Final Report
The Fitwits Zones
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I Am Fitwits Team: Kristin Hughes, Peter Scupelli, Diane Helsen, Sarah Rafson, Tina Chekan, Carol Wooten, Bridget Dye, Sharon Young, Dora Johnson, Chongho Lee, Wes Johnson, Julie Beth Benko, Mimi Weber, Carson Byle Kelly Nash, Keri Galand, The Propel Community, the McKeesport Community.

(See end of report for participants bio's)

Fitwits

The Fitwits Program is an easy-to-use educational tool that bridges the gaps in health literacy, education, awareness and advocacy. The program allows people the opportunity to interact with each other, ask questions, invent new ideas, and play, as they tackle the problems of health literacy and obesity. It aims to be multi-use wherein a strong emphasis is placed on the confluence of individuals, family, doctors, and community in approaching public health interventions.

Long-term Goals

+ Improve food and nutrition practices, attitudes, and behavior
+ Increase individual and group health literacy, awareness, attitudes and behavior
+ Ensure children, young people, and their families adopt practices to stay healthy so that they achieve their full potential in life
+ Work to develop a thriving, replicable service network
+ Help individuals identify and change unhealthy eating habits
+ Make available up-to-date tools and resources that the community can use in order to self-sustain their involvement (i.e., hand-portion guide)
+ Effect changes in school/community/state/federal policies that directly affect childhood obesity

Supporting Objectives

1. Collect and analyze data from children, parents, school personnel and community stakeholders to develop new knowledge about factors that impact children's and families eating behaviors and how that might be changed/affected by certain interventions.
2. Implement a community-based, multi-use educational program targeted towards changing individual, interpersonal, organizational, community and public policy attitudes, value and intentions about healthy practices.

Value proposition

Fitwits is a system of games, health communications and services that enable individuals, families, peer groups and communities customized opportunities for action towards lifestyle transformation. Our team advocates for improved health communications and resources in all facets of individuals' lives.

Fitwits Service Ecology

Fitwits provides an interesting solution for addressing obesity largely through its strong emphasis on service design. The Fitwits service ecology is a complex system of relationships, elements and networks including everything from "players" (kids, physicians, teachers, neighbors); to environments (physician offices, classrooms, restaurants, etc.) to tangible and intangible elements (games, murals, pedometers, stories), and held together by the systems that support them (organizational relationships, volunteers, instructional technology, etc.). These networks can be channeled virtually (e.g. websites, cell phones); through shared materials and/or consist of face-to-face interactions (social activities, doctor's visits).

Obesity trends in the United States

The surge in obesity in the United States is a major public health crisis for children, parents, families, communities, and the future of the nation (Ogden, Carroll, & Flegal, 2008). Obese children are at risk of living shorter lives than their parents. Obese parents risk often-preventable health complications (e.g., type II diabetes, heart disease, stroke, cancer) (Haslam & James, 2005). At an individual level, most obesity cases are believed to result from excessive caloric intake, limited physical activity, and genetic susceptibility (Kopelman, 2000; IOM, 2001). Societal factors associated with obesity rates include increased availability of calorie-rich foods and decreased physical activity (Lau et al., 2007). Behavior change is linked to increased health knowledge and literacy (Ratzan, 2001).

Health literacy implies the ability to access, understand, and use oral and written information to make health decisions (Ratzan & Parker, 2000). In new models of health literacy, prevention of chronic illness is based on knowledge dissemination, ability to act on such knowledge, and behavior modification (Peerson, & Saunders, 2009). Health literacy affects a broad community: individuals, families, workers in organizations, and whole communities. Unfortunately, many obesity prevention education efforts use fragmented approaches (not targeting the whole system) that result in limited effectiveness (Stokols, 1996). Health communications need to be understood, and resonate with the community of use to be effective though. Design research methods can help understand the audiences' needs and assess the impact on the individual or group (Sanders, 2006). In particular, health communications and services co-created by the community of use are more likely to resonate with the intended audience.

Effective obesity prevention requires coordinated services and products across the five contexts that affect health related decisions (i.e., individual, family and group, organizational, community, and public policy (McLeroy, Bibeau, Steckler, & Glanz, 1988; Green, & Kreuter, 1999). Health related behavior change is difficult. For many, healthy lifestyle changes can be perceived as threats to one's identity, culture, and community. For example, people with unhealthy food habits may perceive a prescribed healthy alternative as an attack on their family and community traditions, values, culture, and identity.

