Creator-friendly Algorithms: Behaviors, Challenges, and Design Opportunities in Algorithmic Platforms

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In many creative economy platforms, algorithms significantly impact creators' practices and decisions about their creative expression and monetization. Emerging research suggests that the opacity of the algorithm and platform policies often distract creators from their creative endeavors. To study how algorithmic platforms can be more 'creator-friendly,' we conducted a mixed-methods study: interviews (N=14) and a participatory design workshop (N=12) with YouTube creators. Through the interviews, we found how creators' folk theories of the curation algorithm impact their work strategies — whether they choose to work with or against the algorithms — and the associated challenges in the process. In the workshop, creators explored solution ideas to overcome the aforementioned challenges, such as strengthening their agency, collaborating with the algorithm, and diversifying recommendation strategies. Based on these findings, we discuss design opportunities for how algorithmic platforms can support and motivate creators to sustain their creative work.

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

Additional Key Words and Phrases: Creator economy platform, Algorithmic experience, Folk theories, Participatory design

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1 INTRODUCTION

Creative economy, where creators grow their influence by publishing their content and earning revenue from digital platforms [29], has become an integral part of our culture and economy. The market size of the creator economy is estimated at around $100 billion, and more than 50 million people are working as content creators on various platforms (e.g., YouTube [1], Instagram [2], Twitch [3]) around the world [65]. Van Dijck [59] stated that "YouTube [...] did not produce any content of their own; they merely accommodated the distribution and storage of content produced by their users (p. 113)." Creators, who are producing content in the platform, are an essential part of the creative economy platform in generating creative content and vitalizes online communities [49].

Yet, prior research explained that platforms like YouTube have not been 'creator-friendly' [33]. Achieving success as a professional creator is largely affected by the platform's algorithmic features [18]: e.g., recommending content based on viewers' preferences [57] and demonetizing controversial content which violates community guidelines [41]. Despite its substantial role in the platform, the algorithm's working mechanism is often neither transparent nor comprehensible to

[1]https://www.youtube.com/
[2]https://www.instagram.com/
[3]https://www.twitch.tv/

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creators [11]. Creators try to understand algorithms by developing folk theories based on their experience [22, 24, 64], learning from community-shared knowledge or experts [5, 6], and devising strategies to survive on the platform [16, 41]. Yet, only a small portion of creators succeed — only 4% out of 50 million creators make a decent living income [65] — which potentially makes a vast majority of creators feel insecure [17] and stressed [55]. When their attempts at either understanding or leveraging the algorithm fail, creators sometimes exhibit algorithmic resistance [31, 46] or take collective action against the platforms [2] such as platform migration [9, 23, 39].

In our research, we explore how algorithmic platforms could be designed to be more 'creator-friendly' in the context of YouTube, a popular video-sharing platform. We took a mixed-methods approach to first understand what challenges creators face in their effort to distribute their content, then co-design potential solutions to address uncovered challenges for designing a creator-friendly platform. Through semi-structured interviews (N = 14), we first explored how creators' folk theories of the recommendation algorithm impact their work strategies. Then, we identified challenges that creators encounter (1) when they choose their work strategies, (2) after experiencing the algorithmic impact, and (3) when repeating the cycle of negative expectations and perceptions. To explore design opportunities and considerations for creator-friendly algorithmic platforms, we conducted a participatory design workshop to derive solution ideas to address algorithm-driven challenges. In four workshop sessions (N = 12), participants suggested solution ideas to strengthen their agency and authority, collaborate with the algorithm, and diversify recommendation strategies. Based on the design suggestions, we propose a potential design scenario to show how those design suggestions can be applied in the existing platform. Finally, we discuss folk theorization in the creator context, lessons from conducting participatory design with creators, and potential opportunities for designing a responsible creative-friendly algorithmic platform.

The contributions of this work include:

- Identification of creators' work strategies to work with or against the algorithm and their motivation behind choosing the strategies.
- Identification of creators' algorithm-driven challenges during the creative process on YouTube.
- Design opportunities for creator-friendly algorithmic platforms to improve creators' algorithmic experiences in the creative process.

2 RELATED WORK

In this section, we first provide background about YouTube creators to provide an understanding our research. Then we will review prior work that has been done on algorithms in creator economy platforms and platform consumers' and folk theories around algorithmic platforms.

2.1 Creators on YouTube

Scholars have been interested in a creators' community centering on YouTube and the content they created (e.g., anti-haul [63], ASMR [43]. This is because, over the past three years (2019 – 2022), two million creators have joined YouTube Partner Program (YPP) to earn ad revenue on the platform [49], which allows YouTube to be a mainstream video platform where the newest videos are kept flowing [49, 65]. At the same time, YouTube creators show off their influential power based on their fanbase. For example, PewDiePie, who had the highest number of subscribers, has huge viral power overwhelming that of television celebrities [25]. The number of subscribers they increased on YouTube provides several opportunities for them to earn revenue. They sometimes work with brands or create sponsored videos,

using their popularity. YouTube creators are no more just 'video editors', but often function as small entrepreneurs, dealing with brands and managing teams [55].

From this perspective, creators and YouTube seems to have been a good partnership. However, recent studies and a series of incidents have shown that their relationship has a dark side in terms of the platform's policy [35]. One of the main sources to earn revenue is monetizing their content which should meet 'Advertiser-friendly content guidelines' ruled by YouTube [67]. From the video content to the title and thumbnail, all portions of content should not violate YouTube's guidelines if creators want to earn revenue [68]. Also, a content curation algorithm, which has high invisibility [4] suggests their video content to viewers. Creators become burned out as they feel pressure to create content to attract viewers [32]. According to a study conducted by Ma et al., creators feel precarity to work on YouTube because of algorithmic moderation [41]. Also, in 2017, some creators revolted on YouTube's policy on their algorithm [36].

YouTube has been devising multiple ways to encourage creators to work, such as creator funds [44] and tries to help creators understand their performance [3]. However, what is still challenging for YouTube is that creators perceive YouTube as personae that are far from collaborative images: Agent, Gatekeeper, Drug dealer [64]. To narrow the gap between YouTube's commitments and what exact creators need, it is important to understand how creators decide to work with or work against algorithms, which is yet explored in prior work. The algorithm works differently according to how creators work and their categories. Also, since algorithmic experiences do not end at one time, their algorithmic experiences can be affected by what they previously experienced or expectations. Therefore, we will granularly explore what experiences affect them to behave and how they perceive the algorithm in the end.

2.2 Algorithms in Creative Economy Platform

Algorithms play an important role in dealing with a large amount of content on the platform [48]. From finding specific content for viewers [57] to moderating inappropriate content [41], creators, as content providers, mainly have to do with algorithms. Algorithms aim to work heading toward possible positive reactions [61], so creators' popularity can be largely influenced by the algorithm [18]. Therefore, creators like TikTokers (people who create videos on TikTok [4]) create their content to turn to algorithms so that they can reach a larger audience [28]. For example, many TikTok creators chose to make 'Duets' of which format seems to be preferred by algorithms and then hope that their content would be identified by the audience easily.

Although algorithms seem to open up new opportunities for creators to earn revenue with their crafted content, there has been a concern that algorithms influential effect on their creativity, or creatorship [61]. A creator is defined as anyone who interacts with the field and the domain to perpetuate what they produce [45, 60]. However, Wang pointed out that the feature of the creative economy platform may suppress creators from giving off their potential for creation [61]. Their creativity is encouraged by internal motivation[1], rather than external motivation such as monetary reward or evaluation [14, 61]. Also, the unexplained algorithm policy allows them to feel precarity in the space where they work [41].

Therefore, creators can not fully make an effort to use their own creative content but depend on understanding how the algorithm works. In algorithmic platforms such as YouTube and Instagram, creators collaboratively create algorithm discourse or gossip by collecting empirical understanding from their own experiences [5, 16]. Also, algorithmic experts instructing algorithmic strategies based on self-theorization about algorithms emerged [6].

[4] https://www.tiktok.com

Creator economy platforms should encourage creators to create content with new ideas, however, algorithms may limit their creative process. Also, it needs to discuss how such algorithm-related challenges occur throughout their creative process, which we will uncover in this study.

2.3 Algorithmic Folk theories

Recent work in the HCI community defined 'folk theory' as *"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"* [22, p.3165]. Users try to develop and form their own perspective, which could be non-professional and shared informally [24]. To form and update folk theories, people use various sources of information about online platforms. Then individuals' self-presentation goals mingle with those folk theories, which shape audiences' behaviors [20].

Folk theories have been explored on various curation-based social media platforms such as Facebook [5] [8, 24, 50], Twitter [6] [10, 22], TikTok [22, 31], and Instagram [16, 42, 46, 62]. French and Hancock extracted users' metaphors toward Twitter and Facebook, such that the users hold four primary folk theories for those systems: the rational assistant, the unwanted observer, the transparent platform, and the corporate black box [27]. Ytre-Arne et al. drew the framework of 'folk theories' to analyze the user's perception of algorithms and identified five folk theories: algorithms are confirming, practical, reductive, intangible, and exploitative [69]. Focusing on algorithmic fairness, Burrell et al. explored when lay users reference the keyword 'Twitter algorithm' in Twitter [10]. Especially among tweets about explanations and controls, users suggested strategies and instructions understand and tweak the algorithms. Folk theories formed around Facebook's news feed curation algorithm have been actively researched, including algorithmic awareness [24, 50] and visibility related to popularity games [8]. Another line of research has been done about TikTok, a short-form video app, such as investigating users' assumptions toward the platform algorithm [34] and suggesting the concept of 'algorithmic privilege' and 'algorithmic representation harm' to shape algorithmic identities on the platform [31]. Adding to these social media work, several works covered folk theories in Instagram, such as researching influencers' interpretation and discourse around the algorithm [46], regarding the algorithm as a 'visibility game' among the influencers [16], and discussing the needs of the transparency [62].

