The Algorithmic Crystal: Conceptualizing the Self through Algorithmic Personalization on TikTok

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This research examines how TikTok users conceptualize and engage with personalized algorithms on the TikTok platform. Using qualitative methods, we analyzed 24 interviews with TikTok users to explore how algorithmic personalization processes inform people's understanding of their identities as well as shape their orientation to others. Building on insights from our qualitative data and previous scholarship on algorithms and identity, we propose a novel conceptual model to understand how people think about and interact with personalized algorithmic systems. Drawing on the metaphor of crystals and their properties, the *algorithmic crystal framework* is an analytic frame that captures user understandings of how personalized algorithms (1) interact with user identity by *reflecting* user self-concepts that are both *multifaceted* and *dynamic* and (2) shape perspectives on others encountered through the algorithm, by orienting users to recognize parts of themselves *refracted* in other users and to experience ephemeral, *diffracted* connections with groups of similar others. We describe how the algorithmic crystal framework can extend theory and inform new lines of research around the implications of algorithms in self-concept development and social life.

CCS Concepts: • **Human-centered computing → Empirical studies in collaborative and social computing**.

Additional Key Words and Phrases: algorithms, self-concept, crystallized self, folk theories, TikTok

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1 INTRODUCTION

Algorithms play influential roles in many aspects of people's everyday experiences, including their professional, entertainment, financial, and social lives. Further, people often interface with algorithms in decision-making contexts that range from the next Netflix "watch now" click, to more consequential decisions, such as whether a particular job application is passed on to a human or ignored. However, not everyone is necessarily aware of algorithmic influence in all of these contexts [27, 29]. Even when they are, people are often left to speculate with various degrees of complexity [19] about what is happening inside the algorithmic black box.

Scholars have turned their attention to studying these speculations in recent years, as well as how these speculations influence other perceptions and behaviors. This is particularly crucial, as

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subjective understandings "are not second best to objective measures; in fact, it is perceptions and subjective realities that people judge and act upon" [67]. Perceptions of algorithms can be shaped by individuals' lay theories about their functioning and knowledge about the technical processes that underpin personalization (e.g., algorithmic literacy) [25, 43]. Further, because algorithms change as a result of the data input they receive in a kind of feedback loop [50, 55], Bucher [9] even argues that these perceptions can then influence the nature of the algorithms themselves. Indeed, Karizat et al. [38] refer to this phenomenon as a process of co-production, in which people may influence algorithmic output, but algorithmic output may also influence people's perceptions.

A great deal of scholarly attention has been paid to TikTok in particular as the platform has grown in popularity (e.g., [2, 5, 40, 65]). The For You Page (FYP) is of particular relevance, as it is the first feature of the platform that users interface with, and involves algorithmically-curated videos purportedly based on users' interests. In the current study, we aim to understand how TikTok users think about the FYP algorithm as it relates to their identity. We focus on the idea of self-concepts [44] to describe the many identities, roles, beliefs, and values that compose an individual.

In addition to potentially emphasizing relationships between perceptions of the algorithm and perceptions of the self, TikTok also affords strangers as the main audience for one's content [4]. Instead of direct interactions with networks of known ties, Zulli and Zulli [77], as well as Abidin [2], suggest that social media platforms like TikTok afford a different kind of social experience. As such, people's self-concepts may be particularly salient in terms of how they perceive others on the platform. As such, we ask the following:

RQ: How do participants perceive the algorithm in relation to their self-concept?

We conducted semi-structured interviews with 24 self-reported active TikTok users. The results of this study suggest that our participants recognized parts of their identity in the FYP algorithm's content recommendations. Subsequently, they felt a desire to bring algorithmic representations of themselves into alignment with their own self-concepts. Participants felt that their behaviors could shape the algorithm's ability to accurately reflect their multifaceted and dynamic interests and preferences. Further, the algorithm facilitated feelings of "mere belonging" towards others on the platform, with multiple participants reporting positive feelings toward others even though little to no interpersonal interaction took place. We synthesize our results with prior literature on algorithmic interactions and self-concepts, and introduce an analytic framework - the *algorithmic crystal framework* - that coalesces our findings and can help guide future work.

1.1 Related Work

One way to approach investigating perceptions of algorithms and the sociotechnical systems in which they operate is by exploring algorithmic folk theories, or "intuitive, informal theories that individuals develop to explain the outcomes, effects, or consequences of technological systems, which guide reactions to and behavior towards said systems" [21]. Although these folk theories are developed with varying levels of awareness of algorithmic capabilities [19], they can shape people's behaviors on platforms, which in turn can be treated as input data for the algorithmic decisions themselves. A dominant algorithmic folk theory is that of Personal Engagement [25], in which people anticipate that the more they interact with a specific type of content, the more they would see similar content on their algorithmically-curated feed. In a general sense, many algorithmic systems that determine the content that users are exposed to actually work in this way as well [62]. Overall, algorithmic folk theories can be considered a collection of perceptions about algorithms that influence peoples' behavior when interacting with these systems.

Other scholars have investigated perceptions of algorithms from different lenses [52, 53]. For instance, Bishop [7] examined "algorithmic gossip" or how people talk about their algorithmic interactions with others. This is especially prominent among content creators; through this discourse, content creators may change their behaviors in order to achieve goals like gaining visibility on a certain platform. Relatedly, Siles et al. [56] also approaches perceptions of algorithms from a more pluralistic sense. These authors argue that it is through people's collective algorithmic imaginaries, or "ways of thinking about what algorithms are, what they should be, how they function and what these imaginations in turn make possible," [9] that large scale changes in human-algorithm interactions can be enacted. Although these concepts highlight various mechanisms through which scholars can better understand interactions between humans and algorithms, they converge by focusing on perceptions of these technologies, and how these perceptions may influence behavior.

In particular, the role of identity in algorithmically-curated interactions has been a prominent area of investigation, especially on the TikTok platform (e.g., [6, 38, 41, 59]). For instance, some TikTok users perceive that the "algorithm recogniz[es], classifi[es], sort[s], and suppress[es] social identities" on the platform, replicating extant gender-based or racialized power dynamics present outside of TikTok [38]. Indeed, popular media has also reported on user experiences related to thinking about the self, speculating that the videos shown to users say something about the type of person they are [68], or even allow users to better understand their own identity [8, 45].

Researchers have often examined self-concepts - or the the many identities, roles, beliefs, and values that compose an individual [44] - on social media as they are demonstrated through self-presentation (e.g., [12, 64, 72]). Recently, Simpson and Seeman [59] have investigated how algorithmically-curated content can both affirm and violate notions of one's own identity, especially in the case of users with marginalized identities (e.g., LGBTQ+ users). French [28] also found similar effects, even indicating that people's perceptions of themselves may change based on information provided by an algorithm. In the case of TikTok, Bhandari and Bimo [6] argue that because users overwhelmingly engage with a "personalized algorithm which repeatedly confronts users with various aspects of their own personas" called the For You Page, the processes of self-perception may interact with platform affordances in unique ways and rely on different mechanisms than in previous research on the topic.

Since the affordances on a platform can allow, or even encourage or discourage, various behaviors [18], people's experiences on TikTok may be shaped by what features are or are not available. Even though other platforms such as Twitter or Reddit allow interactions with strangers, for instance, the visual salience of the content creator is not highlighted in the same way it is on video-based platforms like TikTok [42, 77]. Further, the aforementioned algorithmically-curated FYP is arguably the most salient feature on the platform. As such, "network form[ation] through processes of imitation and replication" [77] in terms of visual content is common, meaning that users do not necessarily need to have direct social interactions with others to form connections. The networks of content connected by similar algorithmically-curated content on TikTok have been discussed as "rabbit holes," "silos" and "subcultures" [1], as well as "sides" [24]. TikTok does allow the formation of interpersonal networks with the ability to follow one's known ties or direct-message others. However, predominance of the FYP, combined with the visual salience of the content creators, is in notable contrast to many popular social media platforms which rely heavily on content from known ties in a network, rely less on visual content, or both.

The lack of direct, interpersonal connections between platform users may mean that how people think about others, specifically in relation to themselves, has the potential to be particularly salient. Further, the ways in which algorithmically-curated content interacts with perceptions of the self may be especially notable as well, as recent researchers have also noticed. In this paper we examine how TikTok users perceive the FYP algorithm, particularly in the context of personalized content, as well as how perceptions of the algorithm influence beliefs about the self.

2 METHOD

2.1 Participants

Our sample consisted of 24 students recruited from three universities in California, two community colleges (n = 13) and one private university (n = 11), in order to increase the potential for diversity in our sample. They were recruited through an online participant recruitment system called Sona to take part in a "TikTok Study." Sona is an online scheduling service used by the universities to manage their research participant pools. By signing up to take part in our study on Sona, students attending these universities can complete research studies in exchange for research credits, which are a required component of their social science classes. We stopped recruiting participants after achieving saturation, or when we started hearing similar ideas from participants [15]. Participants were required to be 18 years or older and active TikTok users in order to be eligible to participate. We allowed participants to interpret the term "active" however they wished. The average age of participants was 23 years old (range: 18 - 43). The majority of participants identified as female (n = 18; male, n = 6). Our sample included 11 participants identifying as Hispanic/Latino, 8 as White, 4 as Native American/Indigenous, 4 as Asian/South Asian, and 1 as Black/African American, with some identifying with multiple identities. The majority of participants were heterosexual (73.9%), with 1 identifying as queer, 1 as bisexual/pansexual, 1 as bisexual, 1 as undecided, and 1 who declined to respond. In order to protect the privacy of participants in our relatively small participant pool, we report the demographic information in aggregate above, as opposed to in an individualized manner in Table 1. All participants received research credit, part of a course requirement, for their participation.

