

Improving TaleBlazer Analytics

by
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Abstract

TaleBlazer is a platform for creating and playing augmented reality location-based mobile games. TaleBlazer Analytics is an automated system for collecting and analyzing anonymized player data from these games. This thesis presents additions and improvements made to TaleBlazer Analytics to allow for a more in-depth view of data from individual games, as well as aggregated across games. The updated system will ultimately help researchers, game designers, partner organizations, and the TaleBlazer development team in better understanding how users play TaleBlazer games.

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Chapter 1

Introduction

TaleBlazer is an augmented reality (AR) location-based game platform that allows users to make and play their own mobile games. These games are played on mobile devices but take place in the real world, with the application tracking user movements through device GPS. Users can interact with virtual characters and items in the game by physically moving to specific locations, “bumping” them, and triggering more options or actions in the game. Games are created online and modified by game designers through an online editor using a blocks-based programming language.

TaleBlazer is a part of the Scheller Teacher Education Program (STEP) Lab at MIT. One of the aims of the group is to understand the educational impact of games and their effectiveness at engaging users. TaleBlazer Analytics is an automated system that gathers and analyzes data about mobile users’ behavior, and is a tool to help in determining the impact and reach of TaleBlazer games.

1.1 Motivations

Those interested in the data provided by TaleBlazer Analytics can be split into the following groups: TaleBlazer developers, game designers, educational researchers, and organizations. Each group has specific interests in TaleBlazer and key pieces of data that are important.

TaleBlazer developers are those on the TaleBlazer team, working on the application. They are primarily interested in the technical aspects of TaleBlazer and having data to inform future development decisions and troubleshoot with. For example, knowing what kind of devices players are using is very useful, especially if one device is generating more errors than another.

Game designers are more interested in seeing how users are playing their games. For example, if many users are getting stuck in a particular place in a game, it’s useful to know where, so that the game can be modified to improve user experience.

Educational researchers are interested in analyzing a player's knowledge from interactions with a game for research purposes. An educational researcher might want to know how long each decision is taking for a player in a game, and how the player's decisions change throughout a game; possibly seeing if the player has gained knowledge after playing through a questionnaire.

TaleBlazer is partnered with several organizations, such as zoos, nature centers, historic locations, and living history museums. These organizations are interested in the effectiveness and impact of TaleBlazer as a tool for engaging visitors. As an example, they might care about how many gameplays are occurring over time, and how many people are completing their games.

TaleBlazer Analytics was made to help provide these interested parties with relevant and meaningful data. Before TaleBlazer Analytics, to collect gameplay data one would need to observe players as they played. While this did—and still does—provide useful data, it interfered with gameplay and required trained research staff, making it labor intensive. It also didn't provide a complete picture of what was happening during gameplay. A first iteration of an automated and non-interfering data collection system was created in 2013-2014 as a solution to these problems and as the M. Eng thesis work of Fidel Sosa [1]. As more users use this analytics system, bugs and areas for improvement have been found. As a part of this thesis work, the analytics system has been expanded to meet newly realized needs.

1.2 Chapter Summary

This thesis describes background, design, and development of additions to TaleBlazer Analytics. Chapter 2 gives an overview of TaleBlazer and the original state of TaleBlazer Analytics. Chapter 3 describes initial evaluation, analytics examples, user feedback, and questions to be answered by the system. Chapter 4 explains changes made to TaleBlazer Analytics. Chapter 5 reviews user tests conducted on the system, feedback received, and changes in response. Chapter 6 proposes future work for the project. Chapter 7 details the overall contributions of this thesis and concludes.

Chapter 2

Background

2.1 TaleBlazer

TaleBlazer is an AR location-based game platform developed at the MIT Scheller Teacher Education Program (STEP) Lab. TaleBlazer is a platform for both the creation and playing of AR games. Users can design and create their own games through the online editor, and publish them to be played by others on the mobile application. Through the Android or iOS TaleBlazer mobile application, players can download and play TaleBlazer games by moving around the real world location the game takes place in.

2.1.1 TaleBlazer Technology

The TaleBlazer platform is composed of:

- The online game editor, with which users create and edit games
- The mobile application, with which users play games
- The server, which stores and serves games
- The analytics server and frontend, which records and displays gameplay data
- The multi-player server, which coordinates multiplayer gameplay

The editor is a frontend written in JavaScript, HTML, and CSS, hosted on the TaleBlazer server. It allows for the creation and editing of games. Games are modified through a blocks-based programming language on the online editor (Figure 2-1). The server stores all game content and media (images, videos, and audio) when a game designer saves a game. The server is written in PHP using the CakePHP framework, and uses a MySQL database to store and retrieve data. The mobile application is built using Appcelerator Titanium Studio, which allows Javascript code to be compiled into native iOS or Android applications.

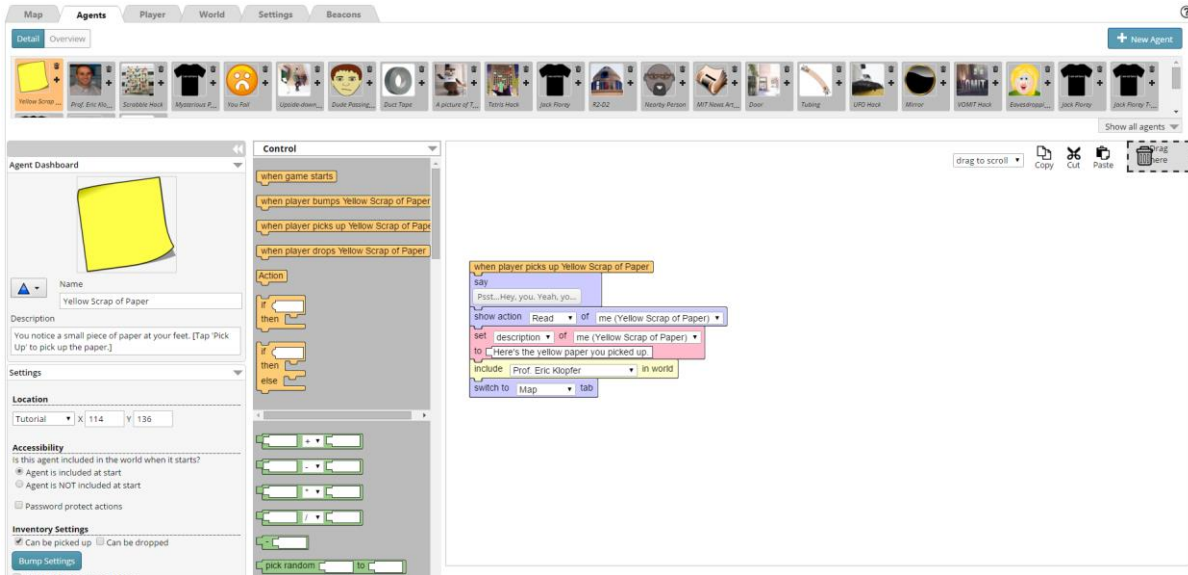


Figure 2-1. TaleBlazer online game editor.

2.1.2 TaleBlazer Gameplay

TaleBlazer games have one or more *regions*, or real-world locations where the game takes place. In each region, there are *agents*, or virtual entities that represent items, characters, or whatever the game designer desires. Games may have one or more *scenarios*, or different “versions” of the same game that players can pick from when starting. For example, the player may be asked to pick between “Easy”, “Medium”, or “Hard” versions when first starting a game. The game designer can use the player’s scenario selection later in the game logic to give different game experiences for each scenario.

The characters a player can be in a game are represented by the *roles* made available. Games can have a single role or multiple roles. Game designers can specify different behaviors in the game logic for players playing different roles. For example, a player may be asked to pick between three types of characters, with each role seeing different information in the game. This would necessitate multiple players to share what they each learn in the game to find all information in the game.

Traits are variables that the game designer can attach to agents, roles, and the game world itself. Traits have names and values, and can be changed over the course of a gameplay based on the actions made by the player and behaviors defined by the game designer. For example, a game world trait or role trait can be used to track a score.

Players can interact with agents by *bumping* them. There are multiple ways to bump an agent, including: physically moving close to an agent's coordinates and being detected by GPS while outdoors, or by being near a radio beacon when indoors. In some instances, players can also tap on an agent's icon on the game map to trigger an interaction. Game designers decide what kind of agent bump is to be used. Bumping into an agent causes a *script block*, or code written by the game designer, to be executed, and an agent dashboard to appear in the mobile application.

Players can choose between different *actions*, or buttons on the dashboard (Figure 2-2). Selecting an action causes another script made by the game designer to be executed. For example, if an agent represented an item, the player could pick it up to use later in the game. Or if an agent represented a character asking the player a question, the player could select an answer, with different answers causing different game behavior.

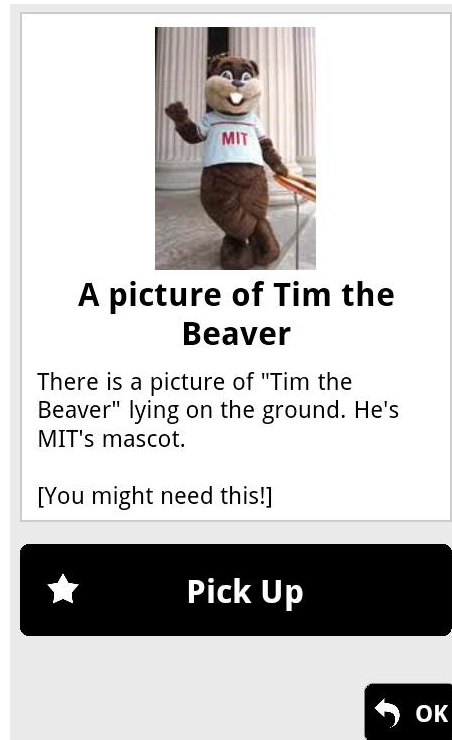


Figure 2-2. TaleBlazer agent dashboard. The agent “A picture of Tim the Beaver” can be picked up.

2.2 TaleBlazer Analytics

Analytics is only available to TaleBlazer organizations, or entities that have partnered with and been approved by TaleBlazer, allowing for their games to be easily accessible to players through the “featured” section of the TaleBlazer application. To make sure data is used responsibly, only data from organization games is tracked. The only gameplay data tracked in non-organization games is the total number of downloads, which allows the TaleBlazer team to follow general game usage across the platform.

In this paper, a *game* can be composed of many different game versions saved by the game designer during the game creation and editing process. Players may play different versions of a single game, depending on the version broadcast, or made available by an organization to play. A *gameplay* represents a single play through by a player of one version of a game.

This section describes the original version of TaleBlazer Analytics, the backend structure of which was left in largely the same state for this thesis work.

2.2.1 Data Collection

TaleBlazer Analytics uses an event-based approach to data collection. Events record their in-game time of occurrence and event-specific information. The following pieces of data are collected:

- Devices
- Sessions
- Agent bump events
- Region switch events
- Game completion events
- Analytics events

Devices

Device OS, version, model, and screen resolution are recorded. To keep data anonymized, each device is given a unique TaleBlazer ID that cannot be tied back to the device or be used to identify it for non-TaleBlazer purposes. This ID allows data across multiple gameplays on the same device to be tracked.

Sessions

Sessions store all of the information about a single gameplay. All recorded events in a gameplay are tied to a particular session. Sessions store the start time of the gameplay and time of the last recorded event. They also store information about the role and scenario chosen, and if tap to bump was enabled by the player. In addition, sessions store the device ID to link the gameplay to a specific device, and the game ID to link the gameplay to the particular version of the game being played.

