

Getting Kids Moving Again: Mobile Games, Connected Playgrounds, and Data Collection

Summary

Children today spend less and less time outdoors engaging in healthy physical activity, compared to just a few years ago, and more and more time indoors, sedentary, and exposed to a number of screens: cell phones, iPods, tablets, computers, and televisions. The negative health consequences of these habits are already evident, and will likely worsen over time. But while many parents might perceive screen-technology as an obstacle to improving their child's fitness, recent studies have shown that a new generation of mobile games can actually be a very effective tool at motivating higher physical activity amongst kids while also increasing parental engagement. They use the appeal of mobile games and apps to encourage children ages 3 to 9 (dubbed "touchscreen natives") out to the playground, along with a parent who holds the device.

At the connected playground, movement, activities and goals earn the children their sought after rewards of badges, avatars, etc. Not only are the parents and children engaged in play, but also the aggregate data collected (exceeding online safety and privacy guidelines for children) helps inform landscape architects, playground designers, planners, multi-family housing owners, funders, and municipalities about what equipment is used, how it is used, and when it is used. This data can lead to the funding, design, and construction of highly utilized, highly effective playgrounds, as well as creating parent/child time and a healthier younger generation. To enhance and encourage investments in future connected playgrounds, the data has the ability to track the ROI of playground expenditures.

Learning Objectives

By the time you have completed this educational unit, you will be able to:

1. Describe the decline in child physical activity over the past few decades, the reasons for it, and the consequences.
2. Identify a new generation of mobile game apps and connected playgrounds that drive children outdoors, increasing physical activity and engaging parents in playground activities.
3. Discuss the health benefits of connected playground activity for both children and their parents.
4. Define how playground owners and operators can use aggregate data on usage patterns of connected playgrounds to formulate programs, set budgets, apply for grants, and get community engagement.
5. Discuss a potential case study of playgrounds that are Internet and app driven, and collecting data to help in municipal planning and fundraising for playgrounds.

Introduction

Year over year, annual national surveys report a general decline in physical activity among children and a corresponding increase in screen time. Time spent outside by children has been reported to be on a well-documented decline since the 1980s.

Childhood obesity is a growing concern in North America, and around the world. In the United States alone, as measured by body mass index (BMI), an estimated 17.5% of children ages 3 to 19 are obese. In Canada, the prevalence of obesity among that age group is 13%.¹ This can have a devastating impact on adult health with growing epidemics of diabetes, heart disease, and other illnesses.

Child activity in past decades was centered on walking to school, gym classes in school, and neighborhood outdoor play. Today, children are more likely driven to school, and school gym activities can be victims of budget cuts.

And rather than playing with friends outside, children today are likely glued to any number of screens: television, computer, cell phones, iPads and other touch screens as they play video games and explore the world of online content.

Digital, computer, and television screens are often blamed for the rise in sedentary lifestyles and childhood obesity. It's easy to forget that we are raising a generation of touchscreen natives: children whose attention is largely consumed by the excitement and allure of screen-based devices.

According to a recent annual report card on physical activity for children and youth, 76% of 5 to 11 year olds are getting more than the recommended limit of 2 hours of screen time a day.² Perhaps even more shocking are self-reports of children who claim as much as 7 hours and 48 minutes of screen time per day.³ This staggering number is coupled with reports of decreased outdoor physical time, as only 14% of 5-11 year olds are getting the recommended amount of 60 minutes of moderate to vigorous activity a day.

Some groups are so alarmed by increases in screen time that they want to ban the sale of smartphones to kids. Parents Against Underage Smartphones, or PAUS, is a non-profit group pushing the proposal.⁴ According to PAUS founder Tim Farnum, a Denver-area parent and anesthesiologist: "Eventually kids are going to get phones and join the world,

¹ <http://www.cbc.ca/news/health/child-obesity-at-highest-level-in-canada-and-u-s-1.3203561>

² (ParticipACTION, 2016)

³ (Leatherdale and Ahmed, 2011)

⁴ <https://www.usatoday.com/story/tech/nation-now/2017/06/19/colorado-group-wants-ban-sale-cellphones-smartphones-kids-under-13/407898001/>

and I think we all know that, but little children, there's just no good that comes of that."

On the other hand, Colorado Sen. John Kefalas, D-Fort Collins, thinks such a law would overstep the government's role into private family life.