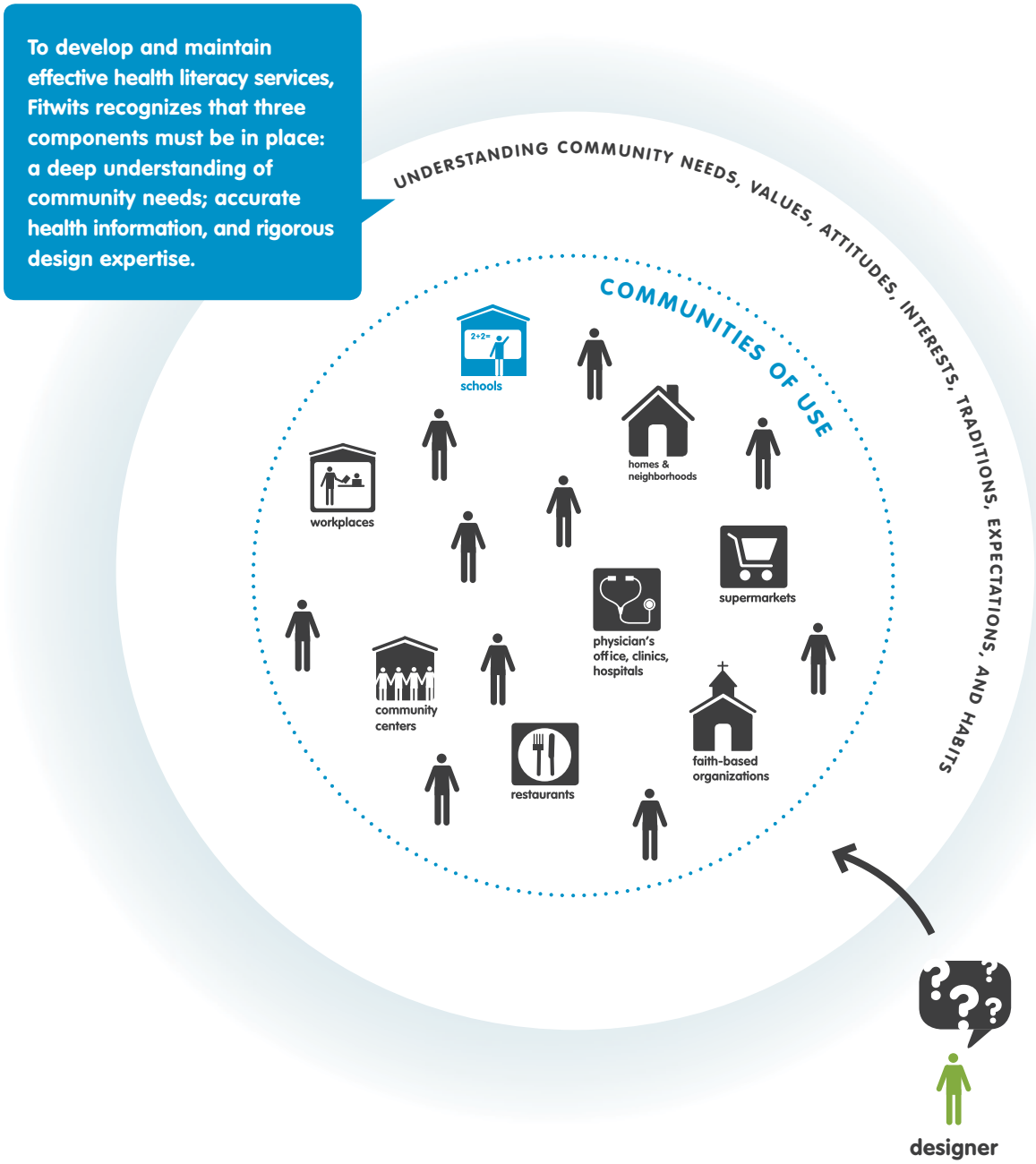
The socio-ecological model allows designers to consider where and whom to target with the health services. The socio-ecological framework has five contexts or levels that are associated with people's health: individual, interpersonal, organizational, community, and public policy (Bronfenbrenner, 1979; McLeroy, et al. 1988). At the individual level, choices may reside in people's attitude, values, and intentions. At the interpersonal level, people's choices may be shaped by relationships. At the organizational level, people's choices may be influenced by rules, policies, procedures, and incentives in organizations. At the community level, people's choices may reflect social norms, social networks, standards, and practices. Finally, at the public policy level, people's choices may be linked to government policies, regulations and laws at many levels.

Fitwits Zones

Fitwits Zones is designed to reflect recent thinking within obesity education, echoing calls for "an ecological model," wherein a strong emphasis is placed on the confluence of the individual, family, community, and society in approaching public health interventions. According to Sallis et al., the most powerful interventions operate on multiple levels to ensure safe and convenient places for healthy behavior, implement motivational and educational programs to encourage those behaviors, and use media and community organization to change social norms and culture.

The Fitwits Zone strategy uses games and health services as a method of engagement within the environments where individuals, families, communities, and society form impressions, make decisions, and "try-on" new health behaviors. A Fitwits Zone is considered to be a three-mile radius from a Fitwits Zone Center, such as a school building or community center.

To develop and maintain effective health literacy services, Fitwits recognizes that three components must be in place: a deep understanding of community needs; accurate health information, and rigorous design expertise.



Summary: *I Am* Fitwits: Zone Two, Propel McKeesport, Mckeesport PA, 2011-2012.
The *I Am* Fitwits game is a school-based game that operates at multiple levels where obesity related health decisions are shaped. Children, their peers, family, teachers, and school staff learn about health, nutrition, and exercise through games. At home, family activities inform, motivate, and promote healthy eating and physical activity. In school, teachers, principals, and staff are encouraged to implement school policies that support increased health education, healthy nutrition and increased physical activity.

The *I Am* Fitwits game posits that obesity prevention begins with increased health knowledge combined with the ability to act on such knowledge in everyday life. Students in third, fourth, and fifth grade at the Propel School at McKeesport participated in the six-month game from January to June 2011. The goal of the game was to increase obesity prevention knowledge, change attitudes, and increase self-efficacy with regards to healthy lifestyles.

During the game, participants learn healthy lifestyle knowledge through game challenges in the areas of nutrition, exercise and health literacy. As the game progresses, challenges increase in difficulty. Players are motivated individually to integrate elements of a healthy lifestyle into their personal, family and school routines by earning game cash, points, and rewards. Changes to school policy and community organization policy are supported and rewarded through game play.

The game was evaluated with thee types of measures: game participation, physiological, and self-report. The number of activities that participants turned in throughout the game quantified game participation. The physiological measures were collected before and after the game by a registered nurse (e.g., height, weight, body mass index (BMI). Likewise pre-post surveys were given to game participants. Self-report survey measures included knowledge, self-efficacy, attitude, values, and barriers to healthy lifestyle topics.

Game play strategies differed by grade. The third grade players focused on grade level activities and peer-to-peer activity. Fourth grade focused on family tokens, peer-to-peer tokens, and grade challenges. Fifth grade game players rallied around family tokens in the beginning of the game, peer-to-peer tokens and completed many individual challenges. The fifth grade players focused on peer-to-peer nominations throughout the game. Third and fourth grade teachers played a critical role in engaging their students at school, whereas, the fifth grade teachers played a lesser role.

BMI scores were measured twice (fall 2009, fall 2010) prior to the beginning of the Fitwits game and after the game ended (June 2011). Overall, there was a much larger increase in BMI scores from 2009 to 2010 (prior to the game) than from 2010 to 2011 (when the game was underway). These data suggest that the rate of increase in BMI decelerated after the game. The decrease in rate of BMI (increase) is more evident in boys when compared to girls.