Table 1. Self-reported participant demographic information

Participant	Age	Gender	Participant	Age	Gender
P1	22	Male	P13	19	Female
P2	22	Male	P14	20	Female
P3	21	Female	P15	18	Female
P4	21	Female	P16	18	Male
P5	20	Female	P17	24	Female
P6	18	Male	P18	25	Female
P7	19	Female	P19	30	Female
P8	24	Female	P20	22	Female
P9	20	Female	P21	43	Male
P10	20	Female	P22	31	Male
P11	21	Female	P23	24	Female
P12	31	Female	P24	27	Female

2.2 Procedure

Data collection consisted of interviews that were conducted remotely using the video-conferencing platform Zoom due to the COVID-19 pandemic. The interview protocol was developed by the research team in order to provide opportunities to explore users' perceptions, engagement, and reasoning about the TikTok platform. All interviews were conducted in a semi-structured format to allow researchers to explore and probe participants' perspectives. The final protocol consisted of 32 open-ended questions that asked about participants' perceptions and attitudes about the TikTok app (e.g., How would you describe TikTok? How do you tend to use it?), their understanding of the different types of content (How would you describe the content you see on TikTok?), and how they understood the functioning and characteristics of the algorithm (How would you describe the TikTok algorithm if it were a person?). We also asked participants to report demographic information about their age, gender, race and ethnicity, and sexual orientation at the end of the interview, with all participants having the option to not answer any questions. This study was approved by the IRB at the first authors' university.

2.3 Research Positionality Statement

Some of the identities represented in our research team included woman of color, immigrant, and first-generation college student. Our team includes experts in social media, algorithms, and folk theorization.

2.4 Data Analysis

Interviews were conducted remotely by the first authors from February through May 2021. The interviews were recorded using the record-to-computer feature on Zoom with participants' consent, and the audio was transcribed using an automated online transcription service (Otter.ai). The first authors removed identifying information from the transcripts, assigned all participants an ID number (e.g., P1, P2), and flagged instances of technical errors in the recordings (e.g., from poor Internet connection). All transcripts were checked for accuracy twice, first by one of four research assistants and then by the first authors. The checked transcripts were imported into the qualitative coding software ATLAS.ti for analysis and coding. Quotes included in the manuscript were lightly edited for clarity.

The first authors generated an initial list of in-vivo codes, using phrases from participants themselves (e.g., the "relatable" quality of other users) which were iteratively reviewed and discussed by the research team. Example codes included feeling "seen" by the algorithm, feelings of control over the algorithm, and the diversity or similarity of content identified by the algorithm.

New axial codes were added to the codebook throughout the coding process to capture new insights and to identify higher-order themes (e.g., strategic engagement with the algorithm) [73]. Example codes included lay or folk theories about the algorithm's functioning, perceptions of the algorithm (e.g., as a person), and signals of algorithmic personalization. Throughout this process, we wrote research analysis memos [46] where we identified key themes that emerged from the qualitative coding and review process, exemplar quotes, and questions for discussion with the research team. Materials including the full interview protocol and list of codes are available upon request from the corresponding author.

In addition, we created a data matrix to identify higher-level patterns at the participant level [46]. For example, we classified participants by their degree of reported perceived personalization of the TikTok For You algorithm, their sense of belonging or engagement with TikTok groups or "sides," the amount or intensity of their TikTok use, and whether they created content for TikTok or predominantly consumed it. Using this matrix, we were able to organize our observations of individuals' perspectives on the algorithm around individual differences, such as users' preferred method of engagement or the amount of their use.

3 FINDINGS

3.1 The Algorithm Knows Me Well: Reflecting Multifaceted and Dynamic Self-Concepts

We examined how individuals theorized about the relationship between the algorithm and their sense of self-concept. As other research has observed (e.g.,[25, 57]), some participants evaluated the algorithm more positively when it offered them relevant or personalized content. The majority of participants, particularly those who were heavy or frequent TikTok users, believed that the algorithm learned who they were and what they liked by analyzing traces of their behavior. Prior work has discussed this kind of theorizing as an algorithmic folk theory of personal engagement [25]. While some participants expressed uncertainty and curiosity about how the algorithm worked, many perceived their experiences as the algorithm attempting to understand and reflect them.

Specifically, some participants emphasized the importance of the algorithm's ability to recommend content in line with a sense of self-concept that they viewed as fundamentally *multifaceted* and *dynamic* - two characteristics we discuss in turn below. Based on our analyses, we found that participants noted that they had varying identities and interests, some of which remained relatively stable and constant over time (nationality, native language, a life-long passion for theater, etc.), and others that were more likely to evolve or change (photography, nature, baking, or a particular TV show, etc.). How good an algorithm was perceived to be, then, was a function of its sensitivity: the algorithm's continuous "tailor[ing]" or "mold[ing]" to the set of facets that comprised users' self-concept (P4, P10, P15), resulting in a feeling one participant described as the algorithm "know[ing them] so well" (P10).

Many tended to value moments when the algorithm seemed to reflect many different facets of themselves. Rather than providing recommendations for only one or two key interests, the TikTok algorithm was described as "tailored to everything you'd want to see and be entertained by" (P14) and "showing me everything, like everything from the corners of my mind" (P8). For example, one participant (P13) enthusiastically attributed her enjoyment of TikTok to the diversity of content recommendations that spoke to her many specific interests, commenting that "it's nice that they all blend into [a] customized page for me." Having described herself as being passionate about education, pets, theater, horse videos and Vine-like humor, among other topics, she said:

> *"It doesn't take long for [TikTok] to calculate what videos I watch, what videos I don't watch, what my engagement is. So it just becomes more and more specific the more I use it. I don't see how it can get any more specific, like it's pretty insane how accurate it is right now."*

As demonstrated by the above quote, the specificity of the algorithm was determined by its ability to aggregate and recommend content that reflected the many and multiple facets of participants' self-concept. The "insane" accuracy of the algorithm, then, was about creating a unified blend of customized content recommendations that reflected users' diverse interests and identities into a single stream. It was not enough for the algorithm to provide highly specific recommendations for one particular interest, which could be interpreted as the algorithm producing a reductive representation of the self. For example, one participant (P14) preferred TikTok's algorithm over the Instagram Explore page because they thought it was better at capturing the multifaceted nature of their personal interests:

> *"With the Instagram Explore page, I feel like there's so much less variety, like if you click on a specific kind of post more than [once], it'll just give you a lot of that same post. Whereas with TikTok, I feel like the selection is so much larger... Even while tracking what you're more likely to enjoy or view... it's still a much wider selection of different kinds of content, or different kinds of styles of posting or different trends."*

In addition to being multifaceted, we observed that most participants tended to view themselves and their interests as changing over time - or as being dynamic. Thus, they wanted the algorithm to be responsive and rapidly update its representation of the user’s self-concept. For example, the TikTok algorithm was seen as better than others that were perceived to be more stagnant, which caused some people to feel constrained by older identity elements and outdated preferences and thus typecast as one-dimensional. For example, one participant (P13) described TikTok as being able to “catch on to what I like, almost immediately” whereas the Instagram algorithm “took a long time to catch up to what I like”:

> *“[My Instagram Explore Page] has not updated in the slightest, no matter how many times I will ‘like’ different things or whatever. I had a huge Disney phase, it’s all Disney stuff on my Explore page, and I’m so sick of it. So just that fact alone is making me use it even less and less.”*

In this quote, we can see that the participant felt “sick of” the Instagram Explore page algorithm because it was recommending content for an outdated version of herself that she no longer identified with. Being shown a reflection of her former self as an avid 16-year old Disney fan by the algorithm felt uncomfortable and frustrating. As demonstrated in the above example, the discontinuity between one’s current self-concept and an algorithmic representation of a previous self can create a sense of temporal dissonance in identity, especially when differences between past and present selves are salient - which might be particularly relevant for emerging adults [3] transitioning from Disney-fan childhood to adulthood.

However, this does not mean that participants wanted the algorithm to continuously start from scratch when attempting to reflect their current interests. A common theme we observed across participants was a tension between wanting the algorithm to cater to past interests, while also being receptive to new interests and creating opportunities for personal growth and new discoveries. Although some participants expressed that they did not want the algorithm to concentrate on specific interests, others pointed out that they valued when the algorithm was able to remember former interests and rotate through a combination of former and newer interests in a way that they described as “time-shifting” (P2). As one participant explained, she felt that her experience with TikTok involved “never staying on one [interest area] for long,” but rather that her feed “goes through a cycle” (P13). For example, she appreciated when the algorithm appeared to remember that she enjoyed watching videos from Frog TikTok; even if frog videos had not “come up for a while” on her feed, she felt confident that it would come back up again eventually. Another participant (P2) voiced a similar sentiment, saying:

> *“And I think that kind of goes back to the algorithm too... There’s a lot of people that like to talk about a specific thing, and that obviously shifts over time. But there are certain communities probably that persist over time, whether it’s about elections... there’ll always be that community of posts that you can probably find if you like something or look at a profile that has something like that.”*

Together, these findings suggest that people understood personalization processes in the FYP as the algorithm trying to develop an accurate representation of their self-concept, preferably in a way that captured their multifaceted interests and dynamic ability to change over time. At a high level, we observed that some users believed the algorithm could know their "their true self" because it was capable of identifying content in line with the contours of their identity.