"Frankly, I think it should remain a family matter," he told USA Today.⁵

These issues bring to mind two questions:

1. What can be done to get kids engaged in more physical activity?
2. How might the appeal of screens be leveraged to achieve that objective?

One of the best practices to come out of fitness research and educational design is the notion of "stealth learning."⁶ This concept means that as a player is doing something critical to a game experience, they are also learning that thing i.e., learning by doing in a natural context and the intrinsically rewarding experience that follows. So one participates in fitness because one's chosen game activity intuitively calls for it.

In their 2005 paper, "Resurrecting Free Play in Young Children: Looking Beyond Fitness and Fatness to Attention, Affiliation, and Affect," Burette & Whitaker also make several recommendations for motivating physical activity in children by moving away from the traditional focus on health and physical well being and instead focusing on mental well being and enjoyment.

In congruence with the concept of "incidental activity," they suggest that imaginative play be offered to younger children with prescriptive play elements for those age groups who would gravitate towards testing themselves against a more structured challenge (e.g. racing, high scores etc.) as per their developmental phase. In either case, the game premise offer naturally calls for specific types of physical activity.

A New Generation of Mobile Game Apps and Connected Playgrounds

While many observers of childhood health issues are quick to list the negative impacts of the hours spent with digital content, lost in the discussion are the positive impacts. The biggest asset of course, is that children tend to be intensely interested in digital-based experiences. Anyone who has dealt with a chronically bored child can appreciate the power of this interest. Video games can also teach valuable moral lessons such as caring and helping and hard work. Video games can create a sense of community as players compete against each other all over the world, and even teach teamwork. In the latest iteration of augmented reality, digital games can even get players outside and

⁵ <https://www.usatoday.com/story/tech/nation-now/2017/06/19/colorado-group-wants-ban-sale-cellphones-smartphones-kids-under-13/407898001/>

⁶ Cordova and Lepper, 1996

interacting with the world.

The fairly recent phenomenon of Pokémon Go is a good example of digital media apps and augmented reality that get players out of their homes and into the world as they look for the Pokémon.

That is the same concept embraced in the newest social good, digital games that drive children out of the house and into the playground.

So rather than fighting against the interest young children have in digital content and games, some tech pioneers have taken on the task of harnessing that interest for the good of the child with a suite of mobile games not only intended to get kids off the couch, but also participating in greater amounts of vigorous activity on the playground. These games leverage the use of imagination by presenting fictional scenarios that prompt instances of embodied play on the playground, supported by the phone in unique ways.

The value of this approach is supported by experts who suggest that in order to “maintain the outdoor recreation participation of children across America, park and recreation professionals may need to embrace the expanding role of technology.”⁷ This is from a report titled: “Children’s time outdoors: results and implications of the national kids survey,” by Larson LR, Green GT, Cordell HK (2011) Journal of Park and Recreation Administration.

How Playground Apps Work

Playground apps are generally a suite of augmented reality, imagination-driven playground games for parents to play with their children aged three to nine.

Typically these games can be played on any playground, but they work best on playgrounds with the specific augmented reality markers installed, markers which can unlock new content, activate mini-games and reveal treasures when scanned. Usually, no special equipment is required. Parents simply download the free apps.

The playground app games take place on the playground and involve a parent holding their phone with a game open, helping guide the child through an imaginary scenario. The child spends most of their session time playing away from the phone on playground equipment based on game directives. The child returns to the phone intermittently to perform a game function, complete a mini game or advance their progress through the game’s imaginary scenario. Ideally, it is an explicit goal of the games to encourage physical play while discouraging screen-fixation. The games are designed to get kids playing through the phone, rather than on it.

⁷ (Larson et al, 2011, p. 17).

Every playground app has its own goals and criteria. For instance, the games developed by one company follow a 90/10 rule, which means that kids must be physically active for at least 90% of the game, with only 10% of their attention ever spent with the screen. The result is “heads up” play that is best for the child, yet actively involves their parents, grandparent, or caregiver.

Games that children might play with support of these apps run the range from obstacle courses to treasure hunts to make believe adventures to team play. The apps are typically available on many different types of platforms.

In short, these mobile games are about parents mediating imagination-driven experiences for their children on the playground using the app on their cell phones. The intent is to ensure that the child is unencumbered by technology and is focused safely on physical play with playground equipment.