While these are encouraging results for this pilot study in one school, comparison with a control group school is necessary to determine if the changed BMI increases can be attributed to the Fitwits or are part of a more general societal trend. Fortunately, future work can easily compare the historic BMI data from this study to a control group school in the Propel School network with a similar student population. Students, parents, and teachers said they enjoyed the Fitwits game. They found it to be fun, easy enough, and not too time consuming. If given a chance they considered themselves quite likely to play the game again.

Overview

When approaching the Propel School in McKeesport, PA, the research plan was designed to gain a better understanding of the following questions: (1) Can a school-based obesity prevention game successfully engage entire families linked to a school network, and lead to improved nutrition, increased fitness, and health literacy advocacy? (2) Can a six-month school-based educational obesity prevention game create healthy conditions for change (new types of social relationships, and social organizations) and help maintain and grow a culture of health-minded individuals, families, schools and communities? (3) Can a game designed to engage multiple levels and styles of learners play a role in classroom instruction and inspire student-learning styles and innovative teaching methodologies?

Participants

Students

117 consented students played the *I Am* Fitwits game. Internal review (IRB) was obtained through Carnegie Mellon University. No additional public school board reviews or consents were required.

- 3rd grade: 35 consented students (37 total in 3rd grade)
- 4th grade: 35 consented students (40 total in 4th grade)
- 5th grade: 47 consented students (50 total in 5th grade)
- Teachers: 6 total, 2 per grade.
- Teaching Aides: 6 total, 2 per grade

Fitwits Crew (see back for full-list of participants bio's)

Fitwits Design Team: Comprised of faculty from the Carnegie Mellon School of Design and graduate and undergraduate student assistants. The Design Team held weekly meetings to develop visual material, narrative and evaluation strategies.

Coordinator: Full-time staff member in charge of managing the game. The coordinator maintained enthusiasm and interest in the game, coordinated events, and encouraged and helped facilitate projects and initiatives related to Fitwits.

Champions: Two parents of third, fourth and fifth grade students who were recruited from the local community to help ensure a high level of participation and facilitate communication between the Fitwits coordinator and the school community.

School Principal: Helped organize school events and customized the game to work within the existing system at school. She helped implement policy changes at the school to create a healthier environment.

School Nurse: Ensured that the game ran smoothly by working closely with school administration and teaching staff, and helping to monitor and promote student health initiatives.

Content Experts: Outside organizations were important for developing relevant and accurate content to send home with students in Fitwits material, and as advisors and activity directors for Family Nights.

Corporate and Non-profit Partners: Partnerships were vital to supporting initiatives related to Fitwits through in-kind and financial donations.

Volunteers: A network of volunteers from outside of the school community donated their time to ensure the success of Fitwits events and initiatives.

Game Grammars

Game Grammars refers to the rules, objects and language of the game that change based on how the game is played. Players think, learn, interact, make decisions and use their imagination based on the game structure (or grammar) and rules in place. Over time, new social interactions, social networks and patterns of behavior emerge through game play.

Fitwits Health Pledge: All student players signed the Fitwits Health Pledge to be a champion for their own health, and that of their classmates, school, families and community. Each student received a wristband that will hold Fitwits Character tokens rewarded when specific goals were accomplished.

Class Presentations: The Fitwits team conducted a 1-hour Fitwits presentation so students could learn core concepts of the program including a definition of obesity, BMI, health complications related to obesity, and preventative health measures.

Fitwits Cash: The primary reward system in the game. Almost every element of the game was incentivized through cash, even the tokens were assigned a cash value that created a hierarchy of challenge and influence.

Weekly Fitwits Folders: Student players received weekly Fitwits folders that included weekly challenges, Fit Tips (basic health information concepts to support content in the challenges), prizes, and peer-to-peer and family token applications.

Student, Teacher & Grade Game Challenges: Students and teachers were given weekly Game Challenges to integrate Fitwits lessons into their home and/or classroom teaching. The challenges could win players substantial Fitwits Cash if they were returned and completed successfully.

Thought-Starters: Ideas for ways to earn merit tokens. Teachers used the cards as a resource throughout the game to earn Shining Bright and Star Power tokens

Endless Merit Tokens, Wristbands and Merit Applications: While students received a Character token for their wristbands every month, Endless Merit tokens had to be earned. There were five (5) levels of merit tokens including: Friends Helping Friends, Family Business, Teacher's Touchdown, Shining Bright, and Star Power. Tokens were awarded throughout the year to students and snapped into their Fitwits wristbands.

Character Token: Each player in the game received one automatically as a milestone at the beginning of each month. These tokens represented a Fitwits character that was connected to the narrative of the month.

Merit Token and Merit Application: Carried Fitwits Cash value and had to be earned by filling out an application explaining why the individual (and/or peers, class, grade, school) deserved the token and cash reward.

Friends Helping Friends: *This token was awarded to players who nominated other players who they feel had done a great job of adopting healthy habits. Both the nominator and the nominee received $500 Fitwits Cash and a token for their bracelets.*

Family Business: *This token was awarded to players in two ways. The first was by nominating a family member who they felt had done a great job of adopting healthy habits. The second was by attending two out of the six Fitwits Family Nights. The nominator was awarded $500 Fitwits Cash and a token for his/her bracelet.*

Teachers' Touchdown: *This token was awarded to the entire class when teachers completed initiatives toward creating a healthy environment in the classroom. Every player in that class received $1,000 Fitwits Cash and a token for their wristband.*

Shining Bright: *This token was awarded to the entire grade when the teachers in that grade worked together to coordinate a healthy initiative at school. Every player in the grade received $2,000 Fitwits Cash and a token for their wristband.*

School Power: *This token was awarded to school staff who designed a new healthy policy*

that affected the whole school. This token was awarded to all players in the game along with $5,000 Fitwits Cash

Awards & Weekly Presentations: Designed to recognize high achievers and to provide incentive to be a top earner in each class and at the top of the grade in the school. Official Fitwits Certificate awards were presented in front of the class every week.