Agent Bump Events

Agent bumps can occur in many ways, including: physically moving close to an agent's coordinates and being detected by GPS, by being near a radio beacon and being detected by

Bluetooth low energy, or by tapping on an agent when tap to bump is enabled. Each agent bump event records the name and ID of the agent bumped, time of the bump, how the agent was bumped, and the session ID of the gameplay the bump occurred in.

Region Switch Events

Region switch events occur when the player moves from one region to another. Each region switch records the ID and name of the region switched to, the time of the event, and the session ID of the gameplay the switch occurred in.

Game Completion Events

End Game blocks are placed by the game designer in the editor to be triggered when the end of a game has been reached, as TaleBlazer Mobile cannot automatically determine when a player has completed a game. When this block is triggered in a game, a game completion event is recorded, and the session for the particular gameplay is marked as completed.

Analytics Events

Analytics Events are custom events that allow game designers to track data they specifically care about, such as a player's choice or score at the end of a game. Game designers can create and name their own custom Analytics Events, then place them in the game to be triggered at a specific time and track a particular value. Each time an event is triggered, an Analytics Event is saved with the name and unique ID of the event, session ID of the gameplay, and the value to be tracked.

2.2.2 Implementation Overview

The three main components of TaleBlazer Analytics are the:

- Analytics server, which is a RESTful web service for sending and receiving analytics data
- Analytics client, which sends data from the mobile application to the server
- Analytics website, which asks for data from the analytics server and displays it through a frontend

Analytics Server

The server is a Node.js application built using the Express web framework, and is responsible for collecting, processing, and analyzing all gameplay data received from TaleBlazer Mobile through the analytics client. The server follows the Model-View-Controller design, and is also a RESTful web service, meaning that all interactions with it occur through a REST API. The REST API for the server has endpoints for data collection from TaleBlazer Mobile and data analysis for the analytics site.

Analytics Client

The analytics client is a Javascript client integrated into the TaleBlazer mobile application for iOS and Android devices. The analytics client sends data to the Analytics server for device registration, session creations, and processing of events through the analytics API.

Analytics Site

The analytics website displays data collected about a single game by using the analytics API. The analytics site is written in JavaScript, with a frontend made using a Bootstrap layout and ECT Javascript templates.

The Overview page in the original version of Analytics shows general data about a game, such as the number of games initiated, number of games completed, average completion time, and the total lifetime download count (Figure 2-3).

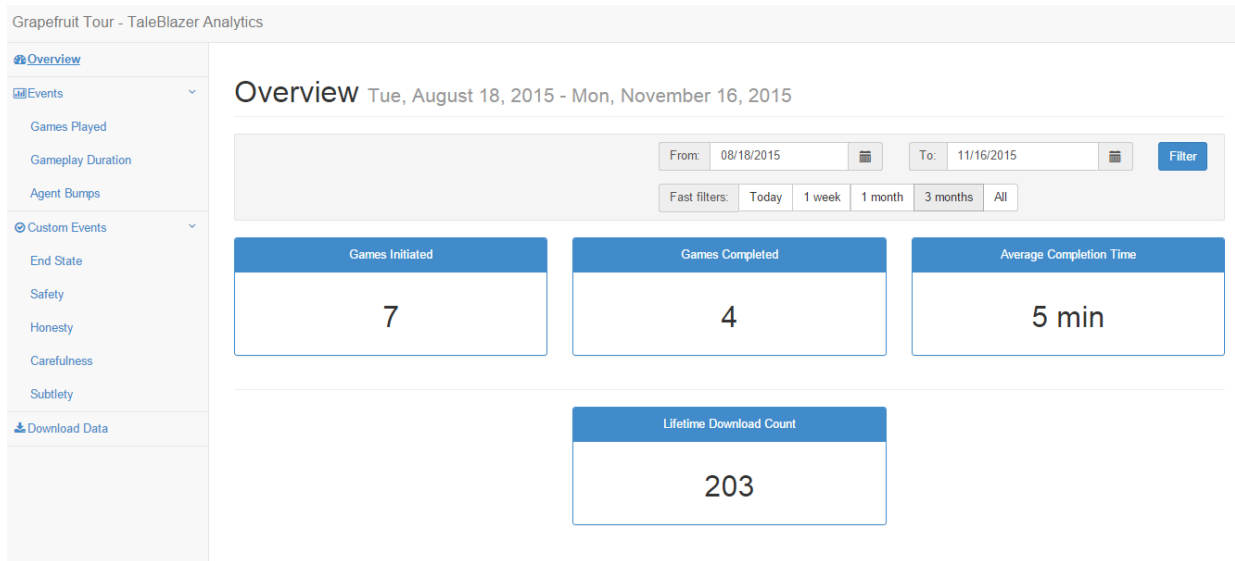


Figure 2-3. Original Overview page.

Other pages of the original analytics site include:

- Games Played Page
- Gameplay Duration Page
- Agent Bumps Page
- Analytics Events Pages

These pages of the analytics site each show a specific set of data that can be categorized by date, game version, or other factors. For example, the table on the Games Played page (Figure 2-4) is categorized by date by default, and for each date shows the number of gameplays initiated (but not completed), gameplays completed, and the total number of gameplays.

The Agent Bumps page is similar but is categorized by agent by default, and for each agent shows the agent name, number of unique bumps, and total number of bumps. Agents can be bumped multiple times in one gameplay, so *unique bumps* show the number of different gameplays in which the agent is bumped, and *total bumps* include repeat bumps. Similarly, Analytics Events can be triggered with the same value multiple times, so both unique events and total events are given on the Analytics Events page. Each Analytics Event in a game has its own

page. The Gameplay Duration page (Figure 2-5) displays a table of all play durations, grouped into 15 minute intervals.

All pages can be filtered by a specific date range, or have a “fast filter” applied, which filters for a pre-determined date range like the past week or month (Figure 2-4). Each page also has a left-hand sidebar linking to all other pages (Figure 2-6).

Data can also be downloaded from the site in the form of a CSV file, which can be further analyzed by users outside of TaleBlazer.

Games Played Fri, August 2, 2013 - Fri, April 24, 2015

Categorize by: Date

From: 08/02/2013 To: 04/24/2015 Filter

Fast filters: Today 1 week 1 month 3 months All

Statistics (by Date)

10 records per page Search:

Date	Total Games Played	Games Initiated (Not Completed)	Games Completed
Jun 18 2014	1	1	0
Jun 23 2014	6	1	5
Jun 24 2014	1	1	0
Jun 25 2014	12	8	4
Jul 7 2014	1	1	0
Jul 30 2014	8	5	3
Aug 5 2014	1	1	0
Aug 6 2014	4	3	1
Aug 11 2014	1	1	0
Aug 13 2014	2	1	1

Showing 1 to 10 of 43 entries

Previous 1 2 3 4 5 Next

Figure 2-4. Filter panel and data table on original Games Played page.

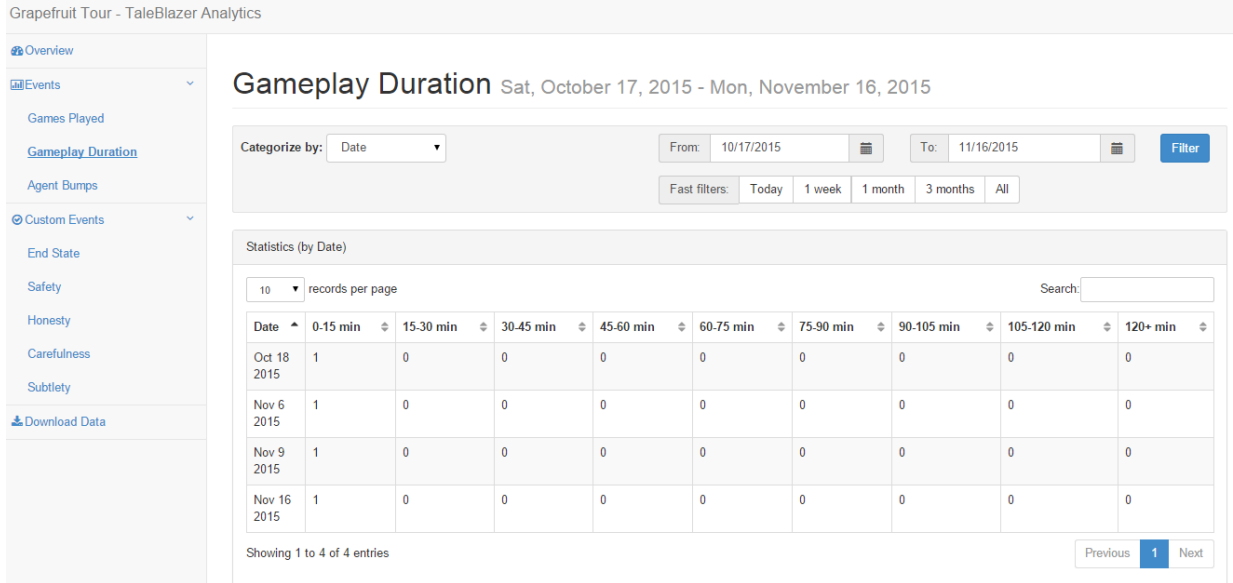


Figure 2-5. Original Gameplay Duration page.

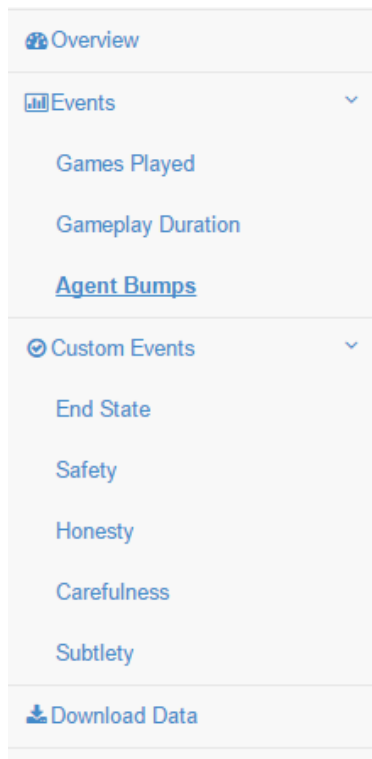


Figure 2-6. Original sidebar navigation.

Chapter 3

Preliminary Work

The original Analytics UI was evaluated for improvements to be made, and users of it were interviewed over how they used it. A list of common questions users have about their games was created, and the new UI designed to be able to answer these questions. Existing analytics services were also reviewed to find examples of good practices to use in our UI.

3.1 Initial Evaluation

The TaleBlazer Analytics system was implemented from scratch as the work of a previous M. Eng student [1], with much effort put into deciding what game data was to be tracked, and implementing the entire Analytics server, client, and UI structure. The UI was kept as simple as possible, as the focus was largely on completing a working version of TaleBlazer Analytics. Looking through the UI initially, there were many areas for improvement found and marked as potential areas of work.

3.1.1 User Interface

The Analytics site was very separate from the main TaleBlazer site. Going from the main TaleBlazer site to the Analytics page for a game could be jarring for a user, as they are quite different stylistically, as seen from a screen capture of the TaleBlazer site (Figure 3-1) and Analytics site (Figure 2-3). One change that could be made was to modify the Analytics UI to match the TaleBlazer styling more closely.



Figure 3-1. TaleBlazer homepage.

