Curious Users of Casual Creators

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ABSTRACT

Casual creators are a type of design tool identified by Compton & Mateas, characterised by an orientation towards enjoyable, intrinsically motivated creative exploration, rather than task-oriented designer productivity. In our experiments holding rapid game jams with *Wevva*, a casual creator for mobile game design, we have noticed, however, that users seem to vary considerably even within the context of using a casual creator. Some people focus on designing specific games, while others explore the design space extensively, or even focus exclusively on prodding the edges of the design space looking for its possibilities and limits. We hypothesise that the latter group of users is driven primarily by curiosity about a casual creator and its design space. This results in different patterns of behaviour to the former group (of design-oriented users), which may worth characterising and perhaps explicitly designing for.

CCS CONCEPTS

• **General and reference** → **Design**; • **Human-centered computing** → *Interaction design theory, concepts and paradigms*; *Mobile devices*; • **Software and its engineering** → *Interactive games*;

KEYWORDS

casual creator, game design, curiosity, design space

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1 INTRODUCTION

A *casual creator* is defined by Compton & Mateas [8] as "an interactive system that encourages the fast, confident, and pleasurable exploration of a possibility space, resulting in the creation or discovery of surprising new artifacts that bring feelings of pride, ownership, and creativity to the users that make them." Casual creators differ from the majority of creativity-support and design-support tools in that instead of being task-focused, they "prioritize[] the experience of autotelic creativity above productive output".

In ongoing work, we have been researching and developing casual creators for mobile game design, which we call fluidic game designers [7, 17]. These are mobile apps that allow game players, who also serve as the game designers, to explore a parameterised design space rapidly, without coding, and with quick context shifts between mobile game playing and designing.

Two related research questions that arise in designing fluidic game designers are how to construct suitable parameterised design spaces, and how to understand and analyse the ways different users explore those spaces. We recently began tackling the first question, proposing a methodology for constructing parameterised design spaces for casual creators [7]. This methodology consists of an iterative process of expanding a large space followed by contraction and careful re-expansion in tandem with design of the casual-creator interface. In this paper, we take an initial step towards investigating the second question by differentiating a subset of users who appear to use fluidic game designers differently than others. We propose *curiosity* as a concept through which to analyse the way this subset of users approaches design spaces when using casual creators.

In our experiments hosting 1–2 hour rapid game jams with fluidic game designers [10], we have noticed that users approach casual game design in a variety of ways. Some participants use the design apps in a very exploratory way, designing many different games, seemingly motivated primarily by discovering the range of different things they can create (and which things they can't, i.e., where the boundaries of the design space lie). Other participants design in a more focused way, trying to make particular games – which may be predefined – that they find fun, and iterating on their designs more frequently.

Compton & Mateas already position casual creators as being more about design exploration rather than completion of specific artifacts. Our observations suggest that even within the context of casual creators, users vary in a similar way, some being closer to task-focused (albeit still approaching the tasks more casually than professional designers), and others closer to purely explorative. One way of viewing this is as simply a microcosm of the larger split between casual creators and professional design tools. However, that still leaves the question of why users vary in this way even when using a casual-creator rather than design-tool interface, and what implications that might have for designing casual creators.

We develop, and present preliminary evidence for, a hypothesis that the casual-creator users who are closer to being purely explorative are motivated primarily by *curiosity about the casual creator* and/or about the design space that it enables them to explore. Curiosity as a frame for looking at how users approach casual creators may give us more concrete guidance on how to analyse and design for these users' behaviour.

Our preliminary evidence in favor of the hypothesis that curious casual-creator users constitute a distinct usage style comes from two experiments, both of which used the fluidic game designer *Wevva* [19] (see figure 1). We collected informal observations from

