

1. Problem

The game was released a couple of months ago and has recently experienced an unexpected decrease in user retention. It is imperative to identify the reason for this decline.

2. Hypothesis

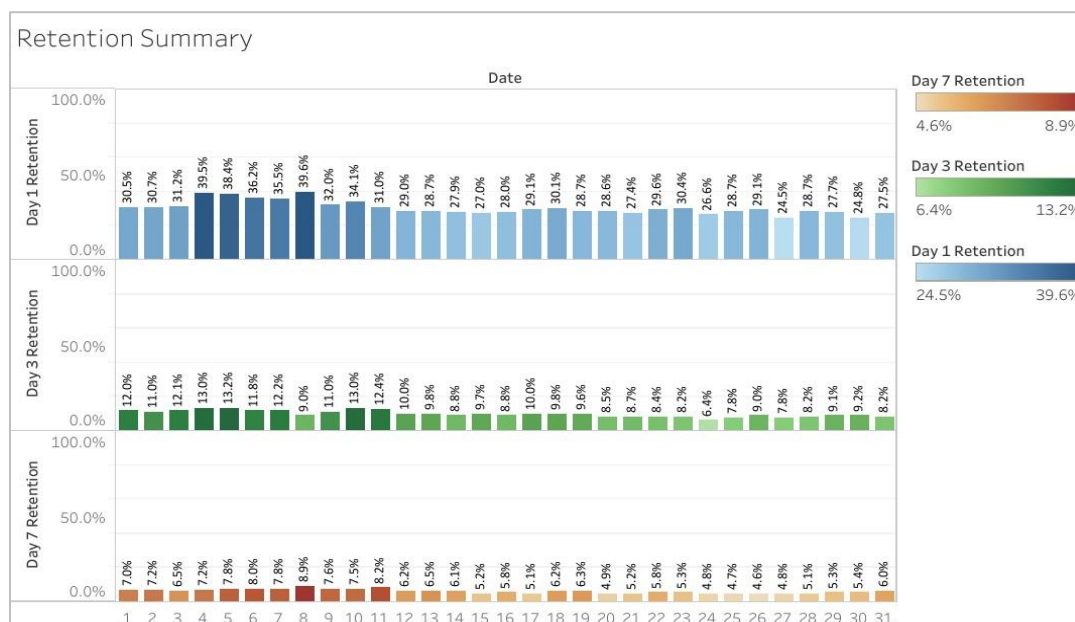
Hypothesis 1: Gameplay Difficulty: Users may be finding certain levels too challenging, leading to frustration and a decrease in retention.

Hypothesis 2: Technical Issues: Bugs, crashes, or other technical problems might be affecting the user experience, causing them to leave the game.

3. Analysis

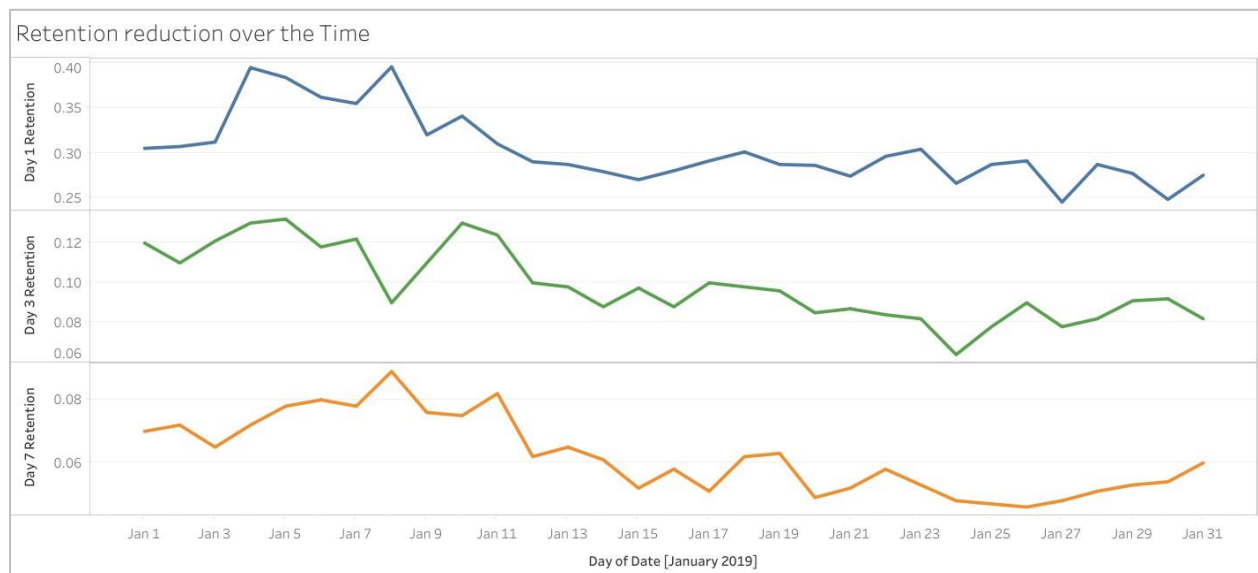
3.1 Examine the retention rate behavior.