3.2 Aligning the Algorithmic Self with the Actual Self

In addition to evaluating how well the algorithm’s representation of them fit with their self-concept, almost all of our participants had a working understanding that the algorithm’s representation of them was shaped by their everyday use of the app, such as the videos they watched and the content they engaged with. Whereas previous work on algorithmic selves has highlighted that there are various degrees of user awareness of how their data are represented through datafied systems [11], our findings indicate the potential for users to not only be aware that this personalization process is occurring, but also to want to bring their algorithmic self into alignment with their actual self.

One way some participants thought they could shape the algorithm was casual and unintentional: simply by being themselves and following their natural interests when engaging with content. Many reasoned that the algorithm could learn who they really were over time because it was making inferences from their everyday watching behavior, such as the number of times they watched the same video, whether or not they investigated a particular content creator, or if they skipped over a certain type of content ("I think I definitely enable it when I watch a video maybe twice... or if I look at the comments, or if I like it" - P5). Unlike other social media platforms with stronger norms around engaging with content to maintain social ties (e.g., feeling obligated to "like" a friend's Instagram pictures [32]), the FYP algorithm could build an understanding of the user's interests through content they organically gravitated to. While some participants saw this as producing quick, easy, and accurate representations of themselves, others felt like they had little control over what the algorithm learned in this fashion because it was like it was "read[ing] your mind" (P15). As one participant expressed, "It's like he knows everything… the thing that we cannot control is definitely the AI" (P19). Thus, in this process, the algorithm's representation of the self could be closely aligned with one's actual self with little effort on the part of the user, but also difficult to evade or fabricate.

In contrast to these organic expressions of interest, another way that participants attempted to align the algorithmic self with their self-concept was more effortful and strategic. Some participants described feeling like they could shape what the algorithm learned by actively curating their engagement through deliberate interactions with the app. In this process, algorithms were valued when seen as responsive to bids from users to adjust its representations of them and recommendations for them. For example, several people described how these bids could be made explicitly by deliberately engaging with features to send a request to the algorithm (e.g., indicating they're 'not interested' by clicking on this option or saving the video):

> *"If I really liked the video, and I want similar ones, it's obviously liking the video or commenting, or adding it to my [collection of Favorited videos]. ... I know for videos [that] I don't want to see... you can press the video and it'll pop up like, a 'not-interested' option... Sometimes I'm like, 'No, I don't want to watch this.'"* - P9

Users could also make bids implicitly by modulating their behavior in hopes that the algorithm would pick up on this change and thus learn to better model some facet of themselves. For example, in the context of describing her feed, one white participant (P18) described how she noticed that the algorithm was showing her videos of predominantly white creators and that she tried to deliberately change this by strategically engaging with Black creators:

> *"Yeah I would say that at first I was probably seeing mostly white people... But again with BLM and everything - I started liking content by more Black creators and a more diverse set of creators."*

We observed that people tended to make different attributions when they made a bid to the algorithm to change how it represented them. Some people felt they needed to do so because the algorithm was not sensitive enough to who they were, or that it was biased in its own way to showing particular content - which reflected poorly on their evaluation of the algorithm. A few participants, however, expressed a tension between their actual behavior and the kind of person they wanted to be. In this frame, they viewed the algorithm itself as highly capable of learning and modeling who they were, but felt uncomfortable about some of the identity facets that it brought to light. For example, this tended to involve content recommendations that indulged in interests that they viewed as unhealthy, such as snack foods. Seeing unsavory facets of oneself detected by the algorithm and reflected in its recommendations could spark a potentially discomforting process of self-reflection and awareness.

Rather than viewing the algorithm as a purely mechanical function that recommended relevant content, we found that participants tended to anthropomorphize the algorithm to varying degrees. Some made sense of the personalization processes underlying the algorithm as being a "people-pleaser" (P22) that was capable of changing itself to be as similar to the user as possible. As one participant (P6) explained:

> *"It's whoever you are. It's like... the Pokemon that just turns into you. Or tries to. I mean, my TikTok experience is going to be completely different from someone else's because [it] got so personalized to me so quickly... So the algorithm is just you. Or it's just trying to be you."*

For participants like P6, the algorithm was viewed as a fundamentally malleable entity whose core mission is to transform itself into a copy of the user by learning to represent their interests and identities. However, people varied in how they thought about the goals of the algorithm in trying to learn and satisfy their tastes. For example, some participants viewed this in a purist, positive light, characterizing the algorithm as someone who enjoyed meeting their needs: "It would be someone who's very obedient and very, like a people-pleaser. They like to accomodate for you" (P15). In contrast, others were more critical, viewing the algorithm's motives for wanting to please them with more cynicism or apprehension. For example, one participant framed the algorithm as ensnaring, describing it as someone who "like, just wants to give you whatever you want" as a ploy to "keep you there [on the app] and not let you go" (P11). On the other hand, participants like P7 viewed the algorithm's people-pleasing qualities as less malicious, but still hollow or insincere:

> *"It's kind of like, if someone were to change their personality with everybody that they met in order to be - not necessarily the best person with the other person, but what they expect the other person would want, who they would want to hang out with."*

Despite these differing perceptions, however, people's understanding of the algorithm appeared to be unified by a shared orientation to viewing the algorithm as attempting to represent themselves, with more or less fidelity. Overall, our findings suggest that people's understanding of personalization processes shaped how they thought about the algorithm's representation of themselves, why it was learning to form such a representation, and how to bring their algorithmic self and actual self-concept into alignment.

3.3 I'm Not the Only One: Algorithmic Exposure to Others on the Platform

Participants were able to experience a variety of sides, or subcultures [1, 24, 77] on their own algorithmically personalized feed, which contributed to an acknowledgement of themselves as complex, multifaceted, and dynamic. In comparison, they often had a more simplified, one-dimensional perception of others who happened to be on the same side as them. Rather than interacting with others on the platform through a conventional network of known ties and with direct interpersonal contact - like dyadic or group messaging on Facebook - our analyses suggested that people tended to view others' content through the lens of their own self-concepts as curated through algorithmic personalization.

Perhaps the most consistent perception mentioned by participants was the relatability of content creators on TikTok, regardless of what category of video they made. One participant (P3) mentioned that they were seeing people "very similar" to them, while another (P12) found that she enjoyed "watching stuff that [she could] relate to about parenting" because of the parts of participants' self-concepts that overlapped with content creators. Other participants remembered thinking "oh my god, I'm not the only one who feels this way!" (P23) after seeing content about a TV show they enjoyed or that they were "not alone" (P24).

In contrast with other platforms that have algorithmic recommendation systems that primarily rely on content from members of one's network of known ties, it was not considered particularly important for participants on TikTok to have many overlapping interests with a singular other user on the platform. For example, one participant (P18) who enjoys musical theater and singing noted the following about Kristen Chenoweth, an actress and singer:

> *"She posted another video where she was harmonizing with the fire alarm… I've had similar things where... I'm like, 'Oh... the vibration from my toothbrush makes this sound… and then lets me harmonize to it.' And so it's totally relatable."*

Where does this feeling of relatability stem from, even among participants and content creators who have minimal interests or identities in common? In the case of our participants, relatability appears to be driven by the familiarity of another's self-concept when compared to one's own, even if these self-concept dimensions are only partially overlapping. Further, relatability is largely experienced in a content-based, rather than person-based manner, similar to the phenomena noted by Zulli and Zulli [77], as well as Abidin [1] and Klug et al. [42]. One participant (P6) even mentioned that people were just "vessel[s]" for relevant content that could have "anybody's face" on it, exemplifying the relative lack of importance of personal relationships as opposed to personalized content.

To further explain this phenomenon, we draw on Walton et al.'s [74] proposition of mere belonging, or the "minimal, even chance, trivial, or potential, social connection with unfamiliar others." In past psychological research, feelings of mere belonging have led to increased interpersonal liking or better outcomes in social interactions, even in transitory or short-term settings. However, many of our participants had minimal direct social interaction with content creators or other users of the platform, although exposure to videos remained transitory. Some participants were even able to pinpoint the source of mere belonging, with one participant (P7) stating that "you don't talk to [people on the sides]... you don't know them, but you feel that sense of connectedness because you both… like one thing." A noteworthy instance of this was described by another participant (P23):

> *"I am Mexican, but it was very hard for me to learn Spanish. And so TikTok made this whole thing - they call them the 'no sabo' kids. [It] means 'they don't know' Spanish. So I was on 'no sabo' kids for a long time and they just don't know Spanish [either]. And it was cool to see how many people who are so into their culture and love everything about being Mexican - but just don't know how to speak Spanish - come together. It was really nice actually."*

In the case of this participant, no sabo kids are people who share a specific life experience with her, which in turn brings about positive feelings towards them, but who she otherwise does not directly interact with. Other participants noted similar feelings of ephemeral belonging to the sides of TikTok that they were also on. One participant (P2) mentioned that she "never post[s] videos" and she "very rarely comment[s]" but does feel that other TikTok users "share similar sentiments as [her]." For these participants, algorithmically personalized content allows them to see others who share similar aspects of their self-concept and reap some social benefits, such as feelings of connection, without direct interpersonal interaction.