Other than social media, folk theories have been studied in the context of gig economy platforms such as Airbnb [7] and Uber [8]. The most contradictory point of the gig economy with general social media is they are run through providers who provide content creation labor, driving labor, or house to earn money on the platform. In the Gig economy, freelancers perceive the platforms as useful spaces to find work and gain work experience, but they also advise against using them as the main source of income [12]. Similarly, Jhaver et al. investigated the users' algorithmic perception of Airbnb Hosts, where the algorithm plays an important role in monetization [30]. They found that Airbnb hosts' perception of the algorithm was not specific, but they showed the tendency of double negotiation to either attract potential guests as well as algorithms. Based on their understanding through the algorithmic assignment of drivers, Lee et al. found that Uber drivers created their work strategies and focused on their own controls [38]. For instance, they limited the work area by 'turning off the driver mode' when they returned from long-ride.

Our study investigates folk theories in the creator economy context, and among the formation of folk theories, we observe the challenges driven by the algorithm.

[5] https://www.facebook.com/
[6] https://twitter.com/
[7] https://airbnb.com/
[8] https://www.uber.com/

3 METHODS OVERVIEW

In this paper, we took a mixed-methods approach combining semi-structured interviews and participatory design workshops. From the literature review, we found the current recommendation algorithm and platform are not creator-friendly. To devise a creator-friendly algorithmic platform, we need to investigate how creators interact with the algorithm and what kind of difficulties are underneath during those interactions. Furthermore, we wanted to investigate how and in what aspect the current algorithmic platform, in our case, YouTube, is supportive of creators. Through the semi-structured interviews, we expected to explore the needs of creators when interacting with the algorithm in existing platforms by extracting the algorithm-related strategies and challenges of creators. Then, we used a participatory design workshop method to explore design opportunities for a creator-friendly algorithmic platform by leveraging the challenges we investigated. Participatory design [51] has been widely used for imagining and designing algorithmic experiences [13, 58, 70] in HCI and CSCW communities. We tried to closely connect the two methodologies by utilizing the output of interviews (Section 4) — creators' algorithm-driven challenges — as the primary material of the design workshop (Section 6). We intended to let creators empathize with existing creator-unfriendliness in current practices and potentially transform them into creator-friendly platform designs.

4 STUDY 1: CREATOR INTERVIEWS

To understand the formation of creators' perceptions, expectations, and behaviors and the algorithm-driven challenges, we conducted a semi-structured interview study with YouTube creators who reported that they perceived experiencing algorithmic effects on their creative process, either positive or negative. In what follows, we introduce the recruitment process, participant dynamics, interview protocol, and results of the data analysis.

4.1 Recruitment

We invited participants who meet two conditions: a creator was defined as someone who (1) owns a YouTube channel and actively maintained it for over a year and (2) is earning financial income from YouTube, either inside (e.g., ad revenues, YouTube Partners Program) or outside the platform (e.g., PPL). We first posted recruitment advertisements on (1) an online YouTube creator community in South Korea [9], (2) social media platforms (Twitter, Facebook), and (3) several university online boards. Adding to this, we sent out cold emails to creators who specified business emails on their YouTube channels. To populate the invitation list, we first listed creators by searching YouTube with diverse keywords from public lists of common video categories [56] on the internet. We narrowed down to creators (1) whose 'Joined date' in the channel description exceeds more than a year with active video uploading and (2) who have more than 1,000 subscribers— which is the Minimum eligibility requirement to join YouTube Partners Program.

In the pre-survey, we asked about creators' working period on YouTube, channel category, experience in paid plan advertising, level of commitment, and the goal and purpose of running their channel. Additionally, we used the pre-survey to secure diversity in channel categories.

4.2 Participants

In total, we recruited 14 YouTube creators (5 female, 9 male). All participants were running their channels in Korean, aged between their 20s and 30s. The channels dealt with diverse topics such as computer science, beauty, Vlog, and

[9] http://ktube.kr/

music-related topics. Half of them were full-time, and the other half were part-time. The active period of the channels varied from 2 years to more than 8 years (See Table 1).

Participant ID (Gender, Age)	Channel category	Channel started in	Total number of subscribers	Level of commitment
P1 (M, 30s)	Computer science	May 2017	156K	Full-time
P2 (F, 20s)	Vlog	May 2017	31.5K	Part-time
P3 (M, 20s)	Music playlist	December 2018	107K	Part-time
P4 (F, 30s)	Beauty & Fashion	August 2014	124K	Full-time
P5 (F, 30s)	Beauty	July 2014	352K	Full-time
P6 (M, 30s)	Single-person households	December 2018	377K	Full-time
P7 (M, 20s)	Pop music review	March 2018	5.39K	Part-time
P8 (M, 30s)	Journalism & News	January 2018	191K	Part-time
P9 (M, 30s)	Marketing & Ads	September 2018	371K	Part-time
P10 (M, 20s)	IT & Travel	June 2018	6.93K	Full-time
	Car review	September 2021	Not open to public	
P11 (F, 20s)	Animation	December 2018	42.9K	Part-time
P12 (F, 20s)	Vlog	August 2020	36.9K	Part-time
P13 (M, 20s)	Cover music video	May 2020	75.5K	Full-time
P14 (M, 20s)	Game	December 2015	100K	Full-time

Table 1. Participants' demographics, channel information, and their level of commitment at the time of interviews.

4.3 Interview Protocol

We designed the interview questions in three main parts. In the first part, we asked about their overall experience as a creator, such as how they perceived the algorithmic impact and felt about those experiences. In the second part, we focused on asking how they took action to work with or against the algorithm. By asking about their behavior strategies, we also asked what kind of challenges they had experienced during the creative process in the algorithmic platform. During this part of the interview, we asked participants to share their YouTube Studio, which is a data analytics tool officially provided by YouTube, and reflect on their past experiences based on the performance metrics that YouTube Studio provides (e.g., view counts, video watching data analytics, etc.). Other than YouTube Studio, we asked how their decision-making process during the creator activity is influenced by the algorithm and their knowledge. Finally, we asked about their ultimate goals as a creator and how the YouTube algorithm should be improved to support them. The authors reviewed the participants' channels before the interviews to gain background context and ask personalized questions. All interview sessions lasted up to 2 hours remotely over Zoom. All interviews were conducted in Korean and audio-recorded upon their permission. Participants were compensated with 160, 000 KRW (Approx. 135 USD).

4.4 Data Analysis

All interview sessions lasted up to 2 hours remotely over Zoom. We transcribed the audio recordings of interviews with Clova Note [10] and analyzed the transcripts using an open coding method [15]. Using a qualitative analysis tool,

[10] https://clovanote.naver.com/

Dovetail [11], two native Korean authors coded the transcripts individually using an inductive approach, then discussed them iteratively to reach a consensus. After producing initial codes, we refined and grouped them to answer the research questions. The quoted statements in this paper were translated into English.

5 FINDINGS 1: CREATORS' ALGORITHMIC WORK STRATEGIES AND CHALLENGES

Creators showed two opposite behaviors of either working with or against the algorithm. The behaviors a creator exhibit is not fixed throughout the whole creative process — they change based on the constantly updated expectations and perceptions toward the algorithm. We aimed to unpack the motivations behind each behavior and discovered a cyclic relationship between expectation, perception, and behavior. We describe this iterative decision-making process as the *creative decision-making cycle* (Figure 1). For creators, their expectations of the algorithm's impact and its helpfulness influence what actions the creators might take (e.g., deciding which topic to cover in their next video). Creators then receive feedback on their behavior through the results of their creative work, on which they believe the algorithm exerts its influence [18]. With the new results, creators perceive the algorithm, adjust their expectations toward it, and repeat the decision-making cycle.

In the following sections, we explain the two groups of expectations toward the algorithm—whether it is creator-supportive or not—with example contexts. For each group, we present the creators' corresponding behaviors: (1) working with and (2) working against the algorithm.

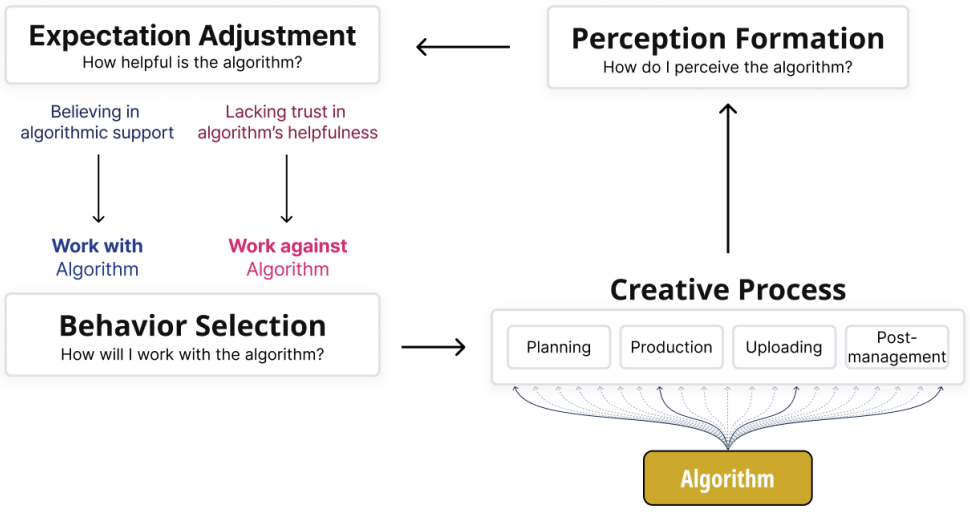

Fig. 1. Creative decision-making cycle. Based on the cycle, we explain the creator's expectations and perceptions behind the decision-making process on their behaviors. Within the cycle, the creative production process locates between behavior selection and perception formation. We explain the perceptions and expectations in Section 5.1 and behaviors (work strategies) in Section 5.2.

[11] https://dovetailapp.com/

5.1 What are Creators' Perceptions and Expectations Toward the Algorithm?

We categorize expectations into two categories based on whether the creator perceives the algorithm as helpful and supportive, or not. We focus on two concepts that frequently emerged in our interviews, as well as previous work: being 'blessed' or 'doomed' by the algorithm [53, 54]. These refer to the creators' perceptions of the positive and negative impact that the algorithm had on their content. All participants stated that they had experienced small or big algorithmic blessings, such as a sudden increase in the number of views or subscribers or high comment traffic. In comparison, participants experienced frustration or disappointment when the results were poor despite the effort put into creating the content, and blamed the algorithm for it. Participants explicitly used terms such as "dead," "abandoned," and "no more opportunities to be blessed" expressing their dismay.