For encouraging robust play activity, a successful playground app’s most important principle is that of “embodied play,” which means that kids need to be using their bodies to enact or participate in the games and not simply be sitting on a bench and passively moving their progress forward through an avatar. In the most advanced playground app games, children are effectively the avatars.

For example, if a playground app game situates a player as a spy, the child playing might need to glide down a slide, escaping from the fortified strongholds of evil syndicates. If a child is a car in a playground app game, he or she is completing laps and stopping for repairs at a “pit stop.” If a child is a treasure hunter in the playground app game, he or she might be squeezing through passages (tubes) and climbing up inclines (climbers) leading into ancient chambers. The goal of the developers of these playground apps is to make it all about fun, role-play and imagination, and ultimately, game scenarios that naturally call for physical activity.

Health Benefits of Connected Playground Activity for Children and Parents

Effective playground app games should be designed to encourage certain levels of activity. Some sessions are intended to be highly vigorous games that get and keep heart rates relatively high for short stints. Others are intended to keep activity light to moderate for longer durations of time. This lets children work up to games that ask more of them in terms of exertion without having to jump into something too demanding right off the bat. This also allows for the opportunity for parents to shift their child down to lighter forms of activity as to not exhaust them from too much vigorous output during a given playground session.

One level of activity considered very beneficial is Moderate to Vigorous Physical Activity (MVPA). This level of activity produces increases in breathing and heart rate, and is the

equivalent of brisk walking or bicycling.

Unlike solitary video game playing at home, playground app games involve the parents and social support. Such support, especially from parents, is a factor consistently linked with higher levels of MVPA in children.

In a study where playground app gameplay was compared with typical free play playground sessions, and measuring heart rate activity between them, the playground app play demonstrated heart rates significantly higher in the app play session than the free play.

The Data Driven Playground

We have seen the value of playground app games for children and parents. There is a secondary benefit to what are being called “connected playgrounds.” That benefit is the anonymous data that can be collected and used to formulate programs, set budgets, apply for grants, and get community engagement. Prior to the advent of the digitally connected playground, landscape architects, planners, funders, users, and the community were without data to know or understand how, when, and by whom a playground was used. The data collected can now enlighten all stakeholders, thus making a case for ROI.

Compliance with Child Privacy Laws

Landscape designers and others who specify a connected playground should ensure that the app developers are fully compliant with children’s privacy laws. These are known in the U.S. as the Children’s Online Privacy and Protection Act (COPPA)⁸ and in Canada as the Personal Information Protection and Electronic Documents Act (PIPEDA)⁹. To ensure full protection for players, all information collected via a playground app gameplay session should be anonymized, segmented, and encrypted. Specifiers should ensure that the app company will not harvest random information from the family’s device or other information such as:

- Names
- Phone Numbers
- Photos
- Email or messages
- Contacts or addresses

⁸ <https://www.ftc.gov/enforcement/rules/rulemaking-regulatory-reform-proceedings/childrens-online-privacy-protection-rule>

⁹ <https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/the-personal-information-protection-and-electronic-documents-act-pipeda/>

If a playground app company adheres to COPPA and/or PIPEDA, such personal information will not be collected or used in any way.

The Value of Aggregate Playground Data

Today, virtually every industry is being transformed by the availability of big or deep data. Surprisingly, very few cities have access to any sort of real-time data when it comes to their playgrounds spaces. As a result, public capital expenditures are made in an unavoidable vacuum.

The aggregate data that playground app games make possible provide valuable and unique insights into how playground ecosystems function. The companies that gather this data via connected playgrounds use this data to generate a playground profile for each community to provide insights in the following areas:

Peak hours — What are the peak hours each playground is used? What is the optimal time of day for play? This could help parks departments plan special events, classes, and activities.

It also gives parks departments insights into the best time to schedule maintenance, the best time of day to send parks staff to engage with the community, the ability to compare one park to another to see why and how time of day trends are occurring, to monitor data and determine the effectiveness of certain initiatives to drive families to the playgrounds, and to test methods on how to boost usage during slow times.

Daily demographics — Who is using the playground each day? What are the ages and genders? If more boys than girls are using the playground, perhaps that signals the need for investment in equipment that will be of more interest to girls.

This data gives a sense of which members of the community are getting the most out of the playground / park infrastructure, and informs parks boards about the main demographics to help determine effective programs and initiatives, etc.