3.1.2 Aggregate Pages

Analytics only showed information about a single game, so to see information about all of an organization's games, each individual game's page would need to be viewed. There was also no way to easily see how two games were performing in comparison to each other. To make this process easier, an aggregate organization overview page could be made, to quickly view all of an organizations games at once.

3.1.3 Filtering

Analytics allowed for date filtering, through either a user specified date range, or selecting a pre-determined date range. However, there are numerous ways to filter the data on each page through

different metrics beyond simply the date. Expanding these filtering options was marked as an area for improvement.

3.1.4 Data Visualizations

There were no data visualizations in the previous version of Analytics; data was only displayed through tables (See Figure 2-5), or a downloadable CSV file. This led to a very text-heavy UI, that took extra time to read and understand. Adding visualizations as a substitute or to augment these data tables was decided to be another area for improvement.

3.2 Existing Analytics Services

We reviewed other analytics software to find examples to consider before modifying TaleBlazer Analytics. We found sites that showcased good design in data presentation, displaying information in an understandable manner without cluttering the UI.

Many of these features can be seen in GameAnalytics [2], a tool for adding analytics to mobile gaming apps, that tracks information such as user acquisition, player progression through games, custom events, and errors. Figure 3-2 shows a sample screenshot of the dashboard, which is able to be filtered and compared by specific traits, shows many “at a glance” pieces of data, and contains graphs and charts that separate data across Android versions and locations.

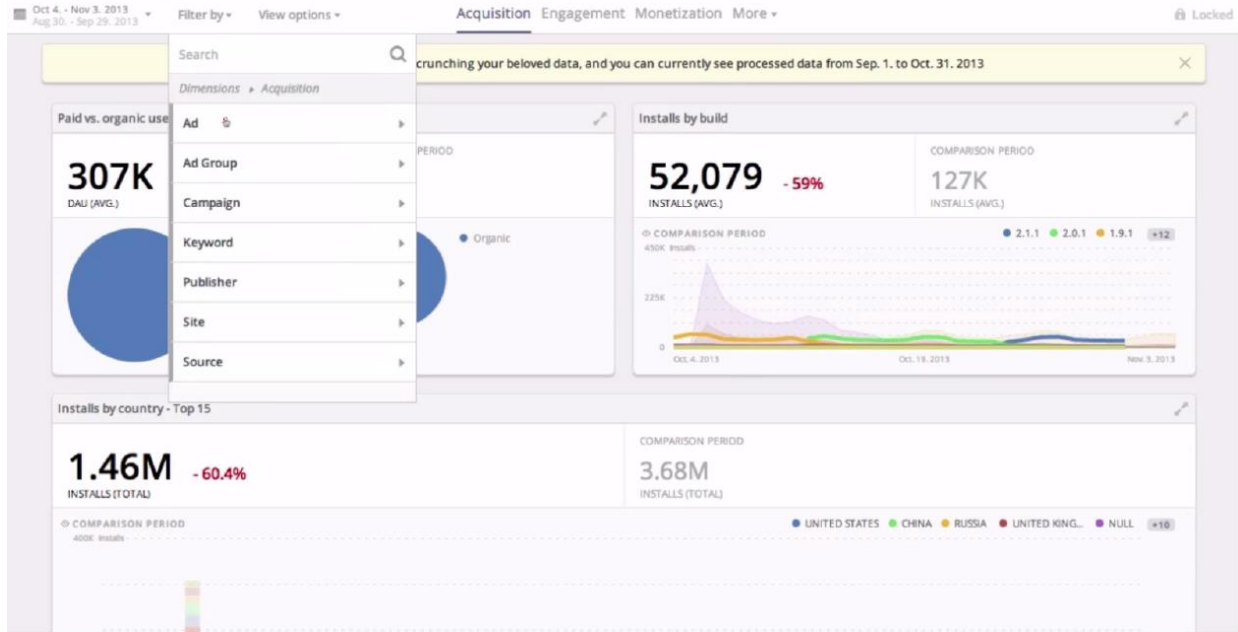


Figure 3-2. GameAnalytics dashboard.

Another interface looked at is Google Analytics [3], a web analytics service for tracking and reporting website traffic. Figure 3-3 shows a screenshot for the Audience Overview dashboard, which displays site traffic over time. Data can be further filtered by the user’s operating system, browser, country, language, screen resolution, and more. This interface also shows many “at a glance” pieces of data, and contains both graphs and tables (See Figure 3-4).

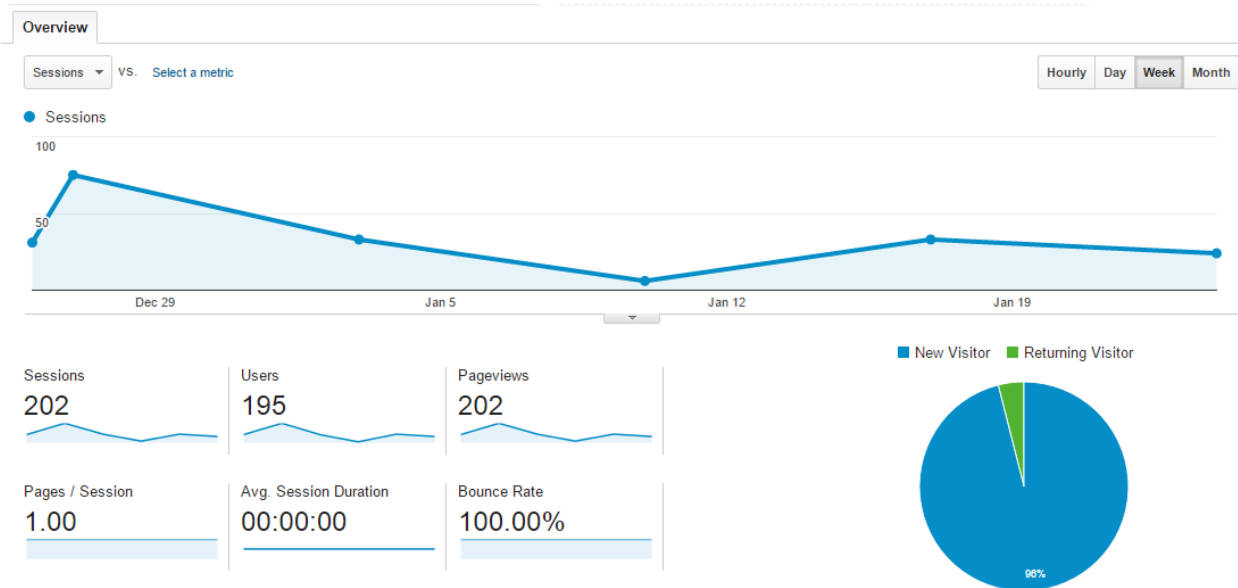


Figure 3-3. Google Analytics dashboard displaying web traffic over time.

Primary Dimension: **Browser** Operating System Screen Resolution Screen Colors Flash Version Other ▾

Plot Rows Secondary dimension ▾ Sort Type: Default ▾

Browser ?	Acquisition			Behavior		
	Sessions ? ↓	% New Sessions ?	New Users ?	Bounce Rate ?	Pages / Session ?	Avg. Session Duration ?
	202 % of Total: 100.00% (202)	96.04% Avg for View: 96.04% (0.00%)	194 % of Total: 100.00% (194)	100.00% Avg for View: 100.00% (0.00%)	1.00 Avg for View: 1.00 (0.00%)	00:00:00 Avg for View: 00:00:00 (0.00%)
<input type="checkbox"/> 1. Chrome	162 (80.20%)	98.15%	159 (81.96%)	100.00%	1.00	00:00:00
<input type="checkbox"/> 2. Firefox	29 (14.36%)	96.55%	28 (14.43%)	100.00%	1.00	00:00:00
<input type="checkbox"/> 3. Internet Explorer	5 (2.48%)	100.00%	5 (2.58%)	100.00%	1.00	00:00:00
<input type="checkbox"/> 4. Safari	5 (2.48%)	20.00%	1 (0.52%)	100.00%	1.00	00:00:00
<input type="checkbox"/> 5. Android Browser	1 (0.50%)	100.00%	1 (0.52%)	100.00%	1.00	00:00:00

Figure 3-4. Google Analytics dashboard displaying table of browser traffic.

Using examples such as the above, we formulated the following design principles and best practices:

- showing “at a glance” information about data
- using cards or a visual barrier to separate multiple pieces of data on the same page
- a combination of charts and graphs to show information
- extensive sorting and filtering options
- the ability to compare data from different filters against each other

We took these overarching principles and used them to guide the work of this thesis.

3.3 Initial User Feedback

Game designers at partner institutions were approached prior to this thesis, as well as at the beginning of this thesis work. Three users were questioned prior to this thesis [4], and two users were questioned again for this thesis. Users were interviewed about how they used TaleBlazer and TaleBlazer Analytics, and what needs were or were not being met by the system in place.

For this thesis, users were asked the following through web calls:

- Do you currently use TaleBlazer Analytics? If so, how?

- What are you interested in learning from Analytics?
- What data do you care about? Can you find this data currently?
- What do you think of the adding Analytics Events feature?
- Are you interested in seeing visualized data?
- Do you have any questions, concerns, or suggestions?
- How would you feel about the following changes?
 - Ability to filter by:
 - Game completion
 - OS and version
 - Tap to bump
 - Game duration
 - Custom event values
 - Specified days (weekday, weekend)
 - Season
 - Year
 - Ability to compare data between two filters
 - For example: games played on weekends on Android versus games played on weekdays on iOS
 - Aggregate data for all games in an organization

We found that partners were most interested in seeing what choices were being made by players, how long players were taking, and how often games were being played in general. They also were very interested in determining where exactly players were stopping in their games, as this could immensely help understand the gameplay if they were to discover players were often getting stuck at a specific agent or losing interest in the game at one location. Some wanted an easy way to filter out test gameplays when looking at the Analytics site, and gameplays where the user never bumped an agent or only played for a few seconds, signifying that it wasn't a "valid" play. Similarly, partners were interested in seeing data from only games that were completed.

Some found the fixed grouping of gameplay durations into size time intervals (Figure 2-5), with the smallest being 0-15 minutes, as too restrictive. Requests were made by users to allow these groupings to be user-editable, and perhaps displayed on a histogram for easier reading than just a large table. Partners responded positively when asked if they would find more extensive filtering and comparing, and aggregate organization data as useful additions to the Analytics site.

3.4 Research Questions

After interviewing partner organizations, and the TaleBlazer team, the resulting feedback was synthesized into a set of research questions. This gave us the concrete task of enabling users to more easily answer these common research questions about TaleBlazer gameplay.

Organizations are largely interested in the effectiveness of TaleBlazer games, and metrics on how many players there are, as well as how they are playing. They also often have more than one game available, and having a way to view aggregate data on all of their games would be useful in comparing games. Their interests are largely covered by questions such as:

- How many gameplays are there?
- How many “valid” gameplays are there? Meaning gameplays that are not a test play by the game designer, and the player did not immediately close the game.
- How long are players playing each game?
- How long does it take players to complete a game?
- How popular is a game over time? Are there more or less players than last month, or last year?
- How do an organization’s games compare to each other?
- How many players are completing or not completing a game?
- Where are players getting stuck in a game?
- In certain organizations: How many plays occur over the weekend when mostly families are visiting, versus the weekdays when mostly school field trips are visiting?
- What devices are players playing games on?

