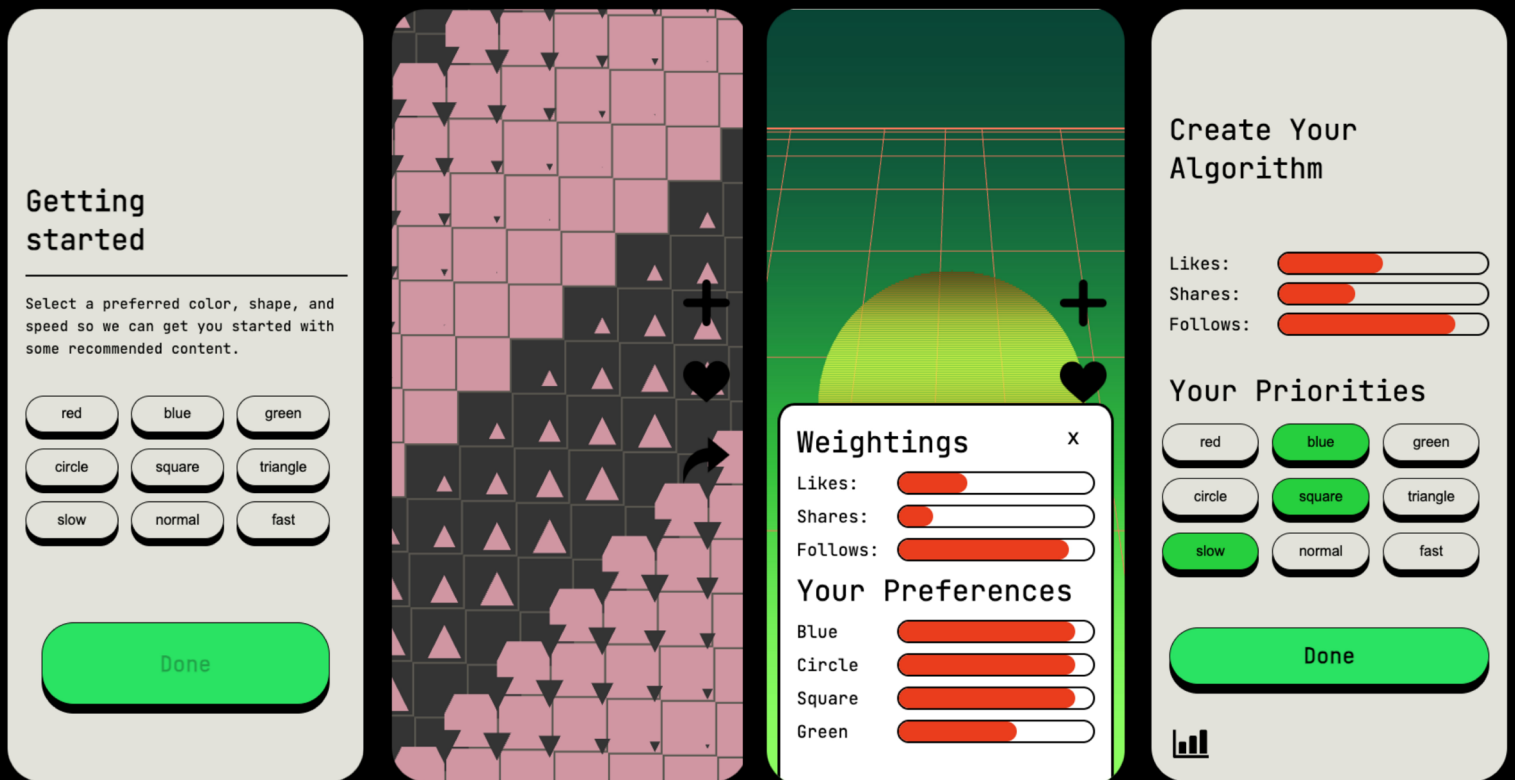


Retrospective

THE ALGORITHM

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ABSTRACT

Engaging responsibly with emerging technologies requires a clear understanding of their use and impact. However, most existing AI literacy efforts emphasize programming skills and are delivered through formal school curricula. In contrast, we describe "The Algorithm": a literacy initiative that addresses ethical AI use and engages the general public through a web-based, interactive explainer. The explainer, which simulates vertical video feeds, breaks down how social media recommendation systems work, their limitations, and their societal impact. Here, we detail the process of engaging with stakeholders, translating sociotechnical concepts into accessible content, making deliberate choices about storytelling, and designing technical features. Through this work, we offer a practical example of designing responsible AI literacy initiatives while balancing the following: gamification with educational depth, sensationalism with nuance, relatability with universal approachability, and open exploration with structured guidance. Our approach highlights some key design considerations for creating engaging and thoughtful literacy tools.

CCS Concepts: • Human-centered computing → Empirical studies in interaction design; Human computer interaction (HCI); • Applied computing → Interactive learning environments.

Additional Key Words and Phrases: literacy, explainer, responsible AI, recommendation systems, social media

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I. INTRODUCTION

The rapid pace of AI development has outpaced efforts to improve public understanding of AI technologies . While AI literacy initiatives can vary in target audience and format, ranging from targeted educational curricula to large-scale public campaigns, they often involve building “competencies that enable individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI as a tool online, at home, and in the workplace.”