Teacher Workshops and Thought-starters: Teacher workshops were conducted at the school to provide the Fitwits team with feedback about how the game was impacting the teachers' classrooms, how it was helping them, which elements were more difficult than others, etc.

Wall of Champions, Scoreboards, and Score Charts: A publicly located Wall of Champions, scoreboards and score charts were placed throughout the school and updated weekly.

Posters and the School Environment: Every teacher received a poster for Fitwits, giving their class an identity with a Fitwits character and a color.

Family Nights: A series of monthly, hands-on events, facilitated by various content experts.

Weekly Giveaways: Small items in Weekly Fitwits folder, like pencils, pins, magnets and toys.

Game Rules

The rules for I Am Fitwits *were as follows*:

1. Students finished as many take-home challenges as they could. Challenges went home every week in bright orange folders, and students returned completed challenges in their bright orange envelope, placing the envelope in their classroom Fitwits drop-box. Envelopes were collected every week.
2. Students competed to earn as much Fitwits cash as they could. Every completed challenge earned players $100 Fitwits Cash. Score cards in each class helped players monitor their progress and see how much money they could spend in the Fitwits store at the end of the year.
3. Students, teachers or school administrators could complete challenges to earn merit tokens, which in turn earned players in their class Fitwits Cash and tokens for their Fitwits wristbands. There were several levels of merit tokens that could be earned by filling out applications available from the School Nurse. *(See descriptions above)*.
4. The individual player, classroom and grade with the most Fitwits cash accumulated by the end of the game was declared the winner!

Game Rewards and Incentives

There were three ways to earn Fitwits Cash:

1. Challenges: Challenges happened both at home and at school. Students could earn points by completing challenges sent home in the weekly Fitwits folders (that could be shared with other family members), and by participating in Fitwits challenges in-class, which were administered by the teachers.
2. Merit Tokens: Earning merit tokens was the best way to accumulate Fitwits cash. Players won Merit tokens by a) inspiring others to nominate them for making healthy changes b) nominating others who exhibited healthy behavior or c) earning tokens when a teacher or school administrator did something to make the classroom or school a healthier environment.
3. Family Nights: Coming to two or more monthly Fitwits Family Nights earned players $500 Fitwits Cash and a Family Business merit token.
4. Fitwits Cash: Collected by players and cashed out at the end of the game. Students received the balance of their Fitwits bank accounts to redeem for prizes in the Fitwits Store at the end of the year.

Game Challenges and Folders

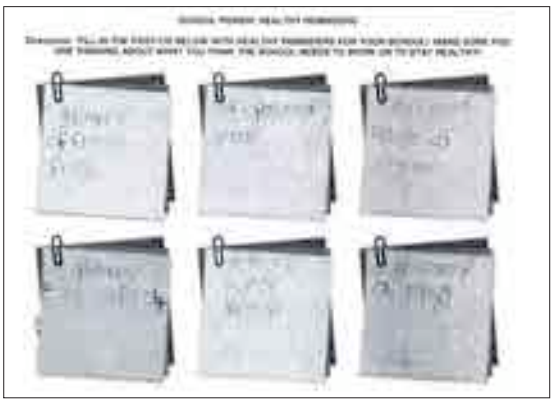
Based on a familiar "Thursday Folder" routine, in which important information went home to parents/guardians each week in designated folders, Fitwits folders were chosen as the means to distribute game challenges and communicate with participants. Students and parents were already accustomed to receiving information in take-home folders, so the addition of the Fitwits folder did not disrupt the normal school routine.

The weekly Fitwits Game challenges were the heart of the material being sent home in the folders. Game Challenges gave students activities to do individually, with friends, or with their family. Each month presented a new story developed around a particular Fitwits character. In January, Elvis Pretzley, the host from America's Next Top Bottle, was in McKeesport looking for hot new talent. February had players following Queen of Wheat as she travelled around the United States. In March, the challenges told the story of an international delegation of Fitwits visiting McKeesport for the Fitwits G11 summit. Then in April players heard the story of Phil, the taco whose naïve sister Spill had gone missing. Every completed challenge had a Fitwits Cash value of $100.

Each week an orange Fitwits Folder filled with a set of game challenges went home with the students. The folder was printed with the Fitwits logo and Fitwits character icons, which corresponded to each month of the game and were checked off as players moved through the months of game play. The folders contained a variety of material designed to engage students and families in different ways. Each folder was personalized with the student's name along with a barcode, a system designed by the Fitwits Core Design team to track the score of individual players. Many students took additional steps to further personalize their own folders.

Challenges were a formalized form of play, distributed at evenly paced intervals. They encouraged learning in new ways, and created a cultural shift in the school system, inspiring teachers to adapt their curricula in subjects like math, reading and science to incorporate the narrative constructed by the Fitwits challenges. Despite the formalized system developed around the challenges, the activities themselves often allowed players to use their imaginations and engage in unstructured learning. Fitwits stories were told through the weekly challenges and were also reinforced at the classroom and school-wide levels. The stories made thinking about and incorporating health lessons fun and less intimidating for families and teachers.

Game challenges were designed as situated learning experiences, providing students a more active process of learning. They also created different types of conditions in which players could apply the knowledge from each challenge. When students are afforded the opportunity to learn in different contexts, eventual transfer of knowledge into everyday settings is evident.



Example. Knowledge of Fitwits health content is applied to various teacher's assignments.

Challenges provided a broad range of tasks that complemented different learning styles, which helped students become engaged in their own inquiry. The Fitwits challenges allowed students to explore health information in a new contexts, generate questions, and form ideas and impressions about it. The challenges inspired cross-generational transfer of knowledge (conversations between teachers and students, parents and students), facilitated group and discussions.