Chapter 4

Implementation

Changes made to TaleBlazer Analytics occurred primarily on the Analytics server and Analytics site, with updates being made to the server responses to API requests, and modifications to the Analytics frontend to display this data in new ways. Filters were added to all pages, and the general UI modified. In addition to this, changes were made to the Game Overview and Gameplay Duration pages, and an Organization Overview page was created.

4.1 Game Overview

The Game Overview page, which originally only included a few large, boxed overview statistics, was updated to give a better in-depth view of a game's data

4.1.1 Overview Statistics

The overview statistics on the Game Overview page acted as a way to quickly get “at a glance” information about a game. The page previously showed the following overview numbers:

- Games Initiated
- Games Completed
- Average Completion Time
- Lifetime Download Count

One confusing aspect of the overview statistics used previously was that the average completion time included data from both uncompleted and completed games. It made users unable to answer the question of how long it took players to complete a game. Instead, the time from gameplay start to gameplay completion (for completed games), or gameplay start to last event time (for uncompleted games), was averaged together from all gameplays. The average gameplay times for completed, uncompleted, and all games are separate values with different significances, but the previous UI only displayed one. The phrasing “games initiated” also represented all games ever initiated, completed or uncompleted, which may have been unclear for some users.

To remedy these problems, overview statistics were grouped into:

- Completed Gameplays
- Uncompleted Gameplays
- Total Gameplays

With “total gameplays” representing both completed and uncompleted gameplays. Each group includes the number of gameplays and average duration (Figure 4-2). This removes the confusion over the meaning of an average completion time, and provides more information than the previous UI.

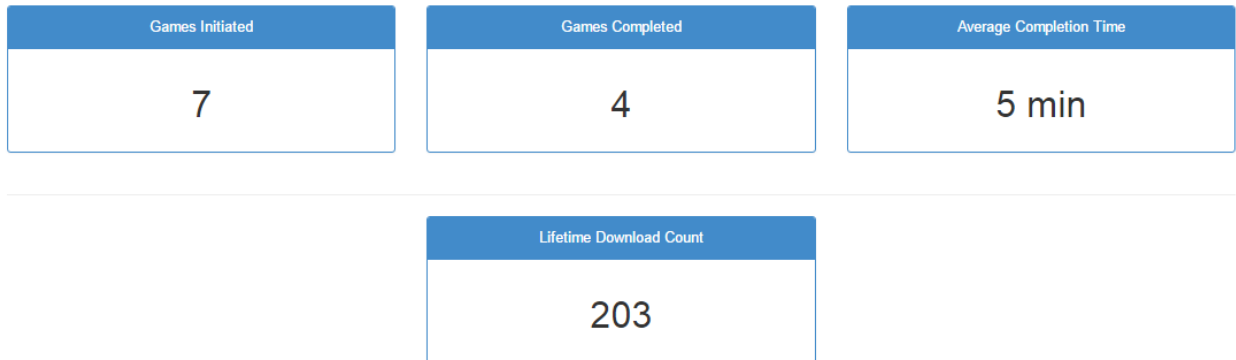


Figure 4-1. Overview statistics on original Game Overview page.



Figure 4-2. Overview statistics on updated Game Overview page.

4.1.2 Data Visualizations

The previous Game Overview page and Games Played page made it difficult to answer questions about the number of gameplays over time for a game, or easily see trends in gameplay. The Games Played page displayed a table listing the completed, uncompleted, and total games played each day (Figure 4-4). If looking across a very large date range, such as months, scrolling through the table of gameplays by date didn’t give a very intuitive overview for how games were

played over time. Additionally, days without plays would not have a row in the table, making it easy to not notice when a game was not being played.

To easily view how many gameplays were occurring over time, a bar graph displaying this information was created (Figure 4-3). The date range in the bar graph responds to the range of dates for the gameplays, grouping plays into hours, days, or months as appropriate. This allows users to answer questions about gameplay trends, such as if there were more games in one month over another, or if the number of gameplays are increasing over time.

The previous Analytics UI didn't mention devices, or allow for organizations to view what kinds of devices users were playing their games with. To allow organizations to answer the question of what OS is being used by players, a pie chart displaying the percentage of gameplays with Android devices and percentage of gameplays with iOS devices was created as well (Figure 4-3). Both visualizations were made using the Flot.js plotting library. Work was done on the server side to return more data through the API calls, as well as on the client side to process information returned from the server into the correct format to be displayed by these charts.

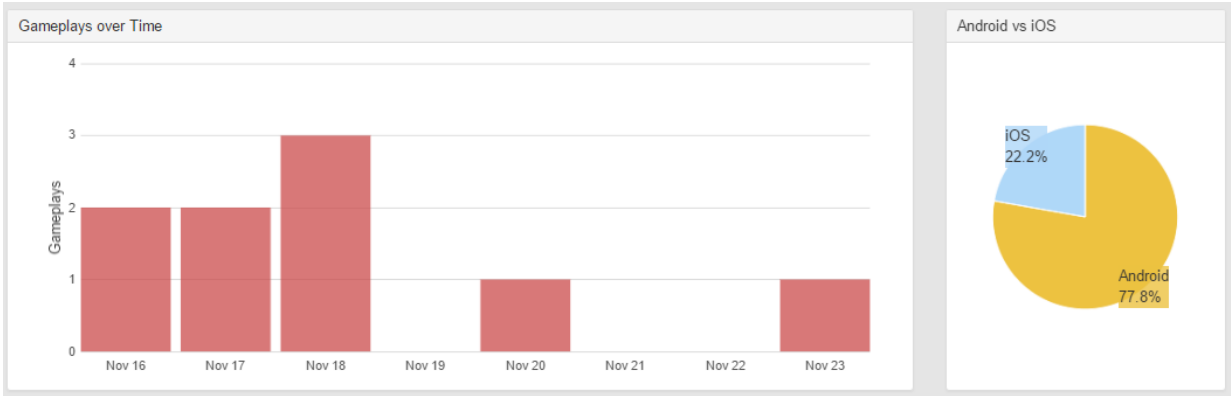


Figure 4-3. Visualizations on updated Game Overview page. Gameplays over time bar graph and Android vs iOS pie chart.

4.1.3 Data Table

Because the gameplays over time graph displays the same data as that in the Games Played table (Figure 4-4), the table in the Games Played page was moved to the Game Overview page so that

all data related to Games Played could be seen together on one page, instead of disjointed across two pages. The table heading titles and order were modified to match the overview statistics: completed gameplays, uncompleted gameplays, and total gameplays.

Date	Total Games Played	Games Initiated (Not Completed)	Games Completed
Aug 25 2015	1	1	0
Sep 14 2015	1	1	0
Oct 10 2015	1	0	1
Oct 18 2015	1	0	1
Nov 6 2015	1	0	1
Nov 9 2015	1	1	0
Nov 16 2015	1	0	1

Figure 4-4. Data table on previous Games Played page.

Date	Completed Gameplays	Uncompleted Gameplays	Total Gameplays
Nov 18 2015	1	2	3
Nov 20 2015	1	0	1
Nov 23 2015	1	0	1
Nov 30 2015	0	1	1
Dec 1 2015	0	2	2

Figure 4-5. Data table on updated Game Overview page.

4.2 Organization Overview

The Organization Overview page was created as a new page for TaleBlazer Analytics. While a Game Overview page was already available, there was previously no way to view aggregate data about all games in a specific organization.

4.2.1 Overview Statistics

To match the format of the updated Game Overview page, the same “at a glance” information (Figure 4-6) was put into the Organization Overview. This displays information about completed gameplays, uncompleted gameplays, and total gameplays, out of all games in an organization. This allows organizations to answer questions that previously weren’t possible, or would have been tedious to find the information for, such as how many people overall are playing their games, and how long they are playing for.



Completed Gameplays		Uncompleted Gameplays		Total Gameplays	
Total	Average Duration	Total	Average Duration	Total	Average Duration
48	11.7 min	84	2.2 min	132	5.7 min

Figure 4-6. Overview statistics on updated Organization Overview page.

4.2.2 Data Visualizations

To allow organizations to see the number of gameplays over time for all games, and see trends in gameplay across all games, the same gameplays over time bar graph and Android vs iOS pie chart as on the Game Overview page (Figure 4-3) were used in the Organization Overview page.

The largest difference from the Game Overview page is that instead of looking at a single game, multiple games are being looked at. Organization games are displayed as a stacked bar graph, so users can still see gameplays over time for individual games, and see how different games compare to each other (Figure 4-8). This also allows them to see the trend in total number of gameplays across all games. Users can select specific games to look at through a game filter above the graphs, which allows them to focus on data for just those games they care about, or filter out test games (Figure 4-7). Both graphs update when changes are made to the games selected. This allows organizations to answer questions about how their games compare to each other, such as which is the most or least popular. It also allows organizations to see trends in overall gameplay, and spot out busy or more popular times for plays.

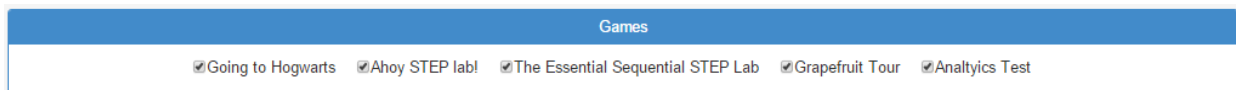


Figure 4-7. Game selection on updated Game Overview page.

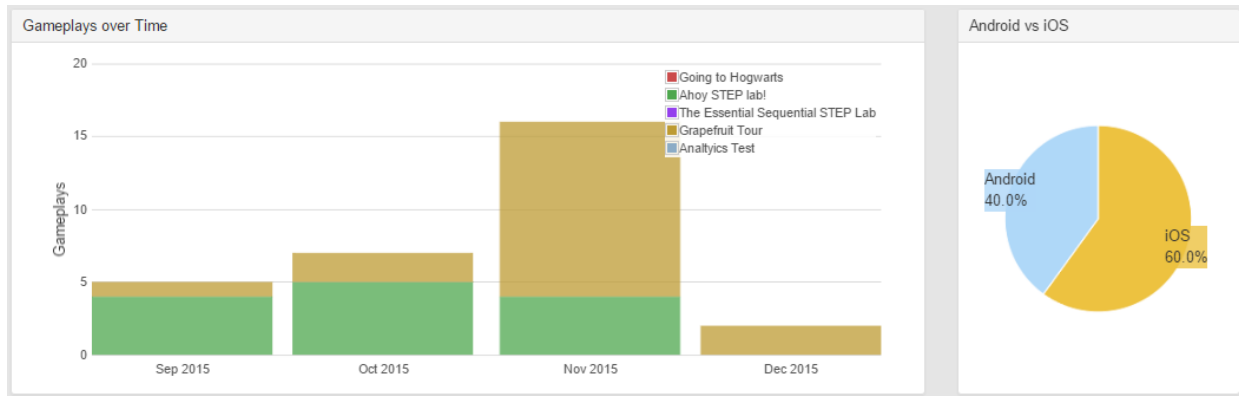


Figure 4-8. Visualizations on updated Organization Overview page. Gameplays over time bar graph and Android vs iOS pie chart.

4.2.3 Data Table

Matching the Game Overview page, the Organization Overview page also contains a table displaying more detailed information. Each individual game’s “at a glance” information is shown, so users don’t need to visit each individual Game Overview page to get this information. This allows users to answer more detailed questions about each game while on the Organization Overview page, such as how many people are playing each game, and how long they are taking to play.