In the provided dataset, we have day_1_retention, day_3_retention, and day_7_retention rates spanning a one-month period from January 1, 2019, to January 31, 2019. To achieve a comprehensive understanding of retention metrics and observe their behavior, we can create a graphical representation of the retention rate over time for each of the three retention categories. The 'Retention Summary' graph and the 'Retention Reduction Over Time' graph mentioned below effectively illustrate the retention patterns within the data.



- The retention summary graph indicates that day_1_retention rates consistently surpass day_3_retention and day_7_retention rates throughout the observed period.
- The day_1_retention rate consistently hovers at approximately 30% (mean = 30.3%) throughout the observed period, **indicating that new users exhibit a significantly higher level of engagement on the first day of installation compared to the subsequent days**
- **This observation justifies that players tend to lose interest in playing the game for a few days, possibly indicating a decline in engagement or an increase in difficulty as the game progresses to deeper levels.**

The graph titled 'Retention Reduction Over Time' below illustrates the retention behavior across various retention metrics over the given period.



- A reduction is noticeable in all three retention metrics over the period, particularly from the middle of the month.
- **This might be attributed to a modification in the gaming environment (internal/external change).**

3.2 Identify other variables affecting the reduction in retention rates.

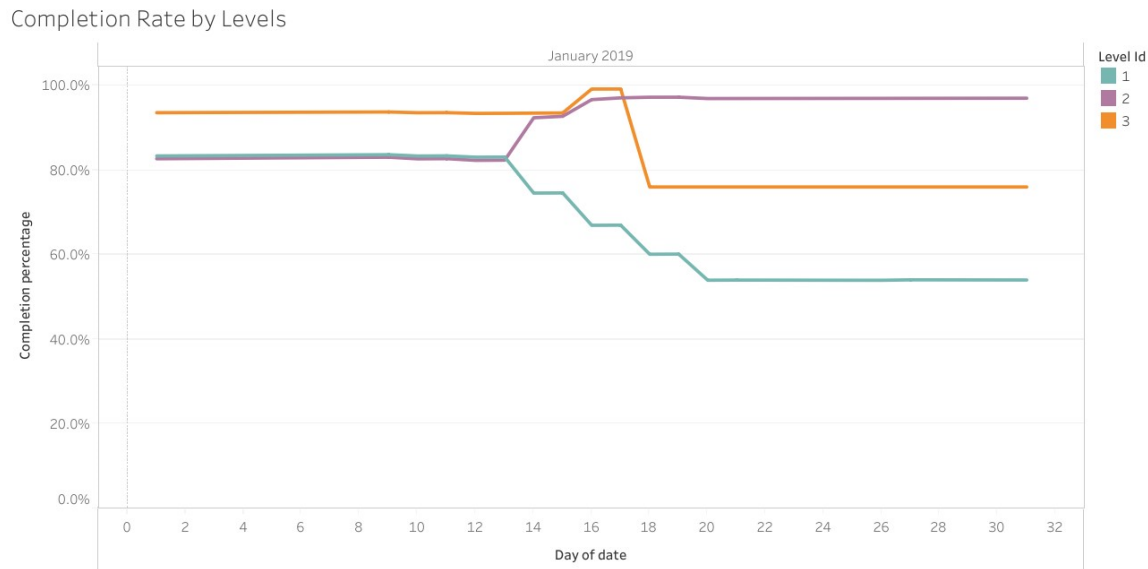
The next step in addressing this issue involves a thorough analysis of the underlying causes for the observed unexpected behavior, delving deeper into the provided dataset