Length of each session — How long are children and their parents staying at the playground? How can the playground be designed to encourage longer play sessions?

Allows parks departments to monitor the ROI on their playground initiatives when trying to drive more families to parks. Parks boards can compare their parks and investigate why play sessions might be longer at one park vs. another, and allows parks boards to see the real-time impact of changes on their playgrounds, such as adding or removal of equipment, adding or removing benches, etc.

Influence of weather on playground attendance — What impact does the weather have

on playground use? If the playground is deserted during hot and sunny days, perhaps this signals the need for investment in a shade structure.

Also provides insights into the best times of year to invest or plan for playground activities, for timing of marketing and programming initiatives, and helps predict attendance based on forward-looking weather reports.

Favorite equipment used — If the data shows that slides get much more use than swings, based on aggregate data collected from play sessions, there would be a better return on investment to include more slides and fewer swings.

This leads to more efficient government spending, more informed / better playground design, and allows parks departments the chance to build the exact playgrounds their communities are asking for based on the insights gleaned from the data.

User language — What language is spoken by those using the playground app? This could help make decisions for signage at the playground, and for outreach efforts by parks departments.

Also provides interesting information about demographics and which communities are being served most by the playgrounds and parks.

Personalized activity profiles for families — Just as personal fitness trackers motivate individuals to reach goals, the playground app can help parents and their children track their activity on the playground.

Allows families to monitor whether or not their children are hitting their daily recommended activity level targets, rewards them for meeting or exceeding activity standards, and provides a breakdown of which games are being played most to help suggest more similar games to increase the amount and length of play sessions.

Benchmarking with other sites — What are the differences in usage patterns between one playground and another? A playground operator or specifier can compare different communities with similar demographics to determine the optimum playground design.

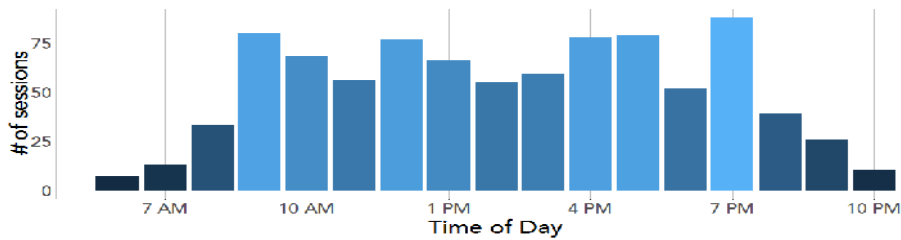
Allows for tracking ROI of particular playground initiatives when trying to drive traffic to parks, and to monitor spending efficiencies and park resource distribution among different communities. The data helps determine the best potential locations for new playground builds when comparing different communities based on Census data and existing playground usage patterns.

Each time a playground app game is played, it generates a burst of related data. This data is created as a by-product of gameplay itself and is driven by the fun. As more and more families download and play app-driven playground games, more and more

detailed information is created about how each community interacts with their playground.

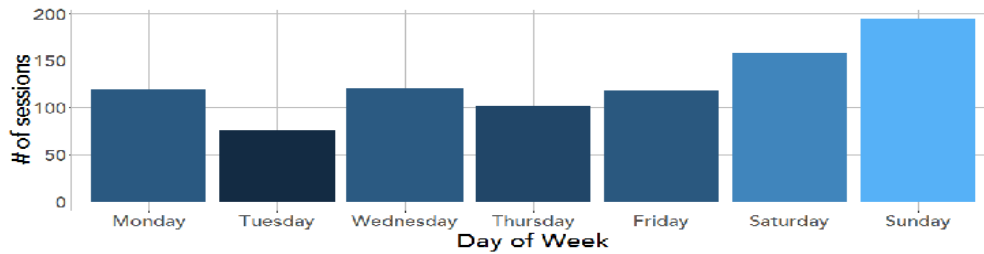
All of this data will be uploaded and stored securely in the “cloud.” Ideally, each playground will have its own unique profile of gameplay activity. The app companies can also create specialized data reports to give answers for in-depth issues facing playground operators.