Name	Completed Gameplays	Uncompleted Gameplays	Total Gameplays	Avg Duration (Completed)	Avg Duration (Uncompleted)	Avg Duration (Total)
Ahoy STEP lab!	0	9	9	0	7.0	7.0
Analytics Test	0	0	0	0	0	0
Going to Hogwarts	0	0	0	0	0	0
Grapefruit Tour	2	1	3	6.6	0.0	4.4
The Essential Sequential STEP Lab	0	0	0	0	0	0

Figure 4-9. Data table of organization games on updated Organization Overview page.

4.3 Filtering

The previous version of Analytics included only a time filter, and a way to categorize values in a table. However, there was no way to filter the data by other parameters through the web UI.

After reviewing feedback from partner organizations, and looking at the TaleBlazer team needs, the following filter parameters were selected to be implemented:

- Completion
- Tap to bump
- Device OS
- Day of the week
- Gameplay duration

These filter options were implemented on the server, with additional SQL calls made for each request to restrict data to match these parameters. The ‘Filter’ button was also removed from the UI, to allow for instantaneous filtering of data after each selection of a filter option (Figure 4-10). All data on each page is put through the filters selected.

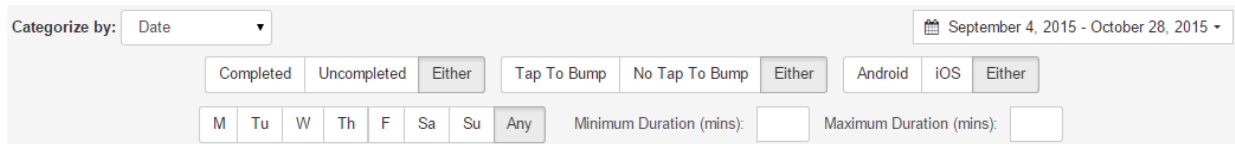


Figure 4-10. Updated filter panel. Filters set to allow ‘Either’ completion state, ‘Either’ tap to bump state, ‘Either’ OS, ‘Any’ day, and no restrictions set on gameplay duration.

Organizations can view game data in numerous ways through these filters, answering many different types of questions. For example, they can view the number of valid plays, which can be represented by completed gameplays, gameplays lasting longer than some amount of time, gameplays without tap to bump enabled, or however else one wants to define this. If one wanted to only look at completed games without tap to bump enabled, and longer than five minutes, they could check ‘Completed’, ‘No Tap to Bump’, and enter ‘5’ as the ‘Minimum Duration (mins)’ in the filter. By using the filtering panel, a user could look at agent bumps, analytics events, and gameplays for only valid gameplays, ignoring those gameplays that they don’t care about.

The filter panel can also be used to compare between sets of data. For example, an organization could look at the gameplays over time graph for ‘Either’ device, then ‘Android’, to understand what gameplays are coming from Android devices. It also allows users to view data from weekend or weekday gameplays, which can be used to see which is more popular.

4.4 Gameplay Duration

One request by partners was to make the fixed grouping of gameplay durations user editable, instead of being fixed by the UI into 15 minute intervals (Figure 2-5). For games shorter than 15 minutes, it was impossible to learn more details about exact durations. Different games require different granularity of bucketing. For example, one game may take most users under 15 minutes to complete, but another may often require users play up to an hour to complete, with a wide spread of gameplay durations. Viewing gameplay durations solely in a table format was also cumbersome to quickly comprehend.

To solve these problems, a histogram to show these gameplay durations was created to be displayed in addition to the table (Figure 4-12). An input was added for users to type in their own interval sizes (Figure 4-11), to view the durations with finer or coarser granularity than the original fixed intervals.

A screenshot of a user interface element showing a label 'Interval Size:' followed by a text input field containing the number '5'. The input field has a light gray border and a small square focus indicator on the right side.

Figure 4-11. User input for interval size on updated Gameplay Duration page.

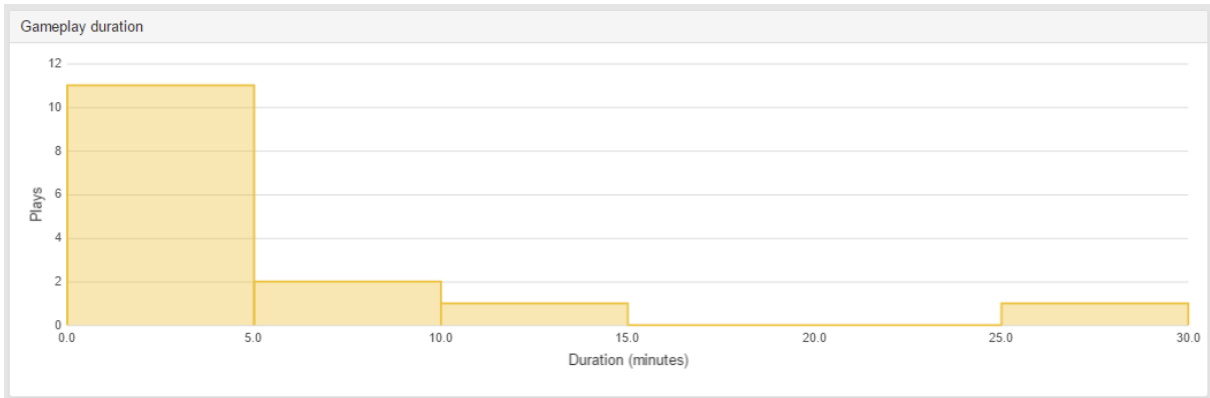


Figure 4-12. Histogram of gameplay durations on updated Gameplay Duration page. Intervals grouped into five minute buckets.

4.5 Improved UI

The TaleBlazer Analytics UI was also modified to better match the styling of the main TaleBlazer site (Figure 3-1), as the two were previously styled extremely differently, giving them the appearance of two unconnected entities.

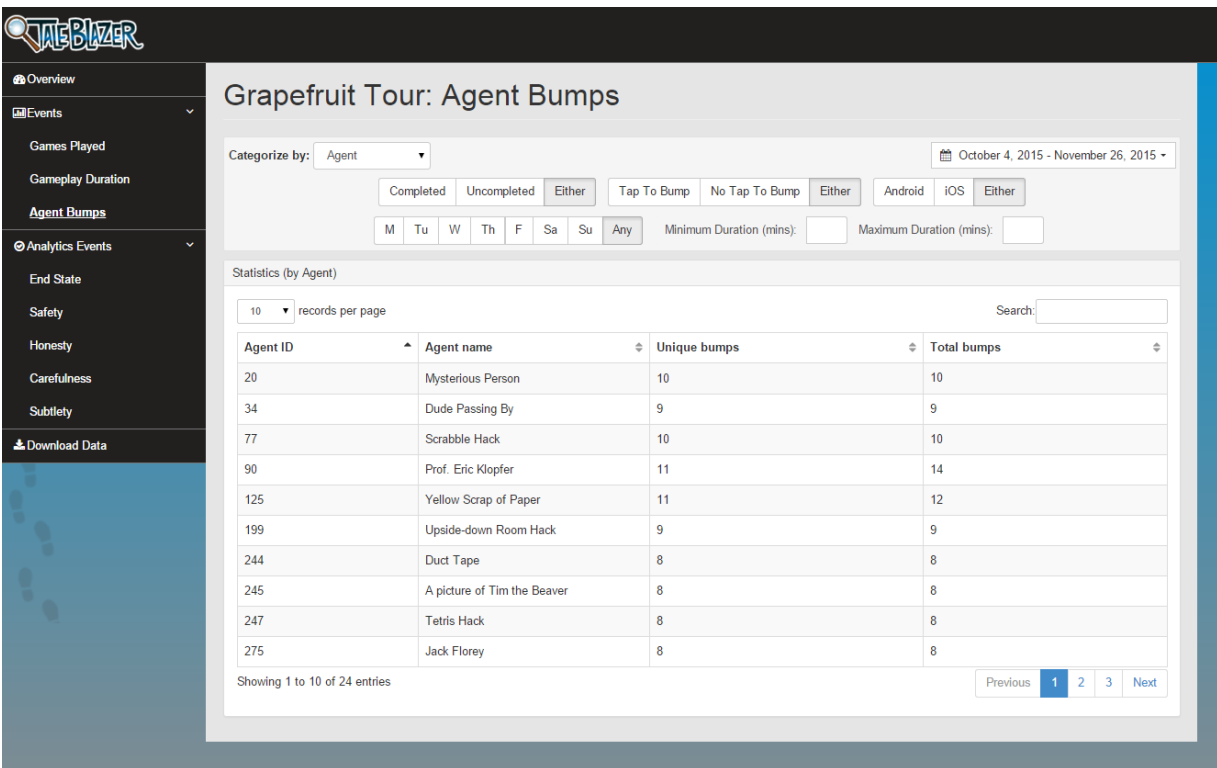


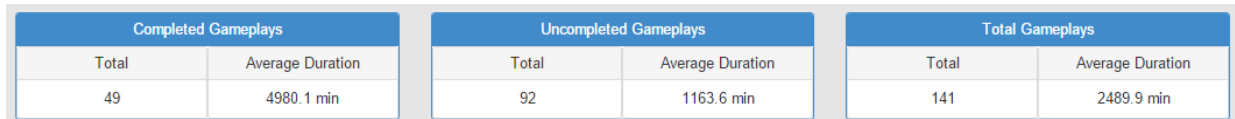
Figure 4-13. Updated Agent Bumps page. Shows the updated UI styling for Analytics.

4.6 Other Work

In addition to the work above, some Analytics bugs in the gathering and displaying of data were fixed in the beginning of this thesis work, a way to track game downloads over time was added, and a script to restart the Analytics server was created.

4.6.1 Tracking Downloads

Game downloads previously were only being tracked by a ‘total downloads’ entry for each game. Downloads were also previously coupled to gameplays, meaning that each time a game was downloaded by a player, it was immediately started for play and a new session registered, even if the player didn’t intend to play it until much later. This caused many inflated game durations to be seen in Analytics (Figure 4-14), as players would download a game but not play it until hours or days later. This was recently fixed by another TaleBlazer team member, and downloads are no longer coupled to gameplays. In light of this change that had been planned to happen, a new table in the database to track game downloads was created. For each new download that occurs, the time and game ID is recorded. This will allow organizations to view game downloads and gameplays over time separately, now that they are no longer tied together. Game downloads aren’t displayed yet on Analytics as there hasn’t been enough information for many organizations collected, but it will be in the future.



Completed Gameplays		Uncompleted Gameplays		Total Gameplays	
Total	Average Duration	Total	Average Duration	Total	Average Duration
49	4980.1 min	92	1163.6 min	141	2489.9 min

Figure 4-14. Inflated gameplay durations in Game Overview statistics.

4.6.2 Restart Script

TaleBlazer Analytics and TaleBlazer are run on the same server, which restarted partway through this past summer. It was found that TaleBlazer Analytics did not correctly restart, meaning data wasn’t collected for some period of time. To avoid this problem from happening in the future, a script was created to restart TaleBlazer Analytics in case of a server restart, so that this will not occur again.

Chapter 5

User Testing

5.1 Test Overview

After finishing the work described in Chapter 4, we conducted user testing to gather feedback on the new Analytics system. A detailed testing guide (Appendix A) was given to three partner organization testers, who were familiar with TaleBlazer and had designed games before. Testing was conducted either in person or through online screensharing.

