

🌱 Customer Engagement Analysis in Excel

A Data-Driven Look at How Platform Features Shaped Student Behavior

💡 Introduction

In 2022, **365 Company** introduced several new engagement features on its learning platform — XP points, leaderboards, streaks, in-app coins, and a broader course library.

The goal was simple: **increase student engagement** and make learning more interactive and rewarding. But did it actually work?

In this *Customer Engagement Analysis in Excel* project, I used descriptive statistics, distribution analysis, and hypothesis testing to evaluate whether these new features led to measurable engagement improvements between **Q4 2021 and Q4 2022**.

📊 Project Overview

Tools Used: Microsoft Excel (Descriptive Statistics, Data Analysis ToolPak, Charts)

Skills Demonstrated: Data Cleaning, Exploratory Analysis, Hypothesis Testing, Statistical Interpretation, Business Storytelling

Dataset: Engagement logs from 365 Company (sample dataset provided with anonymized user IDs)

Time Period: Q4 2021 vs. Q4 2022

Key Variables:

- student_id — unique identifier
- student_country — user location
- Paid — 1 for paid subscribers, 0 for free
- minutes_watched_21 — total minutes watched (Q4 2021)
- minutes_watched_22 — total minutes watched (Q4 2022)

🎯 Business Question

Did the new platform features (XP system, coins, leaderboard, and streaks) lead to higher student engagement in 2022?

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More specifically:

- How did engagement change for **paid vs. free users**?
- Were low-engagement users (1–100 mins in 2021) reactivated successfully?
- What does the statistical evidence say about engagement improvement?

Methodology

The analysis was performed entirely in **Excel**, using a structured approach of five tasks:

1. **Descriptive Analysis** — comparing means, medians, and standard deviations of engagement across years.
2. **Distribution Shape** — analyzing skewness and kurtosis to detect asymmetry and outliers.
3. **Confidence Intervals** — estimating true population means for paid and free users.
4. **Hypothesis Testing** — using two-sample t-tests to confirm whether engagement increased significantly.
5. **Country-Level Comparison** — testing whether engagement differed between U.S. and India users.

Step 1 — Descriptive Analysis

To start, I focused on users who watched between **1–100 minutes** in Q4 2021 — the *low-engagement group* with the most potential for growth.

Paid-Plan Users

- **Mean:** increased from **33.8 → 273.0 minutes**
- **Median:** increased from **26.3 → 40.3 minutes**
- **Standard Deviation:** exploded from **28.2 → 854.6 minutes**

Interpretation:

Paid users who were low-engagers in 2021 watched far more in 2022. The sharp rise in mean and median indicates genuine improvement — though the massive standard deviation shows a few users watched **hundreds of hours more** than others.

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Free-Plan Users

- **Mean:** increased from **25.4** → **117.6 minutes**
- **Median:** decreased from **14.2** → **11.8 minutes**
- **Standard Deviation:** jumped from **26.2** → **468.9 minutes**

💬 *Interpretation:*

While the average watch time rose, the typical (median) free user actually watched **less** in 2022. This means the increase was driven by a small subset of power users — not the entire free-user base.

Step 2 — Skewness and Kurtosis

To understand how engagement was distributed, I calculated **skewness** and **kurtosis** for both years.

User Type Year Skewness Kurtosis Interpretation

Paid	2021	0.63	-0.85	Slightly right-skewed
Paid	2022	7.07	58.48	Highly right-skewed, heavy tails
Free	2021	1.17	0.36	Moderate right skew
Free	2022	15.06	315.76	Extreme right skew, many outliers



💬 *Interpretation:*

The distributions became **highly right-skewed and leptokurtic** in 2022 — meaning a small number of students watched *significantly* more than the rest.

This aligns with our median results: a handful of users drove up averages.

Step 3 — Confidence Intervals

To check the precision of our mean estimates, I calculated **95% confidence intervals** for the average minutes watched.