While developing AI literacy involves addressing a broad range of technical and sociotechnical concepts, reviews of current AI literacy projects show that most focus on programming skills within formal educational settings, primarily targeting primary and secondary school students . Figaredo and Stoyanovich, in a recent review, specifically highlight the lack of educational initiatives that (1) cover competencies related to the responsible and ethical use of AI, (2) utilize non-traditional formats, and (3) reach a broader user base, including college students and adults . This gap in AI literacy efforts widens the divide between those developing AI technologies and the general public, which increasingly requires the knowledge and skills needed to participate in and influence AI development.

In response to this pressing need, we present a case study of an AI literacy initiative built for today’s responsible technology landscape. Specifically, we share the process and insights gained from developing “The Algorithm”, a literacy initiative focused on explaining recommendation systems and their impact on users and society. “The Algorithm” reflects a playful, interactive, and web-based approach to ensure broad accessibility. Drawing on evidence from research on games and interactivity, we argue that this combination may help address the current literacy gap, making AI education more engaging and accessible to a diverse user base.

First, we describe “The Algorithm” and its user journey to provide the necessary context. Next, we explore the tradeoffs and decision-making processes involved in the research, story development, design, and technical development stages of the project. Finally, we share qualitative feedback from user testing with our target user group of young people aged 18-24 without a technical background, experts in the responsible technology field, and broader public engagement at conferences and film festivals, highlighting best practices and lessons learned. This case study provides a practical, real-world example of designing AI literacy initiatives for today’s responsible AI landscape; one that iteratively integrates creative, technical, and academic perspectives, grounding the work in the practical, user-centered methods central to human-computer interaction (HCI).



2. ABOUT "THE ALGORITHM"

"The Algorithm" is an interactive online explainer – a piece of content designed to simplify complex topics – aimed at demystifying how recommendation systems in social media feeds work, particularly for the young user base of popular social media apps. It mirrors the format such users commonly encounter: a mobile-first experience with vertical video feeds akin to TikTok, Instagram Reels, and YouTube Shorts (e.g., 41% of TikTok's 800 million users are aged between 16 – 24 years). The explainer personalizes the experience through a custom-built recommendation system (see Section 3.5 for details) and a choose-your-own-adventure narrative, such that each user's experience and the delivery of educational material varies slightly based on their choices.

The experience begins with a story in which users are recruited by a fictional social media company to test a recommendation algorithm they are developing. Throughout the experience, explanations break down how the 'algorithm' functions, and users can observe personalization occurring in real time. While the explainer clarifies how popular, real-world recommender algorithms work, it also introduces features that may not be captured by current algorithmic feeds, such as data transparency and user choice. Thus, the explainer not only reveals what drives current digital experiences but also prompts users to expand their imagination regarding potential future digital experiences.

Figure 1. A snapshot of the onboarding screen the user encounters in "The Algorithm"

Getting started

Select your preferred color, shape, and speed.

red blue green

circle square triangle

slow medium fast

Done

USER JOURNEY

At the beginning of the experience, a user is asked to identify their interests, as is common in a social media application's onboarding process. These interests are limited to the user's favorite color, shape, and speed of content, which are all features of the abstract art content pieces that will then populate their feed. Then, the user swipes - using a finger on a mobile device or by clicking and dragging the screen on a desktop - through full screen animations. The content screens contain algorithmically generated abstract animations of different aesthetics with varying colors, shapes, speeds (more details on content design are outlined in Section 3, Stage 4). While viewing content, the user can tap the 'like', 'bookmark', and/or 'share' buttons. Over time, their feed will personalize to better reflect their interests based on their engagement patterns. The flow of content is interrupted by screens that textually explain concepts such as how recommendation algorithms use data and how they weigh different user interactions.

Based on the user's interactions (or lack thereof), the explainer makes certain assumptions about them (e.g., "Your favorite color is red; you must be hot-headed"). Depending on the outcome, this prompts the user to reflect on the source of seemingly accurate social media recommendations or the incorrect inferences that can be drawn from potentially unrepresentative metadata. To demonstrate algorithmic transparency, later in the experience, the user is able to see the data the system has collected based on their interactions, and how their algorithm records and weighs their different types of interactions. In the final stage, the user can adjust how the algorithm weighs various engagement signals and swipe through a final set of screens that use their customized version of the algorithm, allowing them to view the data collection process in real time.