1. Peak Hours of Day (Number of Sessions)



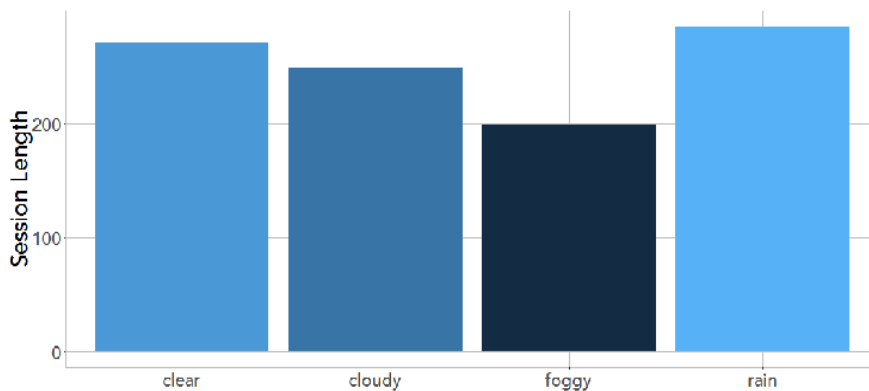
2. Peak Days of Week (Number of Sessions)

This lets you know which days of the week families tend to spend the most time at the playground.



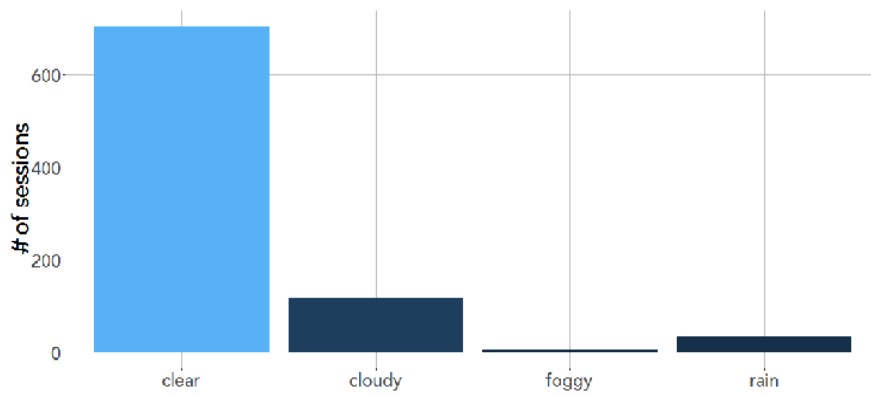
3. Weather Impact: Session Length

This lets you know the relative impact of weather on how long families play on-site.



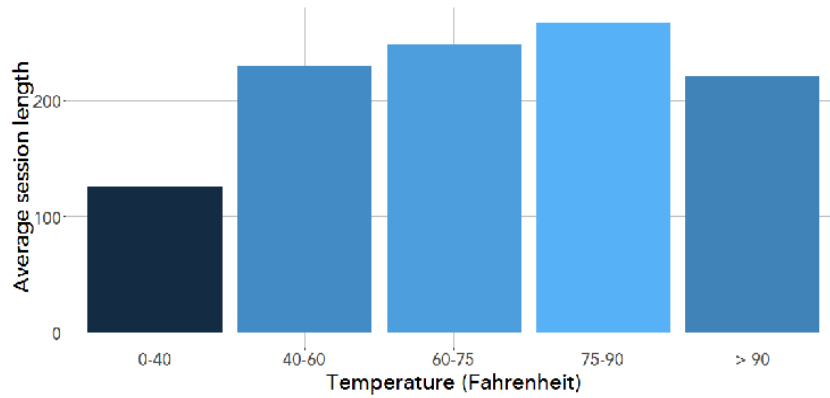
4. Weather Impact: Number of Sessions

This lets you know during what weather conditions families play/or are willing to play on the playground.



5. Temperature Impact: Session Length

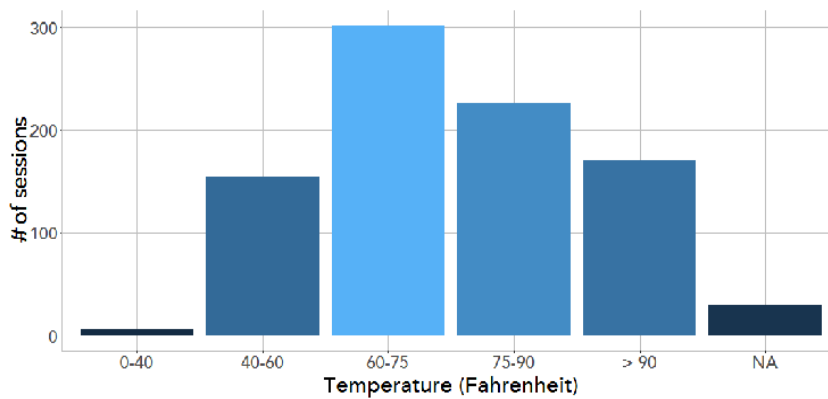
This lets you know the relative impact of temperature on how long families play on-site.