5.1.1 Believing in algorithmic support.

There was a widespread perception that the algorithm is an all-powerful being that determines one's fate. P4 mentioned "To be successful as a creator, it is much more important to be chosen by the algorithm than to put in the effort, such as taking optimization strategies to appear in the top search results." P11 reported that she felt grateful after experiencing an algorithmic blessing. However, she felt as though it was akin to a "miracle", as it was uncontrollable from her side. P9 also mentioned that the algorithm was an incentive that motivates him to continue his career.

Most participants wanted to reproduce the effects of algorithmic blessing to gain popularity or profit. For example, P2 became more conscious of the algorithmic impact after one of their videos reached 600K views seemingly due to the help of the algorithm. Similarly, participants became more aware of the algorithm after experiencing its effects (blessings), but they were uncertain about how to replicate the effect again. On the other hand, participants hoped that the algorithm would "save their life" when their channels were struggling from low performance. For example, P12 thought that the most effective way of overcoming a slump would be getting an algorithmic blessing.

5.1.2 Lacking Trust in Helpfulness of the Algorithm.

Unwanted results after getting algorithmic effect. Despite its potential, the algorithm did not always function as the participants expected. One example was by suggesting the video to the wrong audience. P7 pointed out that while some videos got lucky by being exposed as the top search result, other videos were not as fortunate. They thought the reason was that the "algorithm did not expose the video to the right viewers." P10 pointed out the one-time effect of the algorithm, which is not helpful for creators due to the lack of sustainability. Furthermore, he once got the algorithmic blessing on the video which he made without much effort nor attachment— which made him not feel rewarded. After getting algorithmic blessing, P2 felt regretful about receiving it too early, within the life-cycle as a creator, because she could not stop thinking about the algorithm. She mentioned that "I would preferred not to be blessed."

Doomed by the algorithm. 'Doomed by the algorithm' was how the participants described the feeling of being abandoned or betrayed by the platform due to the algorithm's lack of support. Although participants initially tried hard to leverage the algorithm, expecting an algorithmic blessing, their attempts kept failing. Such failures to replicate the algorithmic benefits made participants lose trust in the algorithm's helpfulness. P7 compared this to fluctuating stock market: something they cannot take their eyes off of, and something that makes people feel exhausted. P4 raised a similar opinion that the algorithm was inconsistent, based on 8 years of her creator experience. Despite their time spent working on as creators, their understanding of algorithms couldn't get any better, making them feel insecure about their future. They thought platforms should explain how their algorithm operates and provide guidelines to increase transparency.

Not supporting creative values. P10 mentioned that the algorithm is 'uncooperative' toward the creators' artistic expressions."I'm not sure whether YouTube is an appropriate platform to continue my creative pursuits. I sometimes want to send a serious message through my content or want to grow as an artist, but the algorithm does not seem to respect me in that sense." P1 was frustrated as he learned that the algorithm seemed to mostly prefer contents that are addictive and entertaining, not favoring the educational content on his channel. He complained that compared to other channels, he has had less opportunity to be blessed by the algorithm.

5.2 How Do Creators Work With or Against the Algorithm?

Interviews revealed that most creators follow a similar process of production: planning, recording, editing, uploading, and analyzing the results. Creators also employed high-level strategies to manage their channels in a long-term manner. In this process, their perception and expectation of the algorithm influenced their decisions.

Overall, they showed two contradictory behaviors toward the algorithm: working with and working against. Participants initially expected and tried to take advantage of the algorithm by intentionally working with it. However, if they kept failing to meet their goals, they started to work against the algorithm, showing indifference toward the algorithm and looking for alternative strategies to increase the performance of their channel. Table 2 shows the creators' behavior strategies working with or against the algorithm across the creative process.

5.2.1 Working with the algorithm.

Many participants chose trendy and timely topics when making videos, thinking that algorithms will favor them. With the high expectation of re-gaining the blessing effect, creators sometimes even negotiate between what they wanted to create for their channel versus what is trending at the moment. We also found three major strategies in doing so, which are explained in detail below.

Halo effect: leveraging the benefits of an algorithmic effect that has already occurred. Participants said they would create new content with the assumption that algorithmic effects would reoccur, a phenomenon that P9 referred to as the 'Halo effect.' Participants tried to detect and replicate elements that were seen as critical in their earlier algorithmic blessings when producing new content. To take advantage of the halo effect, participants would update the title and thumbnail of the blessed video, upload another video on top of it, or made a series of videos similar to it.

Learning from real-world experiments. Participants tried to understand the mechanisms of the algorithm by running real-world experiments with their channels. Some participants actively tested hypotheses, expecting to control the algorithmic impact on their channels. P12 prepared a video based on her hypothesis that a video with the following factors would be blessed by the algorithm: a lightweight topic like eating show (Mukbang), an entertaining title, and a thumbnail with her face. She expected higher view counts and reactions from the viewers, but she did not see the expected results.

Meeting the advertisers' preferences. Earning financial benefits in YouTube platform is mainly supported via YouTube Partners Program— which is enabled by advertisements. Some participants chose topics of their content with advertisers in mind. P6 and P9 thought that the YouTube algorithm would prefer content regarding uncontroversial issues so that more types of advertisements could be added to their videos. P9 said he stopped posting unpopular but diversity-related content (e.g., LGBTQ) that advertisers might not prefer.

5.2.2 Work against the algorithm.

When participants thought that the algorithm will not be helpful for them anymore, they sometimes made decisions to 'ignore' the algorithm. Previous literature discussed similar behaviors toward the algorithm and its changes in

Creative process	Working with the algorithm	Working against the algorithm
Channel Management	• Understanding channel performance from the perspective of viewers • Analyzing the reasons for receiving the algorithmic effect or the lack thereof • Running real-world experiments	• Creating or moving out to a new channel • Collective action with other creators (e.g., leaving the platform) • Gaining profit outside of YouTube
Planning	• Choosing a topic that might be favored by the algorithm • Creating stimulating/timely/trendy content	• Creating videos that creators want to express their creativity • Intentionally avoiding algorithmic impact (e.g., avoid making popular videos)
Production	• Changing the way of structuring and editing videos • Changing the way of recording videos • Producing high-quality content • Creating videos based on the same material (Halo effect)	• Consolidating channel identity while ignoring algorithmic factors • Producing highquality content for other opportunities outside the platform • Planning content not adhering to current trends
Uploading	• Revising upload settings by editing content (e.g., thumbnail, hashtags) or scheduling the publish time • Uploading another video right after the algorithm-favored video (Halo effect) • Uploading videos when other creators upload similar videos (e.g., a new product launch)	• Using upload settings that aim to avoid algorithmic impact
Post-management	• Frequently changing the title or thumbnail when the content seems to be blessed (Halo effect)	• Forming a dedicated fandom community for reliable support

Table 2. Creator's working with and against behaviors across overall creative process.

the context of co-working with an algorithmic persona [64] and collective action in social media [22, 46]. We found two remarkable working-against behaviors from the creators. Participants mentioned creativity, channel identity, and quality of content are important factors to explain how they work against the algorithm. Since they believed that the algorithm is not supporting their primary values, they chose to prioritized them and work against and avoid the algorithm.

Prioritizing Creativity and Channel Identity Pursuing creativity, as a creator, is a natural urge. However, some participants stated that the more they care about the algorithm, the less they can focus on creativity. P3 intentionally tried to avoid the influence of the algorithm when deciding the topic of new content, because he was confident about his content's power, without getting the support from the algorithm. He mentioned, "Whenever I create music playlists, I can choose trendy music in the YouTube community, but I don't. It may attract the algorithm, but I just want to focus on expressing my creativity." P10 made a similar point stating that he did not want to adjust or change his content for an algorithmic impact. Some participants also intentionally disregarded the algorithm to maintain their channels' identity. P5 mentioned that she had thought about whether she should focus on her main content of cosmetics reviews or try popular topics to be chosen by the algorithm. However, she noted, "I consciously try not to care about the algorithm because then I might lose my channel identity and color."

Producing high-quality content for other opportunities outside the platform. Previously, when P10 had just started as a YouTube creator, he admitted that he kept looking for the algorithm a lot because their only source of income was the YouTube Partners Program. However, P10 confidently said that if the content is well-made and high quality, it is possible to gain on-demand production opportunities for companies and paid promotion opportunities (e.g., posting a video with sponsors). He told us, "For now, even though my channel does not get the algorithmic blessing and has low view counts, I'm okay with it. The quality of the channel has been recognized by companies, thus, they request us to create advertising content. Now my main income comes from there, not from YouTube."

5.3 Challenges within the Creator's Creative Decision-Making Cycle

Participants faced many challenges as they navigated through the creative process (planning - production - uploading - post-management). As these challenges appear, they contribute to the growing negative perception on creative activities within YouTube in general. Moreover, additional challenges arose after multiple iterations of the creative decision-making cycle, making it hard for to sustain their career as a creator. In this section, we introduce challenges that creators have experienced during the creative decision-making cycle. As shown in Figure 2, we mapped the identified challenges to each stage in the cycle.

5.3.1 Selecting work strategies. Creators experienced several challenges related to the algorithm hindering them in deciding the ways of creative expressions and identities. Due to the perception of being favored and discriminated by the algorithm, creators had self-imposed constraints on their creative work. Here, challenges are directly related to (1) creative expressions, (2) quality maintenance, and (3) content strategies.

There are many different assumptions and guesses behind what kind of content the algorithm favors, but the fact that what content the algorithm really prefers is actually unknown. By observing how YouTube videos get popular, they believed that the algorithm preferred stimulating and entertaining content over informative and instructive topics, which sometimes makes it difficult to create content that they really wanted. P9 mentioned "Seems like the algorithm less favor informative videos (e.g., eco-friendly topic), which I value quite a lot. If I make the same effort but don't get enough performance on specific types of video, then what should I create?"