Group	2021 CI	2022 CI	Direction
Paid	316.25 – 348.76	351.91 – 384.72	 Increase
Free	129.92 – 137.95	67.71 – 70.59	 Decrease

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 *Interpretation:*

We can be 95% confident that **paid users increased** their engagement, while **free users decreased** it overall.

Step 4 — Hypothesis Testing

Using **two-sample t-tests (unequal variances)**, I tested the null hypothesis:

H_0 : Engagement in Q4 2021 \geq Engagement in Q4 2022

Results:

- **Paid users:** *Reject H_0* ($p < 0.05$) \rightarrow engagement **significantly increased**
- **Free users:** *Fail to reject H_0* ($p > 0.05$) \rightarrow no significant improvement

 *Interpretation:*

The features clearly benefited **paying subscribers**, while the **free cohort saw stagnant or inconsistent engagement**.

Step 5 — Country-Level Comparison (U.S. vs India)

Testing free users in 2022 showed:

- **Fail to reject H_0** \rightarrow U.S. students watched **less** than Indian students on average.
- Engagement was stronger in India, suggesting better resonance with the platform's features and course offerings there.

 *Interpretation:*

This insight opens up a localization opportunity — improving U.S. relevance through tailored content or targeted incentives.

Step 6 — Visual Insights (Recommended Charts)

To visually communicate results, I created these Excel visuals:

1. **Revenue vs. Engagement Comparison:** Bars for minutes watched 2021 vs 2022, by paid/free segment.
2. **Distribution Histogram:** Showing heavy right-skew for 2022 data.
3. **Boxplot:** Comparing medians — free vs paid, across years.
4. **Confidence Interval Chart:** Displaying CI ranges visually (error bars).

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5. Country Comparison Chart: Mean minutes watched in India vs U.S.

📌 *(Insert these visuals as Medium images — recommended size: 1200px width)*

🧠 Insights & Key Takeaways

Insight	What It Means
Paid users' engagement soared	New features effectively retained paying customers
Free users' median engagement dropped	Typical free user not re-engaging — growth uneven
High skewness & kurtosis	A small number of users are hyper-engaged
Confidence intervals diverged	Paid usage increase statistically significant
U.S. < India engagement	Platform features resonate better with Indian students

💬 Business Implications

1. **Free Users Need Targeted Nudges** — Offer short-term XP or coin trials to boost early engagement.
2. **Retention > Acquisition** — Paid subscribers derive real value; focus on keeping them loyal.
3. **Data-Driven Personalization** — Tailor streaks, challenges, and content by region or user type.
4. **Feature Impact Measurement** — Track which specific features (XP, leaderboard, streaks) correlate most with engagement lift.
5. **Localization Opportunity** — Optimize content for U.S. learners to close the engagement gap.

⚙️ Analytical Learnings

This project reinforced that:

- **Averages can lie** — use median and distribution metrics when data is skewed.

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- **Excel** can power deep statistical insight when used with formulas like SKEW(), KURT(), and the **Data Analysis ToolPak**.
- **Statistical storytelling** is key — results only matter when interpreted in business context.

Final Summary

The 365 Company's 2022 engagement features succeeded in **boosting usage among paid subscribers**, but **failed to drive consistent engagement among free users**. Extreme outliers skewed averages, highlighting the importance of medians, confidence intervals, and t-tests for true insight. To sustain growth, 365 should **leverage targeted personalization** and **test incentive mechanisms** to engage its broader audience.

Personal Reflection

Working on this case study strengthened my ability to combine **statistical reasoning and business thinking**.

From data cleaning to hypothesis testing — every step in Excel translated complex engagement metrics into actionable business intelligence.

It proved one powerful truth:

“The right analysis doesn’t just measure engagement — it explains it.”

Call-to-Action

If you found this analysis valuable, follow me on [Medium](#) or [LinkedIn](#) for more data analytics case studies using **Excel, SQL, Tableau, and Python**.