

Exhibit A

**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA**

*PEOPLE OF THE STATE OF CALIFORNIA,
et al.,*
Plaintiffs,

v.

*META PLATFORMS, INC, Instagram, LLC,
Meta Payments, Inc., Meta Platforms
Technologies, LLC., et al.,*
Defendants

IN RE: SOCIAL MEDIA ADOLESCENT
ADDICTION/PERSONAL INJURY
PRODUCTS LIABILITY LITIGATION

THIS DOCUMENT RELATES TO:
4:23-cv-05448

MDL No. 3047

Case No. 4:23-cv-05448-YGR

Judge: Hon. Yvonne Gonzalez Rogers

Magistrate Judge: Hon. Peter H. Kang

**TRIAL REPORT OF RAVI IYER, PHD
August 1, 2025**

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II. Optimization of Meta’s algorithms for quality signals and explicit user preference to promote youth well-being

- (20) Algorithmic recommendations collectively control what a user sees on social media platforms by deciding which of the many millions of pieces of content could be presented to a user. Meta’s algorithms, based on its own descriptions, are optimized for greater usage of its Platforms.⁶ The majority of signals that influence Meta’s algorithmic recommendations are commonly known as “engagement,” which refers to the various actions that users take when interacting with Meta’s Platforms.⁷
- (21) In Section II.A, I explain that optimizing based on quality signals and explicit user preferences rather than engagement would mitigate unwanted, negative, and harmful experiences, including excessive and unhealthy usage, experienced by young users and that it would be feasible for Meta to do so. I explain in Section II.B why the limited protections Meta has in place, including Teen Accounts and time management tools, do not sufficiently address the unwanted, negative, and harmful experiences, including excessive and unhealthy usage, experienced by young users.

II.A. Optimizing algorithms for quality signals and explicit user preference rather than engagement would mitigate unwanted, negative, and harmful experiences for young users

- (22) Meta’s recommendation algorithms, which are optimized primarily for engagement, also include quality signals and signals that are indicative of explicit user preference, though these signals affect the algorithm to a much lesser extent than engagement signals. Quality signals refer to any signal that can reasonably be connected to the experience or safety of youth. Signals that are indicative of explicit user preference include, for example, whether a user reports content or whether a user hides content. Meta’s own internal research has shown that many users will engage disproportionately with sexually suggestive, shocking, disturbing, or otherwise attention-getting content, but will indicate that such content is unwanted and/or perceived to be low quality.⁸ Algorithms optimized based on quality

⁶ Meta describes the signals that influence its algorithmic recommendations in its model cards. “Introducing 22 System Cards That Explain How AI Powers Experiences on Facebook and Instagram,” Meta Blog, June 29, 2023, <https://ai.meta.com/blog/how-ai-powers-experiences-facebook-instagram-system-cards/>; “Facebook Feed AI System,” Meta Transparency Center, June 4, 2025, <https://transparency.meta.com/features/explaining-ranking/fb-feed/?referrer=1>.

⁷ Alex Moehring, Alissa Cooper, Arvind Narayanan, Aviv Ovadya, Elissa Redmiles, Jeff Allen, Jonathan Stray, Julia Kamin, Leif Sigerson, Luke Thorburn, Matt Motyl, Motahhare Eslami, Nadine Farid Johnson, Nathaniel Lubin, Ravi Iyer, and Zander Arnao, “Better Feeds: Algorithms That Put People First,” Knight-Georgetown Institute, March 4, 2025, p. 4, https://kgi.georgetown.edu/wp-content/uploads/2025/02/Better-Feeds_-Algorithms-That-Put-People-First.pdf.

⁸ META3047MDL-207-00011753 at -753-769 and META3047MDL-207-00030977 at -978-980 (“Providing Negative Feedback Should Be Easy (And Why This Would Be Game Changing for Integrity),” September 26, 2019).

signals and user preferences would reduce the extent to which such content is presented to users, whereas engagement-based optimization would increase its presentation.⁹

- (23) Optimizing for explicit user preference and quality signals and reducing the role of engagement have been shown to reduce unwanted time spent and unwanted content for users. Meta’s own internal experiments provide causal evidence that optimizing its algorithm based on quality signals and the use of explicit preference signals improves user experiences.¹⁰ For example, Meta conducted an experiment in which it randomly assigned users to be given an algorithm that showed them less content that was likely to be engaged with (e.g., it was less likely to be commented on or reshared). Users for whom engagement signals were reduced both spent less time using Facebook and saw a lower proportion of content they did not find valuable.¹¹ Per the Wall Street Journal, removing engagement signals means that users specifically see less content that was deemed “bullying, inaccurate information, and graphic violence.”¹²
- (24) Meta has indicated that it makes judgments about the quality of posts in order to improve user experience, either in response to user feedback (e.g., reducing clickbait and engagement bait) or to foster a safer community (e.g., reducing content from producers who violate policies such as bullying or violence).¹³ Although optimizations that incorporate these quality signals have been shown to improve user experiences, their utility is limited by the fact, acknowledged by Meta, that low-quality content is not fully definable.¹⁴ Thus, Meta’s current approach of restricting the distribution of defined categories of low-quality content, while still continuing to optimize for engagement, does not fully address the underlying issues. As discussed in more detail in Section II.B, Teen Accounts’ Sensitive Content restrictions similarly fail to fully address content quality issues. In contrast, optimizing for

⁹ Tom Cunningham, Sana Pandey, Leif Sigerson, Jonathan Stray, Jeff Allen, Bonnie Barrilleaux, Ravi Iyer, Smitha Milli, Mohit Kothari, Behnam Rezaei, “What We Know About Using Non-Engagement Signals in Content Ranking,” *arXiv preprint* (2024): 6 (“Predicted engagement often has a negative relationship with quality scores.”).