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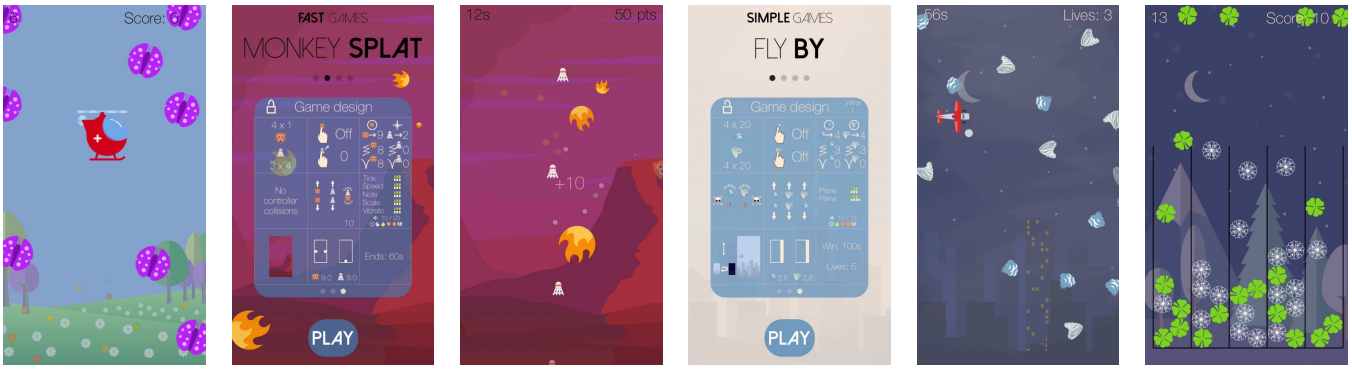

(a) (b) (c) (d) (e) (f)

Figure 1: Screenshots of the Wevva Design app: (a) Wevva game where the controller (helicopter) can be moved by the player (b) Wevva design screen for the game Monkey Splat (c), where the player releases shuttlecocks to shoot down fire (d) Wevva design screen for the game Fly By (e), where the player controls an airplane and has to navigate around hurricanes and clouds (f) Wevva game Let It Snow, is one of the earliest games made with Wevva and requires the player to sort/stack snowflakes and clover leaves. The design interface allows transitioning between all games shown in the figure without programming.

the actions and comments of school-age children who participated in an after-school game design club hosted by Falmouth University at Camborne Science and International Academy. We furthermore undertook a quantitative in-house pilot study with an instrumented version of a fluidic game designer, tracking how users navigate the interface and what kinds of modifications they make. As sources of data, these have obvious strengths and weaknesses. The game-design club is a more natural setting, but our observations were not collected systematically, and participants were aware that they were using a research prototype in development, which might have impacted both their usage of the app and comments to us. The in-house quantitative design study provides concrete data from which we are able to extract details about how patterns in casual-creator usage and design exploration vary, but is relatively small, and participants were all staff members affiliated with the Games Academy (an academic department) at Falmouth University. Nonetheless, we believe that this data is sufficient to establish the plausibility of our hypothesis, and to suggest future research directions.

2 CURIOSITY

Curiosity is often described as a motivational drive to pursue behaviours which are not crucial for immediate survival or as a cognitively induced deprivation of knowledge. The concept of curiosity has been widely studied [4, 5, 15, 16, 18] and due to its influence on the human decision process, it has been a centre of attention in the humanities for centuries.

Our current understanding of what constitutes curiosity originates from what Loewenstein [16] identifies as the previous two waves of intense research on the subject. The first wave, starting in the 1960s, mainly focused on its theoretical construct, causes of curiosity, and curiosity as a motivational drive. The second wave, in the 1970s and 1980s, investigated ways of measuring curiosity and cross-validating scales to support the concept. However, evaluating curiosity proves to be extremely difficult either because physiological measuring techniques were initially not advanced enough or due to complexity of the actual concept and its potential overlaps with related concepts. As part of the first wave, Berlyne [5] provides a two dimensional model that allows for an investigation of exhibited human and animal behaviour. The first dimension of the model spans from perceptual to epistemic curiosity, allowing for behaviour to be classified as either exploration-driven (motivated by novel stimuli) or drnve by the pursuit of knowledge (motivated finding new concepts or ideas). The second dimension spans from specific curiosity – i.e., the focus on a specific piece of information – to diverse curiosity – i.e., seeking novelty and avoiding boredom.

To employ and model curiosity on a computational level, Saunders [20] proposes a model that takes Berlyne's concept as a base and allows the expression of one of the dimensions, namely specific curiosity for robotic agents. In contrast to Saunders' model, Oudeyer in [18] developed a model which could be classified as Berlyne's diverse curiosity – Intelligent Adaptive Curiosity – but is based on [21]. Schmidhuber [21] provides his own definitions of curiosity and boredom from a purely computational perspective. He defines curiosity as a mechanism that drives a predictor to create better models of an environment and boredom as a reinforcement mechanism that provoke mismatches in expectations and results of an adaptive world model. Thereby, Schmidhuber creates a stronger link between curiosity and boredom than Berlyne or Loewenstein who argue that boredom and curiosity are different principles that influence each other but are not necessarily strongly linked. Oudeyer integrates his model, based on Schmidhuber's definition [21], as novelty seeking into an intrinsically motivated drive model utilising perceptual information to adapt its drives. Both Saunders and Oudeyer present computational models that complement each other and support separate parts of Berlyne's theoretical model.