3.2.1 Determine the impact of level completion rate metric on retention rate.

In order to provide a more comprehensive analysis of the levels and user completion patterns, we have introduced a new variable termed “**level completion rate**”.

$$\text{level completion rate} = ([\text{Users Completed}] / [\text{Users Started}]) * 100$$

The observed behavior in the level completion rate over the given period is presented below,



- The graph clearly illustrates a sudden shift in the level completion rate around the middle of the observed period.
- **This could potentially be attributed to a technical change (such as technical issues, game updates, or the introduction of new features) or a shift in monetization strategy.**

We must investigate how the sudden change in the demonstrated level completion rate above impacts the reduction in retention rate.

3.2.2 Identify the relationship between level completion rate vs overall retention rate.

In this section, we will conduct a statistical analysis to examine the impact of the level completion rate on the overall retention rate. Here the overall retention rate is calculated as follows,

overall retention rate = [day_1 retention] * [day_3_retention] * [day_7_retention] * 100).

To examine the correlation between each level completion and the overall retention rate, the Pearson correlation test has been performed. The below tables show the correlation results for each level.

Correlations			
		Overall Retention Rate	Level 1 Completion Rate
Overall Retention Rate	Pearson Correlation	1	.831
	Sig. (2-tailed)		.000
	N	31	31
Level 1 Completion Rate	Pearson Correlation	.831	1
	Sig. (2-tailed)	.000	
	N	31	31

Correlations			
		Overall Retention Rate	Level 2 Completion Rate
Overall Retention Rate	Pearson Correlation	1	-.851
	Sig. (2-tailed)		.000
	N	31	31
Level 2 Completion Rate	Pearson Correlation	-.851	1
	Sig. (2-tailed)	.000	
	N	31	31

Correlations			
		Overall Retention Rate	Level 3 Completion rate
Overall Retention Rate	Pearson Correlation	1	.651
	Sig. (2-tailed)		.000
	N	31	31
Level 3 Completion rate	Pearson Correlation	.651	1
	Sig. (2-tailed)	.000	
	N	31	31

The table reveals significant Pearson correlation coefficients between the overall retention rate and the completion rates for different levels. Specifically, the correlation coefficient for level 1 is 0.831, indicating a strong positive relationship with the overall retention rate (P value < 0.001 for a 2-tailed test). Similarly, the correlation coefficient for level 3 is 0.651, signifying a significant and strong positive relationship with the overall retention rate (P value < 0.001 for a 2-tailed test). On the contrary, level 2 demonstrates a Pearson correlation coefficient of -0.851, suggesting a substantial and negative relationship between the completion rate of level 2 and the overall retention rate.

