of platforms that could be leveraged in similar modules; several exist that could be incorporated into classroom activities (Magoge et al., 2025). However, researchers have noted that some of the challenges of teaching algorithmic literacy include the inability for younger students to understand abstract concepts such as algorithms, little long-term data exists on the effectiveness of such lessons, and students have emotional responses to the content, ranging from appreciation for how experiences are personalised to feelings of frustration at perceived manipulation by algorithms (Magoge et al., 2025). Other critiques of digital citizenship frameworks include a focus on skills, dispositions in online environments, ethics, participation with a focus on adults, rather than what works for children (Kim and Choi, 2018). In terms of my school environment, digital citizenship lessons are often disconnected from the range of subjects we teach, while algorithms are siloed into Computer Science classes. A more holistic approach would weave digital citizenship lessons into all subjects. Finally, other researchers have proposed meeting students where they are, leveraging social media as a tool for learning. For example, Gleason and von Gillern (2018) propose integrating social media platforms into classroom activities, including creating public service announcements and contacting elected officials. The integration of social media reflects the reality that students face, where they must negotiate between their private and online lives (Gleason and von Gillern, 2018), while acknowledging that those lives are mediated and shaped by algorithms.

7.2 Observation Rubrics

Observation rubrics were used to measure student engagement and understanding during the first two lessons of the social media algorithms module, based on the Notice, Describe, and Interpret framework included as part of the module's teacher resources. In lesson one, many student responses were surface level observations where students noticed what content they were being

² Generation AI was also involved in creating the Someone platform. The Little Language Model can be found at the following link: <https://www.gen-ai.fi/en/tools/lm>.

fed. These responses typically reflected the aesthetic qualities of the images they were seeing, such as “oh, this is so beautiful” or “I don’t like that.” Many students described what they were seeing in terms that related to their own enjoyment, while one student quickly became bored of the activity: “This is kind of boring.” Several times, when a student saw something they found amusing, they would share their computer screen with students in their vicinity, rather than sharing the post via the Share feature on the platform. Some students described what they were doing, noting that they were liking every post that appeared, while one student used the Share feature to spam another student with whom they had an interpersonal conflict.

Student responses only rarely elevated beyond the level of Notice. Responses that could be categorised as Describe were linked to the functionality of the interface. Examples include “I sent you something, you need to read the comments” and a question directed to the instructor: “What if you have seen all of the photos?” Only three student observations could be classified as Interpret. While two students were scrolling together, one explained how “likes” work in the interface. Another student, having looked through the content, asked whether the platform itself was real or fake, discerning that what they were seeing was not organic posts and engagement but content that had been curated.

Observations in lesson two were of a similar nature. Students focused more on what they saw and the pleasing qualities of it, as opposed to how the interface worked. However, a few student comments reflected more engagement with the functions of the Somekone platform. For example, one student asked, “Why is it showing me food?” after their timeline became populated with only food-related posts. Another student noted that they were “seeing the same thing over and over again,” while a third asked a question about the purpose of the platform: “Do people post new things every day?” Finally, one student inadvertently contributed to a metacommentary on the nature of social media platforms, confidently stating: “I am the algorithm.”

7.3 Pre- and Post-Module Surveys

When looking at the results from the pre- and post-module surveys, student understanding of recommendation algorithms did not increase due to the content of the module. The module was included as a part of a unit called Our Digital Lives, which covers aspects of students’ online lives from user identities to online safety. However, limited context was given prior to the module pilot, not explaining what kind of knowledge it was meant to build on and expand. Using the SOLO taxonomy, student learning ranged from pre-structural to uni-structural, though a few

students were able to make broader conceptual links, representing multi-structural learning. Several themes emerged from the data that suggest ways for future improvement of the teaching of this module, as well as supplemental material and exercises that would make it more effective.

7.3.1 Themes

In the pre- and post-module survey, several themes emerged in student responses. For example, students were familiar with the way that recommendations work on different platforms: the more they watched a specific topic or type of content, the more they saw of that content. While not present in the post-module responses, in discussions at the end of each lesson, students were able to make the connection between the length of time that they watched something and the impact it had on what they would be recommended. Other themes that emerged including the addictive properties of social media apps, how they track user data to shape what content they push to users, how advertisements are connected to recommendations, as well as the aesthetics that content creators use to attract user views. These four thematic areas could potentially be expanded upon in future digital citizenship modules. However, there were several areas where student knowledge did not keep pace with the material, such as conceptual understandings of how algorithms work, as well as an inability to link the module content to what they experienced on the Somekone platform.

7.3.2 Misunderstanding and Lack of Knowledge of Algorithms

Within the context of the module, algorithms were exclusively linked to social media and recommendations, and algorithms as the technical underpinning of many online functions were not covered by the module material. Using the SOLO taxonomy, students were expected to start with pre-structural knowledge, where they had no prior knowledge of the topic. However, several of the responses revealed uni-structural knowledge, though students did not make the conceptual link to other types of recommendations that they may see on the Internet: algorithms employed in as search engine results or targeted advertisements linked to tracking data. As well, student survey responses exhibited only a surface knowledge of what algorithms do, focusing on passive online activity such as “I watched x, therefore I see more of x,” simple functions of online platforms such as “likes” or “shares,” or the mathematical basis for algorithms.