There has been work on designing for *player* curiosity, presented in [14, 22, 23]. This is relevant, since users of fluidic game designers are both players and designers, so their curiosity as players is one aspect of their curiosity in using the apps. However, their curiosity

as designers and their curiosity in exploring design spaces is at least as important in this context; to our knowledge, designing for curiosity of end-user designers has not been studied.

Looking back at the original research on curiosity and the motivations that drive both animals and people to choose certain decisions over others, favouring either exploration or exploitation, we present an approach that investigates a specific iterative decision making process in a complex parametric space, where participants can explore and engage in a self directed manner. The specific task we focus on here is the creation of casual games inside the Wevva fluidic game designer.

3 ALTERNATIVE CONCEPTS

This paper proposes that curiosity-driven users of casual creators behave in noticeably different ways from casual-creator users generally, characterised by an almost purely exploratory orientation. We acknowledge, however, that there are a number of other ways of explaining differences in explorative versus goal-directed behaviour, some of which overlap considerably. For context and comparison, we briefly mention a few alternative concepts here, and relate them to our hypothesis of curiosity-driven casual-creator users.

In psychology, Apter distinguishes between telic and paratelic metamotivational states, a distinction that was developed as part of reversal theory [1, 2]. In the telic state, users are focused on goals, and evaluate actions by how they contribute to those goals; in the paratelic state, users are focused on the actions themselves, leading to more focus on the appeal of the actions and less on their role in planning towards goals.

In human-computer interaction, Hassenzahl [12, 13] distinguishes an action-oriented mode from a goal-oriented mode, and has studied the implications of these modes for user experience (UX) design. In goal-oriented mode, users are attempting to use the interface to make something specific happen: acquire knowledge, order a product, submit a complaint, etc. In action-oriented mode, on the other hand, users are more spontaneous, focusing on exploring an interface and having fun with the experience.

There are also related concepts in game studies, although generally applied to game players rather than game designers. It is possible these may carry over, especially in our fluidic-game setting where players intersperse design and play. The well-known distinction Caillois [6] makes between ludus (a game) and paidia (play) is one example, as is the distinction Barr [3] makes between players who approach a game with a goal orientation versus an exploration orientation.

Both Apter's and Hassenzahl's distinctions relate to the primary distinction Compton & Mateas [8] make between casual creators and other design tools. They describe casual creator users as autotelic and explorative and casual creators themselves as enjoyable to use. In contrast, design-tool users are described as typically task-focused and interested in qualities of the output more than of the design experience.

Curiosity as a concept is compatible with these distinctions, but focuses on a specific hypothesised motivation for engaging in paratelic, action-oriented, playful, or autotelic (depending on your preferred theoretical frame) usage of a casual creator. In our observations from the after-school game-design club mentioned above, a certain subset of students seemed to be motivated primarily by what we'd call curiosity about the app and about design spaces. They were equally as interested in figuring out what the user interface does, what the physics engine does, etc., as they were in expressing themselves creatively or being interested in the actual games produced.

One pair of students, for example, did not even try to make playable games. Instead, they tried to design games where the score would increase as fast as possible without player interaction. This pair spent the majority of one session scouring all the different options available in *Wevva* for any that could help them make the score increase even faster than they had managed to do thus far.

4 QUANTITATIVE STUDY

To better understand how users engage with the design space of fluidic game designers at a concrete level, and to characterise differences in their exploration, we performed an in-house pilot study with nine users using an instrumented version of the *Wevva* app that logs all interface actions and design changes. From the logged data, we analyse both the games produced and the paths users took through the design space. This quantitative data lets us understand more specifically how users differ in their exploration of design spaces; as it is purely observational, logging this exploration does not in itself establish *why* users take the actions that they do, hence cannot establish that some users are motivated by curiosity. It is, however, consistent with that hypothesis, and shows how usage varies in specific ways.