The algorithmic uncertainty leads to hesitation when trying to make videos with new topics or opening a new channel. P14 mentioned that he wanted to open a new channel for his next phase, but he was concerned about the algorithmic black box. "My current channel is luckily exposed to the algorithm and became famous at that time. As Minecraft is not as popular as before, I want to open a new channel with a different topic. Yet I'm still not sure which category and plan I should prepare for a new channel to be chosen by the algorithm.''

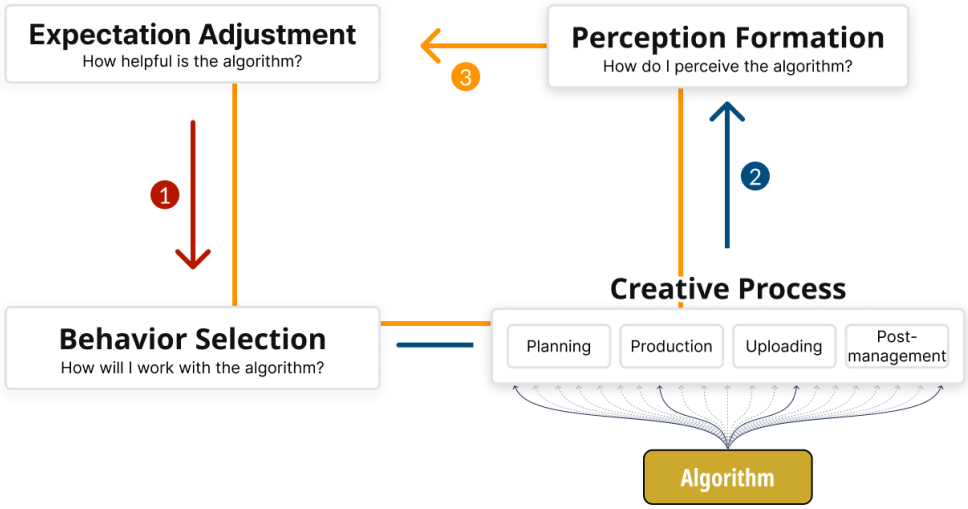

Fig. 2. Challenges occur within the creative decision-making cycle — (1) when deciding on work strategies (Section 5.3.1), (2) after getting performance results on their content (Section 5.3.2), (3) repeatedly experiencing negative aspects of the algorithm (Section 5.3.3.)

Even though creators put in significant effort to generate high-quality content, the algorithm often did not work as they expected, giving relatively low returns. Due to such economic instability, participants sometimes gave up on caring about the quality of content.

Furthermore, being unable to understand the algorithm hindered creators from building concrete strategies for content creation. Some creators thought the algorithm was biased, making it hard for them to establish strategies. P10 mentioned "We don't know which side to focus on between whether we should change the way we produce content or change the way we consider algorithms.''

5.3.2 Reviewing performance after video creation. After deciding on behavior, creators take actions based on their work strategies and complete the creative process until the video uploading and post-management. The distributed video would get evaluated by the platform with quantifiable measures; the performance achieved from video distribution is not only affected by the algorithm but also by audiences, which nobody knows in fact. Based on the achieved performance, creators perceive the algorithmic effect and adjust their expectations. Through this long process, creators encounter challenges related to (1) the high impact of the algorithm, (2) low returns, and (3) lacking feedback, explanations and interpretations.

Participants were often frustrated that their effort and time were not the only factors that affected the performance of their channel and content. As they thought that the algorithm largely influences such results, they recognized it as an absolute and powerful being. P12 mentioned "I want to get 100,000 subscribers by utilizing the algorithm. [...] However, it is a number that's almost impossible without the support of the algorithm.''

In contrast to the significant power the algorithm seems to have, participants sometimes reported feeling helpless when their strategies and efforts did not produce the expected results. P11 mentioned that even though she made similar videos, one video can exceed 1 million views, but another can show insignificant results. She believed the reason for

that difference could only be from the algorithm, as there was no difference between contents. P1 also said he spent a lot of time planning for and creating videos, but not receiving sufficient compensation made him feel discouraged.

Even if they achieved high performance compared to their expectation, it is not transparent whether the return is due to their effort or due to the algorithmic impact. Participants were barely able to interpret YouTube Studio, more than just with provided results. As there is no explanation, participants lose their trust in the algorithm.

5.3.3 Repeatedly experiencing negative aspects of the algorithm. Most creators produce a series of content on their channel, which means their creative process is iterative and long-term during their tenure on YouTube. Therefore, creators' perceptions, expectations, and behaviors keep changing. Challenges specifically related to creators' sustainable career life emerged in the process: (1) discouragement, (2) mental burden, and (3) an unfriendly ecosystem.

By repeatedly experiencing the negative aspect, it is easy for participants to lose their motivation to continue working. Several participants quit their original job and chose to work full-time when they realized that being a YouTube creator may bring a decent financial profit. However, unpredictable algorithmic effects partly contributed to their economic instability (P1, P4, P5).

Additionally, creators feel pressured to continuously pay attention to the algorithm throughout the creative process, which eventually influences their psychological well-being. As other creators' successes were visible and quantifiable (e.g., view counts), participants stated that they compared themselves with other creators' performances, which was very stressful. Furthermore, they thought that taking a rest made them fall behind from YouTube, so they were afraid of taking enough rest. For example, P5 stated that they recently took a 3-month break, after which she felt like her channel was abandoned by the algorithm. This caused her to be regretful about taking a break. Even if participants thought their channel became dead, they could not take any more action on their channel to overcome for several reasons, so they were just stuck. For example, though P4 perceived her channel to be dead, she chose to stay with it and continue working. She could have created new channels, but it would have required a lot of effort, and she would have to endure some period without revenue in the new channel.

Participants felt the algorithm makes the platform an unfair, inconsistent, and biased ecosystem. After having been experiencing algorithms and platforms for a long period of time, P4 pointed out that "I think algorithms need to be more consistent. I think there should be a chance for everyone to be successful if they upload high-quality content consistently. Still, it seems like an ecosystem where opportunities are gradually disappearing for people who have been active for a long time.'' Furthermore, P10 felt a filter bubble negatively affects creators, because it limits exposure and hinders newly spreading to viewers.

6 STUDY 2: PARTICIPATORY DESIGN WORKSHOP

We aimed to discover design opportunities and considerations for a creator-friendly algorithmic platform with the participatory design workshop. With challenges acquired from interviews, we reorganized those challenges and grouped them into values that are highly relevant to creators with a bottom-up approach: *financial benefit, motivation, creative process, plan for improvement, identity, performance, audience, platform, and labor*. In this workshop, we invited UX of AI researchers who could provide design perspectives for AI-infused systems and technical perspectives for the algorithmic experience. They served as the main facilitators of the workshop and prompted YouTube creators to derive specific design solutions. Overall, we ran four sessions of the participatory design workshop with 12 YouTube creators and two UX of AI researchers.

6.1 Recruitment

We followed a similar process of recruitment to our earlier interviews—posting open calls on communities (e.g., social media, university boards) and sending cold emails to potential participants. We invited creators (1) who have been working as a creator for more than a year and (2) who are either earning financial income from their creator activity or strongly willing to earn financial income but failed — highly blaming the algorithm for this failure. In a recruitment survey, we asked one open-ended question — "Please briefly share your dissatisfying points about the YouTube recommendation algorithm as a creator." — and screened creators who did not submit any response.

6.2 Participants

For every workshop, we had three participants who were creators and one UX of AI researcher as a facilitator. Participants were running different genres of channels such as vlogs, beauty, handcrafts, sports, and music. 5 of them were full-time, and 7 were part-time. The average age of participants was 27.33 (SD = 4.05, min = 22, max = 35), and 4 were female. Participants were compensated with 100, 000 KRW (Approx. 72 USD). UX of AI researchers were senior Ph.D. students in industrial design who were doing research about designing AI-infused systems and had experience designing user experience scenarios incorporating new digital technologies. Facilitators were compensated with 250, 000 KRW (Approx. 180 USD). The research team focused on running the workshop based on time table and protocol, not providing any tips or advice to participants. We describe participants' information in detail in Table 3.

Workshop session	Participant ID (Gender, Age)	Channel category	Channel started in	Total number of subscribers	Level of commitment
W1	C1 (F, 23)	Vlog, University life	June 2016	6.3K	Part-time
	C2 (M, 25)	Classical music	March 2019	65K	Part-time
	C3 (M, 23)	Kids, Handcrafts	May 2021	160K	Full-time
W2	C4* (F, 32)	Beauty, Fashion	August 2014	120K	Full-time
	C5 (M, 25)	Classical music	January 2019	17.5K	Part-time
	C6 (M, 26)	Soccer, Sports	January 2019	3.3K	Full-time
W3	C7 (F, 22)	Nail arts	December 2019	90K	Part-time
	C8 (M, 35)	Car review	May 2019	27K	Full-time
	C9 (M, 28)	Music cover	September 2020	150K	Part-time
W4	C10 (F, 30)	Vlog, Beauty	July 2015	189K	Full-time
	C11* (M, 28)	Pop music review	March 2018	5.3K	Part-time
	C12 (M, 31)	IT, Programming	January 2019	1.7K	Part-time

Table 3. Participants' demographics, channel information, and their level of commitment. C4 and C11 are P4 and P7 in the previous interviews.

6.3 Workshop Protocol

Overall, four workshop sessions were conducted remotely over Zoom. The process of the workshop was reviewed and approved by Institutional Review Board (IRB) at our institution.

Pre-training session with facilitators. Before running the workshop, we shared the workshop plan and written protocol in detail with facilitators in the pre-training session. Since the output guided by the workshop is open-ended, we tried to make a consensus on the level of expectation toward the workshop results.

Introduction and Ice-breaking. Since we ran a participatory design workshop, it is important for participants to know each other and feel less awkward. We first introduced the purpose of our research, the goal of this workshop, and the procedure of the workshop. For the ice-breaking activity, creators and a facilitator were asked to introduce themselves, their YouTube channels, and their working experiences. Then, we also asked them to shortly introduce their own perceived experience of the algorithm, such as the blessing effect. Before moving to the main part of the workshop, we provided a short tutorial on using the Miro board so that the participants could get used to the tool during the workshop.