The post-survey results show that students had developed a uni-structural understanding of what algorithms are, with several focusing on the link to mathematics. Their responses state that mathematics was involved in how algorithms function but could not give a clear definition or

explanation of *how* math is involved in predicting recommendations. This gap can be illustrated in the difference between students understanding “an algorithm is involved” and “how an algorithm does what it does.” One suggestion would be to preface the module with an additional lesson on algorithms, including examples of algorithms and illustrations of them in action. Adding this content would give students a better understanding of the logic behind how algorithms function and how that connects to probabilities and recommendation. This content could also be designed with exercises to help students make broader connections between algorithms and other systems in which they are employed, rather than the sole focus on recommendation algorithms.

7.3.3 Lack of Conceptual Links

While the post-module survey captured data on what students see on social media, it is unclear if responses exhibited learning beyond uni-structural in the SOLO taxonomy. For example, lessons 2 and 3 reinforce the idea that the “like” button is simply a function and not a way of a platform inferring any emotional reaction on the part of the user. However, when discussing what they saw on social media, students continually framed it as they “liked” something. Whether they were talking about the use of the button or an emotion is unclear. Furthermore, the design of the final question, “How does social media know what to show you next?” was intended to provoke students to think about the types of engagement bait that they saw in the Someone simulation; however, very few students made the link between the two, instead falling back on a simple explanation of likes equaling similar content. To what extent the survey questions could be re-worked is a matter for future exploration, though I would be hesitant to re-write the questions too closely to what the intended outcome as they might end up leading students to the correct conclusions inadvertently.

7.3.4 Opacity of Algorithms

One of the central issues when teaching students about algorithms is their proprietary nature. Algorithms such as Google’s search engine algorithm and TikTok’s recommendation algorithm are not public knowledge but rather exist as “black boxes” (Pasquale, 2015). These algorithms have a significant impact on what users see when they use these platforms but remain unaccountable in how they influence user experiences on the Internet. Theorists have argued that algorithms control different aspects of individual’s lives, from extracting user data as a form of monetisation (Zuboff, 2019), to racially profiling people of colour while predicting recidivism

rates in incarcerated individuals (Angwin et al., 2016). If educators cannot accurately describe how an algorithm functions, students will continuously be at a disadvantage when trying to think conceptually about how algorithms impact their lives online and off.

7.3.5 Lack of Design Differentiation between Platforms

One of the drawbacks of using a platform like Somekone is that it was generic enough to have the most common features of social media, but not specific or differentiated enough like major platforms like TikTok, YouTube, and Instagram. Social media platforms often have specific forms of engagement mechanisms meant to separate them from their competition, and brand allegiance might play a role in students gravitating to one platform or another. Furthermore, reflecting the “boredom” factor that a few students mentioned when using Somekone, its’ algorithm does not reflect how different platforms are designed for maximum user engagement, from the ways they recommend videos to the non-stop scrolling feed of content and the impact on users’ mental health (Montag et al., 2019). The addictive nature of social media, as referenced by several students in their answers, is not addressed within the module content.

Another limitation of the Somekone system is that it does not include the full feature set of most social media platforms. During the lessons, one of the common questions I received was whether students were able to post. To me represents a desire to be more actively engaged in shaping their online profile and curating what their fellow students see, as opposed to the limited engagement in liking, sharing, and commenting. The desire for students to personalise their experience should be considered in any module design, as the highest student buy-in during the pilot was the activity where students could create their own engagement bait. If a test platform is relegated to the more “reactive” aspects of social media, student comments may be limited to more “surface” observations rather than a deeper understanding of how what they do online influences what they see.

7.3.6 Organic vs. Synthetic Engagement

Another topic for consideration is the difference between organic and synthetic engagement. While students were able to see each other’s comments in Somekone, the module did not distinguish between organic engagement, which consists of engagement on the part of real users, and synthetic engagement, which is coordinated activity intended to artificially boost the engagement of specific pieces of content (Gopinath, 2025). Adding an activity or exercise to draw a clear distinction between the two for students would be a useful way to engage critical

literacy skills and link out to broader topics such as fake news, influencers, online trends, such as 6-7 or Italian Brainrot, and social media memes.

7.3.7 Interpersonal Relationships

One of the more unexpected results of this study was the role that interpersonal relationships would play in how students used the platform. Students were engaged in sharing content with each other, commenting on photos, and directing their fellow students to see what they had written. In one particular case, a student “weaponised” the interface to spam another student with which they has a personal conflict. While the module content and instructor guide made it clear that students should not take emotion or feelings into account in what the recommendation algorithm does, it neglects how the affordances of such technology can be manipulated in ways that are reflective of interpersonal conflicts.

7.3.8 Role of Advertising

Unlike most social media platforms, Someone does not feature advertisements as it is merely a training and education platform. However, the module includes a full lesson discussion of the various types of engagement bait, from clickbait to ragebait and chainbait, among others, which are types of content frequently shared on social media to provoke a user to follow a link (Jung et al., 2022). The lack of a conceptual link between engagement and advertising may not make it clear to students that these tactics are used by all those who post, not just individual users. Furthermore, the content focused on a typology of different kinds of engagement that draw users’ attention but lacked an analysis of the types of language and visuals that they use. The use of emotions, hyperbole, and visual references have been shown to influence user responses, which has an impact on whether the user trusts or distrusts the content or engages with it (Wang et al., 2025).