Seeing others' content through the perspective of parts of one's self-concept, as well as the effect of mere belonging, can be further accentuated by the presumed number of people on a side. Participants described the benefits of sides with fewer other viewers, such as feeling more unique. One participant (P16) noted that "most of the time…I see [the videos] before [they] blow up."

Similarly, another participant (P6) noted that "once you get deep enough into the TikTok [sides], you get a lot of videos that don't have that many views so you feel like you're… really important." Further, P9, who creates content, mentioned that they prefer "a smaller audience... so I can actually see... how [people are] relating to the video."

Although there is no way for participants to truly know how many people are on the same side they are on, they can calculate estimates using the metrics that TikTok makes visible, such as the number of views, likes or comments. Overall, participants intuit that greater degrees of algorithmic personalization, experienced through hyper-specific content made by others, means that aspect of their self-concept is potentially more unique.

4 DISCUSSION

This research explores how algorithmic personalization processes inform user understandings of identity and shape their orientation to others. We focus on the platform TikTok, widely recognized colloquially for the responsiveness of its content recommendation engine [61, 63], and explore how TikTok users perceived the FYP algorithm in relation to their self-concept. Our participants' experiences with the FYP algorithm reflected a recognition of parts of their identity in the content recommendations and a subsequent desire to bring algorithmic representations of themselves into alignment with their own self-concept. Our participants generally understood this alignment to be a cyclical interaction of co-production between the algorithm itself and their own actions [38], whereby the algorithm was appraised in terms of its ability to reflect the multifaceted and dynamic interests of the user. At the same time, our participants felt that their behaviors could shape the algorithm's ability to accurately reflect their interests and preferences. Shaping of the algorithm happened in two distinct ways: through participants' organic interactions with platform content and through their strategic attempts to influence the algorithmically-curated content.

Despite tending to just watch content on the platform rather than creating content or engaging directly with other users, multiple participants reported positive feelings toward other people who had similar interests or identities - even though little to no interaction took place. Other people shown to them on the platform were seen as highly "relatable," because they were understood to be similar to the user in some way deemed relevant by the algorithm. As such, the algorithm facilitated feelings of "mere belonging" towards others on the same side as participants.

We synthesize and extend these findings below by introducing an analytic framework that coalesces our findings and can help guide future work, drawing from literature on algorithmic interactions and self-concept. This framework contributes a new approach to understanding how people understand and experience personalized algorithms.

4.1 The Algorithmic Crystal Framework

Building on insights from our qualitative data, as well as previous scholarship on the "crystallized self" [70, 71], how people perceive personalized algorithms [19, 25, 28], and relationships between the TikTok algorithm and identity (e.g., [6, 38, 41, 59]), we propose a novel conceptual model to understand how people think about and interact with personalized algorithmic systems. Drawing on the metaphor of crystals and their properties, the *algorithmic crystal framework* is an analytic frame that captures user understandings of how personalized algorithms (1) interact with user identity by *reflecting* user self-concepts that are both *multifaceted* and *dynamic* and (2) shape perspectives on others encountered through the algorithm, by orienting users to recognize parts of themselves *refracted* in other users and to experience ephemeral, *diffracted* connections with groups of similar others. We discuss each of these properties in detail below.

4.1.1 Reflective. Crystals have several properties that we draw on for our framework. Crystals are solid structures consisting of flat facets which can be shaped over time into multidimensional prisms that capture and transform light. One transformation is reflection, or returning light back to its source. In the algorithmic crystal framework, algorithms are understood to be *reflective* of various dimensions of the self, including one's interests and identities. This echoes French's [28] notion of the algorithmic mirror, in which algorithmic systems "mine one's online activity, infer one's traits, and reflect those traits back to a person in the form of personalization." Similarly, Hess [34] also argues that interactions with digital technology are often "more like looking into a mirror than looking out a window" in that we see more parts of ourselves than we see of others. Further, Seaver [54] describes how successful recommender systems have to work in conjunction with users' psychological orientations in order to be truly captivating. In our data, reflection took the form of the FYP algorithm curating content for participants that they felt represented their interests or identity, supporting similar findings in other research on TikTok [4, 37, 57]. That is, people felt that parts of their self-concept were accurately *reflected* back to them in the content provided by the algorithm.

4.1.2 Multifaceted. The algorithmic crystal framework reminds us that algorithmic reflections of the self can be *multifaceted* (see Figure 1) as well, as opposed to being flat, one-dimensional, or oversimplified. Similar to work on the crystallized self, which draws on the imagery of the crystal as prismatic to characterize the self as fundamentally multidimensional [70, 71], we found that our participants valued when the algorithm was able to reflect their self-concepts as a constellation of identity facets. These ranged from core traits like ethnicity and sexual orientation and deeply-held passions, to fleeting interests and new discoveries.

Previous work, particularly on TikTok, has found that people understand personalization processes as placing people into different categories and showing content that is thought to fall within these categories [57]. Indeed, one complaint that participants often have of personalized recommendations is that "maybe someone isn't defined by a [single] category" [26]. Karizat et al. [38] also notes the potential expansiveness of one's self-concept in a related way, discussing the reflections of both person and social identities. A crystal can be held up to the light and rotated to reveal one facet at a time; likewise, our participants were shown one piece of content at a time on their FYP and were able to recognize the various facets, or "sides," that pieces of content belonged to. The metaphor of the algorithmic crystal, then, highlights how algorithmic representations can capture and reflect users' many identity components but also, when rotated, allow users to discover new ones. Just as elements of identity can range from the general to the niche, facets can come in a variety of sizes.

4.1.3 Dynamic. The algorithmic crystal framework also highlights how the self is *dynamic* and changes over time. Though the hard structure of crystals may evoke images of rigidity, prior work on the crystallized self highlights that they can take on an infinite variety of shapes, that they can "grow, change, alter, but not [be] amorphous" (Richardson in [71]); with the algorithmic crystal, this fluidity is reflected back to the user via content recommendations that similarly adapt and shift over time (see Figure 1). Just as users may grow in new directions and explore new interests, the algorithmic crystal is assumed to be continuously changing: creating, removing, and refining new facets to represent the user over time. The dynamic nature of the algorithmic crystal also emphasizes the role of the user in shaping the form of their algorithmic representations, a process that Karizat et al. [38] discuss as a form of co-production: wherein individuals shape the algorithm's recommendations and the algorithm in turn shapes how they understand themselves.

Other research on TikTok has highlighted the algorithm's dynamic nature as well; Simpson and Semaan [59] claim that "engaging with content by liking it… was mentioned by all of [their]

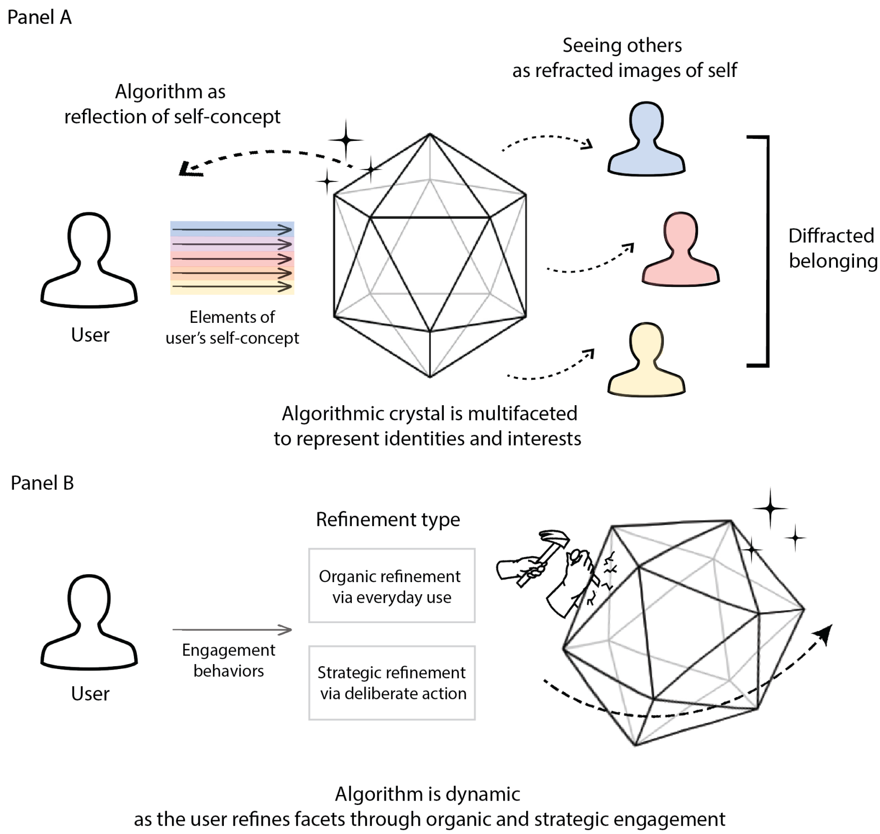

Fig. 1. A visual representation of the algorithmic crystal framework in two panels. Panel A emphasizes the reflective and multifaceted nature of the crystal, as well as the ability to see refracted images of the self and feel diffracted belonging. Panel B emphasizes the dynamic nature of the crystal and types of refinement.

participants as a way to influence the FYP algorithm over time," with other scholars noticing similar patterns of behavior [38, 57]. Just as crystals can be processed to better reveal or occlude underlying patterns - cleaved, polished, even bruised - the algorithmic crystal can be transformed by the user to better reflect their own sense of self, whereby their algorithmic self and self-concept are aligned. We understand this alignment to be desired by users, for both pragmatic (i.e., better content recommendations) and psychological reasons. For instance, people often experience positive feelings about the self derived from seeing two versions of oneself in harmony, rather than dissonance [14, 36]. Further, recent empirical work has indicated that people may feel like certain technologies are extensions of the self [17, 48, 51]. Indeed, Ross and Bayer [51] note that technologies may be perceived as "a part of the self or... a reflection of the self."