¹⁰ META3047MDL-207-00010463 at -482 (“Users With Histories of Positive Engagement From Diverse Others on their Comments Display Higher Integrity”); Josh Constone, “Facebook Will Change Algorithm to Demote ‘Borderline Content’ That Almost Violates Policies,” TechCrunch, November 15, 2018, <https://techcrunch.com/2018/11/15/facebook-borderline-content/>.

¹¹ Anna Stepanov, “Political Content in Feeds,” Meta Newsroom, updated May 28, 2025, <https://about.fb.com/news/2021/02/reducing-political-content-in-news-feed/> (“As part of these tests... we put less weight on comments and shares when ranking political content. When surveyed, people who experienced these changes said they saw less of the content they did not find valuable. Based on those results, we’re further expanding tests globally.”).

¹² Jeff Horwitz, Keach Hagey and Emily Glazer, “Facebook Wanted Out of Politics. It Was Messier Than Anyone Expected,” The Wall Street Journal, January 5, 2023, <https://www.wsj.com/articles/facebook-politics-controls-zuckerberg-meta-11672929976>.

¹³ “Reducing the Distribution of Problematic Content,” Meta Transparency Center, updated April 25, 2025, <https://transparency.meta.com/enforcement/taking-action/lowering-distribution-of-problematic-content/>.

¹⁴ META3047MDL-053-00020001 (“Instagram Well-Being Research Memo,” Facebook Papers, July 8, 2020); Josh Constone, “Facebook Will Change Algorithm to Demote ‘Borderline Content’ That Almost Violates Policies,” TechCrunch, November 15, 2018, <https://techcrunch.com/2018/11/15/facebook-borderline-content/>.

explicit user preference and quality signals and reducing the role of engagement would more fully address the underlying issue.

- (25) It is widely recognized across the broader technology industry that reducing engagement signals in favor of quality signals or explicit user feedback improves user experiences and mitigates unwanted, negative, and harmful experiences. For example, the Integrity Institute, which is an industry group comprised of trust and safety workers across companies, recently released a report showing that Instagram’s engagement-based model leads to untrustworthy content about eating disorders.¹⁵ They recommend optimizing for quality signals instead. YouTube endorses the use of surveys within its algorithms and the importance of demoting borderline content from recommendations.¹⁶ Pinterest has publicly released a “Field Guide to Non-Engagement Signals” to illustrate the need for alternative algorithms rather than a focus on usage.¹⁷ A group of industry professionals across multiple platforms, including public representatives from LinkedIn, has released similar recommendations acknowledging that optimizations for quality or surveys as to explicit user preference will reduce over-usage and unwanted content.¹⁸ Algorithmic reforms that mirror the recommendations in this report have been adopted by policymakers in the European Union and in several U.S. states.¹⁹
- (26) As acknowledged by Meta’s internal research and the broader technology field, optimizing algorithms primarily for quality signals and explicit user preference, rather than optimizing primarily for engagement, mitigates unwanted, negative, and harmful experiences. Such optimization would entail removing all engagement signals within algorithms used for youth, leaving only signals that are indicative of explicit preference (e.g., a “like” or “love” reaction) or signals related to Meta’s judgments of content quality (e.g., whether a post is original). This would include replacing any engagement signal optimizations for comments, reshares, or time spent viewing content with optimizations for explicit user preference and quality signals. Figure 1 below illustrates the current and desired states.