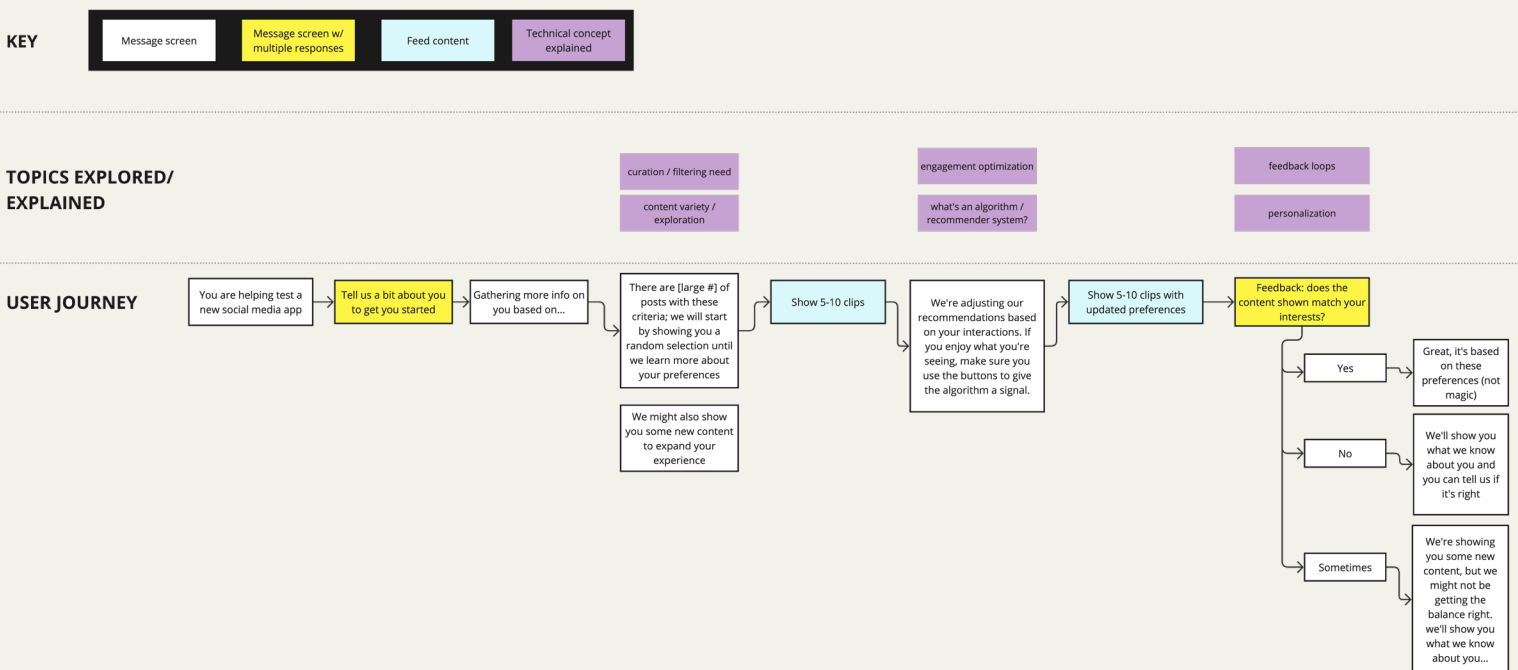


Figure 2. A snapshot of our user journey

3. BUILDING "THE ALGORITHM"

Here, we outline the process of building "The Algorithm," detailing our technical, design, and content decisions, as well as insights gained from pilot user engagement. We focus on the various tradeoffs we considered, which may be applicable to other projects in the technology literacy space.

We first cover our research and goal-setting phase, which includes reviewing relevant academic literature, identifying our target audience and user base, and deciding on our educational approach. Next, we discuss the educational narrative design and balancing educational goals with engagement potential. Finally, we outline our aesthetic design and the algorithmic design process, showing how creative, technical, and academic elements can integrate to build AI literacy interventions.

STAGE I: RESEARCH & GOAL SETTING

During the research phase, we consulted with experts at the Algorithmic Amplification symposium held at Columbia University in 2023, and conducted our own research on social media, design, and AI systems. We focused on distilling, through existing public surveys and news coverage, the knowledge gleaned from our expert consultations and research findings into a set of clearly defined competencies that concern the general public. In addition to our expert consultations, we also hosted a public workshop at the annual Mozilla Festival to gather insights on people's experiences, frustrations, and future visions of social media algorithms.

Centering our target user base requires an intentional effort to consider our users' experiences and needs. Thus, we focused our interview, research, and writing process on our target user group: young people aged 18-24 who do not have a technical background and who engage with types of social media applications our explainer targets (e.g., TikTok). We decided, however, to not limit our target user base to a particular geography, which further informed design decisions to be further discussed.

We conducted 10 user research calls with college students aged 18-24 who do not study computer science or related disciplines, and engaged with leaders of youth-centric initiatives and groups throughout our research and writing processes. This included the organizations Design It For Us, Civics Unplugged, and Accountable Tech - all of which actively engage with a large coalition of young people and their needs.

STAGE 2: CHOOSING AND DELIVERING EDUCATIONAL MATERIAL

When choosing how to deliver educational content in "The Algorithm", we identified three main dimensions to guide the distribution of learning objectives across the experience: **(1)** the different concepts we aimed to introduce, **(2)** different 'manners' through which to introduce these concepts, and **(3)** different 'levels' of educational value. First, following Stage 1, we concretized the concepts from the recommendation systems and algorithmic impact literature that we aimed to

communicate. Then, we identified three manners through which we could introduce these concepts: (1) interactive elements, (2) script text, and (3) resources section that appears after completing the explainer. Finally, we identified four types of learning objectives based on what our user base is and is not already familiar with: (1) introduction: introducing new concepts that the public is largely unfamiliar with, (2) expansion: expanding the public’s knowledge of concepts they are familiar with, (3) formalization: formalizing the public’s knowledge of concepts they are familiar with (e.g., providing definitions, technical terms, historical context), and (4) challenge: challenging the public’s knowledge of concepts they are already familiar with. These are visualized in [Table 1](#).

CONCEPT	LEVEL OF EXISTING KNOWLEDGE	MANNER OF DELIVERY
Feature extraction	Introduction	Text Vignette
The need for algorithmic curation	Introduction	Text Vignette
Exploration vs exploitation	Expansion Formalization	Text Vignette
What is an algorithm?	Challenge	Text Vignette
Engagement optimization	Expansion Formalization Challenge	Interactive
Feedback loops	Expansion	Interactive
Personalization	Formalization	Interactive
Transparency as a solution	Introduction Challenge	Text Vignette Interactive Resources
Data collection via implicit and explicit signals	Formalization	Interactive
Algorithmic choice as a solution	Introduction Challenge	Text Vignette Interactive Resources
Data profiling and inferences	Challenge	Interactive

Table 1. The educational concepts covered by “The Algorithm” and the manner in which they are delivered.