Activity 1: Understanding and Reflecting on Challenges. To understand participants' challenges, we provided 23 challenge cards written from the creator's perspective, with 9 categories of creator-specific values. Creators chose 5-7 cards most relevant to their previous algorithm-relevant experiences. While choosing relevant cards, we asked them to reflect on their experiences, why they chose that card, and how it appeared in their context. After reflecting on the challenges, participants took turns to present what they wrote on their challenge cards. A moderator summarized the chosen cards at a high level. As the final goal of this workshop was to design solutions addressing two of the challenges, participants discussed and decided on two challenges they would develop solutions for. We provide the challenge cards in Appendix A.1.

Activity 2: Connecting challenges with algorithmic perception. To envision what aspect of the algorithm causes the challenges, we asked participants to discuss and choose the 'algorithm hashtags' to match with challenges. We derived nine hashtags from perceptions about the algorithm from our interview data. They contain the feelings and perceptions creators have toward the algorithms when they face challenges — which implies negative sentiments including *uncooperative, authoritarian, favoritism, bothersome, inconsiderate, difficult to know, malfunctioning, capricious, and unstable rewards*. During the discussion, creators shared why the specific algorithm hashtags fall under each challenge. We provide algorithmic hashtags and descriptions in Appendix A.2.

Activity 3: Designing solutions to address these challenges. To design solutions, participants first chose two major challenges that they would like to solve the most and had time to discuss how they could solve those two challenges. Inspired by Zang et al. [70], we provided five intervention types for solution ideas: (1) platform feature (e.g., keyword, hashtag, etc.), (2) third-party apps, (3) collective information sharing, (4) external sources of financial income, and (5) creators' mental changes (perception, behavior, goal reset, etc.). We intended to use intervention types to help creators brainstorm specific types of solutions. We asked participants to choose one intervention type and imagine the solution ideas based on it. A facilitator helped participants to contemplate the specific solutions by asking questions related to algorithmic characteristics and potential side effects of their suggestions.

6.4 Analysis

All workshop sessions were recorded through Zoom. We generated transcriptions with the web app Clova Note and manually corrected the incorrect transcriptions. We analyzed around 4 hours of transcripts, which only included the solution design parts, using thematic analysis [7]. Participants' notes written on Miro were documented in Google docs. We first tried to separate chunks of each design solution and then generated high-level themes by grouping them with open coding [15]. Two authors went through the coding process together and reached an agreement. The quoted statements in this paper were translated into English. The workshop sessions lasted for 112.25 minutes on average (min = 102, max = 117 minutes).

7 HOW TO DESIGN A CREATOR-FRIENDLY ALGORITHMIC PLATFORM

We organized the findings from the workshop into three high-level themes, categorized by the purpose of the design solutions. Then, based on the findings, we present a design scenario that covers multiple design solutions following the creative cycle of YouTube creators.

7.1 Design Suggestions from Participatory Design Workshop

Each creator chose the two most important challenges related to their algorithmic experience in the creative process. Interestingly, participants from workshop 3 added a new challenge, 'hard to know how the algorithm works' from a higher-level perspective.

With the help of the UX of AI researchers, participants expanded their ideas to develop potential system features or ideas for third-party applications. Through analysis of the workshop data, we discovered three major categories of user values: 1) strengthening authority and agency of creators, 2) encouraging creator-algorithm collaboration, and 3) diversifying recommendation strategies. The challenges and solution ideas used in each session are shown in Table 4.

Workshop session	Challenges	Solution ideas
Workshop 1	- Feeling stressed about comparing themselves with others - Difficult to create what they want	- Making tighter connections with other creators (Section 7.1.3) - Communicating their multiple identities to the algorithm (Section 7.1.1)
Workshop 2	- Difficult to cover diverse topics in one's channel - High effort and time, low return	- Inspiring creators with topic suggestions (Section 7.1.2) - Qualitative evaluation of creators' effort (Section 7.1.3)
Workshop 3	- Hard to know how the algorithm works - Difficult to create what they want	- Running ad-hoc evaluation with their own content (Section 7.1.1) - Providing adaptive scaffolding (Section 7.1.2) - Suggesting thumbnail designs (Section 7.1.2) - Supporting new and experimental attempt (Section 7.1.1)
Workshop 4	- Difficult to prepare or predict the algorithmic effect - Difficult to focus on creating high-quality contents	- Providing adaptive scaffolding (Section 7.1.2) - Promise the definite recommendation (Section 7.1.3)

Table 4. Challenges and solution ideas from each workshop session.

7.1.1 *Strengthening authority and agency of creators.*

Communicating multiple identities to the algorithm. To overcome difficulties in creating what they want, participants mentioned that it is easy to lose their channel identity, either by caring too much about the algorithm or being wrongly recognized by the algorithm. W1C2 mentioned that he would like to straightforwardly convey channel's identity to the algorithm by submitting specific keywords or video categories. For example, he usually uploads videos as a 'classical musician,' but he sometimes composes his own songs and is a 'singer-songwriter.' Thus, like updating one's Instagram profile, he would like to indicate which identity he wants to pursue and what kind of content he wants to focus on so that the algorithm can regard it in the promotion. Similar to managing multiple accounts on a single social media (e.g., Twitter), depending on creators' identity expressions, changing the channel characteristics and recommendation methods would be an interesting approach.

Supporting new and experimental attempts. Many participants were eager to make diverse and new content, often in an artistic and creative manner. To alleviate difficulties when making new trials, participants wanted the algorithm to support their experimental attempts by guaranteeing performance or rewards. W3C9 suggested a specific UI example, "If creators upload a new type of content, I think the algorithm 'must' expose it in a separate section, such as the current "Discover New" section." Participants expected that, with the increased exposure, they could have a higher chance to achieve better performance and be incentivized to produce more creative content.

Running an ad-hoc evaluation with their own content. Participants agreed that they no longer want to rely on their uninformed assumptions, folk theories, or imaginaries when interpreting algorithmic behavior. Rather, they expressed that they would like to make objective and informed decisions based on concrete evidence. To overcome the challenges related to algorithmic uncertainty, W3C8 suggested the idea of the 'algorithm test board,' where creators can simulate their video before their upload with the up-to-date version of the algorithm. Participants even showed a willingness to pay for such features. W3C9 also proposed that getting early-stage feedback right after uploading would be helpful. By getting simple analytics on and predicting the performance by comparing it with their previous content, participants can get a sense of how to achieve early reactions from the audience and high performances in their channel, comparing their own video results.

7.1.2 *Encouraging creator-algorithm collaboration.*

Providing adaptive scaffolding. Depending on the purpose of creation, creators might need different instructions and guidelines. In workshops 3 and 4, participants derived similar solution ideas to take personalized suggestions appropriate for their status. W3C9 imagined it as 'completing a game quest' about getting personalized action items to improve their channel performance. After completing each quest, creators can get another guidance to continue their creative work to achieve better performance. Participants in workshop 3 generated a short example scenario together: the algorithm can explicitly say, 'The reason why your video is not getting popular is due to the length of the video.' Then, creators can shorten the length of the video. If they gain more popularity, the algorithm can proactively suggest the next step, like 'I think your thumbnail could be more vibrant and colorful.' Getting personalized instructions and guidance based on each creator's context would make creators perceive the algorithm as more friendly, considerate, and cooperative. Furthermore, it could be an actual reason for choosing a specific creator economy platform to work on.

Inspiring creators. What if the algorithm inspires the creators? Participants from workshop 2 suggested an idea to support the planning stage. W2C5 proposed that the algorithm recommend potential video topics. He thought that he could not break away from his category (classical music), where the topic seems to be limited to covering popular songs. Thus, he wants to get potential topic suggestions from the algorithm like 'Why don't you lie down and play the violin? Can you play with your eyes closed?'. He would like to see whether producing videos with the suggested topic would reward him with an algorithmic blessing. Participants also wanted to take the design suggestions within the video production. For instance, W3C9 mentioned that algorithms could participate in their creative process, such as generating and suggesting thumbnails. When a creator submits their video, YouTube's third-party app can co-create the thumbnail and title with them. Participants thought that as official platforms have enough information about the algorithm, they would be happy to follow the instruction for their creative product.

7.1.3 *Diversifying recommendation strategies.*

Making tighter connections with other creators. Participants felt stressed about the competitive atmosphere on YouTube. To mitigate the competitive atmosphere, participants from workshop 1 proposed controlling the algorithm of the suggested video. W1C2 said, "Currently, the suggested video, which auto-plays after the watched video, feels like it

is recommended randomly based on YouTube's algorithm. Can we decide on the suggested video which comes after our video? " However, the facilitator suggested provoking questions, "What if the creators pay each other money to appear in someone's next video? Would it be fair and transparent?" W1C2 revised her idea that the algorithm can initially provide the candidates of the suggested video, and then the creator can choose one video by themselves— which could be seen as creator-algorithm collaboration. She expected that recommending another creator's video after her video could make creators feel like they are 'working together' and not competing with each other.

Qualitative evaluation of creators' effort. In workshop 2, participants insisted that the qualitative evaluation of videos is required. Participants believed that the current algorithm mostly works with quantifiable measures, such as view counts, likes, audience retention, etc, so algorithm should analyze and judge how much effort and time creators put into making a video. They devised idea that the effort could be measured by the number of cameras and angles, the degree of advanced video editing, the usage of background music, etc. It is expected that the algorithm could more widely spread videos of high effort to many viewers. However, W2C4 disagreed with this idea, given that judging by these features could be more beneficial to already famous creators with big budgets: "To be fair, the algorithm should consider differences between the creator who belongs to the agency and who is working alone, as their resources and the output of creation would inevitably be different." She suggested an alternative way of measuring the effort: "Uploading multiple videos is not about the quality or length of the video, it shows how hard you worked. If newly starting or not-so-famous creators upload, for example, 20 videos, maybe 10th or 20th videos could be recommended to viewers, with higher impact than other videos." Similarly, participants in workshop 4 introduced that a definite recommendation of at least one representative video, which shows the originality and authenticity of that channel, would be rewarding to the creators.