The pilot study took the form of a (roughly) 1-hour game jam, where the main task was to make and share games with the *Wevva* app. Participants were given the open-ended brief of making games that would achieve around 1 hour (or more) of gameplay. Participants were free to choose the target audience of their games (e.g., a particular person, themselves, or a particular demographic), and how to fulfil the brief. This allowed users to either concentrate on the creation of a reasonably large pool of individual artefacts or a single artefact to satisfy the given criteria. Participants were asked to share their games with each other via an asynchronous messaging channel as and when they felt it appropriate. The nine adult participants – all of whom have a professional interest in game design – were chosen to cover a range of different exposures to fluidic game designers, from a complete novice, i.e., someone who had never seen *Wevva* (or any earlier prototypes), to an expert, i.e., the lead developer of the *Wevva* app. Eight participants were on-site, and one participant was remote, and chose to spend 2 hours, rather than 1, on the game jam.

Given the different alternatives for solving the task at hand, the differences in individual backgrounds and the differences in exposure and knowledge of the app, we hoped to trigger the curiosity of some of our participants and observe their approaches. To create games within Wevva, a user can perform different activities, which enable the balancing of parameter space exploration to gain a wider understanding of the app's affordances, with focused experimentation on specific settings to create novel game mechanics. This balance has the potential to relate to the interplay between diverse and specific curiosity.

Participant	1	2	3	4	5	6	7	8	9	min.	av.	max.
Duration (m)	64.1	62.9	62.3	60.6	135.7	61.8	74.9	56.0	65.9	56.0	71.6	135.7
Games played	22.0	23.0	80.0	71.0	70.0	39.0	31.0	68.0	18.0	18.0	46.9	80.0
Av. game duration (s)	51.2	39.6	21.4	17.4	25.2	23.5	47.7	25.2	32.5	17.4	31.5	51.2
Play time (%)	29.3	24.1	45.3	33.9	20.7	24.7	32.9	50.9	14.0	14.0	30.6	50.9
Wins (%)	45.5	34.8	16.2	4.2	22.9	12.8	25.8	10.3	44.4	4.2	24.1	45.5
Losses (%)	13.6	65.2	0.0	2.8	0.0	0.0	6.5	2.9	5.6	0.0	10.7	65.2
Aborts (%)	40.9	0.0	83.8	93.0	77.1	87.2	67.7	86.8	50.0	0.0	65.2	93.0
Games shared	3.0	3.0	6.0	3.0	7.0	2.0	1.0	10.0	5.0	1.0	4.4	10.0
Number of edits	96.0	251.0	212.0	180.0	494.0	193.0	167.0	278.0	145.0	96.0	224.0	494.0
Edit interactions (%)	16.1	27.3	17.7	17.3	26.0	25.1	24.5	24.0	28.0	16.1	22.9	28.0
Edits per minute	2.1	5.3	6.2	4.5	4.6	4.1	3.3	10.1	2.6	2.1	4.8	10.1
Av. edit dist	1.6	2.8	1.5	1.7	4.0	3.2	2.2	2.4	2.1	1.5	2.4	4.0
Coverage (%)	60.0	82.2	75.6	71.1	93.3	82.2	64.4	82.2	66.7	60.0	75.3	93.3

Table 1: Summary statistics from the playing (top half) and making (bottom half) of games in the pilot study. The two participants we hypothesise might be most motivated by curiosity, participants 5 and 6, are highlighted.

Summary statistics from the logging of the participants' sessions is given in table 1, with the following key:

- *Duration:* how long each participant interacted with *Wevva*.
- *Games played:* how many times each participant started playing a game they were making, or which was shared with them by another participant.
- *Average (mean) game duration:* the average length of time for the games played during the session.
- *Play time:* the percentage of the overall app-usage time that each participant spent playing a game.
- *Wins, losses, aborts:* the percentage of games which were won, lost or aborted.
- *Games shared:* the number of games deemed worthy of sharing with the other participants.
- *Number of edits:* the number of times that the design of a game was changed.
- *Edit interactions:* the percentage of non-gameplay interactions (taps/swipes/drags) that resulted in the changing of a game's parameters.
- *Edits/min:* the number of game changes per minute that each participant made.
- *Average (mean) edit distance:* the average number of parameters changed in-between playing of game prototypes (not counting when wholly new games were loaded/ copied/ created).
- *Coverage:* the percentage of the total parameters available that were actually altered at some stage during the session.