To ensure an educational focus was maintained throughout our iterative design processes, we annotated our story design with the respective educational goal of each stage. An example of this can be observed in [Figure 3](#), where the purple cards correspond to the educational concepts delivered in each stage.

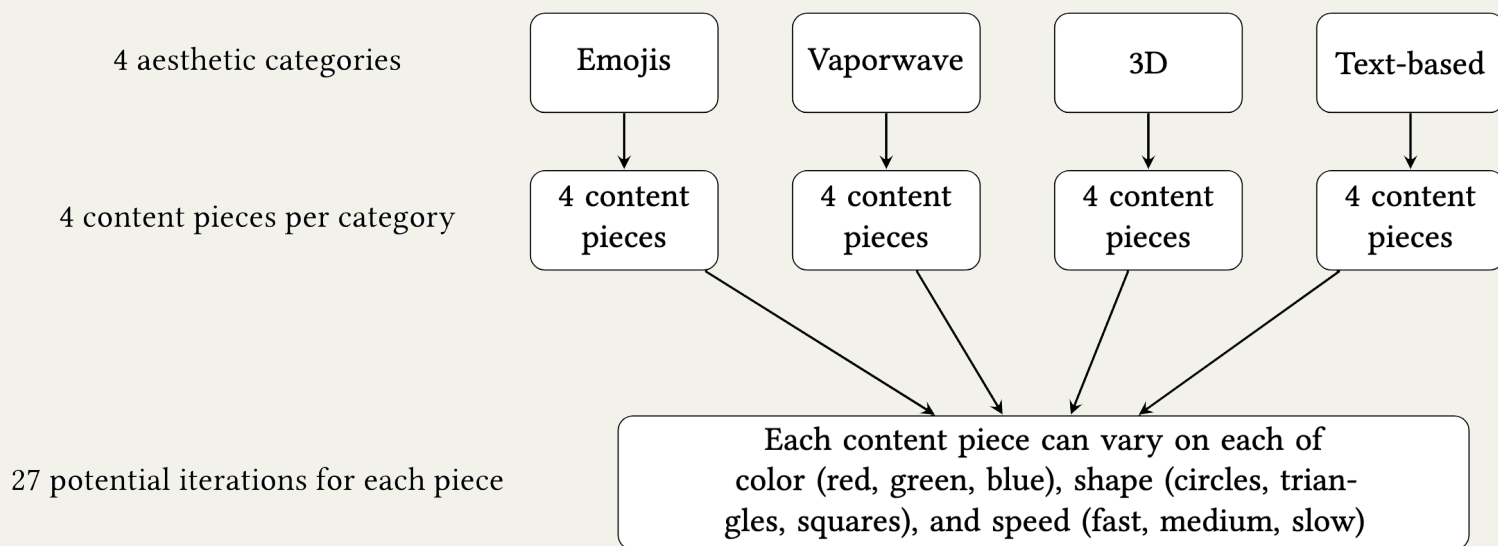


Figure 3. An overview of our content design approach, which allows for the procedural generation of 432 variations of content pieces.

STAGE 3: IDENTIFYING CREATIVE STORY AND TONE

Games and other playful experiences often differ from plain text explainers in that they require balancing the communication of educational value with the presentation of an engaging story and narrative. Thus, our narrative design process required continuously balancing the creative narrative needs with our pedagogical goals.

This involved navigating three main tradeoffs. First, the tradeoff between a sensationalist narrative and a nuanced narrative. While a more deeply personal, shocking, or sensational experience on recommendation algorithms, surveillance or polarization might have garnered a more evocative and emotional engagement, it would have also sacrificed the nuance we deem necessary for an educational exploration of technology's impact. Thus, we avoided overly shocking or offensive content or storylines, instead engaging users through interactivity and first-person storytelling. Second, the tradeoff between a prescriptive tone and a descriptive tone. While building an educational experience requires a certain level of prescription and directional communication, given our explainer explores potential futures and large-scale societal issues that will require public participation, we decided to use inviting and open-ended language especially when delivering educational content from the "Solutions" category in [Table 1](#).

Finally, the tradeoff between gamification incentives and simulating a more realistic user experience with algorithms. While increasing gamification and engagement incentives could make the experience more immersive, we were careful to not induce incentives that ask people to interact with their feed in only particular ways (e.g., engage with certain types of content, or through certain engagement patterns), since we wanted to both encourage users to use the explainer as they would another social media application, and to be able to see how different types of engagement patterns could change their experience.