7.2 Design Scenario

Liz has been working as a climbing YouTuber for more than 3 years. She usually uploads indoor rock climbing videos and explains her climbing tips to her viewers. One day, Liz wants to try new content to expand her channel domain as 'lifestyle.' Thus, she clicks the "Getting Inspired!" button in her YouTube Studio to get recommendations on her new topic. This feature analyzes her previous work and performance and suggests three different topics to activate a positive impact of the algorithm. Several keywords appear on the interface and she chooses the topic of 'fashion.' Specific suggestion, 'Why don't you share your ootd?' (*Inspiring creators*)

Liz shares her weekly outfit before climbing and also interviews several people nearby her so that novices can refer to what to wear when they go indoor climbing. Then, she uses a third-party app provided by YouTube to generate an impressive thumbnail for her. As she produces a new type of video, the platform promises to expose her video in "Discover new." (*Supporting new and experimental attempts.*)

Liz is ready to upload a new video, '#Cootd: Climbing outfit of the day.' At the end of the video upload settings and configurations, the algorithm suggests four video candidates that will potentially be recommended as the 'next autoplay video.' Liz chooses a video by creator James, who has a similar topic to her uploaded video. James notices that his video is recommended by Liz as the 'next autoplay video.' Through this feature, James will get new subscribers who stumbled onto his video after watching Liz's. They do not know each other, but James feels like he got help from Liz and the algorithm to be exposed to a broader audience. (*Making tighter connections with other creators*)

With the support of creator-friendly algorithmic features, Liz finally reached 10,000 subscribers. The platform sent an email with a congratulatory message and asked, 'What is your next goal?' through a pop-up window. More than 70% of her subscribers are women in their 20s and 30s, so she wants to expand her viewership. She sets her goal to 'Increase

the number of male subscribers' and submits it. After that, she gets another email about how to achieve her goals — the 2030s male audience like to watch soccer and e-sports videos. Furthermore, their retention period suddenly decreases when the video length exceeds 3 minutes. Based on those analyses about targeting the audience, Liz could plan for her following content for the male audience. (*Providing adaptive scaffolding*)

8 DISCUSSION

In this section, we first discuss the folk theorization process that we explored in creative economy platforms by comparing to existing work. Based on workshop experiences, we share lessons from conducting participatory design methods with creators. In the end, we try to connect the design suggestions to the existing practices of content-sharing platforms.

8.1 Folk theories in creative economy platform

We explored folk theories behind the creator's work strategies in the context of the creative economy platform in Study 1. Previously, Wu et al. explored YouTube creators' algorithmic perceptions, categorizing them into three personas [64] and examining how these personas prompted them to work with or against the algorithm. Yet, they underexplored the motivations and reasons behind creators' behaviors. Similar to Wu et al.'s work, we observed that creators chose their behaviors between working with or against the algorithm.

Compared with Wu et al.'s work, we discovered a novel motivation behind working against the algorithm. Even though the algorithms positively impact creators, it is not always seen as positive. Not all creators wanted algorithmic impact, and they even perceived it as 'unwanted rewards,' thinking that it was not helpful in the end. Creators tend to dislike the algorithm to bless their channel due to the discontinuity of algorithmic impact, which randomly comes and goes. As a creator, they want to independently plan and manage their expected performance and creative work, which usually hindered by the algorithm.

What we further discovered was how creators choose their work strategies, as shown in the creative decision-making cycle (Fig. 1). Furthermore, our findings also demonstrate that creators' behaviors and folk theories iteratively evolved through the creative decision-making cycle. We emphasize that creators' decisions in the cycle are highly interconnected with the algorithmic interactions and the folk theorization process. Compared to existing folk theorization processes in social media, such as proposed by DeVito et al. [21], our work proposes that the creative process becomes a part of folk-theorization. In both of these cases, the goal of forming folk theories is similar: they try to express creativity or self identity on the platform. However, the significance of leveraging folk theories might differ; creators from our study tend to be more sensitive than social media users toward the algorithm as they earn revenues according to how the algorithm works and shares their content on the platform. Therefore, we claim that our cycle can provide additional insights and contexts in terms of how creators 'create,' as well as how users interpret and respond to the algorithm.

8.2 Lessons from conducting participatory design with creators

Applying Participatory Design (PD) to design algorithmic experiences has been increasingly popular in the HCI community [19, 37, 70], as it allows researchers to gain insights into the needs and motivations of stakeholders with diverse backgrounds [72]. We found that two methodological supports were essential in scaffolding PD for the study: 1) providing clear guidance to facilitators and 2) materials assisting participants in motivating and supporting their knowledge gap. We highlight how algorithmic platforms could be designed by hearing opinions from creators.

First, we invited UX of AI researchers to facilitate the workshop sessions. The facilitators helped participants by prompting questions on technical aspects (e.g., explainability, transparency, controllability, etc.) and real-world examples. To assist this process, we provided a sample set of questions that covered potential follow-up questions to specify designs suggested by participants. Thanks to the facilitators' help, participants were able to better understand the algorithmic concept, and expand their design solutions.

Second, we provided two materials driven by interviews; challenge prompts (Appendix A.1) and algorithmic hashtags (Appendix A.2). Challenge prompts were grouped by creator-specific values, inspired by value-sensitive design method [66, 70, 71], which helped participants to empathize the problem space in a short time. We intentionally generated algorithmic hashtags with the word used in interviews to reflect creators' perspective—using simple terms like *inconsiderate and uncooperative* rather than more technical terms such as opaque and random. This enabled participants to have similar level of knowledge between themselves.

By conducting multiple participatory design workshop sessions, we learned that concrete structural support is needed to guide domain experts in developing detailed solutions. We expect these lessons can be applied to PD with multiple domain experts, who are stakeholders around the creative economy platform, such as advertisers, viewers, and industry practitioners who have high interests but have limited technical knowledge.

8.3 How to design a responsible, creative-friendly algorithmic platform?

In our workshop, parcitipants could successfully derive design suggestions to improve the existing algorithmic platforms. Based on writing a design scenario, we wonder what kind of design considerations should be done with those design suggestions and connect them to real-world applications.

First, participants wanted recognition on their new and genuine contents through methods such as qualitative evaluation of content complexity, commitment or sincerity. This needs should be reflected from the real world, where the replication and commentary videos are pervasive in the platform. Still, consideration of content genuineness might not benefit all creators — where the quality and originality of contents could be a mere representation of available resources of creators, which would consequently penalize independent creators. Then is this truly 'fair'? Sette et al. defined creativity nature or digital influencers, and they newly added 'originality' on top of four dimensions of creativity, including motivation, novelty and distinctiveness, knowledge, and personality [52]. In April 2022, Instagram publicly announced that they will update its algorithm to support content creators, adding new features to improve the ranking for original contents. However, it is still uncertain how Instagram will prioritize original content [47]. Along with the surge of creative economy, protecting one's creative values, such as originality and novelty, will become more important.

Second, participants are highly interested in knowing their audiences, such as "getting information about my target audience's preference and interests" and "communicating multiple identities to the algorithm." By providing new analytics features focusing on potential audience interests, creators would get hints on what kind of contents they should make to satisfy their audience. This kind of needs can be interpreted in two ways: (1) identifying audience with algorithm or (2) ignoring the algorithm but focusing on audience's interest. It could be a good ways to ignore the algorithmic impact, but focusing on what they want to create. Similar to our design suggestion, YouTube is seeking new ways to assist creators to be aware of potential topics of interests for their audience. Recently, they updated analytics tools for their creators. According to a senior project manager in Youtube, 80% of creators in the experiment were satisfied with the tool [26]. Still, there remains the potential conflicts between creating content their target audience desires versus, what they really want to produce.

By observing recent movements of giant creative economy platforms, we could figure out that real-world algorithmic platforms are interested in improving their platforms as more creator-supportive. We envision that investigating the design factors of creator-friendly algorithmic platforms should be more widely studied, and that platforms should carefully consider unintended consequences for other stakeholders.

9 LIMITATIONS

We acknowledge several limitations of the current study. First, participants could have been biased since all participants are Korean. This sample selection might not identify challenges that creators in other cultures. In their statements, there were challenges that might be caused by localized channels, but they were not related to what our study intended. Algorithm challenges and perception towards algorithm were also prevalent to our participants. In the exploratory research, we found that South Korea-based creators also shared their opinions about algorithms through Korea based community (KTUBE), which is similar with YouTube creators sharing their thoughts about algorithm on reddit. Furthermore, Google provide same description about algorithm for creators.

Second, in Study 2, grouping dynamics for workshops could have affected creators to devise solutions. If we grouped session members who work in similar categories with each other, they might have provided much more concrete solutions. We were guided by Lin et al. [40]'s work reporting that grouping people from different perspectives was effective in idea generation. To our knowledge, our study is the first exploration of creator economy algorithmic platform design, so we aimed to provoke diverse solutions in this study.

Also, UX of AI researchers assisting thought process might have affected the role. The facilitators participated in generating solutions with participants, so some thought that the facilitators have might have affected participants. To avoide such a problem, we conducted pre-training sessions with facilitators.

Lastly, we limited the scope of our study to YouTube and YouTube creators. The reported findings and challenges might not generalize to other creator-economy platforms focusing on live-streaming and image-based content. Future research is necessary to examine the wider purview of creator economy platforms.

10 CONCLUSION

Our research explored how algorithmic platforms could be designed to be more creator-friendly, in the context of YouTube. We first examined how unfriendly the platform is for creators, by investigating creators' work strategies regarding its recommendation algorithm and the challenges driven by the algorithm. Through semi-structured interviews, we observed that creators show different work strategies— work with and work against — based on their expectations and perceptions. We explored algorithm-driven challenges in three cases: when deciding on their work strategies, after getting the performance results on their content, and after repeatedly experiencing negative aspects of the algorithm. With associated challenges, we conducted a participatory design workshop and derived directions to achieve creator-friendly algorithmic platforms. Creators wanted to design an algorithmic platform where they could strengthen their agency, collaborate with the algorithm, and diversify their recommendation strategies. Our findings suggest that the platforms consider creators in the design of algorithmic platforms and provide a more friendly environment to continue their creative activities in the creative economy platform.