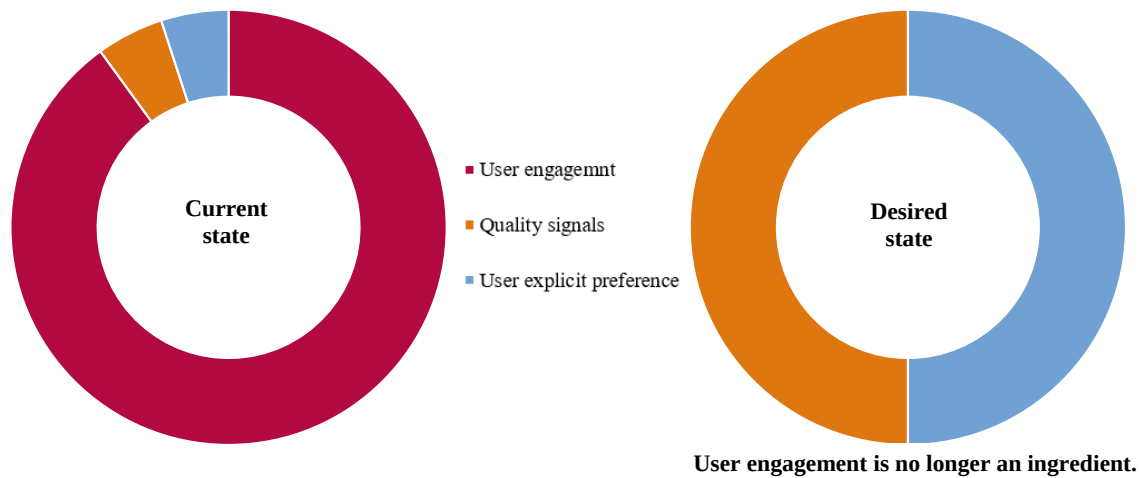
¹⁵ Jeff Allen, “Why Is Instagram Search More Harmful Than Google Search?” Integrity Institute, February 13, 2024, <https://integrityinstitute.org/blog/why-is-instagram-search-more-harmful-than-google-search>.

¹⁶ Christos Goodrow, “On YouTube’s Recommendation System,” YouTube Official Blog, September 15, 2021, <https://blog.youtube/inside-youtube/on-youtubes-recommendation-system/>.

¹⁷ Leif Sigerson and Wendy Matheny, “The Field Guide to Non-Engagement Signals,” Pinterest Engineering Blog, Medium, March 26, 2024, <https://medium.com/pinterest-engineering/the-field-guide-to-non-engagement-signals-a4dd9089a176>.

¹⁸ Tom Cunningham, Sana Pandey, Leif Sigerson, Jonathan Stray, Jeff Allen, Bonnie Barrilleaux, Ravi Iyer, Smitha Milli, Mohit Kothari, Behnam Rezaei, “What We Know About Using Non-Engagement Signals in Content Ranking,” *arXiv preprint* (2024): 1–16.

¹⁹ Harsh Vardhan Pachisia, “The EU’s Digital Services Act takes on ‘The Algorithm,’” Chicago Policy Review, January 1, 2024, <https://chicagopolicyreview.org/2024/01/01/the-eus-digital-services-act-takes-on-the-algorithm/>; “Holding Social Media Accountable,” State of Utah, accessed July 11, 2025, <https://socialmedia.utah.gov/>.

Figure 1: Comparison between the current and desired algorithmic changes

Note: This figure is illustrative of the general direction and types of changes desired, rather than precise or definitive measurements.

- (27) In order to verify that the algorithm’s objective function has indeed been changed, disclosure of the specifics of Meta’s algorithmic practices is needed. According to a broad consensus among industry and academic experts, this disclosure should include a list of signals used within each algorithm, along with data that allows for the understanding of each signal’s impact on content ranking positions.²⁰ Without such detail, it would be impossible to understand which parts of an algorithm were more or less important in driving user experiences. Transparency about product experiment results that relate to these changes as well as the ongoing product decision making for teams working on algorithms also serve important verification purposes by ensuring that these changes are not circumvented.²¹ In particular, long term (12 month or longer) holdout experiments, where a group of users who receive recent changes are compared to a group of users who do not receive such changes, should be conducted, reported publicly, and audited by an independent third party on an ongoing basis.²² In concert, these transparency provisions will provide confidence that Meta’s algorithms have indeed been robustly reformed.

²⁰ Alex Moehring, Alissa Cooper, Arvind Narayanan, Aviv Ovadya, Elissa Redmiles, Jeff Allen, Jonathan Stray, Julia Kamin, Leif Sigerson, Luke Thorburn, Matt Motyl, Motahhare Eslami, Nadine Farid Johnson, Nathaniel Lubin, Ravi Iyer, and Zander Arnao, “Better Feeds: Algorithms That Put People First,” Knight-Georgetown Institute, March 4, 2025, pp. 30–34, https://kgi.georgetown.edu/wp-content/uploads/2025/02/Better-Feeds_-Algorithms-That-Put-People-First.pdf.

²¹ Luke Thorburn, Jonathan Stray, Priyanjana Bengani, “Experiments are the Best Kind of Transparency,” Medium, June 8, 2024, <https://medium.com/understanding-recommenders/experiments-are-the-best-kind-of-transparency-ea35c1661479>.

²² Alex Moehring, Alissa Cooper, Arvind Narayanan, Aviv Ovadya, Elissa Redmiles, Jeff Allen, Jonathan Stray, Julia Kamin, Leif Sigerson, Luke Thorburn, Matt Motyl, Motahhare Eslami, Nadine Farid Johnson, Nathaniel Lubin, Ravi Iyer, and Zander Arnao, “Better Feeds: Algorithms That Put People First,” Knight-Georgetown Institute, March 4, 2025, pp. 38–40, https://kgi.georgetown.edu/wp-content/uploads/2025/02/Better-Feeds_-Algorithms-That-Put-People-First.pdf; Nathaniel Lubin and Ravi Iyer, “How Tech Regulation Can Leverage Product Experimentation Results,” The