4.1.4 Refinement Strategies. People can dynamically refine the facets of the algorithmic crystal presented to them by engaging with the platform and providing more information about their preferences and tastes; this can occur organically or strategically. *Organic* refinement happens naturally, when users interact with content without the conscious goal of training the algorithm. Watching a particularly engaging clip two or three times, or saving it to show a friend later, would fall into this category. Siles González and Meléndez Moran [57] conceptualized similar interactions between users and the TikTok FYP algorithm as a "depuration" process, in which "impurities" are removed from their feeds.

In contrast, *strategic* refinement, or polishing, describes deliberate and effortful attempts to train the algorithm with the goal of eliciting content that is more aligned with one's current or desired self-concept (see Figure 1). People may vary in the extent to which they feel that the algorithm is reflective of who they truly are. However, they may also employ a variety of strategies to try to bring the algorithm's recommendations into line with who they are, or want to be. Participant P18, who consciously sought out non-White content creators, engaged in a form of strategic algorithmic refinement. This refinement can be understood as a form of labor, where certain individuals exert time and energy to make the algorithm their own [38, 58]. There may also be elements of someone's self-concept that they do not want an algorithm to recognize, such as an identity they are still exploring or an interest they are hoping to move away from. As a result, they may employ refinement strategies to shape the algorithm such that it reflects the person they would like to be.

As work on algorithmic domestication suggests [58], however, individuals may vary in the perceived amount of control they have over the algorithm and its representation of the self. For instance, not all users conceptualize algorithms as entities to be strategically polished or have, as described by Devito [19], high folk theorization complexity levels that support them in shaping the algorithm. However, refinement offers an important pathway to conceptualizing individual agency in the context of algorithmic systems [39]. Users can exert influence over what they see and how the algorithm sees them by purposefully avoiding clicking on content they do not want to see more of [22] or by purposely engaging with creators of marginalized backgrounds [38], like in the case of P18 in our dataset. It is important to note that organic and strategic polishing may look the same, because they involve the same behaviors, but motivations for the behaviors are quite different. Distinguishing between these two forms of refinement allows us to acknowledge the role of individual intentions in refining algorithmic representations of the self.

4.1.5 Refractive. Crystals can also bend the direction of light through refraction. Similar to reflection, the process of *refraction* highlights perceived or presumed similarities between the self and other users, such as content creators. Viewing the algorithm's recommendations as a reflection of who they are and what they like, people can come to see others that they encounter through the algorithm as *refracted images* of themselves: an egocentric orientation where people recognize at least one salient component of their own self-concept in others. In the case of our participants and the FYP algorithm, this might mean they recognize a sense of humor, a love of mystery books, or a shared ethnic or professional identity. As explored in other work on the experiences of LGBTQ+ users, finding facets of one's identity represented in algorithmically-shaped spaces like the LGBTQ+ sides of TikTok can help people feel seen and affirmed in that aspect of their identity [59].

In Tracy and Trethewey [71], Richardson also notes that "crystals are prisms that *reflect* externalities and *refract* within themselves" [emphasis added]. In the same way that external images viewed through a crystal are often warped by the contours of its internal structure, seeing another person through the algorithmic crystal can produce an altered view that emphasizes shared facets of interests and identity. Indeed, people can understand the algorithmized self as engaging reflexively with previous representations of themselves [6]. As a result, other users encountered through personalized algorithmic content may feel particularly relatable even in the absence of traditional markers of interpersonal communication and relationship development, such as message exchanges, because they feel like a refraction of the self. The salience of visual content and lack of direct, interpersonal interactions on TikTok, as well as folk theorization about how algorithms organize content around interest facets shared by many people, likely contribute to this process of refraction.

4.1.6 Diffractive. Lastly, crystals can split beams of white light into a spectrum of colors through diffraction. The algorithmic crystal can also *diffract* individuals' self-concepts into its constituent parts in much the same way as a prism breaks up a singular beam of light into a spectrum of colors. Unlike algorithms that attempt to find another individual that shares most aspects of a user's self-concept, such as those on matchmaking platforms, the FYP algorithm exposes the user to multiple groups of others who are each similar to the user in at least one specific way. For instance, a user might view content from creators who enjoy baking, other creators who read fantasy books, and still other creators who share the same political views. Each group of content creators is similar to the user in at least one way, for as many facets as they have in their self-concept - a concept we discuss as *diffracted belonging* (see Figure 1). The algorithmic crystal not only reflects multifaceted aspects of one's self-concept back to the user (e.g., a love for baking), but also creates ephemeral connections and facilitates mere belonging to groups of similar others if they share at least one aspect of the self-concept with the user (e.g., other people who love baking), even if they have nothing else in common. Wellman et al. [75] discuss a similar phenomenon of networked individualism where "an individual's overall community will be heterogeneous because people have multiple interests." In the case of our data, however, these connections are not interpersonal relationships; previous work on imitation publics suggests that sociality on social media platforms such as TikTok can be organized around the "shared ritual of content imitation and replication" with strangers, instead of direct interactions with networks of known ties [77]. Similarly, the refractive and diffractive nature of the algorithmic crystal organizes sociality around shared elements of identity, allowing users to surface content from others like them without needing to truly interact with them.

4.2 Applications and Extensions of the Framework

The algorithmic crystal framework serves as an analytic toolkit that provides a grammar for examining how people understand and experience personalized algorithms and a generative framework for future work. Building from an integration of our findings and prior work on algorithms and identity, the framework contributes to the literature by allowing researchers to rethink relevant theories and concepts regarding how people perceive and interact with algorithmic systems. Below, we propose several pathways by which the algorithmic crystal framework can be used to extend theory and inform new lines of research around the implications of algorithms in self-concept development and social life.

First, future work could expand on these ideas by making fine-grained predictions about how people's folk theories of algorithms relate to their behavior. Our data suggests an association between users viewing the algorithm as reflective of their multifaceted and dynamic self-concept, and their enjoyment of the platform. The degree to which algorithms are holistically perceived as crystal-like may thus be related to decisions around continuance of platform use [19]. The individual dimensions of the algorithmic crystal framework can be examined more closely to hone in on how specific perceptions of algorithms (e.g., as more or less multifaceted or dynamic) shape key processes and outcomes, including self-presentation and algorithmic literacy [2, 4, 20]. Future work could also develop ways to assess perceptions of algorithms as crystal-like (e.g., "To what extent does this algorithm reflect your identities and interests as multidimensional?"). Such measurements introduce an opportunity to study between-person differences in perceptions of the same algorithm, between-algorithm differences in user outcomes, and the impact of within-algorithm changes over time - potentially in the context of user adaptation and resistance to algorithmic change (e.g., platform spirit [19]).

The algorithmic crystal can also serve as a useful framework for exploring the ramifications of simplistic algorithmic representations of user identities or those that cannot adapt to an evolving sense of self. Given the findings of prior work on identity shift and algorithmic mirrors [28], which demonstrate that algorithmically mediated self-presentations can change how people see themselves, the implications of such stereotypical or outdated reflections of the self should be further explored. While misalignment between the actual and algorithmic self may produce dissonance in any individual, reductive reflections of the self (e.g., only being "seen" through one identity, such as gender or race [76]) and outdated reflections of the self (e.g., being "seen" as a role that one may no longer have) may be particularly harmful for certain communities. The failure of an algorithm to capture the self in full as it changes over time may be particularly detrimental for individuals from marginalized identities, for whom self-presentation is of heightened importance [19], and individuals who are undergoing or have experienced a major life change (e.g., adolescents, veterans, widows or divorcees [31]).

On the other hand, the multifaceted and dynamic nature of the crystal may facilitate explorations of how experiences with algorithms may have self-transformative effects. Identity shift refers to the process of self-transformation resulting from intentional self-presentation in a mediated context [10]. While prior research has examined how algorithmic feedback can lead to identity shift by intensifying particular attributes (e.g., introversion, extraversion [49]), the dimensions of the algorithmic crystal may serve as a guide for extant research on more diverse forms of identity shift. For instance, people may experience tension between the algorithmic representation of their true self as produced by organic interactions with the algorithm, and the aspirational version of themselves they may seek to cultivate through strategic refinement. In addition to highlighting distinctions between real and desired selves, engaging reflexively with digital representations of the self has been shown to prompt self-exploration [16] and influence behavior [33]. For instance, students who interacted with altered digital representations of themselves as senior citizens became more conscious of their financial futures and were thus motivated to save more for retirement [60]. What might be the implications of interacting with a multifaceted, dynamic algorithmic representation of the self that can be co-produced and shaped by the user? Applying the framework could allow for nuanced research regarding how personalized content recommendations change people's understanding of who they really are.