We have used the results from this first pilot study to help formulate some questions about the way in which fluidic game designers might be used in rapid game jams. How the app can engage users and whether specific user types exist should be investigated via more detailed future studies. However, even with only 9 participants, we saw a range of different types that users can potentially be clustered under. Those types could also potentially originate from differences in the participants expression of curiosity. In discussion with participants after the pilot study, we noted three quite different types of sessions, as follows:

- Three participants (1, 3 and 8) chose to produce one game with multiple different levels – achieving 3, 6, and 10 levels respectively. They did this by sticking to one major game mechanic throughout the levels, and varying both speed/volume of on-screen game elements complemented by different minor game mechanics to achieve progression through levels. Participant (9) also identified most as being in this category, as they made multiple levels of a game, but also made other games.
- One participant (7) chose to spend the entire session perfecting one game so that it might have achieve higher standalone playing times. The participant was interested in finding a game which would be seen as quite unique with respect to the other games produced in the jam.
- Two participants (5) and (6) used their time to explore as much of the design affordances of *Wevva* as possible. They both produced many prototypes, but participant (5) shared only 2, while participant (6) shared 7. Participant (2) – the novice user with no experience of Wevva – also spent much of their time exploring the space of games available to make, as might be expected. Participant (4) also identified as exploring the space, but often found dead-ends, i.e., where an idea could not be turned into a workable game.

As mentioned as part of our future work below, we hope to be able to predict what kind of session a particular user is engaged in. Studying the results in Table 1, we can propose some metrics that could feature in such predictions. In particular, the two most self-identifyingly explorative participants, namely (5) and (6), had the two highest *coverage* percentages and the two highest *average edit distances*. Moreover, both had lower than average overall *playing times* and higher than average *edit interaction* percentages. This gives some indication – albeit limited given the scale of the pilot study – that these metrics of interaction with casual creators might be used to predict the presence of a curious user, or at least a user engaged in curious exploration. That is, the behaviour of making larger leaps in the design space and not playing games extensively enables users to explore as much of the game space as

possible to satisfy their curiosity. In such situations, a future fluidic game designer could show an explorative user parts of the space he/she may have under-explored, and could possibly automatically construct a game which is distinctive to the ones they have tried up to that point.

It is also informative to compare and contrast the complete novice, participant (2) – who had no idea in advance what kinds of games they wanted to make or how to use *Wevva*, with the expert, participant (8) who had a fairly concrete game idea and knew exactly how to use the app to try out the idea. We note from Table 1 that while both participants made roughly the same number of game-altering edits, and had similar average edit distances, the expert made an edit once every 5.9 seconds during non-playing time, while the novice did so once every 11.3 seconds. The expert was therefore afforded more time to playtest the games made, and indeed spent twice as long playing games as the novice. Note that the novice's experience with Wevva was skewed somewhat because they did not realise that they could abort games, hence they spent some time making games with easily achievable end conditions, in order to be able to finish the games quickly and make edits.

We have also used the pilot study to mark some baselines against which to measure improvements of the game-making user interface in *Wevva*, and/or to provide a basis for comparison with other fluidic game designers (from us or third parties). Given the aim (as per casual creators in general) of making edits as easy and enjoyable as possible, we were particularly interested in the ease of affecting change on a game prototype. It is fairly clear that frustration with a design interface for fluidic games would arise if controls for making edits were hidden or difficult to discover and/or when the control location is known, but takes too long to navigate to. Note that in the pilot study, the most explorative user (in terms of the coverage of parameters they experimented with) was number 5. In fact, this participant tried all but one of the possibilities for changing a game, which we took as a sign that the design interface in Wevva was largely free of difficult to access design controls.

As portrayed in the *edit interactions* row of Table 1, on average, 22.9% of non-gameplay interactions with *Wevva* achieved a change in the parameters of a game being developed. This means that more than 3 out of every 4 interactions with *Wevva* (outside of playing games) were either the user navigating to a design control, or administrative (e.g., copying/pasting games, loading games or game packs, etc.) While navigation and administration are necessary in any design application, we note that these are normally minimised in game design. Hence, in order to make fluidic game designers more enjoyable, we should aim to increase the ease of making game designs and improve upon this baseline. We also note in Table 1 that, on average, participants altered 75.3% of the parameters available, with the lowest percentage amongst participants being 60% (participant (1)) and the highest being 93.3% (participant (5)). Naturally, we need to exercise caution in using these raw figures as a baseline for discoverability of controls in the app, without the context of the session type. For instance, if a user wants to make a game of a particular type, as with participant (1), they are likely to explore the space much less than an explorative user – as was indeed the case for participant (1).