6.

Temperature Impact: Number of Sessions

This lets you know the relative impact of temperature on how much families play on-site.



How Parks and Recreation Departments Use Data

For planning, creating, and operating playgrounds, data is key, but often unavailable. Playground owners and operators can use aggregate data on usage patterns of connected playgrounds for many purposes, including:

Formulating Programs —When data is available on how, when, where, and by whom playgrounds are used, those who create programs for children can be more precise in their decisions. This will ensure a better ROI and attendance for programs offered to the community.

Setting Budgets —In all sectors of society, budgets are typically set to correspond to the end users and their needs. Prior to the use of connected playgrounds and the data collected, the needs and demographics of playground users have largely been unknown, leaving budgeters void of important facts. With clear and specific data on usage, budgets for playground maintenance and development can be set.

Applying for Grants —Grants are typically driven by data, which demonstrates to the granting organization that the grant is justified and will be put to good use. It provides numerical evidence, rather than vague assertions of benefit, that the grant request has substance. Until the advent of playground apps and their ability to collect and aggregate data, such fact-based evidence to support grants was hard to come by.

Getting Community Engagement — The creation of new playgrounds, or improvements to existing playgrounds, can depend heavily on community engagement. It is often the collective energy of community members that cause playgrounds to be created. This energy can take the form of communicating with municipal staff and boards, or can result in direct fundraising efforts. The data collected on local playground usage can be a

motivating factor for such community involvement.

How It Works: Theoretical Citywide Initiative in 40 Playgrounds

Variations of this are already being done in cities across North America, but we will use an imaginary community we'll call "Maple Hills" to illustrate how it works."

Imagine that in collaboration with the Maple Hills Parks & Recreation Department and a leading playground equipment company, a leading playground app company deployed more than 40 app-powered playgrounds across the town with the goal of collecting data.

Over a few months, the app team would work closely with local families, community leaders, and park staff to ensure that the full benefits of app play and data collection were integrated into the programs being offered by the Maple Hills parks department. The goal would be to engage children ages 3 to 9 in more playground play, and to collect relevant data to help Maple Hills in future playground developments.

Where appropriate these statistics would be broken down in terms of individual playground, time of season, during school/summer break or otherwise.

This is how the data would be presented to the stakeholders:

CROSS-SITE SAMPLE USED	3422 UNIQUE FAMILIES
TOTAL NUMBER OF BIBA SESSIONS	56320
AVERAGE BIBA SESSION LENGTH	11 minutes per Game
AVERAGE NO. BIBA GAMES PLAYED PER VISIT	3
BASELINE CALCULATION FOR PLAYGROUND VISIT LENGTH	1 Minute Biba Time= 3.2 Minutes On-Site Time
PRIMARY USER AGE (PARENT)	35-50
AVERAGE CHILD AGE	6*
CAREGIVER GENDER	75% Female/26% Male
PEAK HOURS/DAYS FOR USAGE	Fridays, 3pm-5pm; Sat/Sun, 12pm-3pm
AVERAGE WEATHER	Clear, Windspeed 12km/hr
DEVICE PLATFORM	45% iOS/55% Android

Considering Maple Hills' imagined population of 108,321, and its imagined census data estimate of 19,000 children under the age of 12, the app company's statisticians would determine that the statistical significance of this data would be robust.

While many communities have common needs as it regards the application of data for parks maintenance oversight, budget allocation, etc., a number of communities have their own specific needs where data from a connected playground can assist.

One Potential Issue: Ensuring Attendance for Programs and Events at Park Spaces

The Maple Hills parks board might point to one of their primary issues: ensuring attendance for programs and events being held in their municipal park spaces.

More specifically, Maple Hills might offer a number of child and family oriented programs, but might be looking to offer more of these programs outdoors in the interest of promoting physical activity in their community.