Beyond individual identities, Tracy and Trethewey [71] argue that "by conceiving of identities as ongoing, emergent, and not entirely predictable crystals, people are forced to acknowledge a range of possible selves embodied in a range of contexts - even as they are constrained by discourses of power." Similarly, the structural forces embedded in algorithmic systems can also be understood through the lens of the crystal framework. Applying this lens, the algorithmic crystal provides another mechanism that explains why algorithms may overrepresent certain identity facets, while suppressing others. Users may vary in their awareness and perception of this difference, as examined in Karizat et al.'s [38] work on algorithmic representational harms, or the "users experience[s]... of being rendered invisible, trivialized, suppressed, or otherwise further marginalized on the basis of their identities and the algorithm's understanding of their identities." As such, framing the internal algorithmic logics that shape which identities and interests are amplified or minimized through the framework of the crystal could support extant research on biases and harms. For instance, the identity facets that the algorithm presents as the "default" when users first join a platform can reproduce structural norms. In the case of TikTok, the unrefined algorithm promotes content from white, straight, and conventionally attractive youth from the outset, reinforcing the notion that these identities constitute the norm while othering individuals from marginalized identities [38]. Although people can strategically refine the algorithm over time, the burden of engaging in the labor of refinement again disproportionately falls on individuals from marginalized identities.

The algorithmic crystal also contributes a new orientation to understanding social perceptions in algorithmically-structured spaces. Our framework suggests that because personalized algorithms are organized around an individual's self-concept, some users can come to view others they encounter through the algorithm as refracted images of themselves: an orientation that assumes similarities with visible others based on the folk theory that the algorithm is showing them content reflective of some aspect of their self-concepts. This contributes to our understanding of how people experience different kinds of sociality in algorithmically-curated spaces with specific affordances [2, 6, 77], and demonstrates how folk theorization can shape social experiences. Additional work that characterizes the affect and affiliation dynamics of this orientation to others could contribute meaningfully to our understanding of self-concepts. Further, the framework could be applied to understand how social relationships unfold on platforms affording algorithmic personalization and visually salient content.

The crystal is particularly informative in illustrating the concept of what we call diffracted belonging, a type of algorithmically-mediated connection that facilitates a sense of mere belonging by connecting individuals to n networks of content for n identity facets represented. In the case of TikTok, for example, diffracted belonging appears to be a function of user perceptions that they are iteratively moving from "side to side" and traversing different groups centered around their interests and identities. Diffracted belonging can be understood as a form of social translucence [23], as it provides individuals with partial insight into the ways in which they are connected to other communities of users. In this way, diffracted belonging can be seen as a counterpoint to conceptualizations of algorithmic filter bubbles as stationary, unidimensional echo chambers [13, 47] and a novel extension to psychological theory on mere belonging effects [66]. However, additional work is needed to understand whether such diffractive experiences may recreate dynamics of societal exclusion seen in interpersonal interactions, such as in-group and out-group exclusion [35].

The image of the crystal as being polished or refined by the user connotes agency in one's relationship with the algorithm, and could inspire new design choices. For instance, algorithmically-curated social media content is often described in metaphorical terms like a one-dimensional "stream," where the platform is the active subject that moves while the user stands still. Conversely, consider an image of a person holding a multidimensional crystal that is polished to more accurately reflect the aspects of their self-concept that they want to see, or even rotated to explore new reflections if desired. Rather than positioning users as passive recipients of a feed, the dual processes of algorithmic refinement build upon prior work on strategic curation with algorithms [22, 57] to articulate how individuals can have agency in shaping their algorithmic selves. Further, there are minimal feedback mechanisms for users to reduce unwanted content on their feed, and such mechanisms are typically weak. How might users be able to remove whole networks of content from something like the FYP?

The boundary conditions of the algorithmic crystal framework are likely to be jointly determined through the interaction of both platform affordances and user experience. Indeed, prior work on adaptive folk theorization indicates that human-algorithm engagement is often shaped by structural features, including the technical features (e.g., content modality) of the platform and the psychological characteristics of the user (e.g., algorithmic literacy) [19, 43]. More granular examinations of how networks are organized on particular platforms may prove particularly instructive. Some platforms, for instance, prioritize recommending any content relevant to the user (e.g., TikTok, YouTube), while others prioritize content from known social ties (e.g., Facebook, Instagram). Platforms that more easily afford content-based interactions [42] may better lend themselves to analysis through the algorithmic crystal framework because of the emphasis on personalized content tailored to users' identities. Comparatively, person-based interactions highlight relationships between users and others on the platform and are thus less egocentric. Content recommendations in these cases may thus be more likely to be understood as derived from shared ties, rather than reflections of the self.

Researchers might also apply the framework by investigating the length and modality of content recommended by the algorithm. For example, an algorithm that hosts shorter videos like TikTok may be more likely to be experienced as multifaceted, because of its ability to reflect a greater number of interest facets in the same length of time. Further, algorithms that prioritize video or image data may be more likely to facilitate feelings of refraction and diffraction because the content provides additional visual and audio cues through which users can view others. Zulli and Zulli [77] describe this through the concept of imitation publics, where videos allow for "physical imitation (copying dance moves), reactive imitation (capitalizing and expanding on someone else's video) and narrative imitation (describing the same type of experiences)."

In terms of user experience, we anticipate that people who have more degrees of algorithmic literacy or algorithmic awareness [19] may be more likely to view algorithms as crystal-like, due to their understanding of how the systems learn from personal engagement to recommend content. Similarly, an individuals' conceptualization of platform spirit, or the underlying motivations of a platform's construction [19], may also be an important factor. A person who views algorithms as exploiting users for monetary gain or manipulating attention may not believe the algorithmically-curated content is an accurate reflection of themselves.

Finally, future work should investigate the contexts in which the algorithmic crystal may "break," or when the framework may not apply. The perception of structural changes in the platform, algorithm, or the companies that produce them may fundamentally shift how individuals understand the algorithm in relation to their self-concept [19]. As prior work on adaptive folk theorization demonstrates, such a shift can be caused by a real-world change (e.g., TikTok updating its content recommendation algorithm) or by a perceived change that is assumed to relate to the algorithm (e.g., a user feeling that the algorithm no longer responds dynamically to their interests). For instance, a change to the TikTok algorithm in late 2021 that prioritized videos with high view-counts caused thousands of users to perceive their algorithm as "broken," after seeing content that they perceived to be more mainstream than their usual fare [30]. On the other hand, users can also perceive their algorithms as "broken" if they feel its recommendations are no longer in alignment with their sense of self. This raises important questions, such as: How much change can an individual accommodate before they no longer experience the algorithm as reflective? Indeed, future work should explore the extent to which crystal-like experiences are temporally-bound, as the product of perceived alignment between two constantly evolving entities: the algorithm and the user.

4.3 Limitations

Limitations of this work include the fact that we only interviewed participants who were students at one of three universities in the Bay Area of California participating in research for course credit. Seeing as location is a factor that influences the content people see on their FYP [69], understanding how participants experience TikTok in various geographic regions, particularly outside the United States, is an important area for future work. We also believe that understanding perceptions of those with marginalized identities, especially those not adequately represented in our sample of participants (e.g., LGBTQ+ participants), will shed additional light on how the algorithmic crystal framework can be applied to issues such as algorithmic representational harms [38].

Further, even though we did not impose any prerequisites regarding how a participant used TikTok - only that they had to be "active" users, our sample included only a few participants who created content as opposed to consuming it. It may be the case that content creators have different perceptions regarding how the algorithm is related to their self-concept, as they are often engaging in acts of self-presentation for an audience [12, 20]. Especially in regard to processes of identity shift, users interacting with the algorithm through content creation may receive more sources of feedback (e.g., comments or likes on videos) than those who primarily consume content, potentially accentuating self-perception effects.

4.4 Conclusion

We investigated TikTok users' perceptions of the platform, with an emphasis on how people thought about the algorithm in relation to their own self-concept. Through analyzing data from our 24 semi-structured interviews, we propose the *algorithmic crystal framework*. We found that participants generally believed that they were multifaceted and dynamic individuals with interests and identities that were expansive and changed over time. Participants typically felt positively toward the FYP algorithm because the personalized content accurately represented these varied, fluid interests and identities. Further, they believed that their interactions with the platform were influential in aligning their algorithmic selves, or the types of content they saw, with their actual selves. In general, participants also felt a sense of connection towards other users encountered through the algorithm because they were able to recognize parts of themselves refracted in other users and experience ephemeral, diffracted connections with groups of similar others. Lastly, we discussed pathways in which the algorithmic crystal framework can extend theory and inform new lines of research around the implications of algorithms in social life.