The testing guide gave an overview of TaleBlazer Analytics and described a sample game to be played, as well as the analytics blocks included in the game. The users were asked to play through the sample game and read the overview explaining the structure of the game and data that would be collected. They were then asked use the Analytics site to answer a series questions regarding the demo game and organization for the demo game. They were then free to use the new Analytics site to look at their own organization's games. Users were asked to think aloud while conducting the tests, and verbalize all thoughts while interacting with the UI.

5.1.1 Demo Game

The demo game used was MIT STEP Lab's *Grapefruit Tour*, a pre-existing game already available for play by the public. The game is a tour of pranks (or hacks) around the MIT campus, with users interacting with agents that explain different pranks and ask the user ethical questions about these hacks. Each question answered by the user triggers an Analytics Event that stores a value corresponding to the answer given. At the end of the game, users receive a rating based on how many questions they answered correctly.

5.1.2 Tasks

Testers were first given a series of tasks related to *Grapefruit Tour*. The tasks started with the tester viewing the Overview page for the game. They were asked to determine how many players

had played the game under different conditions (ex: completed, uncompleted, with tap to bump, within a certain amount of time), and the average duration of those gameplays. They were also asked to compare the number of gameplays between weekends and weekdays, between the current month and previous month, and between Android and iOS devices. They were then asked to determine how many users answered all of the questions correctly, and how many users selected a specific answer at one agent. Finally, they were asked what agent is usually the last reached by players, signifying where players often stop in the game. Testers could try to answer their own questions about the game data using the new UI, and share any additional comments they had.

Next, testers were given a series of tasks related to the MIT STEP Lab, an existing TaleBlazer organization, which the *Grapefruit Tour* game is managed by. The test started with the user viewing the Organization Overview page, showing all of MIT STEP Lab's games in addition to *Grapefruit Tour*. Testers were asked how many players had completed or not completed an MIT STEP Lab game, and the corresponding average duration of those gameplays. They were also asked to determine the organization game played the most under different conditions (ex: completed, on the weekend), and the game with the longest average duration. Finally, they were asked to compare gameplays between the current month and previous month, between Android and iOS devices, and between two specific games. Testers could try to answer their own questions about the organization's game data using the new UI, and share any additional comments they had.

Testers then had the optional task of exploring Analytics further by viewing the web page for their own organization and organization's games.

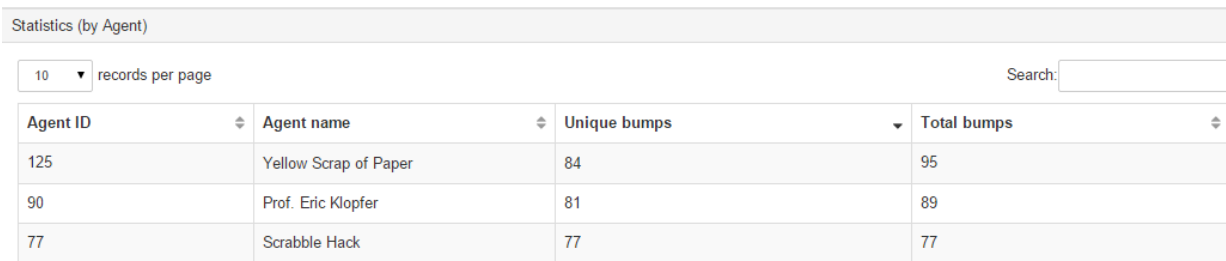
5.2 Results and Feedback

Overall, testers had positive feedback about the updated Analytics UI, and liked the addition of visualizations and “at a glance” data. Important findings from the user testing, and improvements made are listed below.

5.2.1 Final Agent

Before

Users were unable to adequately answer what agent was bumped last in a game most often, as the table on the Agent Bumps page could only be sorted by the number of total or unique bumps. While sorting by unique bumps could give a better idea of how many players progressed from agent to agent, it was still not possible to determine the number of users that ended at each agent and definitively answer the question.



Agent ID	Agent name	Unique bumps	Total bumps
125	Yellow Scrap of Paper	84	95
90	Prof. Eric Klopfer	81	89
77	Scrabble Hack	77	77

Figure 5-1. Sorting agent bumps by the number of unique bumps.

After

A “final bump” column was added to the Agent Bumps page. This column shows the number of gameplays in which the specified agent is the last one to be bumped. Adding all of the final agent bumps together should therefore equal the total number of gameplays for the given set of filters. Figure 5-2 shows an example of the final bump column from the *Grapefruit Tour* game, and is filtered for only completed gameplays. The first four agents in the table all have an End Game block, and signify the endings where the player receives different scores. The column shows that users that completed the game must have ended at one of the first four agents in the table. No player that completed the game ended at the Mysterious Person agent, or any other agent. The Jack Florey T-Shirt agent was the most popular final agent for completed games, and indicates that these players got all four questions correct.

Agent ID	Agent name	Unique bumps	Total bumps	Final bump
400	Jack Florey T-Shirt	4	4	4
404	Jack Florey Sticker	2	2	2
401	Jack Florey Badge	1	1	1
405	1 or 0 Right	1	1	1
20	Mysterious Person	8	8	0

Figure 5-2. Updated Agent Bump table with Final bump column.

5.2.2 Filter Selection

Before

Filters were able to be set through a toggle-able interfaces (See Figure 5-3). Some users were initially confused by this, as the interface for all filter options was the same, despite their different mechanics. For example, multiple days of the week could be selected, but only one type of completion state could be selected.

The screenshot shows a filter panel with two rows of buttons and two input fields. The first row contains buttons for 'Completed', 'Uncompleted', 'Either', 'Tap To Bump', 'No Tap To Bump', 'Either', 'Android', 'iOS', and 'Either'. The second row contains buttons for 'M', 'Tu', 'W', 'Th', 'F', 'Sa', 'Su', and 'Any', followed by 'Minimum Duration (mins):' and 'Maximum Duration (mins):' with empty input boxes.

Figure 5-3. Previous filter panel.

After

The filters were modified to make the difference between single selection options and multiple selection options more explicit. A Bootstrap multiselect dropdown plugin was used to achieve this (See Figure 5-4).

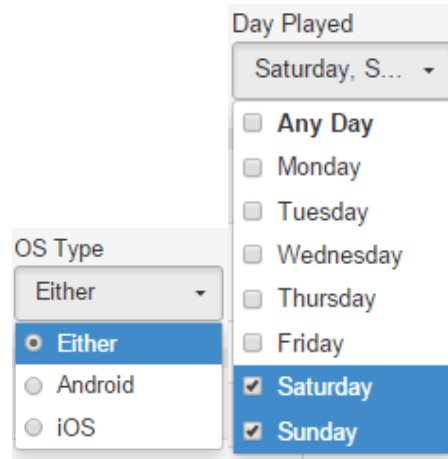


Figure 5-4. Updated single and multiple select dropdowns in filter panel.

5.2.3 Preserving and Clearing Filters

Before

Filters chosen were not preserved across pages, making it cumbersome to reselect filters when viewing a new page. There also was no easy way to reset all filters to their default state, other than manually changing each filter. One tester did not notice the filters weren't being preserved across pages, and assumed they were. Another felt that a way to clear filters would be very useful, especially after trying many filter options out.

After

Like the date range and categorization metric selected, filters are now preserved in the cookie so that they are accessible from all Analytics pages and create a seamless experience for the user. A "Clear Filters" option was added to quickly reset filter choices to default values (See Figure 5-5).

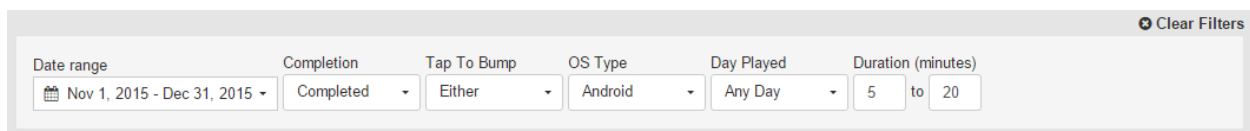


Figure 5-5. Updated filter panel.

5.2.4 Analytics Events

Before

Determining the number of analytics events with a certain value was time consuming, as these were categorized by date by default. To see how many gameplays had a specific value for an analytics event would involve counting the instances across multiple dates (See Figure 5-6). One could categorize by game version, role, or scenario, instead of date, to better group event values, but testers often didn't notice the categorize dropdown, and this is a convoluted way to get information that is commonly needed.



The screenshot shows a web interface for analytics. At the top, it says "Statistics (by Date)". Below that is a "records per page" dropdown set to "10" and a search box. The table has four columns: "Date", "Value", "Unique Events", and "Total Events". The data rows are:

Date	Value	Unique Events	Total Events
Oct 10 2015	1	1	1
Oct 18 2015	0	1	1
Nov 6 2015	0	1	1
Nov 16 2015	0	1	1

Figure 5-6. Analytics Events categorized by date.

After

Analytics events are now categorized by value instead of the date by default. This allows users to easily see how many gameplays had a specific analytics event triggered with a certain value, without needing to count instances across multiple dates. The categorize filter was also moved to the table and out of the filter panel (See Figure 5-7) for increased noticeability.



The screenshot shows the updated web interface. At the top, it says "Statistics by" followed by a dropdown menu set to "Value". Below that is a "records per page" dropdown set to "10" and a search box. The table has three columns: "Value", "Unique Events", and "Total Events". The data rows are:

Value	Unique Events	Total Events
0	3	3
1	5	5

Figure 5-7. Updated Analytics Event table categorized by value.

5.2.5 Analytics Terms

Before

The meaning of some terms was unclear, such as the difference between “unique bumps” and “total bumps” on the Agent Bumps and Analytics Events page. One user was also initially confused by the Analytics Events and what the values stored by them represented.

After

Analytics Documentation in the form of a PDF file was created to assist users in understanding how to add Analytics Events to track data they specifically care about and to track game completions. The documentation is viewable via a link on the Analytics site and explains how to use Analytics to track game data, how to use the Analytics site, and defines key terms.

5.2.6 Games Played

Before

The Games Played page (Figure 2-4) was not necessary, as the same table of gameplays (Figure 4-5) is on the Game Overview page, as well as visualized forms of the data. One user noted this after going between the Game Overview page and Games Played page.

After

The Games Played page was removed to reduce redundancy.

5.2.7 Sidebar Navigation Menu

Before

The sidebar navigation was not completed before user testing, so the Organization Overview page was not linked to from the Game Overview page, making the two very separate, and easy for testers to become stuck on a game page, with no way to click back to the Organization Overview page.

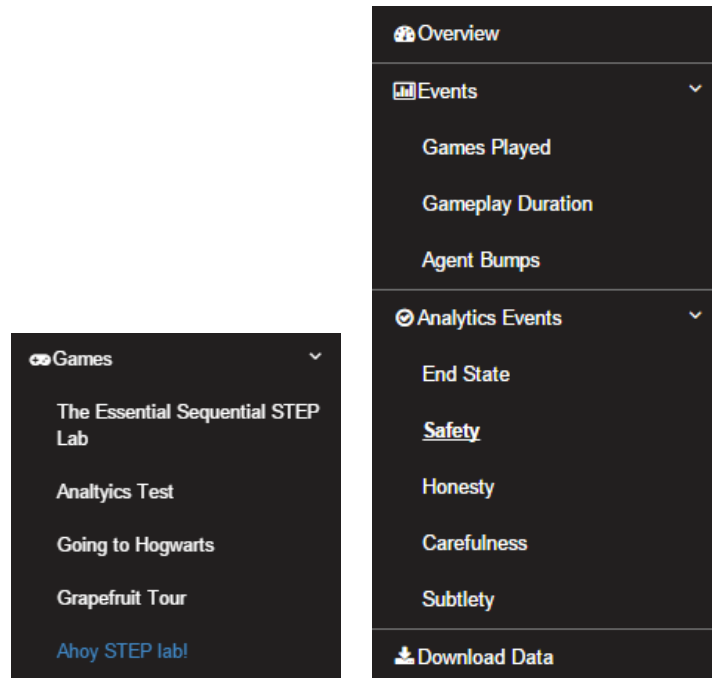


Figure 5-8. Previous sidebar navigation. Sidebar on Organization Overview page (left) and sidebar on all other game pages (right).