7.3.9 Technical Issues

As with any technology in the classroom, the usefulness of an activity is tied to the accessibility and proper functioning of whatever is being used. In the lessons where the Someone platform was being used, students frequently encountered network connection errors, with some unable to access the platform entirely. Students who had such errors were guided to work with the person beside them. Students also encountered errors where the comments they posted on images disappeared, or they observed differences in comments, even when viewing the same photos. One

student also noted that they were able to repeatedly like a single image, which should not have been possible. These technical issues had a significant impact on the effectiveness of the platform, as much of the lesson time was spent troubleshooting student technical issues. The reliance on online platforms to illustrate how algorithms works is thus a double-edged sword: it can be effective only as long as a given platform functions properly.

7.3.10 Other Considerations

Two other considerations bear mentioning: student-teacher relationships, and the use of AI. While this may serve as anecdotal evidence, one dynamic that potentially shaped student responses to the survey was the relationship between the student and teacher. In a previous school year, we conducted a survey with Grade 5 students on their use of social media as a response to a few events of cybermobbing. One of the more interesting elements was how many of the responses were similar to what was discussed in class. My colleague noted at the time that because the survey was done at the end of the year, students may have been giving responses that were predicated on what they thought the teacher wanted to hear, or a reflection of what they have been taught at home rather than their own unfiltered perceptions. That might also be the case in this study. Students frequently brought up social media addiction, advertisements, cyberbullying, and data security, and it might be because they thought that they were the correct answers to give, whereas the survey was not meant to gauge right from wrong. A way to control for this would be to conduct the module toward the beginning of the school year, when they are less familiar with specific class teachers and digital citizenship content. Furthermore, a few answers in the pre- and post-module survey bore the hallmarks of AI use. For example, one response to the question of “What is a digital citizen?” was: “A digital citizen is a person who uses technology—the internet, social media, and digital devices—responsibly, ethically, and safely to participate in society.” While I cannot state with 100% certainty that this response was generated using AI, the use of the “em-dash” reflects how it has become AI’s “signature” (Csutsoras, 2025). and a tell-tale sign of AI use. While it wasn’t made explicit in the survey instructions, if I were to run the module again, I would make it clear that AI use is highly discouraged.

8. Recommendations

Modules such as the social media algorithms module produced by Digital Moment and the Raspberry Pi Foundation need to be incorporated into an interdisciplinary approach to

algorithmic literacy and digital citizenship, rather than in single modules disconnected from a more comprehensive curriculum (C. Glenn, interview with G. Mirenyi, April 18, 2025). As illustrated in this study, student understanding does not increase when treating topics such as recommendation algorithms in isolation. Rather, the best approach would be to build up conceptual knowledge in students across grades and across subjects. This approach would allow students to leverage critical literacy skills, particularly when discussing the content of posts found on social media. Concepts such as “fake news” and the role of AI in knowledge circulation were not discussed within the scope of engagement bait. Rather, the focus was on the “what,” what the user is provoked to do, such as share, like, and engage, without an attentiveness as to the “why” the user is being provoked to do so.

Furthermore, any curriculum that focuses on algorithms and social media needs to adjust to the shifting regulatory landscape. As of May 2026, social media bans for young people have taken effect in Australia (eSafety Commissioner, 2025) and Indonesia (Martin, March 2026), with bans being debated in countries including France, Austria, and Norway (Sky News, April 2026); the Netherlands (Haeck, January 2026) and Germany (Grkrisi and Wälde, February 2026) are also actively discussing taking similar steps. Recommendation algorithms are used on a variety of platforms, so content geared towards algorithmic functioning in search engines and AI, for example, should also be included as subject material.

Finally, from a teacher’s perspective, one additional element for the social media algorithms unit that I would suggest adding is contextual material on why specific aspects of the module were constructed and for what purpose. The module was designed so that teachers who had little experience with technology would be able to run it (C. Glenn, interview with G. Mirenyi, April 18, 2025), but there was a lack of contextual information given to help the teacher explain certain aspects of the lessons. For example, one common question I received during the module was “why are you taking notes?” In the moment I was able to pivot and explain that the observations I was writing down would be useful when we discuss how the Someone platform works. However, teachers who are less technically savvy or unfamiliar with the material, providing a script or rationale for design decisions might make addressing such questions easier in the future.

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Author's Declaration

I hereby declare that I have written this thesis independently and that all contributions of other authors and supporters have been referenced. The thesis has been written in accordance with the requirements for graduation theses of the Institute of Education of the University of Tartu and is in compliance with good academic practices. The text is followed by the name and signature of the author of the thesis and the date.