REFERENCES

[1] Crystal Abidin. 2021. From "Networked Publics" to "Refracted Publics": A Companion Framework for Researching "Below the Radar" Studies. *Social Media + Society* 7, 1 (Jan. 2021), 205630512098445. https://doi.org/10.1177/2056305120984458

[2] Crystal Abidin. 2021. Mapping Internet Celebrity on TikTok: Exploring Attention Economies and Visibility Labours. *Cultural Science Journal* 12, 1 (Jan. 2021), 77–103. https://doi.org/10.5334/csci.140

[3] Jeffrey Jensen Arnett. 2007. Emerging Adulthood: What Is It, and What Is It Good For? *Child Development Perspectives* 1, 2 (Dec. 2007), 68–73. https://doi.org/10.1111/j.1750-8606.2007.00016.x

[4] Kristen Barta and Nazanin Andalibi. 2021. Constructing Authenticity on TikTok: Social Norms and Social Support on the "Fun" Platform. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (Oct. 2021), 1–29. https://doi.org/10.1145/3479574

[5] Corey H. Basch, Grace C. Hillyer, and Christie Jaime. 2020. COVID-19 on TikTok: harnessing an emerging social media platform to convey important public health messages. *International Journal of Adolescent Medicine and Health* 0, 0 (Aug. 2020), 20200111. https://doi.org/10.1515/ijamh-2020-0111

[6] Aparajita Bhandari and Sara Bimo. 2022. Why's Everyone on TikTok Now? The Algorithmized Self and the Future of Self-Making on Social Media. *Social Media+ Society* 8, 1 (2022), 20563051221086241.

[7] Sophie Bishop. 2019. Managing visibility on YouTube through algorithmic gossip. *New media & society* 21, 11-12 (2019), 2589–2606.

[8] Matilda Boseley. 2021. 'I found my identity': how TikTok is changing the lives of its popular Indigenous creators. (2021). https://www.theguardian.com/australia-news/2021/jul/10/i-found-my-identity-how-tiktok-is-changing-the-lives-of-its-popular-indigenous-creators

[9] Taina Bucher. 2017. The algorithmic imaginary: exploring the ordinary affects of Facebook algorithms. *Information, Communication & Society* 20, 1 (Jan. 2017), 30–44. https://doi.org/10.1080/1369118X.2016.1154086

[10] Caleb T Carr, Yeweon Kim, Jacob J Valov, Judith E Rosenbaum, Benjamin K Johnson, Jeffrey T Hancock, and Amy L Gonzales. 2021. An Explication of Identity Shift Theory. *Journal of Media Psychology* (2021).

[11] John Cheney-Lippold. 2017. *We are data: algorithms and the making of our digital selves.* New York University Press, New York.

[12] Sukyoung Choi, Dmitri Williams, and Hyeok Kim. 2020. A snap of your true self: How self-presentation and temporal affordance influence self-concept on social media. *New Media & Society* (Nov. 2020), 146144482097719. https://doi.org/10.1177/1461444820977199

[13] Matteo Cinelli, Gianmarco De Francisci Morales, Alessandro Galeazzi, Walter Quattrociocchi, and Michele Starnini. 2021. The echo chamber effect on social media. *Proceedings of the National Academy of Sciences* 118, 9 (March 2021), e2023301118. https://doi.org/10.1073/pnas.2023301118

[14] Charles Horton Cooley. 1902. *Human Nature and the Social Order.* Scribner, New York.

[15] Juliet Corbin and Anselm Strauss. 1998. *Basics of qualitative research: Techniques and procedures for developing grounded theory.* Sage publications.

[16] Shelley L Craig and Lauren McInroy. 2014. You can form a part of yourself online: The influence of new media on identity development and coming out for LGBTQ youth. *Journal of Gay & Lesbian Mental Health* 18, 1 (2014), 95–109.

[17] Amber L Cushing. 2011. Self extension and the desire to preserve digital possessions. *Proceedings of the American Society for Information Science and Technology* 48, 1 (2011), 1–3.

[18] Jenny L. Davis. 2020. *How artifacts afford: the power and politics of everyday things.* The MIT Press, Cambridge, Massachusetts.

[19] Michael Ann DeVito. 2021. Adaptive Folk Theorization as a Path to Algorithmic Literacy on Changing Platforms. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (Oct. 2021), 1–38. https://doi.org/10.1145/3476080

[20] Michael A. DeVito, Jeremy Birnholtz, Jeffery T. Hancock, Megan French, and Sunny Liu. 2018. How People Form Folk Theories of Social Media Feeds and What it Means for How We Study Self-Presentation. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems.* ACM, Montreal QC Canada, 1–12. https://doi.org/10.1145/3173574.3173694

[21] Michael A. DeVito, Darren Gergle, and Jeremy Birnholtz. 2017. "Algorithms ruin everything": #RIPTwitter, Folk Theories, and Resistance to Algorithmic Change in Social Media. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems.* ACM, Denver Colorado USA, 3163–3174. https://doi.org/10.1145/3025453.3025659

[22] Nicole B Ellison, Penny Trieu, Sarita Schoenebeck, Robin Brewer, and Aarti Israni. 2020. Why We Don't Click: Interrogating the Relationship Between Viewing and Clicking in Social Media Contexts by Exploring the "Non-Click". *Journal of Computer-Mediated Communication* 25, 6 (Dec. 2020), 402–426. https://doi.org/10.1093/jcmc/zmaa013

[23] Thomas Erickson and Wendy A Kellogg. 2000. Social translucence: an approach to designing systems that support social processes. *ACM transactions on computer-human interaction (TOCHI)* 7, 1 (2000), 59–83.

[24] Moa Eriksson Krutrök. 2021. Algorithmic Closeness in Mourning: Vernaculars of the Hashtag #grief on TikTok. *Social Media + Society* 7, 3 (July 2021), 205630512110423. https://doi.org/10.1177/20563051211042396

[25] Motahhare Eslami, Karrie Karahalios, Christian Sandvig, Kristen Vaccaro, Aimee Rickman, Kevin Hamilton, and Alex Kirlik. 2016. First I "like" it, then I hide it: Folk Theories of Social Feeds. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems.* ACM, San Jose California USA, 2371–2382. https://doi.org/10.1145/2858036.2858494

[26] Motahhare Eslami, Sneha R. Krishna Kumaran, Christian Sandvig, and Karrie Karahalios. 2018. Communicating Algorithmic Process in Online Behavioral Advertising. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems.* ACM, Montreal QC Canada, 1–13. https://doi.org/10.1145/3173574.3174006

[27] Motahhare Eslami, Aimee Rickman, Kristen Vaccaro, Amirhossein Aleyasen, Andy Vuong, Karrie Karahalios, Kevin Hamilton, and Christian Sandvig. 2015. "I always assumed that I wasn't really that close to [her]": Reasoning about Invisible Algorithms in News Feeds. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems.* ACM, Seoul Republic of Korea, 153–162. https://doi.org/10.1145/2702123.2702556

[28] Megan French. 2018. *Algorithmic Mirrors: an Examination of How Personalized Recommendations Can Shape Self-perceptions and Reinforce Gender Stereotypes.* Ph. D. Dissertation. Stanford University. https://www.proquest.com/dissertations-theses/algorithmic-mirrors-examination-how-personalized/docview/2436884514/se-2?accountid=14026

[29] Anne-Britt Gran, Peter Booth, and Taina Bucher. 2021. To be or not to be algorithm aware: a question of a new digital divide? *Information, Communication & Society* 24, 12 (Sept. 2021), 1779–1796. https://doi.org/10.1080/1369118X.2020.1736124

[30] Palmer Haasch. 2021. TikTok users reported a For You Page glitch that sent them careening into 'straight TikTok'. *Insider* (2021).

[31] Oliver L Haimson, Jed R Brubaker, Lynn Dombrowski, and Gillian R Hayes. 2016. Digital footprints and changing networks during online identity transitions. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems.* 2895–2907.

[32] Rebecca A. Hayes, Caleb T. Carr, and Donghee Yvette Wohn. 2016. One Click, Many Meanings: Interpreting Paralinguistic Digital Affordances in Social Media. *Journal of Broadcasting & Electronic Media* 60, 1 (Jan. 2016), 171–187. https://doi.org/10.1080/08838151.2015.1127248

[33] Hal E Hershfield, Daniel G Goldstein, William F Sharpe, Jesse Fox, Leo Yeykelis, Laura L Carstensen, and Jeremy N Bailenson. 2011. Increasing saving behavior through age-progressed renderings of the future self. *Journal of Marketing Research* 48, SPL (2011), S23–S37.

[34] Aaron Hess. 2014. You Are What You Compute (and What is Computed For You): Considerations of Digital Rhetorical Identification. (2014). http://contemporaryrhetoric.com/wp-content/uploads/2017/01/Hess8_1.pdf

[35] Miles Hewstone, Mark Rubin, and Hazel Willis. 2002. Intergroup bias. *Annual review of psychology* 53, 1 (2002), 575–604.

[36] E. Tory Higgins. 1987. Self-discrepancy: A theory relating self and affect. *Psychological Review* 94, 3 (1987), 319–340. https://doi.org/10.1037/0033-295X.94.3.319

[37] Sarah Jerasa and Trevor Boffone. 2021. BookTok 101: TikTok, Digital Literacies, and Out-of-School Reading Practices. *Journal of Adolescent & Adult Literacy* (Oct. 2021), jaal.1199. https://doi.org/10.1002/jaal.1199

[38] Nadia Karizat, Dan Delmonaco, Motahhare Eslami, and Nazanin Andalibi. 2021. Algorithmic Folk Theories and Identity: How TikTok Users Co-Produce Knowledge of Identity and Engage in Algorithmic Resistance. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (Oct. 2021), 1–44. https://doi.org/10.1145/3476046

[39] Becky Kazansky and Stefania Milan. 2021. "Bodies not templates": Contesting dominant algorithmic imaginaries. *new media & society* 23, 2 (2021), 363–381.