After

The navigation sidebar was updated so users would always be able to go back to an Organization Overview page from any game page. After clicking on a game in the sidebar in the Organization Overview page, the navigation expands to show all pages related to the selected game.

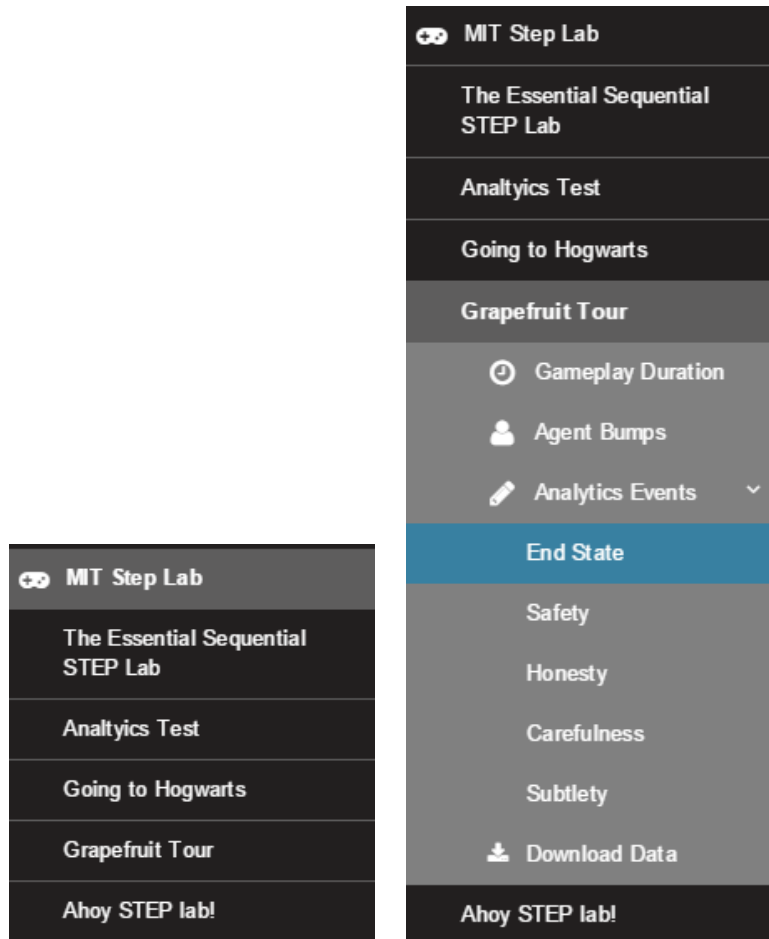


Figure 5-9. Updated sidebar navigation. Sidebar on Organization Overview page (left) and sidebar on all other game pages (right).

5.2.8 Small UI Improvements

Before

UI improvements could be made to better the appearance of the pages, such as clearer page titles, displaying meaningful text when no results are returned for a given query, and giving totals in the tables. The page titles were completely unstyled, and some users were confused as to what page they were viewing (See Figure 5-10). Users also counted values in some tables to get the total, and wanted this to be displayed by default. In the cases when no results were found for a given date range and filter, some elements of the page did not correctly show this information (See Figure 5-11).

MIT Step Lab: Organization Overview

Grapefruit Tour: Overview

Grapefruit Tour: Safety

Figure 5-10. Previous page titles. (From top to bottom) The titles for: Organization Overview page, Game Overview page, and Analytics Event “Safety” page.

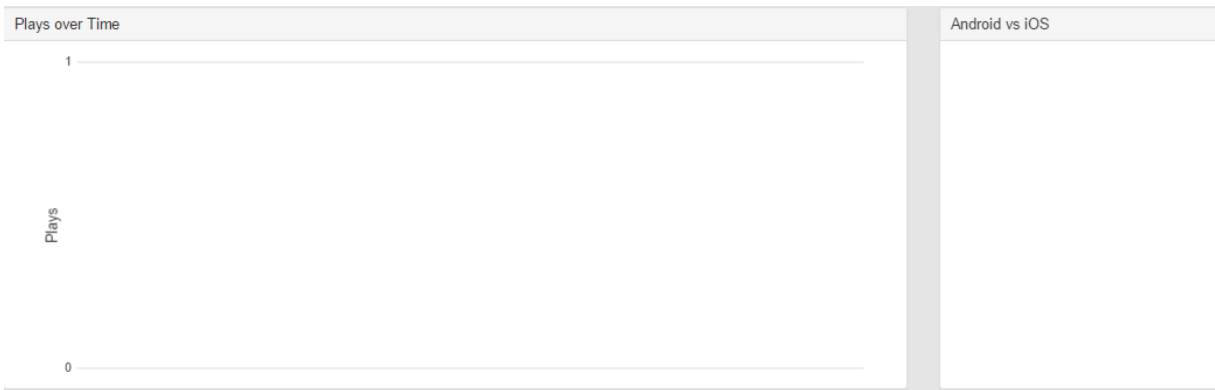
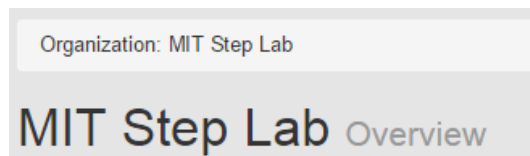


Figure 5-11. Empty graphs. Displayed when no matching results found for a given date range and filter.

After

The UI was modified to include stylized page titles, and a breadcrumb at the top of the page to help users understand what specific data they are looking at (Figure 5-12). “No matching results” text was added in locations where there had previously been large empty graphs when no data was found (Figure 5-13). Finally, table totals in the footer of each table were added as well, to allow for easier viewing of different totals by the user (Figure 5-14).



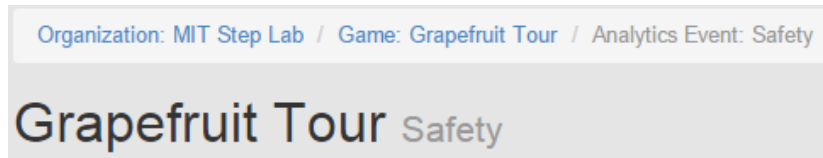
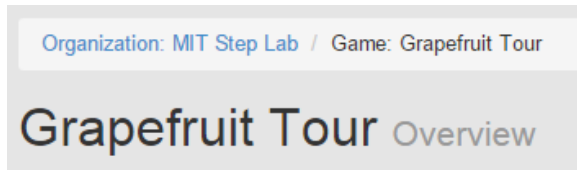


Figure 5-12. Updated page titles. (From top to bottom) The updated titles for: Organization Overview page, Game Overview Page, and page for Analytics Event named “Safety”.

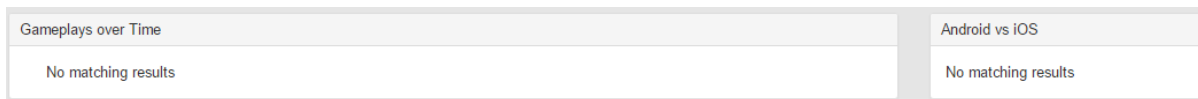


Figure 5-13. Updated empty graphs. Displayed when no matching results found for a given date range and filter.

Statistics by Date

10 records per page Search:

Date	Completed Gameplays	Uncompleted Gameplays	Total Gameplays
Oct 18 2015	1	0	1
Nov 5 2015	1	0	1
Nov 9 2015	0	1	1
Nov 16 2015	1	1	2
Nov 17 2015	1	1	2
Nov 18 2015	1	2	3
Nov 20 2015	1	0	1
Nov 23 2015	1	0	1
Nov 30 2015	0	1	1
Dec 1 2015	0	2	2
Totals	7	8	15

Showing 1 to 10 of 10 entries Previous 1 Next

Figure 5-14. Table totals. Shown on data table on Game Overview page.

5.2.9 Gameplay Duration

Before

Viewing the Gameplay Duration page would occasionally cause the page to freeze, as it would by default categorize gameplay durations into 15 minute buckets. A prior version of the TaleBlazer mobile application didn't separate downloading of a game from the playing of a game, creating many recorded game durations that were much longer than the actual gameplay. Using such a small interval size with these potentially large durations created a large number of unnecessary time buckets, and a huge amount of data being sent in the API response to the UI, which was then very time-consuming to process and be displayed.

After

The Gameplay Duration page was modified to no longer use 15 minutes as the default time bucket when no user input is given. Instead, if no interval size is specified by the user, the server by default will use whatever interval size that results in 10 time buckets being created. The user can then further filter data by setting a maximum duration to look at, to remove the gameplays with extremely long durations, or change the interval size being used.

Chapter 6

Future Work

6.1 Improved Comparisons

Basic comparisons can be done using the current version of Analytics, such as Android versus iOS gameplays, and viewing the bar graph of gameplays over time. However, more complicated queries could be made possible through the Analytics UI. Ideally the comparison system used would be very flexible and allow for many ways to compare data. One possible way to allow for this is to have the user decide two or more ways to filter data, then display this data side by side or overlapped in some way to see the key differences and similarities. For example, data from weekend and weekday gameplays could be compared side-by-side, instead of the user needing to toggle between day selections or keeping two separate windows open with the two filters in use. A side-by-side comparison could also allow for A/B testing of two slightly different versions of a game.

6.2 Aggregate TaleBlazer Data

There is currently no page that provides a general overview for all TaleBlazer games for developers to get a better understanding of games played across the entire system. Manually visiting each Organization Overview page isn't a very feasible way to get this information, especially as more organizations are added to TaleBlazer. This could be useful for the development team to be able to immediately see metrics such as: how many games are being played in all organizations, what type of device is being used the most, and how many players are completing games. It would also allow the team to view the most active, or downloaded, games easily, possibly in the form of a top ten list. Statistics about non-gameplay data, such as game creation and editor use could also be informative to the team. Providing this data, along with the data from Organization Overview pages, in a downloadable CSV file could be useful as well.

Creating this page would be similar to the creation of the Organization Overview, but require repeating the data retrieval process for all organizations. Each time a new filter is selected by a user on the frontend, a new API request is sent and processed by the server. This could be a slow operation with so much data, so caching may need to be implemented to avoid needless recomputation of different statistics.

6.3 User Paths

One recurring request from game designers and educational researchers was a way to understand a user's "path" through a game, or the potential sets of agents and decisions a user can encounter. In games with multiple paths a user can follow, depending on agent interactions and choices made, it can be difficult to find meaning in the data presented.

For example, a game might have multiple Analytics Events, tracking player answers to questions posed at different agents. A researcher may be interested in determining how many gameplays involve a specific set of answers given by the user, or want to filter data about one Analytics Event by what the user answered in a separate event. In the *Grapefruit Tour* game, a researcher might want to see specifically how players that answered only the first two questions correctly performed in the game, or how many people only answered the first and third question correctly. Similarly, one could be interested in seeing data from gameplays that involve a specific set of agent bumps, signifying a certain path through the game. It is not possible to discover this information by using the current UI, although this data can be extracted from the CSV available for download. More research should be done to determine the best way to present this data to the user.