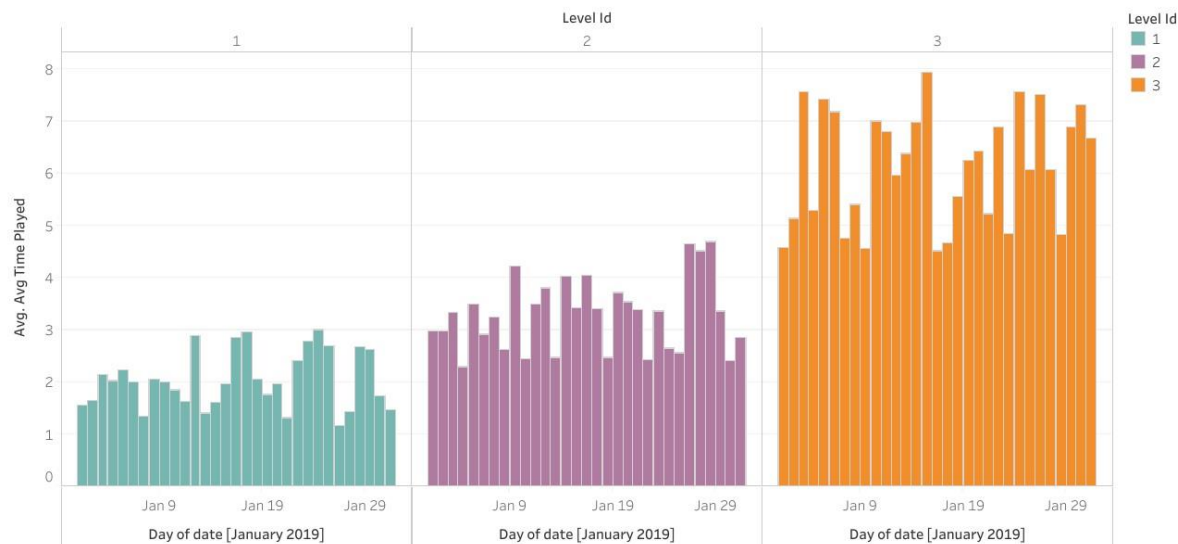
This indicates that the completion rates for level 1 and level 3 tend to move in the same direction as the overall retention rate, either increasing or decreasing together. **This justifies the influence of level 1 and level 3 completion rates on the reduction of the overall retention rate in this game.**

In this section, we have analyzed the impact of completion rates on retention rates. The sudden change observed in completion rates suggests a potential alteration on the technical front (such as issues, updates, or the introduction of new features) or the implementation of a new monetization strategy. Following this change, completion rates decreased in the latter half of the month, leading to a subsequent reduction in the overall retention rate due to their interconnected relationship.

3.2.3 Determine the impact of average playtime and daily user count metrics on retention rate.

In this section, we will explore the influence of average playtime and daily users on the retention rate. The graph below illustrates the average playtime in different levels of the game for the given period.