Signature: 

Date: 27 May 2026

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Appendices

Appendix I – Interview Questions

- How were these modules originally planned? Are they part of a larger project or series of modules? What is coming next?
- Curricular standards – ISTE standards, UNESCO framework for teachers/students
- What was the original goal of the project? How does this link with the broader goals of the Algorithm & Data Literacy Project, if at all?
- In a 2024 paper (“Digital Media Literacy as a Precondition for Engaged Digital Citizenship”) by Kara Brisson-Boivin and Matthew Johnson (of MediaSmarts), they mention that Canada used to be a world leader in digital literacy, but because of inconsistent application of government policy (with a focus on digital infrastructure and less on digital literacy) Canada has fallen back of countries such as Finland. How does this project aim to rectify this situation?
- Are there international projects or initiatives that Digital Moment is looking to or connecting with in developing this content (such as UNESCO)?
- How has the response been from the Canadian provinces, given that education is a provincial responsibility? Here I am trying to get a sense of whether Digital Moment’s activities are driving government policy or reacting to government policy.
- What has been your role in developing these modules?
- Can you describe the process of how the lessons were created?
- In the Unit Overview document, it states that the module is designed so that teachers do not have to be experts in AI, coding, or data science. This is important as in my experience teachers are reluctant to get into technology because of a lack of prior knowledge and time. Have you had any feedback from teachers on the ease of use of the module and lessons?
- How are these modules different from those in other digital citizenship curricula, for example, Common Sense Media?
- Social media use among young students is a highly contentious topic, with many countries banning social media for younger people. What has the conversation been like in Canada?

- Given the social media algorithms module focuses on how functionalities of social media platforms in general, have you had any discussions on how to “sell” this content to concerned parents?
- How does this fit into larger digital citizenship strategies in Canada? Are there any provincial regulations that impact the content you are creating?
- Why did you choose to use Somekone as the main platform for demonstrating how recommendation algorithms work? Are you considering using their other tools for other modules you might produce?
- What data protection considerations have you had to think about when developing this content and choosing a platform for the learning activities?

Appendix II – Digital Tools Used During the Study

Digital tools used during the study:

Tool Name	Use	Privacy and Data Protection
Google Slides	Application for showing lesson content	https://edu.google.com/our-values/privacy-security/frequently-asked-questions/ (in German)
Google Forms	Application for survey collection	
Google Sheets	Application for collation of survey data	
Somekone	Application for demonstrating how social media recommendation algorithms work	https://www.gen-ai.fi/en/privacy

Appendix III – Data Protection Legislation and Links

Note: German links are included for all legislation as the German versions of such documents are the only legally binding versions in the German Federal Republic, while English translations are provided for reference only.

Legislation	Jurisdiction	Link
General Data Protection Regulation	European Union	German: https://dsgvo-gesetz.de English: https://gdpr-info.eu
European Union Artificial Intelligence Act	European Union	German: https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A32024R1689 English: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32024R1689
Bundesdatenschutzgesetz	Germany Federal Republic	German: English: https://www.gesetze-im-Internet.de/englisch_bdsg/englisch_bdsg.html
Datenschutz in der Schule	Free State of Saxony	German: https://www.datenschutz.sachsen.de/datenschutz-in-der-schule-4059.html English unavailable.

Appendix IV – Consent Letter to Parents

Dear LIS Parents,

As a part of the Grade 6 pastoral unit “Our Digital Lives,” your child will learn about how algorithms impact what they see online, on social media. The goal of this module is to teach how actions that students take online have a direct impact on the content they see, and that recommendation systems are a result of decisions made online over time. We understand that social media is a particularly sensitive topic for parents and students and can assure you that we will not be promoting any particular social media platform or the use of social media in general. This unit is a pilot module produced by Digital Moment, a Canadian charity that focuses on digital literacy, and the Raspberry Pi Foundation, a UK-based organisation dedicated to teaching students about computer science.

This module will involve the use of a platform called Somekone, developed by Finnish researchers to illustrate to students how social media platforms use recommendation algorithms based on user interactions. The platform complies with the European Union General Data Protection Regulation (GDPR) and does not collect user data except for IP addresses, which are held for seven days. All students will access the platform via the school’s network. Somekone’s privacy policy can be accessed through this link: <https://somekone.gen-ai.fi/about>.

Accompanying the module will be two short, anonymous pre- and post-module surveys, the results of which will inform a research project on algorithmic literacy conducted by Clinton Glenn, the Learning and Technology Support Specialist at LIS and an MA student in Educational Technology at the University of Tartu. These surveys are meant to develop a baseline of student knowledge prior to the module and what they have learned after taking the module. The post-module survey will only be used to provide feedback to the module’s instructional designer on any areas that students had trouble with or did not understand. The surveys are anonymous and cannot be linked to any specific participant. The results of the study will be published in Glenn’s MA thesis, which is being completed this spring. This thesis is being supervised by Dr. Leo Siiman. By signing the accompanying consent form, you agree that your child’s responses to the pre- and post-module survey may be used in the results section of Glenn’s thesis. No identifying information will link the data collected to your child. You may request a copy of the survey

questions at any time, and you may also withdraw your consent at any point during the study, which is being conducted from the 20th of April to the 13th of May 2026.

For any questions or concerns, please contact the principal investigator, Clinton Glenn, at clinton.glenn@lis.school or clinton.glenn@ut.ee.

Appendix V – Consent Form

School: Leipzig International School

School Project: Digital Citizenship in Pastoral “Our Digital Lives” Lessons

Responsible Teachers: Clinton Glenn

Purpose of the project: Students will interact with the Someone platform to experience in real time how actions they take online, such as liking or sharing images, affect what is recommended to them. This module builds on the concept of algorithmic literacy to provide students with a clear understanding of how social media uses certain engagement practices to influence and shape what users see.

Type of data recorded: Anonymous survey data, anonymous participant observations

Use of survey data: Survey data will be used as a part of the results section of Glenn’s thesis. No identifying information will be included for any survey answers used.

Storage and deletion: All survey data will be deleted within six months from the dates the surveys were originally given.