Challenges were developed around of three categories of activities (Eat Smart, Get Moving, Spread the Word) that operated at three levels of social engagement (Individual, Peer-to-peer, Family). All of the challenges were coded according to this matrix and integrated into the narrative and game structure. For example, Eat Smart challenges emphasized content related to food and nutrition such as: eat fruits and vegetables every day, drink 5-6 glasses of water a day. An example of an Eat Smart challenge on the individual level led players on a search for Fitwit Spill who had run away with Squirt, a Nitwit who is also an artist. As Spill was learning to paint with Squirt, students were asked to develop a list of fruit and vegetables that would create a full color spectrum to integrate into their diet.

Each week the Fitwits game coordinator went to the school to collect the completed game challenges and applications for tokens. Each game player had an assigned identification number barcoded on his or her game envelope. The completed game challenges in each game envelope were scanned with a barcode scanner that stored into a Microsoft Access computer database. The barcode scanner allowed research assistants to quickly enter the completed activities for each game player. The computer database was double checked each week for scanning errors (e.g., double scanned or missing challenges). The database was used to create data file reports containing game challenge participation. For each student game participant each game challenge was coded as done or not done. The average number of game challenges was calculated weekly for each player.

Some challenges were designed to go directly to teachers instead of into the students' Fitwits folders. An example of this was the Eat Smart challenge in April. The challenge stated that Fitwits Headquarters had received a mysterious packet of seeds and Detective Elvis Pretzley needed teachers to plant the seeds to see what would grow. Students were given seed packets in their Fitwits Folders to plant as a class. To the Fitwits Team's surprise, within a week of distribution many non-Fitwits classes were also seen growing vegetable and flower seeds in their classroom windows.

Data-visualization of game play per grade and level of engagement

In the section that follows is an overview of all the game rhythms as they manifested themselves by grade; parts of the game are presented in graphs by grade (e.g., individual, peer-to-peer, family, teachers/classroom, school power). Then game rhythms that result are shaped by choices that individuals, peers, families, and teachers in each grade made. For instance, the third grade players earned the most points overall winning the game. Their winning game strategy focused on grade level activities and peer-to-peer activity (figure 3-1). Fourth grade focused their activity on family tokens, peer-to-peer tokens, and grade challenges. Interesting to note that the most energy in the game emerged in the interpersonal levels (e.g., peer-to-peer, family), and at the grade level. Individual game players turned in fewer challenges compared to the peer-to-peer, family, and grade challenges.

It is evident that the teachers played a greater role in engaging the children in playing the game at school compared to parents at home. As such, future work that aims to focus on take home activities should further explore strategies that may engage parents to support children in doing the activities. Additional research is necessary to determine parents' barriers to helping their children with take home activities (see appendix).

Fifth grade game players rallied around family tokens in the beginning of the game, peer-to-peer tokens and completed many individual challenges. As a grade the teachers were unable to rally behind grade challenges. The game players focused on peer-to-peer nominations throughout the game. The low participation on the grade challenges suggests that teachers played a lesser role compared to the individual game players. More research is necessary to determine the barriers for fifth grade teachers.

In the figures that follow, the types of activities in the game are discussed in more detail individually according to the type of activity and comparing across grades. Participation in the take home activities varied over time by grade. Figure 2-3, shows the fourteen take home folders. On average participants completed approximately one and half take-home challenges each week. The first week of the game each student completed on average 2.7 home challenges; the last week, less than half of the students completed a challenge (.5).

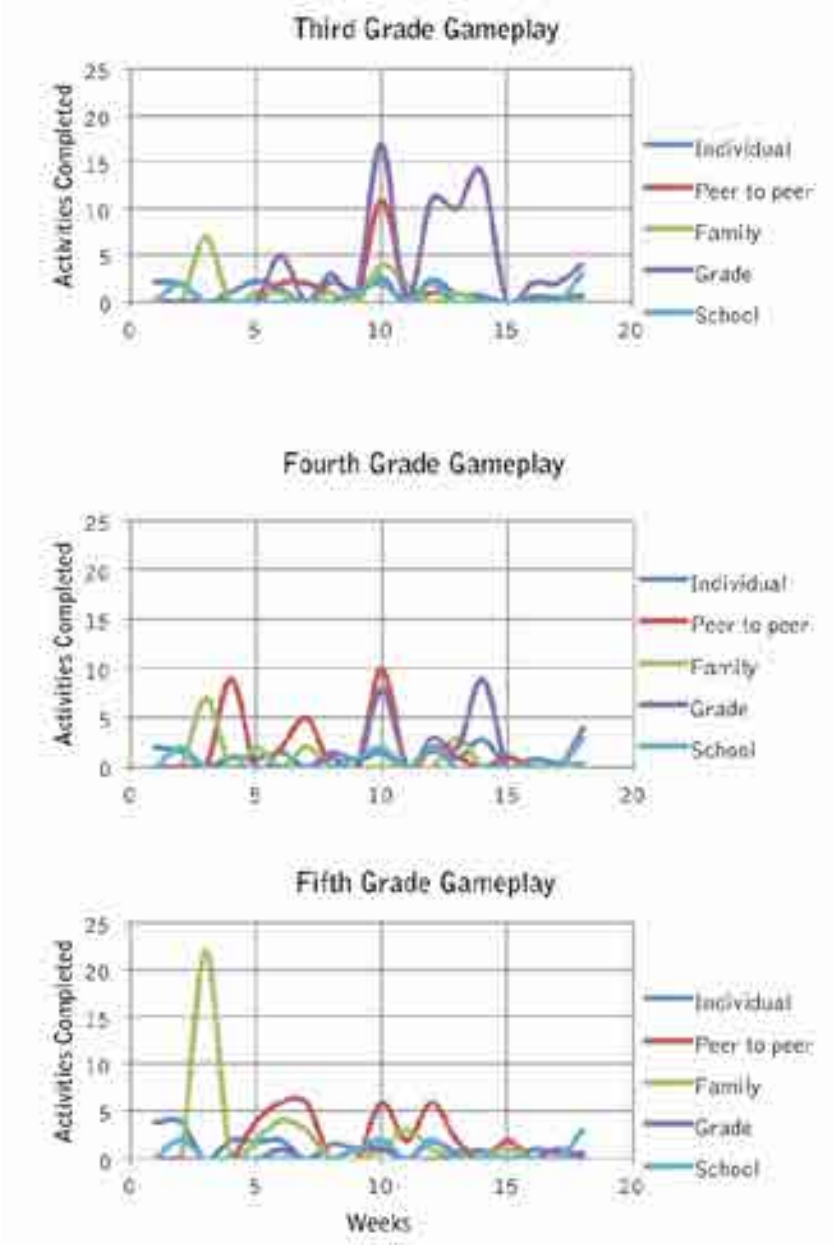


Figure 3-1. Gameplay by grade plotted over the 18 weeks of the game. For each grade is the average: individual activities, peer-to-peer activities, family activities, grade activities, and school wide activities.