REFERENCES

[1] Teresa M Amabile. 1985. Motivation and creativity: Effects of motivational orientation on creative writers. *Journal of personality and social psychology* 48, 2 (1985), 393.

[2] Jack Bandy and Nicholas Diakopoulos. 2020. TulsaFlop: A Case Study of Algorithmically-Influenced Collective Action on TikTok. https://doi.org/10.48550/ARXIV.2012.07716

[3] Matt Binderm. 2021. YouTube rolls out new content-specific creator analytics for YouTube Shorts, livestreams. https://mashable.com/article/youtube-content-specific-analytics

[4] Sophie Bishop. 2018. Anxiety, panic and self-optimization: Inequalities and the YouTube algorithm. *Convergence* 24, 1 (2018), 69–84.

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

[6] Sophie Bishop. 2020. Algorithmic experts: Selling algorithmic lore on YouTube. *Social Media+ Society* 6, 1 (2020), 2056305119897323.

[7] Virginia Braun and Victoria Clarke. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3, 2 (2006), 77–101. https://doi.org/10.1191/1478088706qp063oa arXiv:https://www.tandfonline.com/doi/pdf/10.1191/1478088706qp063oa

[8] Taina Bucher. 2017. The algorithmic imaginary: exploring the ordinary affects of Facebook algorithms. *Information, communication & society* 20, 1 (2017), 30–44.

[9] Taina Bucher and Anne Helmond. 2017. The affordances of social media platforms. (2017).

[10] Jenna Burrell, Zoe Kahn, Anne Jonas, and Daniel Griffin. 2019. When users control the algorithms: values expressed in practices on twitter. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–20.

[11] Lindsey Cameron, Angele Christin, Michael Ann DeVito, Tawanna R. Dillahunt, Madeleine Elish, Mary Gray, Rida Qadri, Noopur Raval, Melissa Valentine, and Elizabeth Anne Watkins. 2021. "This Seems to Work": Designing Technological Systems with The Algorithmic Imaginations of Those Who Labor. In *Extended abstracts of the 2021 CHI conference on human factors in computing systems*. 1–5.

[12] Juan Carlos Alvarez de la Vega, Marta E. Cecchinato, and John Rooksby. 2021. "Why lose control?" A Study of Freelancers' Experiences with Gig Economy Platforms. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–14.

[13] Florian Cech. 2021. Tackling Algorithmic Transparency in Communal Energy Accounting through Participatory Design. In *C&T'21: Proceedings of the 10th International Conference on Communities & Technologies-Wicked Problems in the Age of Tech*. 258–268.

[14] Barrie L Cooper, Pamela Clasen, Dora E Silva-Jalonen, and Mark C Butler. 1999. Creative performance on anin-basket exercise: Effects of inoculation againstextrinsic reward. *Journal of Managerial Psychology* (1999).

[15] Juliet Corbin and Anselm Strauss. 2014. *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Sage publications.

[16] Kelley Cotter. 2019. Playing the visibility game: How digital influencers and algorithms negotiate influence on Instagram. *New Media & Society* 21, 4 (2019), 895–913.

[17] Stuart Cunningham and David Craig. 2019. *Social media entertainment*. New York University Press.

[18] Stuart Cunningham, David Craig, and Jon Silver. 2016. YouTube, multichannel networks and the accelerated evolution of the new screen ecology. *Convergence* 22, 4 (2016), 376–391.

[19] Fernando Delgado, Solon Barocas, and Karen Levy. 2022. An Uncommon Task: Participatory Design in Legal AI. *Proceedings of the ACM on Human-Computer Interaction* 6, CSCW1 (2022), 1–23.

[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*. 1–12.

[21] 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* (Montreal QC, Canada) *(CHI '18)*. Association for Computing Machinery, New York, NY, USA, 1–12. https://doi.org/10.1145/3173574.3173694

[22] 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*. 3163–3174.

[23] Emory James Edwards and Tom Boellstorff. 2021. Migration, non-use, and the 'Tumblrpocalypse': Towards a unified theory of digital exodus. *Media, Culture & Society* 43, 3 (2021), 582–592.

[24] 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*. 2371–2382.

[25] Kristy Beers Fägersten. 2017. The role of swearing in creating an online persona: The case of YouTuber PewDiePie. *Discourse, context & media* 18 (2017), 1–10.

[26] Brian Frederick. 2022. YouTube experimenting with new features for Analytics Research Tab. https://www.searchenginejournal.com/youtube-experimenting-with-new-features-for-analytics-research-tab/464041/

[27] Megan French and Jeff Hancock. 2017. What's the folk theory? Reasoning about cyber-social systems. *Reasoning About Cyber-Social Systems (February 2, 2017)* (2017).

[28] Laura M Herman. 2021. Remixing, Seeing, and Curating: Algorithmsâ€™ Influence on Human Creativity. In *Creativity and Cognition*. 1–4.

[29] CB Insights. 2021. The creator economy explained: How companies are transforming the self-monetization boom. https://www.cbinsights.com/research/report/what-is-the-creator-economy/

[30] Shagun Jhaver, Yoni Karpfen, and Judd Antin. 2018. Algorithmic anxiety and coping strategies of Airbnb hosts. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. 1–12.

[31] 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 (2021), 1–44.

[32] Jacob Kastrenakes. 2021. YouTube creators can now get $10,000 per month for making Shorts. https://www.theverge.com/2021/8/3/22606291/youtube-shorts-fund-launches-100-million

[33] Jin Kim. 2012. The institutionalization of YouTube: From user-generated content to professionally generated content. *Media, culture & society* 34, 1 (2012), 53–67.

[34] 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*. 84–92.

[35] Susanne Kopf. 2020. "Rewarding Good Creators": Corporate Social Media Discourse on Monetization Schemes for Content Creators. *Social Media+ Society* 6, 4 (2020), 2056305120969877.

[36] Sangeet Kumar. 2019. The algorithmic dance: YouTube's Adpocalypse and the gatekeeping of cultural content on digital platforms. *Internet Policy Review* 8, 2 (2019), 1–21.

[37] Min Kyung Lee, Daniel Kusbit, Anson Kahng, Ji Tae Kim, Xinran Yuan, Allissa Chan, Daniel See, Ritesh Noothigattu, Siheon Lee, Alexandros Psomas, et al. 2019. WeBuildAI: Participatory framework for algorithmic governance. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–35.

[38] Min Kyung Lee, Daniel Kusbit, Evan Metsky, and Laura Dabbish. 2015. Working with machines: The impact of algorithmic and data-driven management on human workers. In *Proceedings of the 33rd annual ACM conference on human factors in computing systems*. 1603–1612.

[39] Frederike Lichtenstein. 2017. Is Vidme the 'NewTube'? Why video creators are changing sides and how they feel about it. *Masters of Media* (2017).

[40] Phoebe Lin and Jessica Van Brummelen. 2021. Engaging teachers to Co-design integrated AI curriculum for K-12 classrooms. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–12.

[41] Renkai Ma and Yubo Kou. 2021. "How advertiser-friendly is my video?": YouTuber's Socioeconomic Interactions with Algorithmic Content Moderation. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (2021), 1–25.

[42] Phoebe Maares, Sandra Banjac, and Folker Hanusch. 2021. The labour of visual authenticity on social media: Exploring producers' and audiences' perceptions on Instagram. *Poetics* 84 (2021), 101502.

[43] Jessica Maddox. 2021. What do creators and viewers owe each other? Microcelebrity, reciprocity, and transactional tingles in the ASMR YouTube community. *First Monday* (2021).

[44] Stephanie McNeal. 2022. Workers demand gig economy companies explain their algorithms. https://www.buzzfeednews.com/article/stephaniemcneal/youtube-mcbrooms-quitting-david-dobrik

[45] Jeanne Nakamura and Mihaly Csikszentmihalyi. 2001. Catalytic creativity: The case of Linus Pauling. *American Psychologist* 56, 4 (2001), 337.

[46] Victoria O'Meara. 2019. Weapons of the chic: Instagram influencer engagement pods as practices of resistance to Instagram platform labor. *Social Media+ Society* 5, 4 (2019), 2056305119879671.

[47] Praneeth Palli. 2022. Instagram is tweaking its algorithm for original content creators. https://in.mashable.com/tech/30551/instagram-is-tweaking-its-algorithm-for-original-content-creators

[48] Emily Pedersen. 2019. My videos are at the mercy of the YouTube algorithm": How content creators craft algorithmic personas and perceive the algorithm that dictates their work. *Technical Report No. UCB/EECS-2019-48* (2019), 01.

[49] Aaron Pressman and Danielle Abril. 2021. YouTube creator economy flourishes with $30 billion payments. https://fortune.com/2021/06/02/youtube-creator-economy-advertising-revenue-war-for-talent-yt-influencers/

[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*. 173–182.

[51] Elizabeth B-N Sanders and Pieter Jan Stappers. 2012. *Convivial toolbox: Generative research for the front end of design*. Bis.

[52] Guilherme Sette and Pedro Quelhas Brito. 2020. To what extent are digital influencers creative? *Creativity and Innovation Management* 29 (2020), 90–102.

[53] Tanusree Sharma, Zhixuan Zhou, Yun Huang, and Yang Wang. 2022. " It's A Blessing and A Curse": Unpacking Creators' Practices with Non-Fungible Tokens (NFTs) and Their Communities. *arXiv preprint arXiv:2201.13233* (2022).

[54] Beth Singler. 2020. "Blessed by the algorithm": Theistic conceptions of artificial intelligence in online discourse. *AI & society* 35, 4 (2020), 945–955.

[55] Chris Stokel-Walker. 2018. Why YouTubers are feeling the burn. https://www.theguardian.com/technology/2018/aug/12/youtubers-feeling-burn-video-stars-crumbling-under-pressure-of-producing-new-content

[56] TechPostPlus. 2022. YouTube video categories List (complete guide). https://techpostplus.com/youtube-video-categories-list-faqs-and-solutions/

[57] Anna M Turri, Karen H Smith, and Elyria Kemp. 2013. Developing affective brand commitment through social media. *Journal of Electronic Commerce Research* 14, 3 (2013).

[58] Kristen Vaccaro, Ziang Xiao, Kevin Hamilton, and Karrie Karahalios. 2021. Contestability For Content Moderation. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (2021), 1–28.