Voluntary participation: Participation is voluntary. Refusing consent will not disadvantage your child. If you refuse consent, your child will be able to participate in the module, but they will not engage in the survey, and their observations will not be recorded.

Withdrawal of consent: Consent may be withdrawn at any time with effect for the future.

Student name: _____

Class: _____

_____ I consent to my child taking part in this study.

_____ I do not consent to my child taking part in this study.

Parent/Guardian name: Signature:

Date:

Information according to Art. 13 GDPR

Responsible controller: Clinton Glenn Clinton.glenn@lis.school

Data Protection Officer: Sebastian Heinemann Postbox.Datenschutz@lis.school

Purpose of processing: Survey and observation data are collected for the purpose of testing the effectiveness of the module content on student's comprehension of the material and to provide recommendations for future development.

Legal basis: Art. 6(1)(a) GDPR – consent of the parent/guardian.

Categories of data: anonymous survey data collected via Google Forms/Sheets and anonymous participant observation data collected by the study author.

Recipients: survey data and participant observations may be used as a part of Clinton Glenn's MA thesis at the University of Tartu, Tartu, Estonia. Study data is not linked with any identifiable student data and any quotes used in the thesis remain anonymous.

Storage period: original survey data and observation data will be destroyed within six months of the study (at the latest, 20 November 2026).

Rights of data subjects: Parents and students have the right to access, rectification, deletion, restriction of processing, and to withdraw consent at any time. They also have the right to lodge a complaint with the competent supervisory authority.

Appendix VI – Pre- and Post-Module Survey Questions and Reasoning

Survey questions and reasoning behind each question. These questions were based on the lesson objectives in the social media algorithms module and concepts that students may or may not be familiar with prior to the study.

Question: English	Question Type	Reasoning/SOLO Taxonomy
What is a digital citizen?	Written response	This is to get a baseline as to what students think and understand about their lives online Pre-Module SOLO Taxonomy anticipated: Pre-Structural/Uni-Structural Post-Module SOLO Taxonomy anticipated: Uni-Structural
What is social media? Can you give an example of a social media app?	Written response	This is to get a baseline as to what they think or know social media to be Pre-Module SOLO Taxonomy anticipated: Uni-structural Post-Module SOLO Taxonomy anticipated: Multi-structural
What do you like about social media? What do you not like about social media?	Written response	Gives a sense as to what students see online that has an impact on them socially and emotionally Pre-Module SOLO Taxonomy anticipated: N/A Post-Module SOLO Taxonomy anticipated: N/A
What is an algorithm?	Written response – students encouraged to	Tests whether students understand what an algorithm is and if they have any examples.

	write “I don’t know” if they don’t know	Students should be aware of the concept prior to the survey. Pre-Module SOLO Taxonomy anticipated: Pre-Structural Post-Module SOLO Taxonomy anticipated: Multi-structural
What things on social media get your attention? Why?	Written response	This question tests whether students understand the concept of “bait” posts meant to draw their attention and reactions online Pre-Module SOLO Taxonomy anticipated: N/A Post-Module SOLO Taxonomy anticipated: N/A
How does social media show you content?	Written response	Asks students to think about the interface of social media and how items are displayed to them Pre-Module SOLO Taxonomy anticipated: Pre-Structural/Uni-Structural Post-Module SOLO Taxonomy anticipated: Uni-Structural/Multi-Structural
How does social media know what to show you next?	Written response	Students should reflect on how their interactions affect what they see Pre-Module SOLO Taxonomy anticipated: Uni-Structural Post-Module SOLO Taxonomy anticipated: Multi-Structural

What are some of the things that social media posts do to get your attention?	Written response	Asks students to think about the types of content they see online, what aspects of the content catch their attention (and whether they understand the concept of “bait” without using the term) Pre-Module SOLO Taxonomy anticipated: Pre-Structural Post-Module SOLO Taxonomy anticipated: Uni-Structural
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Appendix VII – Lesson Content

The following links include all lesson content for the Social Media Algorithms module, including PowerPoint slides, lesson plans, teacher listening guides, and assessment rubrics (also called listening rubric).

Unit Overview:

https://docs.google.com/document/d/1iHcf90NDDmc4qW4RROXJjx5NdoEe4Ct/edit?usp=drive_link&ouid=102399288086249611747&rtpof=true&sd=true

Session (Lesson) 1:

https://drive.google.com/drive/folders/1LPEHb1n3e3EeYsOR5J8sbc_jr_LQlyFg?usp=sharing

Session (Lesson) 2:

<https://drive.google.com/drive/folders/1Drg-TJH1zpnY70i1egVqHNP54hSre48H?usp=sharing>

Session (Lesson) 3:

<https://drive.google.com/drive/folders/1ElvJNzSX8AhWRDW2RiBUT4IX0lDzAg7H?usp=sharing>

Appendix VIII – Someone Interface Screenshots

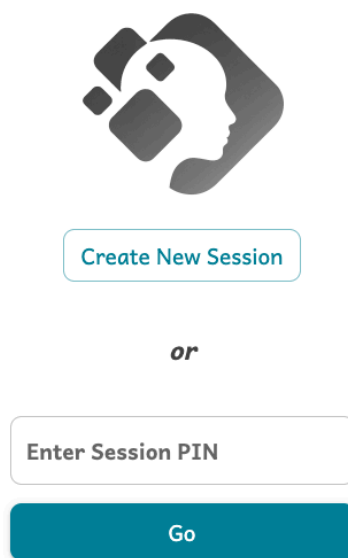


Figure 1. Login screen.