A potential problem is that while Maple Hills program coordinators would be fairly aware that week-end afternoons were the ideal time to host family-oriented events, they would have no idea which of their parks were the most trafficked or whether they could rely on extending indoor events to their chosen outdoor locations and still expect the same traction.

App Company Determines Playground Traffic

This would be an indicator for the app company to figure out which of Maple Hills' playgrounds had the most traffic, not only from the perspective of general attendance, but also from the perspective of time-spent on-site. After all, parks that are more thoroughfares for a community in between home and another event would be less effective for hosting an event than a park which served more as a destination for a community.

In addition, the department would likely want a sense of "best times to play" as it pertains to the difference between school and summer break. After all, with an event schedule that is year-round, they would need to know how to plan for all times of the year.

Data Reveals Attendance Patterns

Ultimately, the team for the playground app company would endeavor to provide Maple Hills with activity density data that could show them, month to month, which of their 44 registered playgrounds were being used and how often. The app company would then continue to update these "heat maps" so that, as school months changed to summer months, they could see exactly how play patterns and family attendance were changing in each of their parks. The revelation likely to emerge was that, for Maple Hills, certain regional parks near schools that had been previously congested during school hours were largely vacated during the summer months.

During summer, key parks in large residential neighborhoods would be swelling with family attendance, and these parks tended to be close together and further away from the recreation center than the parks Maple Hills would presume to be the most trafficked, i.e. those nearest schools.

After verifying the target age range for their programs, in this theoretical scenario, Maple Hills might switch some of their outdoor summer programming to these neighborhood parks, and potentially have a significant increase in attendance.

Examples of Data Used for Decision Making

In another potential scenario, Maple Hills budgets \$500k for new playground builds for the year, but decision makers can't tell whether it would be a smarter move to put in a single large \$500k destination playground or whether to build 5 smaller \$100k playgrounds around the community. By analyzing the data and looking at how the different playgrounds of various sizes and locations have performed in the past, Maple Hills was able to determine that they'd get the most bang for their buck and best satisfy their community needs by building a single large \$500k destination playground/tourist attraction.

Perhaps, partway through the year, Maple Hills realize that, due to spending efficiencies, they actually have additional funds available to invest in playground infrastructure, but are unsure of how best to deploy those funds to maximize value. By analyzing individual equipment usage data in similar playgrounds, they determine that when an extra swingset is added in community playgrounds of a certain size, playground attendance increases dramatically. As a result, they do an assessment of all of their playgrounds of that size that do not have swingsets and decide to invest in upgrading them with that additional piece of equipment.

Or, it's possible that when analyzing the individual equipment usage on a particular playground over the course of the month, the Maple Hills parks staff realize that there's been a dramatic decrease in slide usage all of a sudden at one of their local parks. After noticing this data trend, they decide to go to the park itself to find out what's going on and notice that, in fact, the slide has been damaged and is no longer functional which explains the decrease in usage data. Thanks to the data collected, they were able to be alerted of the issues with the piece of equipment and could then replace the slide and ensure that their community could use it for play once again.

The problem for this imaginary city -- and for actual cities all across North America -- is the lack of suitable data with which to make decisions and to back grant applications for funds. This is a place where the app company could solve that problem.

Conclusion

Playgrounds were once the epitome of simplicity. Kids with little else to do played and climbed and socialized with others. Modern life and touchscreens have worked to keep children in the homes after school, not moving much, and with great negative health and social impacts. While some would remove touchscreens, smartphones, and other

devices from young children, an innovative movement has begun to use children's enthrallment with screens and video games to get them to move again.

In this new world of connected playgrounds, app developers have created series of fun and engaging games that require the child to perform a number of tasks on the playgrounds based on imaginary scenarios – spies, car racing, etc. – and then report back to their parent or caregiver holding the smartphone. Studies have shown that app-enhanced play on connected playgrounds causes children to play more vigorously than they do in so-called free play.

The side benefit of app-enhanced playground activity is a collection of aggregate data that helps landscape architects, planners, municipalities, and others understand how playgrounds are used, by what age group and gender, and at what time of day or season. This data can also be used for fundraising, grant applications, and community engagement.

These playgrounds of the future – being deployed today in many cities around the U.S. and Canada – are fun, engaging, data-driven, and sure to contribute to wiser playground development and proven benefits to children.

End