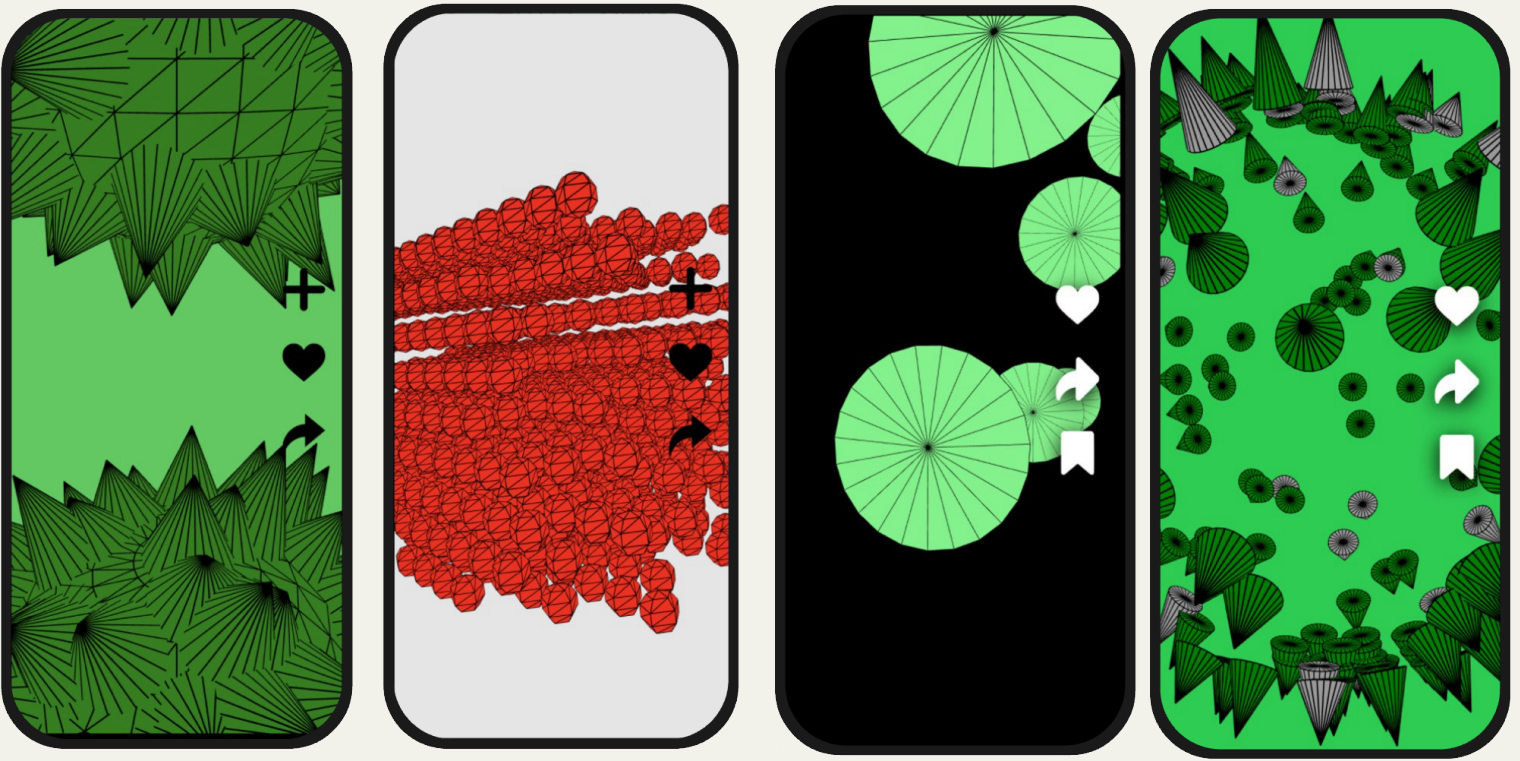
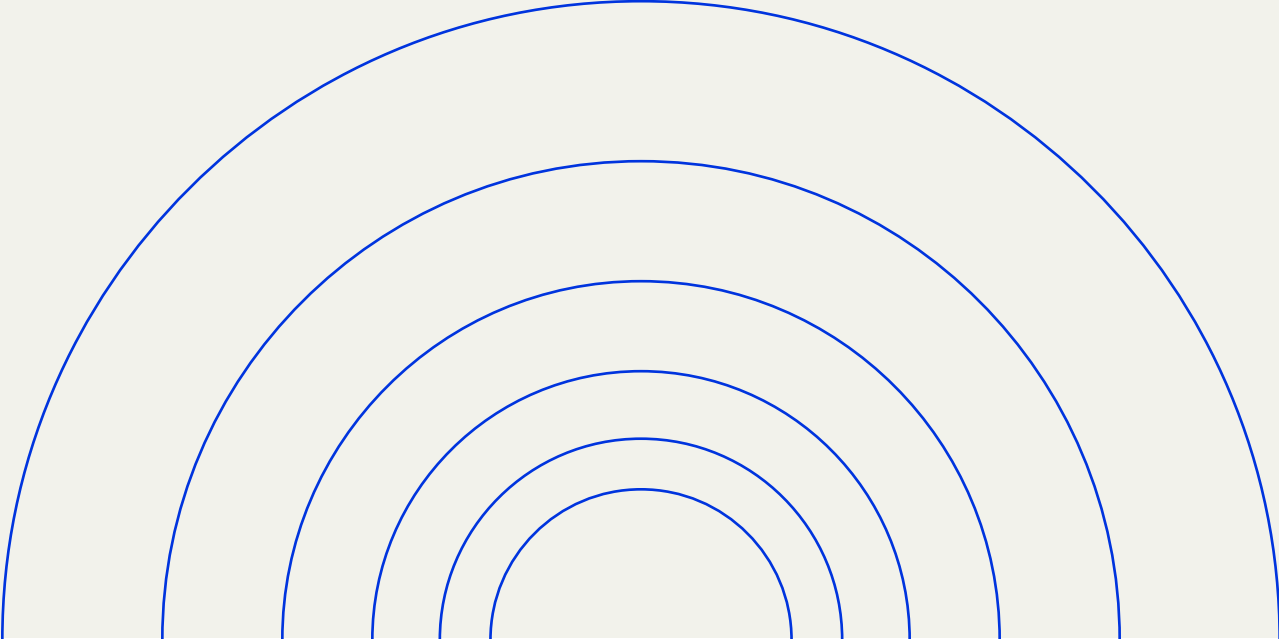


Figure 4. A sample of 4 content pieces from the '3D' category, which can each vary on color, shape, and speed.