The total number of individual take home challenges each week varied throughout the game from a minimum of four, to a maximum of seven. The top part of Figure 3-2 shows the total amount of percentages completed for each challenge folder handed out. The bottom part shows the percentage of completed take home challenges completed on average each folder. The patterns are similar to. Interesting to note that the percentage of completed take home challenges varied in the beginning by grade until week four. The fifth graders doing close to twice the amount of take home challenges compared to the fourth and third graders.

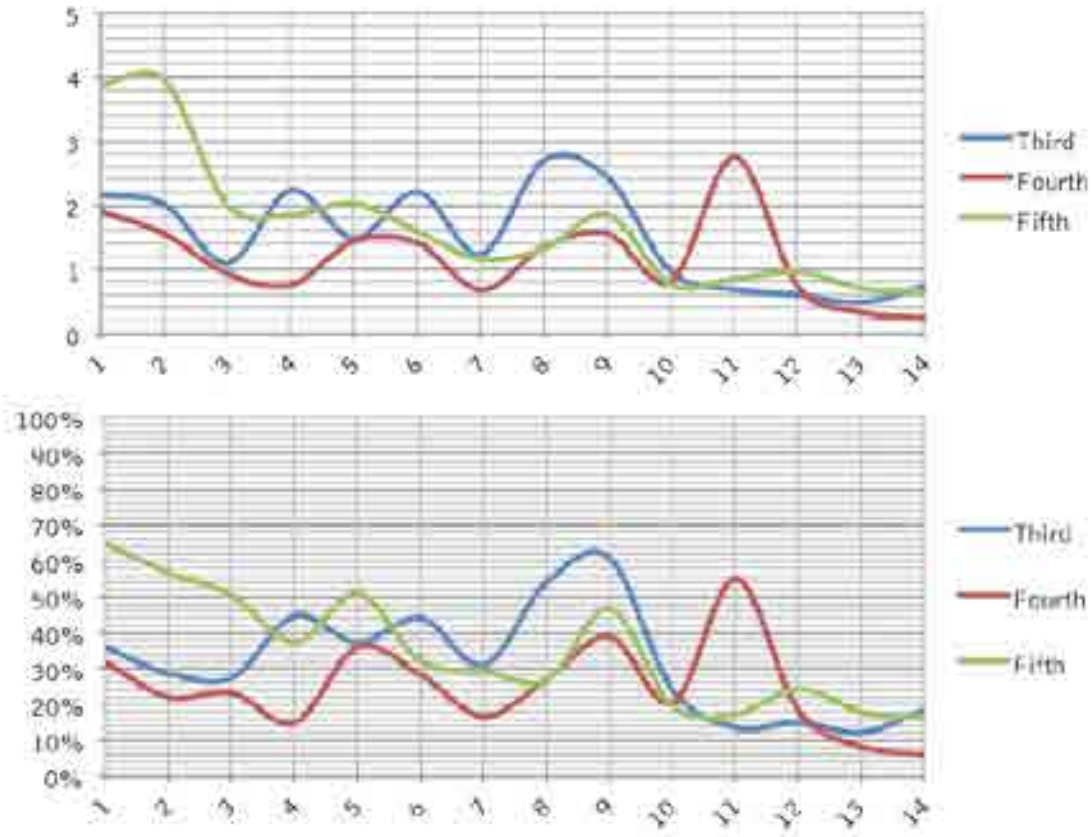


Figure 3-2. (Top) Number of take-home challenges completed plotted for each grade by folder handed out. The total number of challenges in each folder varied from 4 to 7 throughout the game. (Bottom) Average percent of completed take home challenges plotted by grade for each challenge folder handed out.

Given the challenges were the same for all grades, one may wonder why the stark difference between the grades? The original Fitwits materials were developed for 9-12 year olds. Further development and testing of the materials is necessary to determine what factors may be at play in the first three weeks (e.g., reading levels, cognitive ability, language skills). Regardless of the differences in initial participation on take home challenges, in the last three weeks participation was more similar between the grades.

Peer-to-peer tokens required the game players to nominate a person that was engaged in healthy behavior. Interestingly, the fourth grade had the first spike of peer-to-peer nominations in the game. The third graders instead were able to surge on week ten with eleven tokens. The fifth grade was unable to go past six tokens (Figure 3-3).

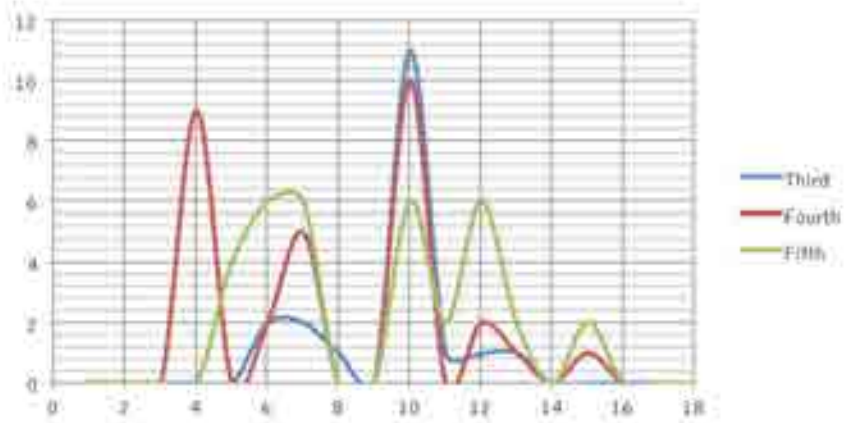


Figure 3-3. Total number of peer-to-peer applications by grade plotted by week.