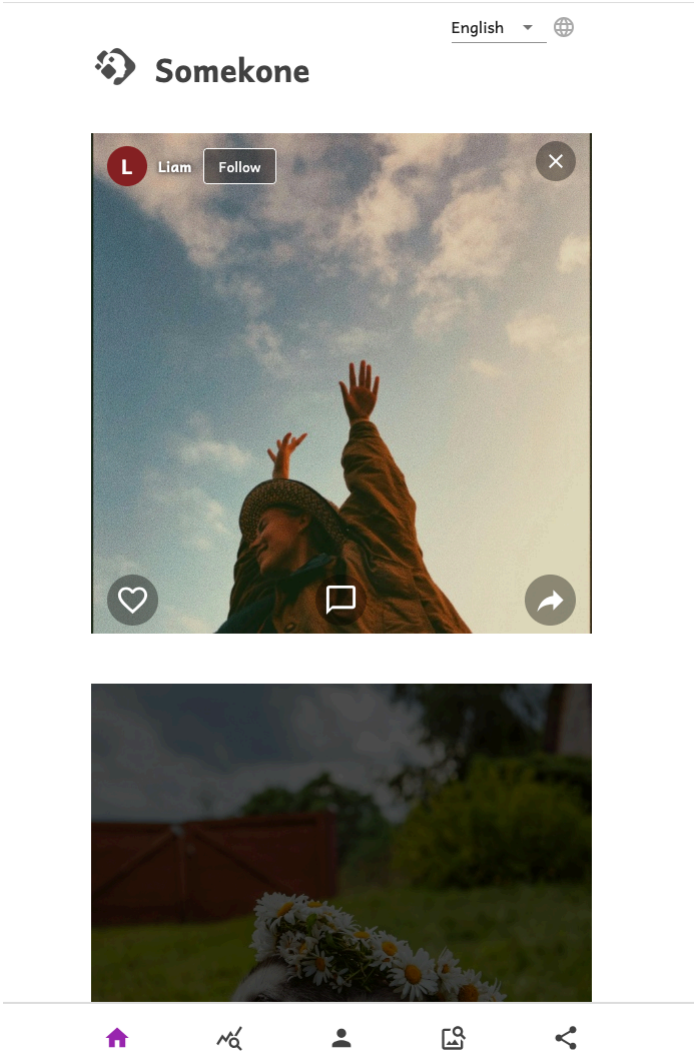


Figure 2. Image Feed.

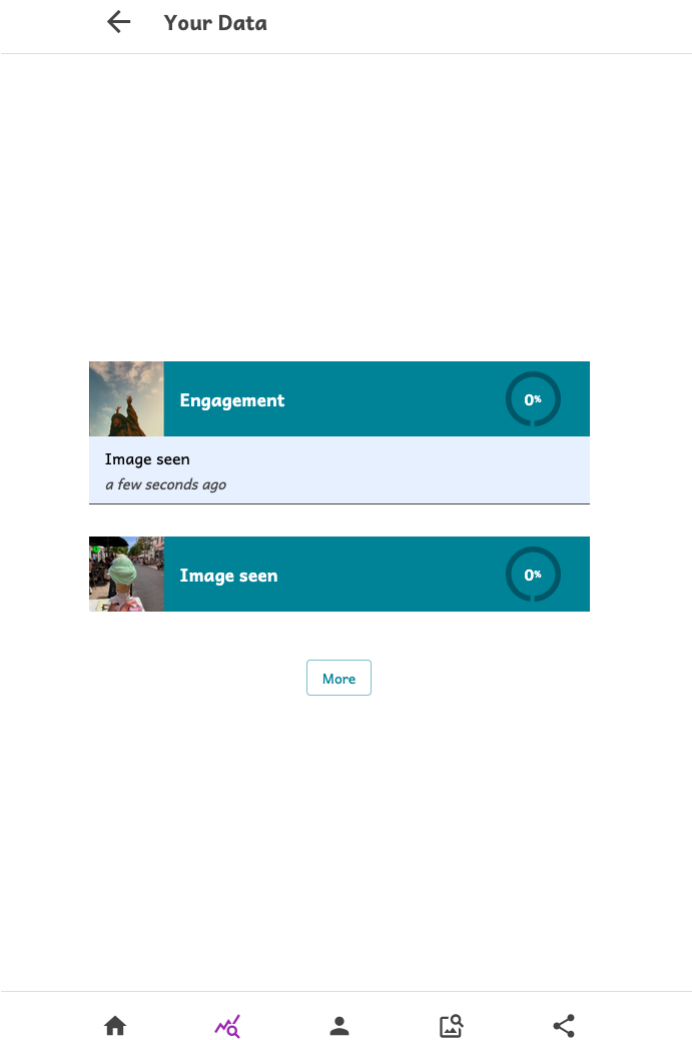


Figure 3. User data and engagement.