STAGE 4: DESIGNING CONTENT

Building a simulation of a vertical video feed requires designing both the content that will appear in the simulated feed and the recommendation algorithm that will drive what appears on that feed.

In designing the content pieces that appear in the feed, we considered a wide range of content types. For example, we considered using a sample of currently trending TikTok videos that vary across substantive topics, i.e. politics, sports, music, and fashion, and thus represent different people's interests. As a narrower



alternative, we considered content of the same category, such as news headlines that varied by category. However, such types of content risked anchoring the experience to a fixed geographic and cultural context. Additionally, complex content pieces make it difficult for users to visually identify the personalization in a short experience. Finally, such directions did not meet our technical need for generating a sufficiently large quantity of content screens to allow a choose-your-own-adventure swiping experience. Consequently, we ultimately opted for abstract content pieces of different aesthetic styles that varied visually across three different attributes: color, shape, and speed. The four different aesthetic styles of the content pieces are shown in Figure 4. We used the JavaScript library p5.js to create four distinct templates of each aesthetic style that take color, shape, and speed as attributes. We opted for this approach because it allowed us to create content that is **modular**, **scalable**, and **universally approachable**.

- **Modular:** We wanted to visually illustrate the features our recommendation algorithm extracts from content pieces and serves to users (e.g., color or shape). Abstract, code-based content allows for the real-time generation of different combinations of attributes according to users' updated preferences during the application experience.
- **Scalable:** We wanted to generate a large volume of content to make sure users' experiences are varied, thus resembling real-world online content consumption. Abstract, code-based content allows for the real-time generation of a large repository of content pieces.
- **Approachable:** We wanted to create content pieces that can appeal to and generate engagement signals from a wide range of users who speak different languages, have different popular culture references, and are of varying age groups. Abstract content allows us to leverage general aesthetic categories (e.g., text, 3D, emoji-based) and features such as color, shape, and speed, which do not restrict our target user base within particular cultural, demographic, or linguistic contexts.



***COMPLEX CONTENT PIECES
MAKE IT DIFFICULT FOR
USERS TO VISUALLY IDENTIFY
THE PERSONALIZATION***

STAGE 5: DESIGNING THE RECOMMENDATION SYSTEM

In designing the recommendation system, we opted for a simplified recommendation system written in JavaScript that allows us to illustrate how individual actions and perceived preferences interact with recommendation algorithms to shape algorithmic feeds. Our algorithm utilized a user preferences vector that consisted of a single numerical value representing each of the different values our content attributes could take. The vector was first initialized with users' stated preferences for the different attributes during onboarding, and then was continuously increased depending on user engagement signals with the displayed content. Each of the engagement signals - like, share, bookmark - was given certain weights (2.5, 1, and 0.5, respectively) in the updating of user preferences to match recommendation systems in production. Every time the recommendation algorithm was employed, it would first compute the "ideal content piece" by creating a vector consisting of the aesthetic category, color, shape, and speed values with the highest preference score. Then, it would use the dot product to measure the similarity between this ideal vector and the vectors of the remaining content pieces, randomly serving the next three pieces of content that are closest to the ideal from those the user has not yet seen.

While we desired a highly customizable, create-your-own-narrative approach to the experience we experimented with different ways of employing our recommendation algorithm to create a balance between exploitation and exploration:

- **Personalized experience:** users should be able to experience a progressive level of personalization that becomes more apparent and effective as they spend more time in the game and more time engaging with content
- **Moments of diversity:** while we aimed to illustrate exploitation, we also wanted to create room for exploration and occasionally show users content that is not personalized to increase steerability, allowing them to introduce diversity to their feeds

We decided to follow a staged-approach to maintain that balance. In other words, the recommendation algorithm was employed differently in the different stages of the experience:

- **Stage 1:** no recommendation algorithm. We initialize the first 10 pieces of content in the feed non-algorithmically and only using users' stated preferences that were provided during onboarding. We do not use our recommendation algorithm here as we aimed for less dynamism in this stage to allow users to first explore the new environment, the scrolling pattern, and the different buttons at the beginning of the experience. We also wanted to collect a sufficient amount of engagement data before employing the algorithm in order to reduce its sensitivity to each individual data point, thereby avoiding the creation of random experiences
- **Stage 2:** recommendation algorithm generates 3 pieces of content at a time. In the second stage, which is the first part of the personalized experience, we use the recommendation algorithm and user engagement signals to update users' feed. We occasionally introduce random content to allow users to interact with new

attributes and to model exploration.

- **Stage 3:** custom recommendation algorithm generates content. In the last stage, we allow users to update the recommendation algorithm's weighting of different engagement signals. This new updated algorithm is what is now used to generate new content to appear on users' feeds.