Of perhaps most interest from this pilot study was a comparison of participants 5 and 7, as they represent opposite ends of the design/exploration spectrum. When questioned after the session, participant 5 expressed an interest in "seeing what was out there" with the Wevva app, i.e., the design affordances, leading to well known or new game mechanics, clones of existing games, or novel gaming experiences. In contrast, participant 7 expressed an interest in making a particular game that they had in mind before the session, and they laboured to make this design conception a reality. We could project two types of curiosity onto these users, in terms of quality (participant 7 – asking whether the parameters in the design app afford a particular game) and quantity (participant 5 – asking about the range of game affordances available with the design parameters).

It is fair to say that exploratory participant 5 enjoyed interaction with the casual creator more than the design-oriented participant 7. This is not surprising, given that *Wevva* is a hand-held game design app, which requires no programming or graphic/audio design. While this makes the app more easy, enjoyable and intuitive to use than more sophisticated game design environments, it naturally limits the range of games that can be made, and hence particular game ideas can rarely be executed as explicitly desired. In game jams following the pilot study, we have encouraged participants to not become obsessed with achieving a particular design, as they may be held back by the limited nature of the design app. We have instead encouraged them to move on to new games or try alternatives for an existing game if they cannot achieve a goal quickly, and we believe this has enhanced their experience.

5 CONCLUSIONS AND FUTURE WORK

We describe a phenomenon that we've observed where some users of casual creators [8] for designing mobile games [7, 17] appear to be motivated primarily by curiosity *about the casual creator* and the design space for which it serves as an interface. This contrasts with users who are focused more on their own creative goals, such as designing a game they find fun or innovative. We hypothesise that curiosity can serve as an analytical tool and design goal for a subset of such users when experimenting with casual-creator designs. These users interact with a casual creator more in order to find new things it can do and understand its possibilities and limitations, rather than to create things with it *per se*.

The hypothesis that some casual-creator users appear primarily curiosity-driven is based on rapid game jams [10] we've held with the fluidic game designer *Wevva*, a casual creator for mobile-game design [19]. Our hypothesis about motivation is primarily derived from observation of both the modes of use and comments made by school-age children participating in an after-school design club at a local school using *Wevva* over a period of several weeks.

In order to understand in more detail how users vary in their usage of fluidic game designers, we carried out a quantitative in-house study with an instrumented version of *Wevva* that logs all interface actions and design changes, as well as saving the games produced. This gives us some concrete information about variation. It is worth noting that the quantitative study shows how users vary in their exploration of mobile-game design, but does not directly test motivation – its results are consistent with some users being curiosity driven, but it does not directly show that this is the causal explanation.

There are at least two kinds of future studies that could provide more information about whether and how curiosity served as a motivation for casual-creator users.

Firstly, the quantitative pilot study is clearly only a pilot study, and should be extended with investigations of larger and more diverse sets of users. We collected some data already that can be used for this purpose. During the after-school game design club measured above, we logged the same kinds of data shown in table 1 in this paper, but with an external set of users, and over a period of weeks; we plan to analyse that data in future work. That should allow us to understand, given a different population and data collected over a longitudinal period, whether the types of design sessions described above are representative of those that take place in general, rather than being an anomaly of the pilot study.

Secondly, in order to more solidly claim that curiosity is in fact the specific driver of the exploratory behavior we observed in a subset of design sessions, a study investigating motivation and establishing causation would be necessary. This is more methodologically difficult, but there are some possible directions. A number of psychology researchers have run studies with the goal of empirically measuring curiosity-driven behavior, primarily using self-report surveys [11]. Such self-report instruments are imperfect, and there is not currently strong consensus behind a specific validated way of measuring curiosity. Nonetheless, one step forward would be a study attempting to link, at least on a correlational level, the quantitative measures we collect through our design-session logging (i.e., those in table 1) with one of the existing psychological instruments that attempts to assess curiosity. This would at least allow us to begin understanding the extent to which we are measuring the same phenomenon that psychology researchers are measuring under the term "curiosity".

Finally, we focus here on casual creators, but there may be lessons for other classes of design tools as well. For example, tools for exploring design spaces that have an artificial intelligence component providing design assistance – mixed-initiative creative interfaces (MICIs) [9] [25] and design space explorers [24] – seem likely to elicit a curiosity-driven mode of use in some users as well, perhaps depending on how the AI features are designed and framed for the user. This direction is important to us, because one of our reasons for characterising this (seemingly) curiosity-driven set of users is to allow us to better support such player/designers in creating and exploring game spaces by including a detection mechanism that is able to predict a session type as it progresses online. Such predictions could be used to enable the app to adapt to the session type it is being used in, and drive more advanced automatic generation of content and games that fits with a particular users' motivations in using the app.

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