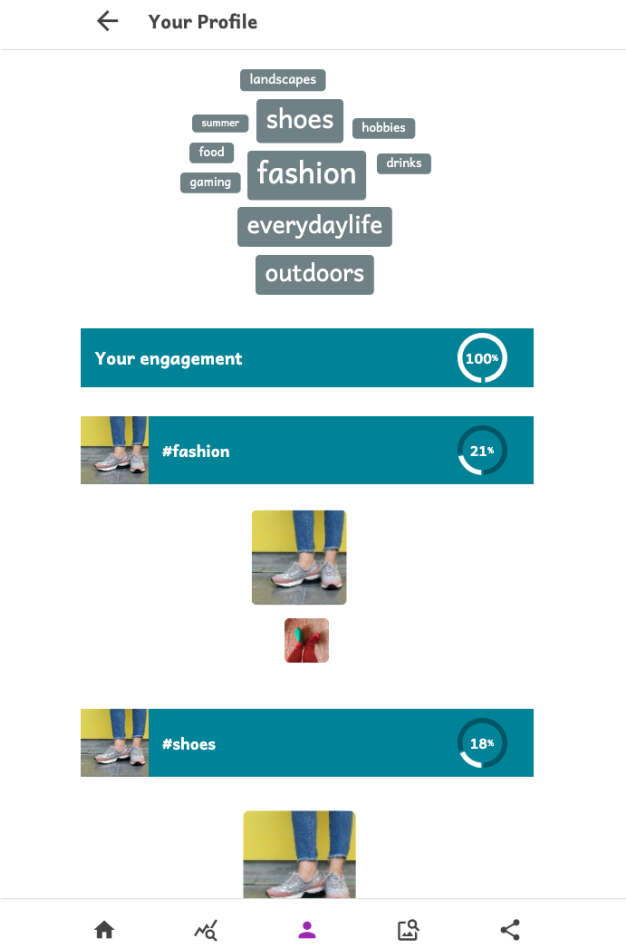


Figure 4. User Profile.

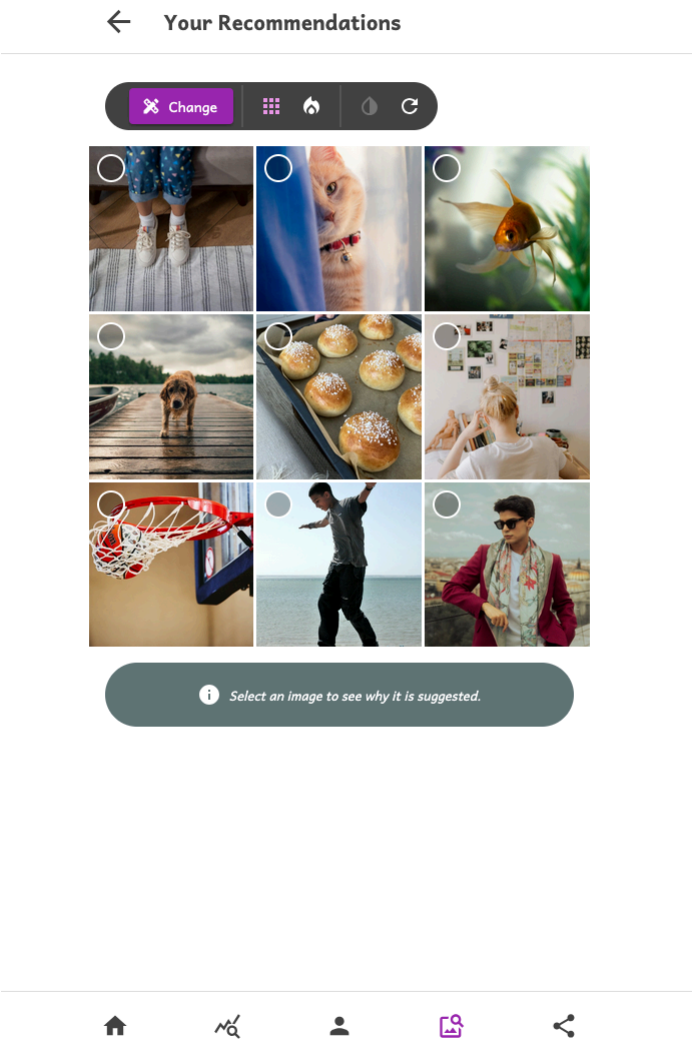


Figure 5. User Recommendations.