Family business tokens involved nominating a family member that exhibited healthy behavior. The third and fourth grades lacked a major surge in family nominations. The fifth graders dominated in the fourth week for this activity with twenty-two nominations (Figure 3-4). However, the fifth graders scored lowest in the game overall. Future iterations should explore ways to motivate game players to engage with their families, and with the game.

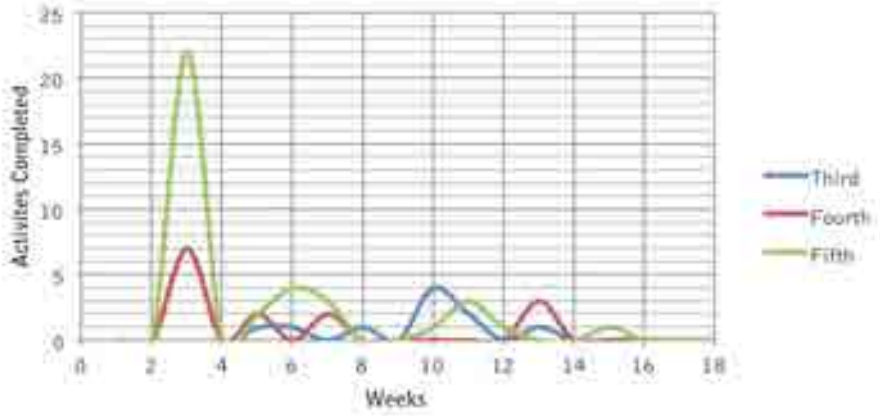


Figure 3-4. Total number of family business tokens plotted for each grade by week.

Teachers and grades were challenged by a series of "Thought Starters". Most grades waited until the fifth week to tackle the class challenges (Figure 3-5). The patterns observed differed by grade. The third and fourth grades exhibit similar patterns with regards to class challenges. A simple explanation of this pattern may be that the third and fourth grade classrooms are in the same wing of the school whereas the fifth grade classrooms are located in a different wing of the school. This suggests that proximity of the competing grades may have afforded greater awareness of what the other grade was doing and thus encouraged greater competition and commitment to the game.

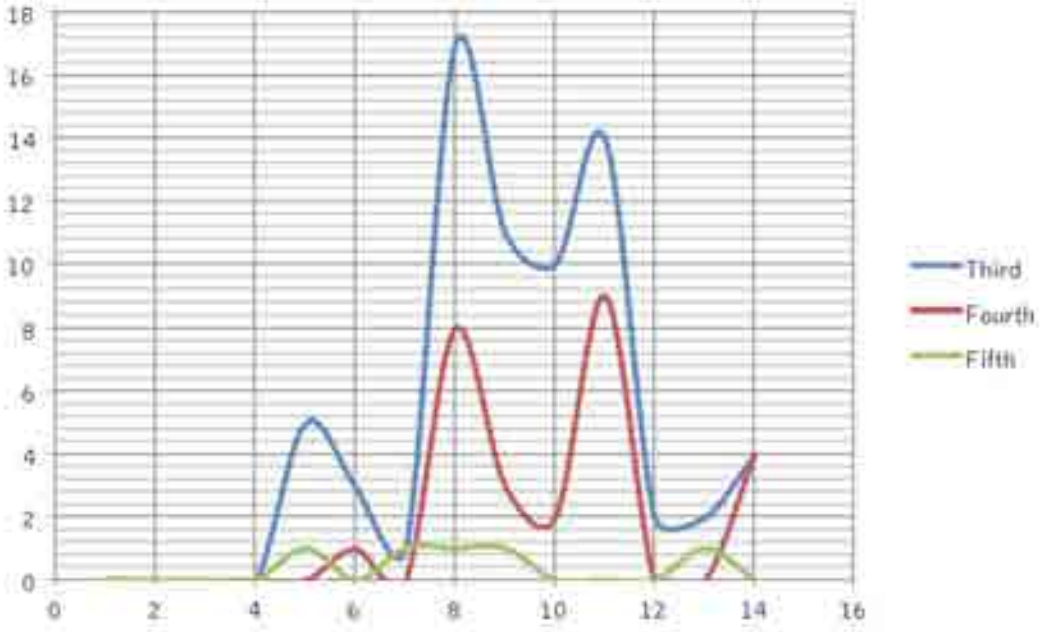


Figure 3-5. Number of class challenges done with each folder plotted by grade.

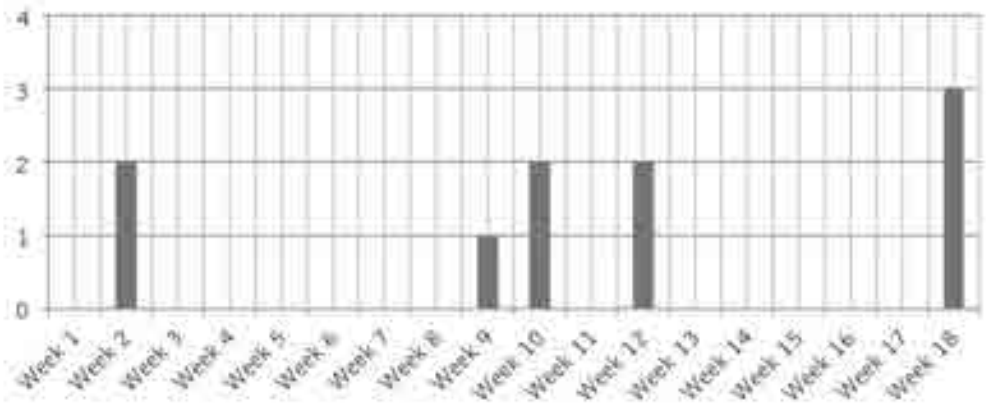


Figure 3-6. Total number of school power tokens submitted by week.