As user engagement patterns may vary drastically in the simulation we created, we realized the importance of moderating this open-endedness by testing the resiliency of the recommendation algorithm's role in creating a valuable experience across user journeys, and adjusted it accordingly for the following three main clusters:

- Users who do not engage with the displayed content at all
- Users who engage with the displayed content that they enjoy
- Users who engage with the displayed content randomly

STAGE 6: USER TESTING

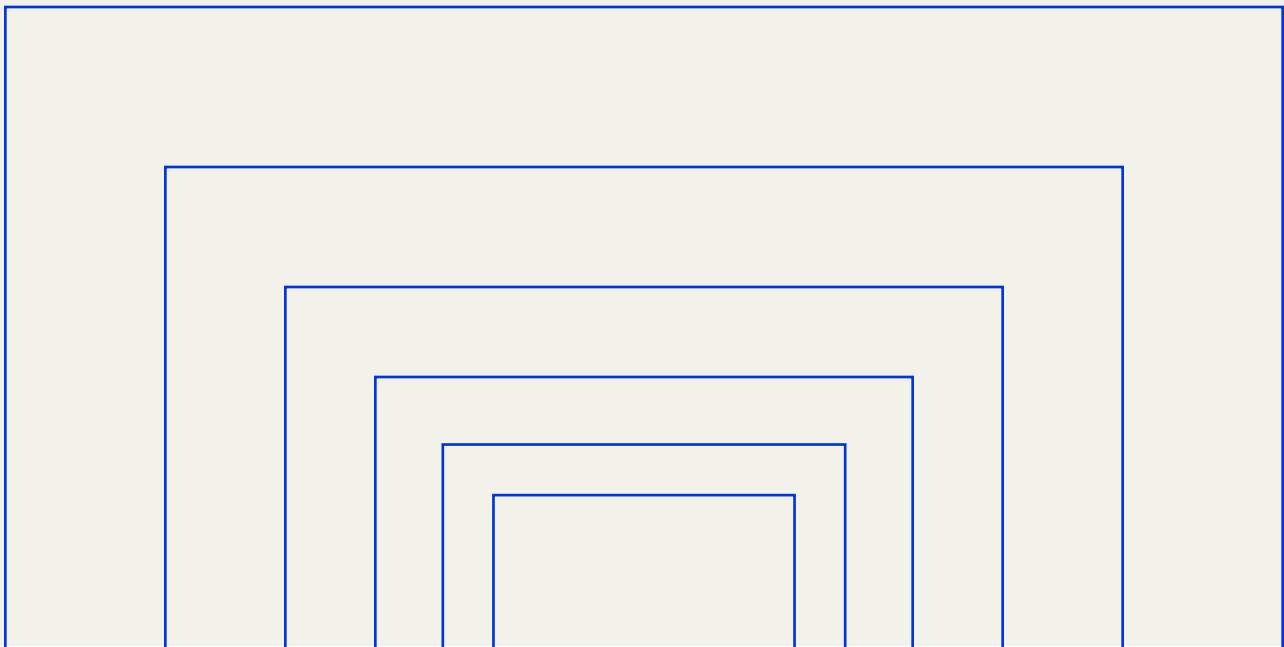
User studies for this case study were reviewed and approved by the University of Oxford's Central University Research Ethics Committee board. After completing the first version of the prototype, we conducted user testing with three main audiences:

- **Target user base:** we recruited 25 participants within our target demographic of 18-25 year olds through the research participant crowdsourcing platform Prolific. First, we asked the participants questions about their educational level, experience playing games, and their perception and understanding of recommender systems. Then, we asked participants to engage with the explainer. Upon completion, we asked them to fill out a survey about their understanding of recommender systems. The survey prompted participants to provide directed as well as open-ended feedback on the user experience, narrative, educational output, and any other general feedback.
- **Domain experts studying technology and its societal impacts:** we conducted a 45 minute live user testing session with 15 PhD students and 1 faculty member at the University of Oxford's Oxford Internet Institute, an academic department dedicated to studying the social, political, and economic impact of emerging technologies. The participants were all between 19 and 38 years old with diverse backgrounds in STEM and social sciences. The participants gave both directed and open-ended feedback on the user experience, narrative, and educational value of the explainer.
- **Domain experts on immersive art experiences:** we conducted 20 minute live feedback sessions with 19 industry professionals in the art curation, immersive experiences, and digital art spaces at the International Documentary Film Festival Amsterdam (IDFA)'s interactive documentary lab. The participants gave feedback on the narrative, aesthetics, and engagement value of the explainer.

The main takeaways from the feedback sessions were distilled by co-analyzing notes from the sessions after they were all completed, which helped identify key insights and patterns:

- **Diverse audiences provided diverse insights during feedback sessions:** Academic researchers offered detailed feedback on educational content and value. Artists and curators provided insightful critiques on design and engagement, while the target user group enabled us to verify the alignment of the project with user needs and expectations.
- **Insufficient walk-through:** while the experience simulates a TikTok feed, and while most participants had previously interacted with short form vertical video feeds, participants reported that engaging with our interface was not intuitive. This led us to add a more explicit tutorial at the beginning of the experience.
- **Fading narrative:** participants reported that the abstracted content and exploratory nature of the explainer could benefit from a more guided narrative structure. This led us to reference the narrative and main task of understanding algorithms to provide feedback throughout the experience and not just at the beginning in the introduction.
- **Lost educational value:** participants reported a lack of structure in the delivery of educational value in plain text. This led us to shift to focus on introducing one concept at a time and to visually highlight technical and conceptual terms to identify those concepts and assist in better recall.