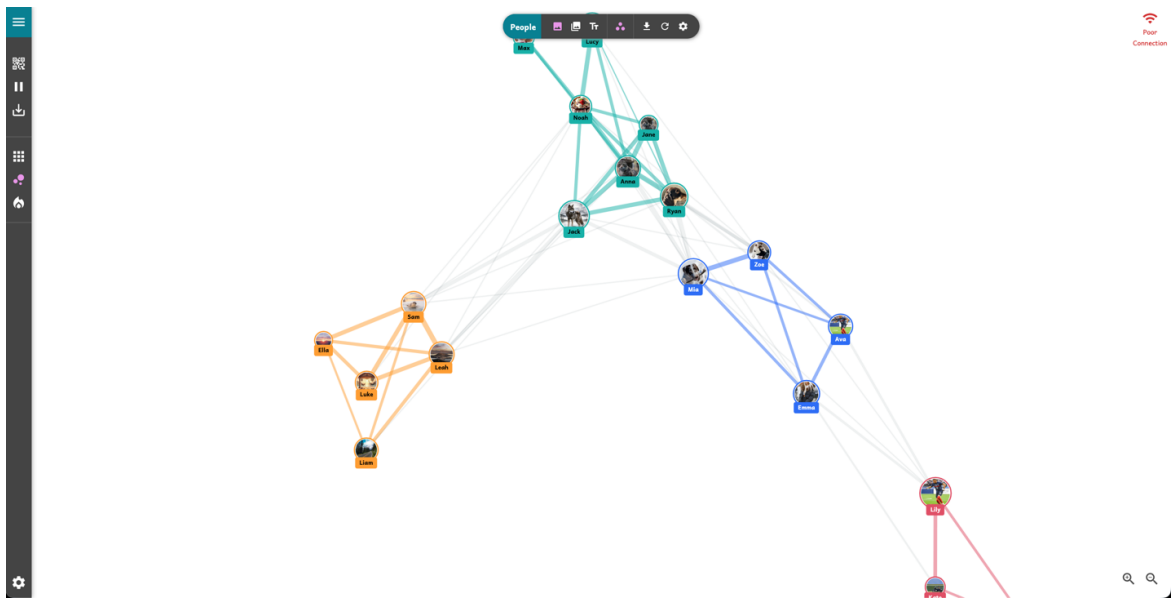


Figure 6. Social Graph display.

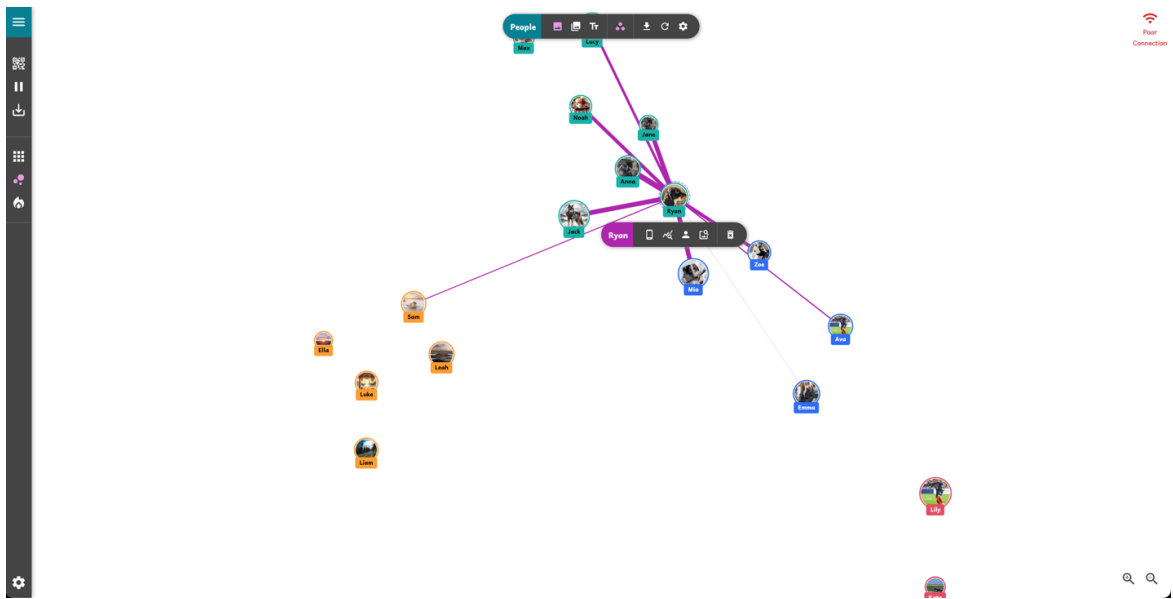


Figure 7. An illustration of a single user's connections to other users based on engagement data.

Appendix IX – Listening Rubric Results

Lesson	Class ¹	Level of Understanding	Comments
1	1	Notice	“Can we like this?” “Oh, this is so beautiful” Student choosing a username that is different from their name (other student “telling on them”) “X has decided to name his username ...” Laughing and showing each other photos Lots of reactions to what they were seeing (cats, etc.) “I don’t like that,” referring to the way the system works Sharing a comment with another student (by showing their computer) before posting it
	1	Describe	“It has lots of likes” “I sent you something, you need to read the comments” Again, “I sent you something”
	1	Interpret	One student explained to another how likes work

	2	Notice	“Am I logged in?” “This is so cute.” “This looks like a cloud” “Wow, look at this” when noticing the engagement tool “This is kind of boring” “Oh, this is cute.” “I’m liking everything” “I liked all the pictures” “Look, look, look!” (shoved the tablet in a classmate’s face)
	2	Describe	“I am trying to spam him” - weaponising the interface to deal with an interpersonal conflict “What if you have seen all of the photos?” - what next?
	2	Interpret	“So it’s fake?” Platform possibly not working: “We don’t see the same thing after we comment”

			“Why are you taking notes?”
2	1	Notice	“Oh, I really like that” “Like, like, like” Majority of comments reflecting students like or dislike of the content they were seeing in their feeds
	1	Describe	“I sent you something” “Where can I see it?” “I’m going to send it to...”
	1	Interpret	Comments not showing Images appearing multiple times, able to like things multiple times One student asking why another used a specific username
	2	Notice	“I am seeing the same thing over and over again” “I am the algorithm” (perhaps interpret)
	2	Describe	“Why is it showing me food?” “Do people post new things every day?”
	2	Interpret	N/A

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INTO MIDDLE SCHOOL DIGITAL CITIZENSHIP CURRICULUM”**

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