[59] José Van Dijck. 2013. *The culture of connectivity: A critical history of social media*. Oxford University Press.

[60] Chetan Walia. 2019. A dynamic definition of creativity. *Creativity Research Journal* 31, 3 (2019), 237–247.

[61] Xiaoren Wang. 2021. YouTube Creativity and the Regulator's Dilemma: An Assessment of Factors Shaping Creative Production on Video-Sharing Platforms. *Alb. LJ Sci. & Tech.* 32 (2021), 197.

[62] Philip Weber, Thomas Ludwig, Sabrina Brodesser, and Laura Grönewald. 2021. "It's a Kind of Art!": Understanding Food Influencers as Influential Content Creators. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–14.

[63] Rachel Wood. 2021. 'What I'm not gonna buy': Algorithmic culture jamming and anti-consumer politics on YouTube. *New Media & Society* 23, 9 (2021), 2754–2772. https://doi.org/10.1177/1461444820939446
[64] Eva Yiwei Wu, Emily Pedersen, and Niloufar Salehi. 2019. Agent, gatekeeper, drug dealer: How content creators craft algorithmic personas. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–27.
[65] Young Entrepreneur Council (YEC) Yec. 2022. Make the most of the creator economy. https://www.forbes.com/sites/theyec/2022/07/18/make-the-most-of-the-creator-economy/?sh=7565921916e9
[66] Daisy Yoo, Alina Huldtgren, Jill Palzkill Woelfer, David G Hendry, and Batya Friedman. 2013. A value sensitive action-reflection model: evolving a co-design space with stakeholder and designer prompts. In *Proceedings of the SIGCHI conference on human factors in computing systems*. 419–428.
[67] YouTube. Online; Accessed: 2022-09-12. YouTube Partner Program overview eligibility. https://support.google.com/youtube/answer/72851?hl=en.
[68] YouTube. Online; Accessed: 2022-09-14. YouTube channel monetization policies. https://support.google.com/youtube/answer/1311392?hl=en.
[69] Brita Ytre-Arne and Hallvard Moe. 2021. Folk theories of algorithms: Understanding digital irritation. *Media, Culture & Society* 43, 5 (2021), 807–824.
[70] Angie Zhang, Alexander Boltz, Chun Wei Wang, and Min Kyung Lee. 2022. Algorithmic management reimagined for workers and by workers: Centering worker well-being in gig work. In *CHI Conference on Human Factors in Computing Systems*. 1–20.
[71] Haiyi Zhu, Bowen Yu, Aaron Halfaker, and Loren Terveen. 2018. Value-sensitive algorithm design: Method, case study, and lessons. *Proceedings of the ACM on human-computer interaction* 2, CSCW (2018), 1–23.
[72] Douglas Zytko, Pamela J. Wisniewski, Shion Guha, Eric PS Baumer, and Min Kyung Lee. 2022. Participatory Design of AI Systems: Opportunities and Challenges Across Diverse Users, Relationships, and Application Domains. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts*. 1–4.

A APPENDIX

A.1 Challenge cards

Creator's value	Category of challenges	Quotations (Participants)
Financial benefit	High effort and time, low return	"Even if you put in more time and effort, they [the algorithm] does not promise good rewards." (P1)
	Economic instability as being of full-time creators	"As being a full-time YouTuber, the only way to earn life income is gaining high view counts with the support of the algorithm. Thus, I becomre more and more sensitive and conscious of the algorithm." (P10)
Motivation	Difficult to feel accomplishment	"While I'm busy for my real life, I yet tried my best — such as creating videos that are likely to be chosen by the algorithm, and increasing the quality of video — to please the algorithm. However, I could not get the algorithmic effect, which made me difficult to feel accomplishment." (P12)
	Feeling continuous anxiety	"Since I don't know anything, I just keep creating videos in the dark cave, waiting for the algorithm to push my video." (P10)
	Feeling stressed about comparing themselves with others	"Many other YouTubers are getting popular by [riding] the algorithm, so it is easy to pay too much attention to the algorithm. However, if the algorithm does not choose the content, creators might give up on creating content by losing their motivation." (P14)

Content creation	Difficult to cover diverse topics in one's channel	"The algorithm does not show my contents that I think is novel. Although I feel satisfied to create such useful and necessary contents, I felt disappointed when the view counts are too low with respect to my efforts." (P9)
	Difficult to make new trials	"It was difficult to decide categories and identity of channels to make it more exposed. So I just couldn't create a new channel." (P14)
	Difficult to focus on creating high quality contents	"'I've been thinking provocative contents and topics that the algorithm would expose more. It makes me less motivated to create quality contents" (P10)
	Difficult to establish strategies	"I feel lost when I was confused if I should change the way we create contents or the way we consider the algorithm "(P10)
Planning	Difficult to prepare or predict the algorithmic effect	"We created our recent two videos by referring to popular videos to have more exposure. But it wasn't really successful." (P12)
	Difficult to do posthoc analysis	"I couldn't guess why that video gets boosted [by the algorithm]. Even, the sudden increase of subscribers and view counts happened after more than a year when I uploaded that video." (P4)
Identity	Difficult to create what they want	"Before getting the algorithmic blessing, I uploaded some ordinary videos like diary. But after the blessing, I try to upload videos that I think viewers want to watch. That makes me upload more fun and interesting ones, editing some ordinary scenes" (P12)
	Too many similar contents	"Within the same category, everyone uses the same sources (e.g., background music) and the same format. Only the slight difference in the direction between creators makes the contents standardized and become uniform." (P11)
Performance, Success	Difficult to settle as a creator	"My goal is to achieve 100 thousand subscribers on my channel. In fact, it would be impossible without the support of an algorithm." (P12)
	Difficult to affect the performance of each content (short-term effect)	"When I create the same video with some popular video, sometimes I get the algorithmic effect together so that it exceeds a million views. Otherwise, it shows similar performance as normal. It seems like a fortune." (P11)

	Difficult to affect the success of overall channel (long-term effect)	"These days, every channel has its own keyword. My channel's keyword, beauty, has been distracted as the algorithm kept choosing videos of my pet. As a result, the following videos of cosmetic reviews and make-up tutorials are not showing their best performances due to losing the keyword of the channel." (P4)
Audience	Potentially share the video to unspecified majority	"When starting my channel, I didn't feel burdensome as I didn't have many viewers and it was just for fun. But as I get more viewers by the algorithm, I realized I need to be careful in my speaking." (P6)
	Barely share the video to target viewers	"I was hoping to make our videos exposed to viewers who have a good fit our channel, which could make a place of communication betwee such viewers. However, I don't think our videos have been exposed to such viewers." (P13)
	Difficult to predict how the viewers access the video	"We suddenly got many subscribers not because of beauty but because of hamsters. That was like I wanted to share my daily life in addition to beauty, so I uploaded a video with hamsters. It had many view counts, and I got 100K subscribers probably by algorithmic blessing." (P4)
Platform	Filter bubble	"I kind of think it becomes more difficult to look for information to have more balanced view as the media like online news shows part of information." (P10)
	Provided with limited information	"There's not enough information about exploration features. My analytics show high incoming portions by searching, so I think we can get more view counts by improving that part. But I'm not sure what the exploration is." (P10)
	Unfair ecosystem	"I think everyone needs to have equal opportunities to be popular if they keep uploading quality contents. However, I feel this system doesn't give equal opportunities for those who have been active for a long time " (P4)

Labor	Hard to take enough rest	"There are many YouTubers who are not in a good health condition as they cannot properly sleep and just work too much. It's actually not true to get algorithmic blessing when you're not working. I wasn't really active when beauty industry in general had a hard time due to COVID-19, and I no longer get such algorithmic blessing after that." (P5)

Table 5. Challenge cards that were written from the creator's perspective for activity 1 of the workshop. The cards illustrate nine categories of creator-specific values with the related challenges and the participants' interview responses derived from study 1.

A.2 Algorithmic hashtags

Algorithmic perception	Quotations (Participants)
Uncooperative	"I'm not sure whether YouTube is an appropriate platform to continue my creative job. I sometimes want to give a serious message or want to grow as an artist, but the algorithm does not seem to respect me in that sense." (P10)
Favoritism	P1 was frustrated as he learned that the algorithm seemed to mostly favor contents that are addictive and entertaining, not like the educational content on his channel. He complained that he appeared to have better quality content and made more efforts than other channels but got less opportunity to be blessed by the algorithm.
Authoritarian	Contents creators are freelancers and earn as much money as they can. However, several participants (P5, P11, P12, P13) thought they were working under a boss, algorithm. They thought of themselves as subordinates, and the boss dominated them. The boss doesn't acknowledge their work reasonably, and they are also forceful in producing content even though it is unwanted.
Keeping an eye on it	"Like a lover, I'm always curious about the algorithm that 'Where is your heart heading?', 'What are you thinking now?'. Yet, I don't actually try to understand the algorithm 100% and fall it down. We care about our lover's feelings." (P9)
Inconsiderate	"After my video got blessed by the algorithm, I could not reproduce it anymore. It made me to feel that the algorithm is mean." (P2)
Difficult to know	"It would be better to give up on thinking about the algorithm, as it is too complex and abstract. However, I'm unsure whether trying hard to understand and apply it to my creative work would be helpful." (P8)
Malfunctioning	"Thanks to the algorithm, some videos were lucky to be exposed to the top search result. Yet, there are some cases where the low number of viewers converted into subscribers. The algorithm did not recommend the video to the right people." (P7)

Capricious	P7 compared the algorithm to insecure stock that people exhaust; because they cannot take their eyes off it and don't know when it is effective. Like rapidly fluctuating stock markets may give a mental burden to investors, he thought that unstable algorithm changes lower creators' creativity.
Unstable reward	"Recently, my energy has been a little bit off. I was adhering to my own strategies [such as changing thumbnails, choosing topics for algorithm], but there were no rewards from the algorithm." (P5)

Table 6. Algorithmic hashtags for activity 2 of the workshop. The nine hashtags are derived from the perceptions about the algorithm from the study1 results. Participants' specific interview responses are also illustrated in each hashtag.