We adjusted the explainer to reflect those changes and then conducted another similar round of user testing on Prolific to capture bugs and a last round of feedback. After adjusting the explainer to fix any bugs, we arrived at the final version of “The Algorithm”.



6 OUTCOME



We launched “The Algorithm” in February of 2024 on whatsthealgorithm.com. According to our Google Analytics data, as of October 2024 the website was visited by 2,800 unique users. In addition to the interactive explainer itself, we curated a set of additional resources on topics such as user controls, algorithmic choice, and engagement optimization, as well as links to other academic and policy centers working on the impact of recommendation systems, especially in relation to youth issues. After the launch, we continued to bring the experience to in-person, physical spaces, engaging with academics, artists, educators, and students. We presented the project at the Oxford Inclusive Gaming Conference in Oxford, The Mozilla Festival House in Amsterdam, the Sheffield International Documentary Festival in Sheffield, the Design Justice AI Institute and DiscoTech exhibition in Pretoria. We also ran participatory workshops at the March on Washington Festival in Washington, D.C., and are planning to do so at the Teen Tech Center at The New York Public Library in New York City.

7 DISCUSSION

The experience of building, testing, and showcasing “The Algorithm” exhibits the importance of centering the targeted user group and iteratively balancing between technical, artistic, and pedagogical needs. We believe further research is needed to gauge the efficacy of our approach as well as AI literacy interventions more broadly at improving autonomy, safety, and well-being of users.

Building with the target user group, rather than building for them. “The Algorithm” highlights that building responsible AI literacy requires treating the target user group as key collaborators, whose perspectives and experiences offer valuable insights. After all, early user research and continuous engagement with youth advocates directly informed many of the project’s decisions. This is particularly important when working with younger users, who often possess a deeper familiarity with AI systems. Their knowledge and reflections can challenge the assumptions of traditional top-down, expert-driven approaches to knowledge dissemination, underscoring the importance of collaborative and responsive design.

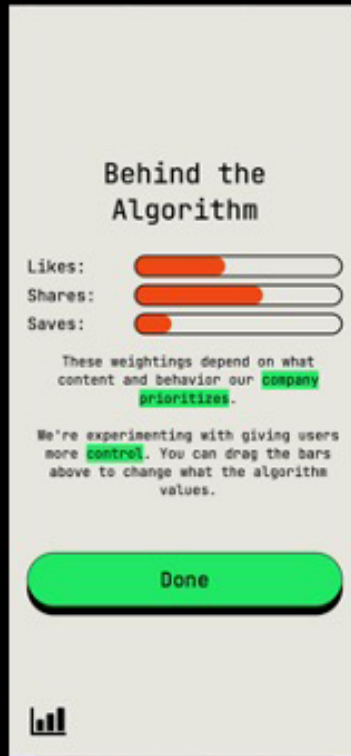
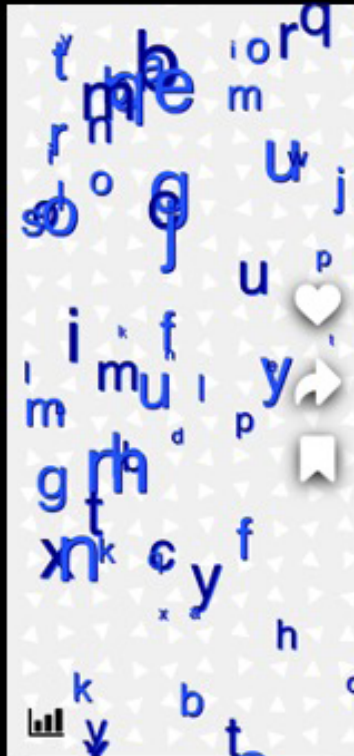
Iteratively adjusting learning needs and design needs. Navigating various trade-offs required an iterative balancing between our design and development processes and our learning outcomes. For example, as previously stated, our choice of abstract aesthetics was informed by technical requirements, such as the explainer’s need to procedurally generate replicable content that personalizes over time. It was also informed by our strategic and pedagogical priorities, such as not wanting the explainer to be fixed to a particular geographic or cultural context. While we initially sought a more gamified and narrative-oriented storyline, we had to make sacrifices to earlier gamification plans to ensure we were not inducing behaviors or engagement patterns at the cost of effectively delivering educational material.

Further measuring the impact of literacy interventions. To advance this work, more research is needed on effective methods for creating AI literacy initiatives that target diverse audiences and incorporate creative approaches and storytelling. While our study draws on education, game design, and human-computer interaction, further specialized research at these intersections is crucial. This will help us better understand how to design impactful literacy interventions and effectively measure their outcomes. Future research can explore how literacy interventions affect users’ mental models of AI, as well as their sense of agency, trust, and control. Additionally, understanding how these impacts vary by pedagogical approach, language, and personalized, interactive elements warrants further investigation.

“The Algorithm” was built in collaboration with Isabel Lee who worked on game and web development, Andy Wallace who worked on game design and content development, and Gabriel Silveira who worked on visual design and illustration. We are grateful to everyone who has played “The Algorithm” and provided feedback in formal and informal capacities. “The Algorithm” was funded by The Mozilla Foundation’s Creative Media Award, and we are grateful to the organizers of this award program for their continued support. Lujain Ibrahim acknowledges funding from the Dieter Schwarz Foundation - Oxford Internet Institute. We are grateful to Borhane Blili-Hamelin and Rogelio Cardona-Rivera for feedback on this draft.

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