6.4 Better Integration with TaleBlazer

It currently takes many steps and going through multiple pages for organizations to update the version of a game being broadcast, or being made available for others to play. Viewing Analytics for a particular game involves going to the Edit Organization Profile page in TaleBlazer, which lists all of the games in an organization. Here, users can also click on a link to go to a particular game's Game Overview page. However, there is currently no way to go from TaleBlazer to an Organization Overview page, as this isn't linked to anywhere on the TaleBlazer site. Shortening

the multi-step process for updating a game and placing links to Analytics in obvious, easy-to-find locations would help in making Analytics more user friendly and intuitive to use, as well as more a natural extension of TaleBlazer.

Additionally, TaleBlazer Analytics is not integrated with TaleBlazer's authentication and authorization system. Analytics currently isn't restricted at all – anyone may visit the analytics page for a game. Although the data collected is anonymous, it should still be restricted to only those authorized to view it. Organizations may prefer that non-members not be allowed to see gameplay metrics. Analytics pages for games and organizations should be restricted to organization members and the TaleBlazer team, and an aggregate page for all TaleBlazer games would need to be restricted to just the TaleBlazer team. The same login credentials as those in the TaleBlazer server can be used for this to occur.

6.5 Timezone Support

Events are recorded using UTC time and displayed in the Analytics UI in the timezone of the user viewing the web page. This can make it difficult to interpret data for games occurring in a different timezone from the user viewing the data. Similarly, the dates in the CSV available for download are also in the local time of the user downloading the document, which means they must be manually converted to the desired timezone. Adding an option for timezone selection to the filter panel would be a small but useful modification, especially as TaleBlazer grows in its user base around the world.

Chapter 7

Contributions and Conclusion

7.1 Contributions

The contributions of this thesis include:

- Evaluation of prior Analytics system and user needs
- Organization Overview and Game Overview pages:
Data related to all of an organization's games can now be viewed together, allowing organization's to compare games more easily and understand playing trends. Similarly, all data about a game can be viewed together. In both instances, visualizations to display plays over time and device comparison were created as well.
- Improved filtering:
A system was implemented to allow for more filtering of data beyond just the date. This allows organizations to answer more complex questions about their game data.
- Improved UI:
Through user testing and evaluations, more functionality was added to the UI, and modifications made. User requests were met, such as a way for users to define their own gameplay duration intervals.

7.2 Conclusion

TaleBlazer is a platform for creating and playing location-based augmented reality games, and TaleBlazer Analytics is its automated game data collection system. This thesis expanded on initial work done on the Analytics system to allow for more in-depth viewing of data from individual games and aggregated from games in organizations. This will ultimately help researchers, game designers, organizations, and the TaleBlazer team in better understanding how users play TaleBlazer games.

Appendix A

TaleBlazer Analytics Testing

Description of Analytics

Thank you for helping me test the TaleBlazer Analytics platform. As you may know, TaleBlazer Analytics gathers and analyzes data about mobile users' use of TaleBlazer games. TaleBlazer organization administrators use this tool to help better understand how and when their games are played. For all games that have been explicitly broadcasted by an organization, data is automatically collected, including:

- how many users played a game (number of gameplays)
- how long a gameplay session was (gameplay durations)
- agents bumped
- and user-created analytics events (these events must be specifically flagged in the game editor by the game designer).

During today's user-testing, we'll be looking at MIT STEP Lab's "Grapefruit Tour" game. After familiarizing yourself with the gameplay, you will be asked to view and analyze data related to this game. You will also be asked to view and analyze data from multiple games from the MIT STEP Lab's games. Finally, you may explore analytics for your own or another game if desired and have time. Let's get started!

Tasks

Task 1: Familiarize Yourself with Grapefruit Tour and Data Collection

We will be looking at data from the Grapefruit Tour game, which gives a tour of pranks (or hacks) that have been pulled on the MIT campus. To understand analytics data associated with this particular game, we will first play through the game.

Open the TaleBlazer mobile app and go to the Featured page, select MIT STEP Lab, and select Grapefruit Tour. Select this game to play. Turn on Tap to Visit so that it can be played remotely. You can do this by selecting the menu symbol in the top left corner, going to the *Settings* page, and enabling 'Tap to Visit'.

Play through the entire game. When you bump into the *Mysterious Person* agent, select 'Yes' to continue playing the game. Agents will ask you questions; answer each question as you wish. Once done with the game, tap on the 'How did you do?' green box to see the final agent, marking the end of the game.

Over the course of the game, you will bump into many agents that will ask you questions. The following other agents will ask you a question, which will be recorded by the analytics system:

- Dude Passing By: Cool or Uncool
- Jack Florey: Yes or No
- Nearby Person: Yes or No
- Eavesdropping Woman: Yes or No

Each question has an incorrect and correct answer. Your number of correct answers is displayed on the Player tab under ‘Hacking Ethics.’ The final agent, gotten to by selecting the ‘How did you do?’ green box, is determined by your number of correct answers.

The possible final agents are:

- *Jack Florey T-Shirt*: 4 Correct
- *Jack Florey Badge*: 3
- *Jack Florey Sticker*: 2
- *1 or 0 Right*: 1 or 0
- *You Fail*: never said ‘Yes’ to *Mysterious Person* agent to start the tour

Analytics Event Blocks

In Grapefruit Tour, when the player bumps the *Dude Passing By* agent, they are asked to make a choice that impacts the safety of others. The game designer wants to know which choice each player makes when encountering this agent. Since button clicks are not automatically recorded by the TaleBlazer analytics system, the game designer used analytics events and the 'trigger analytics event' block to track this information. Analytics events are created via the *Settings* page on the game editor, and added to the bump script of a desired agent using the ‘trigger analytics event’ block.

For the *Dude Passing By* agent, when the player taps the ‘Cool’ button (which is the unsafe choice) the analytics event ‘Safety’ is triggered with a value of 0. When the player taps the ‘Uncool’ button (which is the safe choice) the analytics event ‘Safety’ is triggered with a value of 1. These values are recorded for each analytics event triggered. An example of these blocks is displayed below.



Likewise, the ‘Honesty’ event reflects which choice the user made for the *Jack Florey* agent -- 0 for agreeing that stealing is good (or the ‘Yes’ button) and 1 for not agreeing that stealing is good (or the ‘No’ button).

The ‘Carefulness’ event reflects the choice at the *Nearby Person* agent – 0 for agreeing that hacks should cause damage (or the ‘Yes’ button) and 1 for not agreeing that hacks should cause damage (or the ‘No’ button).

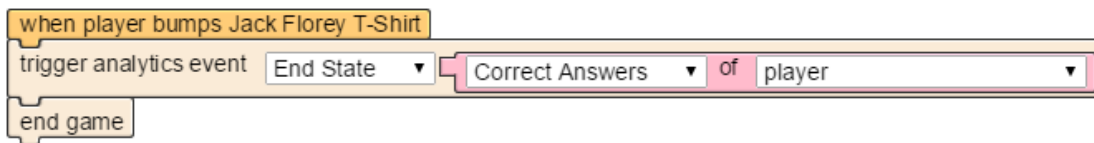
The ‘Subtlety’ event reflects the choice at the *Eavesdropping Woman* agent – 0 for agreeing to the unsubtle hack (or the ‘Yes’ button) and 1 for not agreeing to the unsubtle hack (or the ‘No’ button).

End Block

When a player reaches the final agent in Grapefruit Tour and sees how well they performed, the gameplay is completed. However, the TaleBlazer Mobile software cannot determine automatically when a player has completed a game. To track the completion of a game, an ‘end game’ block must be added to a game.

In Grapefruit Tour, an ‘end game’ block is added to the bump script of each of the five possible final agents (listed earlier), so that when the final agent is bumped it is triggered and marks the gameplay as completed. Gameplays not marked as completed are uncompleted.

Below is an example of a bump script on the *Jack Florey T-Shirt* agent that uses the ‘End State’ analytics event block to record the number of correct answers of a player. It also uses the ‘end game’ block to signify the completion of a gameplay.



Task 2: Answer Questions on Grapefruit Tour

Now that you have an understanding of this game, we can go to its Analytics page to look at data about it. Please visit: <http://analytics.taleblazer.org/overview/633>

Note: all analytics for Q1-13 will be looking at data about the Grapefruit Tour game. Using this Game Overview page, and those pages linked to in the sidebar (Games Played, Gameplay Duration, Agent Bumps, etc), please try to answer the following questions about the game. For each question, restate what you believe the question to be asking and think aloud as you try to answer it.

1. How many players played and completed the game? How long did these gameplays last?
2. How many players played, but did *not* complete the game? How long did these gameplays last?
3. How many players completed the game in less than five minutes overall?
4. Of all players who played the game, did more players play on weekends or weekdays?
5. Did more players play this month or last month?
6. Did more players use iOS devices or Android devices overall?
7. How many players used ‘tap to bump’ (aka tap to visit) overall? How many played who did not use ‘tap to bump’?
8. How many players didn’t use tap to bump and completed the game overall?
9. How many players got all four questions correct overall?

- a. Note: *Jack Florey T-Shirt* is the agent reached by players that end with four correct answers. The ‘End State’ analytics event also tracks the number of correct answers.
10. How many players said ‘Uncool’ to the Dude Passing By agent, selecting the safe choice?
 - a. Note: this corresponds to the ‘Safety’ analytics event being triggered with a value of 1
 11. What is the last agent usually reached by players that didn’t complete the game?
 12. Can you think of other questions the game designer might be interested in?
 - a. What are they?
 - b. Try answering these questions using the analytics platform. Can these questions be answered? Explain.
 13. Do you have any comments or questions about the analytics functionality?
 - a. Did it behave as you expected?
 - b. Was it easy to understand?

Task 3: Answer Questions on MIT STEP Lab’s Games

Now we will look at data for all of the MIT STEP Lab organization’s games. Please visit: <http://analytics.taleblazer.org/organization/5>

Again, try to answer the following questions, while thinking aloud:

1. How many players completed MIT STEP Lab’s games overall? How long did these gameplays last?
2. How many players played, but did not complete MIT STEP Lab’s games overall? How long did these gameplays last?
3. What game was played the most overall?
4. What game was completed the most overall?
5. What game was played the most on the weekend overall?
6. What game was played the most this month? Last month?
7. What game takes players the longest time to complete overall?
8. Did more players use iOS devices or Android devices overall?
9. Did more Ahoy STEP Lab and Grapefruit Tour players use iOS devices or Android devices overall?
10. Can you think of other questions the organization administrator might be interested in when comparing multiple games from their organization?
 - a. What are they?
 - b. Can these questions be answered?
11. Do you have any comments or questions about the analytics functionality?
 - a. Did it behave as you expected?
 - b. Was it easy to understand?

(Optional) Task 4: Explore Analytics Further

If you have extra time, feel free to further explore the Analytics site for Grapefruit Tour/MIT STEP Lab's games and/or broadcasted games of your own.

Things to consider while testing are listed below:

- What questions do you have about YOUR data? Can these questions be answered?
- For questions that can be answered, is the way to do this intuitive? Did the UI respond as you expected?
- What functionality would you like to see that is missing or would make understanding the data easier?

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