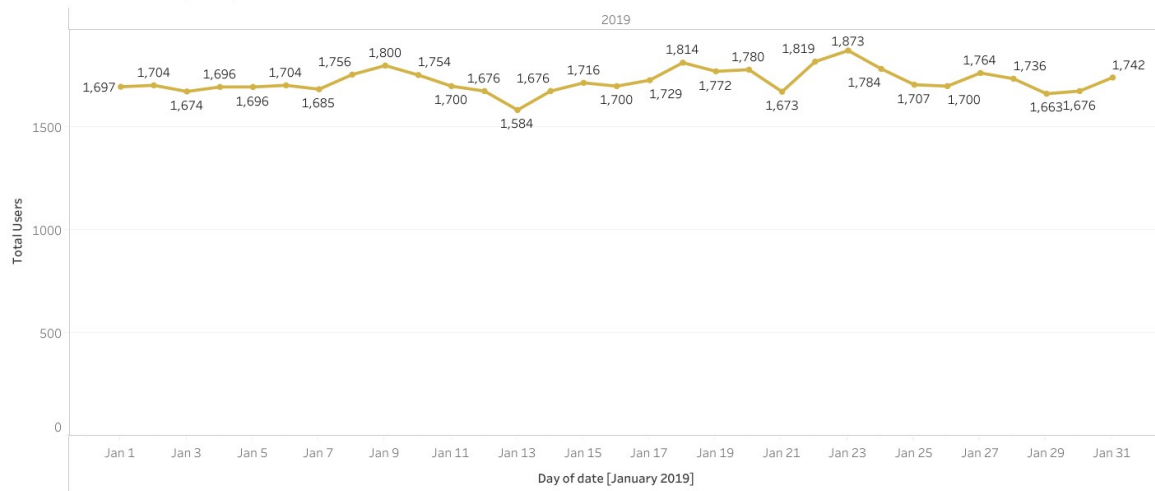
Average time played by Level



From the above figure, we can observe that the **volume of** average playtimes follows an ascending order from level 1 to level 3. However, there is minimal variation in the **pattern** of average playtimes across all levels during the specified period.

Similarly, there is no significant variation in daily users over the specified time period, as illustrated in the graph below.

Daily Active Users (DAU)



Here, average playtime and daily active users remains the same while a decrease in level completion rate of level 1 and level 3 (refer 3.2.1) suggests that players are encountering more difficulty in progressing through the game. The reasons here can be;

- Level 1 and level 3 may be getting progressively harder by newly introduced feature in the middle of the month which is causing players difficult to progress in the game.
- There may be bugs or glitches in the game that are making it difficult for players to progress.
- Despite maintaining a consistent number of daily users, most of these users are newly acquired players, not existing ones.

4. Conclusion

- The game exhibits significant initial engagement, successfully capturing players' attention on day 1. Nevertheless, as players advance through the levels, the content may become less engaging or more challenging, leading to a decline in retention.
- A sudden change occurred in the game environment around the midpoint of the period. If this change was intentional, it should have been implemented to enhance player engagement.
- This particular change primarily results in a decrease in the level completion rates for both level 1 and level 3.
- Subsequently, an investigation revealed that the reduction in the completion rate is associated with the decline in retention rate.
- Even though the completion rate changed during the middle of the period, the average playtime and daily active users remained the same.
- In this context, average playtime and daily active users remain constant, while a decrease in the level completion rates of level 1 and level 3 suggests that players are encountering increased difficulty in progressing through the game.
- Therefore, the sudden change here can possibly be an update to increase difficulty in level 1 and level 3, a bug, a glitch, etc.
- There was a decrease in player retention during the early part of the specified period, and it worsened after the sudden change of the game in the middle period.

5. Recommendation

1. Adjust gameplay difficulty gradually.

To address the issue of decreasing user retention due to challenging levels, consider adjusting the difficulty curve gradually. Implementing a more gradual increase in difficulty will allow players to adapt, reducing frustration and potentially improving retention.

2. Thorough testing and quality assurance

Conduct thorough testing and quality assurance to identify and address any technical issues, bugs, or glitches in the game. Regularly update the game with bug fixes and improvements to enhance the overall user experience and prevent technical issues from negatively impacting retention.

3. Communicate changes effectively.

If intentional changes are made to the game environment to enhance player engagement, ensure that these changes are communicated effectively to the player community. Provide clear in-game notifications or update messages to inform players about the changes and highlight any improvements or new features.

4. Optimize level design.

Evaluate and optimize the design of levels, particularly levels 1 and 3 where completion rates have decreased. Consider incorporating player feedback and analytics data to refine the level design, making it more engaging and balanced.

5. Monitor and analyze player feedback.

Establish a system for actively monitoring player feedback through in-game surveys, community forums, or social media. Analyze this feedback to identify recurring issues or concerns raised by players and use this information to guide further improvements.

6. Enhance rewards and incentives

Consider introducing or enhancing in-game rewards and incentives to motivate players to continue engaging with the game. This could include special bonuses for completing challenging levels, unlocking exclusive content, or participating in events.

7. Continuous data analysis

Implement a continuous data analysis strategy to monitor player behavior, retention rates, average play time, daily active users, player segmentation, player feedback and ratings, and other relevant metrics. Regularly assess the impact of changes and updates on player engagement, allowing for timely adjustments based on the evolving needs and preferences of the player base.