[40] Melanie Kennedy. 2020. 'If the rise of the TikTok dance and e-girl aesthetic has taught us anything, it's that teenage girls rule the internet right now': TikTok celebrity, girls and the Coronavirus crisis. *European Journal of Cultural Studies* 23, 6 (Dec. 2020), 1069–1076. https://doi.org/10.1177/1367549420945341

[41] Vanessa Kitzie. 2019. "That looks like me or something i can do": Affordances and constraints in the online identity work of US LGBTQ+ millennials. *Journal of the Association for Information Science and Technology* 70, 12 (Dec. 2019), 1340–1351. https://doi.org/10.1002/asi.24217

[42] Daniel Klug, Yiluo Qin, Morgan Evans, and Geoff Kaufman. 2021. Trick and Please. A Mixed-Method Study On User Assumptions About the TikTok Algorithm. In *13th ACM Web Science Conference 2021*. ACM, Virtual Event United Kingdom, 84–92. https://doi.org/10.1145/3447535.3462512

[43] Abby Koenig. 2020. The algorithms know me and i know them: using student journals to uncover algorithmic literacy awareness. *Computers and Composition* 58 (2020), 102611.

[44] Mark R. Leary. 1996. *Self-presentation: impression management and interpersonal behavior.* Westview Press, Boulder, Colo.

[45] Amalie MacGowan. 2020. The TikTok Algorithm Knew My Sexuality Better Than I Did. https://repeller.com/tiktok-algorithm-bisexual/

[46] Matthew B. Miles, A. M. Huberman, and Johnny Saldaña. 2020. *Qualitative data analysis: a methods sourcebook* (fourth edition ed.). SAGE, Los Angeles.

[47] Eli Pariser. 2011. *The filter bubble: what the Internet is hiding from you.* Penguin Press, New York. OCLC: ocn682892628.

[48] Chang Sup Park and Barbara K Kaye. 2019. Smartphone and self-extension: Functionally, anthropomorphically, and ontologically extending self via the smartphone. *Mobile Media & Communication* 7, 2 (2019), 215–231.

[49] Gwen Petro. 2021. *Adding Insult to Algorithm: How Unfavorable Behavioral Advertising Impacts Self-Concept.* University of California, Santa Barbara.

[50] Emilee Rader and Rebecca Gray. 2015. Understanding User Beliefs About Algorithmic Curation in the Facebook News Feed. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems.* ACM, Seoul, Republic of Korea, 173–182. https://doi.org/10.1145/2702123.2702174

[51] Morgan Quinn Ross and Joseph B Bayer. 2021. Explicating self-phones: Dimensions and correlates of smartphone self-extension. *Mobile Media & Communication* (2021), 2050157920980508.

[52] Andreas Schellewald. 2022. Theorizing "Stories About Algorithms" as a Mechanism in the Formation and Maintenance of Algorithmic Imaginaries. *Social Media+ Society* 8, 1 (2022), 20563051221077025.

[53] Nick Seaver. 2017. Algorithms as culture: Some tactics for the ethnography of algorithmic systems. *Big data & society* 4, 2 (2017), 2053951717738104.

[54] Nick Seaver. 2019. Captivating algorithms: Recommender systems as traps. *Journal of Material Culture* 24, 4 (Dec. 2019), 421–436. https://doi.org/10.1177/1359183518820366

[55] Donghee Shin, Bu Zhong, and Frank A. Biocca. 2020. Beyond user experience: What constitutes algorithmic experiences? *International Journal of Information Management* 52 (June 2020), 102061. https://doi.org/10.1016/j.ijinfomgt.2019.102061

[56] Ignacio Siles, Andrés Segura-Castillo, Ricardo Solís, and Mónica Sancho. 2020. Folk theories of algorithmic recommendations on Spotify: Enacting data assemblages in the global South. *Big Data & Society* 7, 1 (2020), 2053951720923377.

[57] Ignacio Siles González and Ariana Meléndez Moran. 2021. "The most aggressive of algorithms": User awareness of and attachment to TikTok's content personalization. https://hdl.handle.net/10669/83230

[58] Ellen Simpson, Andrew Hamann, and Bryan Semaan. 2022. How to Tame: LGBTQ+ Users' Domestication of TikTok. *Proceedings of the ACM on Human-Computer Interaction* 6, GROUP (2022), 1–27.

[59] Ellen Simpson and Bryan Semaan. 2021. For You, or For"You"?: Everyday LGBTQ+ Encounters with TikTok. *Proceedings of the ACM on Human-Computer Interaction* 4, CSCW3 (Jan. 2021), 1–34. https://doi.org/10.1145/3432951

[60] Tamara Sims, Sarah Raposo, Jeremy N Bailenson, and Laura L Carstensen. 2020. The future is now: Age-progressed images motivate community college students to prepare for their financial futures. *Journal of Experimental Psychology: Applied* 26, 4 (2020), 593.

[61] Ben Smith. 2021. How TikTok Reads Your Mind. (2021). https://www.nytimes.com/2021/12/05/business/media/tiktok-algorithm.html

[62] Oren Soffer. 2021. Algorithmic Personalization and the Two-Step Flow of Communication. *Communication Theory* 31, 3 (Sept. 2021), 297–315. https://doi.org/10.1093/ct/qtz008

[63] WSJ Staff. 2021. Inside TikTok's Algorithm: A WSJ Video Investigation. (2021). https://www.wsj.com/articles/tiktok-algorithm-video-investigation-11626877477

[64] Nicole Strimbu and Michael O'Connell. 2019. The Relationship Between Self-Concept and Online Self-Presentation in Adults. *Cyberpsychology, Behavior, and Social Networking* 22, 12 (Dec. 2019), 804–807. https://doi.org/10.1089/cyber.2019.0328

[65] Yiran Su, Bradley J. Baker, Jason P. Doyle, and Meimei Yan. 2020. Fan Engagement in 15 Seconds: Athletes' Relationship Marketing During a Pandemic via TikTok. *International Journal of Sport Communication* 13, 3 (Sept. 2020), 436–446. https://doi.org/10.1123/ijsc.2020-0238

[66] Henri Tajfel and John C. Turner. 1986. The social identity theory of intergroup behavior. In S. Worchel and WG Austing (Eds.). Psychology of intergroup relations. (1986).

[67] Leila Takayama. 2009. Making sense of agentic objects and teleoperation: In-the-moment and reflective perspectives. In *2009 4th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 239–240.

[68] Kaitlyn Tiffany. 2021. I'm Scared of the Person TikTok Thinks I Am. (2021). https://www.theatlantic.com/technology/archive/2021/06/your-tiktok-feed-embarrassing/619257/

[69] TikTok. 2020. How TikTok recommends videos #ForYou. https://newsroom.tiktok.com/en-us/how-tiktok-recommends-videos-for-you

[70] Sarah J. Tracy and Sophia Town. 2020. Real, Fake, and Crystallized Identities. In *The Oxford Handbook of Identities in Organizations*, Andrew D. Brown (Ed.). Oxford University Press, 390–407. https://doi.org/10.1093/oxfordhb/9780198827115.013.3

[71] Sarah J. Tracy and Angela Trethewey. 2005. Fracturing the Real-Self?Fake-Self Dichotomy: Moving Toward "Crystallized" Organizational Discourses and Identities. *Communication Theory* 15, 2 (May 2005), 168–195. https://doi.org/10.1111/j.1468-2885.2005.tb00331.x

[72] Laura Vandenbosch and Steven Eggermont. 2016. The Interrelated Roles of Mass Media and Social Media in Adolescents' Development of an Objectified Self-Concept: A Longitudinal Study. *Communication Research* 43, 8 (Dec. 2016), 1116–1140. https://doi.org/10.1177/0093650215600488

[73] Maike Vollstedt and Sebastian Rezat. 2019. An introduction to grounded theory with a special focus on axial coding and the coding paradigm. *Compendium for early career researchers in mathematics education* 13 (2019), 81–100.

[74] Gregory M. Walton, Geoffrey L. Cohen, David Cwir, and Steven J. Spencer. 2012. Mere belonging: The power of social connections. *Journal of Personality and Social Psychology* 102, 3 (2012), 513–532. https://doi.org/10.1037/a0025731

[75] Barry Wellman, Anabel Quan-Haase, Jeffrey Boase, Wenhong Chen, Keith Hampton, Isabel Díaz, and Kakuko Miyata. 2003. The Social Affordances of the Internet for Networked Individualism. *Journal of Computer-Mediated Communication* 8, 3 (April 2003), 0–0. https://doi.org/10.1111/j.1083-6101.2003.tb00216.x

[76] Brita Ytre-Arne and Hallvard Moe. 2021. Folk theories of algorithms: Understanding digital irritation. *Media, Culture & Society* 43, 5 (2021), 807–824.

[77] Diana Zulli and David James Zulli. 2020. Extending the Internet meme: Conceptualizing technological mimesis and imitation publics on the TikTok platform. *New Media & Society* (Dec. 2020), 146144482098360. https://doi.org/10.1177/1461444820983603