The principal of the Propel School played the game by submitting school power token applications (Figure 3-6). The three school power tokens in week nine and ten coincide with somewhat increased game play in all three grades (Figure 3-1).

Communication

The Weekly Fitwits Folders were also an important communication channel with students and their families. They alerted families to Family Nights and other Fitwits events and contained invitations and RSVP information for upcoming events. Each week, Fit-tips were also included in every folder. The Fit-tips were directed at parents/guardians, offering ideas and providing just-in-time support if activities posed in the challenge were difficult to comprehend. Fit-tips content was reinforced on the Wall of Champions every week in the school cafeteria. Small toys were a draw for students to open up the folder every week, something that many parents and students cited as something they looked forward to when they took their folders home every Thursday.

One parent mentioned that on days the Fitwits challenges were sent home, her daughter wanted to open the folder, "as soon as she gets in the door and she puts her coat away [saying], 'We have to do this,' so we start on it right away and she usually finishes it in a day. She

doesn't wait and let it drag on. She loves it. She is very excited about it" (Parent_65). Another parent added, "[My daughter] comes home with her bright orange folder and she rips the folder open before she does her homework. And it's like, 'okay, homework first, then we'll do this,' and it kind of helps because she makes sure she gets her homework done so she can do the Fitwits" (Parent_24).

To evaluate the changing enthusiasm and reactions to the game, Parent Report Cards were included in the Weekly Fitwits Folders. While directed at parents to indicate whether they felt satisfied with the weeks' Fitwits activities, it seems that the students were often expressing their opinions on these report cards instead (although we do not have conclusive evidence).

There were several barriers to the success of the Weekly Fitwits Folders with the students. First, there was initially confusion among students about the game play process. Many students reported that they had completed the weekly challenges with their family but had not turned them in to receive credit. Other students returned folders full of blank challenges, which did not make them eligible to receive points that they may have earned. Additional challenges included the difficulty of processing the student's information that was incomprehensible or nonsensical to the team member who was inputting data. Students received credit for their work in many cases despite little evidence of their engagement in the material.

However, students and parents expressed enthusiasm for the Fitwits Folders. As a parent describes about her son, "He does his regular homework first and then he starts the Fitwits… and so we start to do it together and his younger brother that's in second grade gets incorporated into it, so they like it and they have fun" (Parent_40). Another added, "It's fun… it's extra, but it's outside their normal learning. It's not sitting down at the table and doing the paperwork, and she likes to draw so a lot of the different drawing projects were fun. [My daughter] is really excited about it and she talks about [Fitwits] a lot" (Parent_23).

Some students reported barriers in completing the challenges. Among them were not having enough time to complete Fitwits challenges in addition to homework and after-school commitments. Another was that families are too busy to help students complete their challenges, so students resigned to completing the challenges on their own, which may have limited their Fitwits experience. A busy parent noted, "My mind is so clogged. I have five kids coming in a lot and I have two grandsons. There are like five people coming in at one time after school trying to talk to me, so it's difficult…[my daughter] is trying to talk to me about it and I'm like doing this or doing that and more geared on did you get your reading done or did you get your homework done than something like [Fitwits]" (Parent_39).

A significant difficulty the Fitwits Team faced was the ever-diminishing supply of orange Fitwits folders. The Fitwits system and budget did not account for new folders being issued every week. Internally the folder barcode system was critical to managing the volume of data that the students turned in every week. Lost folders meant lost information and lost time. Students responded well to the incentive of $100 of Fitwits cash for each folder returned. Many students who didn't engage in the weekly challenges earned cash by turning in empty folders.

The Weekly Folder system was initially designed under the assumption that students would return the weekly challenges the same week as they were sent home. This proved to be untrue; as a result, the last week of each month became the "Instant Replay" week. During the Replay week, students were given folders with two randomly assigned challenges from the previous weeks and a note that reminded players that they would receive credit for turning their old challenges in late. The "Instant Replay" system sustained the rhythm of the weekly folders, and so the incentive system was devised to help overcome the unanticipated challenge of students losing their folders every week.

Drop-Box

The tool designed to facilitate communication between the Fitwits team and teachers was the Fitwits Drop-Box. Originally, the Fitwits Drop-boxes located outside of every classroom was meant to be a place where teachers could leave materials (merit applications, evidence of Fitwits activities, etc.) for the Coordinator with minimal time being taken out of the teachers' schedules. In practice, these drop-boxes only complemented the personal communication between the Coordinator and the teachers every week.

Reflection: Fitwits Game Challenges

The game operated at multiple levels of the socio-ecological model (e.g., students, friends, families, teachers, and school administrators). From the data presented in this section it is clear that third, fourth, and fifth graders gameplay followed different rhythms, opting for different strategies. For instance, the third grade players focused on grade tokens and peer-to-peer tokens (Figure 3-1). Fourth grade focused their activity on family tokens, peer-to-peer tokens, and grade tokens. Interesting to note that the most energy in the game emerged in the interpersonal levels (e.g., peer-to-peer, family), and at the grade level. This suggests that the teachers likely played a critical role in engaging the children in playing the grade tokens at school compared to parents take home challenges. Fifth grade players rallied around family tokens in the beginning of the game, peer-to-peer tokens and completed many individual challenges. With the fifth grade, given the spike in activity was centered on family tokens during week four. The game players focused on peer-to-peer nominations throughout the game. The low participation on the grade challenges suggests fifth grade teachers weren't as engaged as in other grades.

The initiative that best exemplifies the effect Fitwits had on multiple levels (individual, peer-peer, family, group, community) and grades is the school garden. Spurred on by a Fitwits Thought-Starter that challenged teachers to plan a school garden with their students, the fifth grade, lead by a fifth grade teacher and one of the Champions, transformed an empty, blighted lot into a gathering place for the school and community, earning several merit tokens for their efforts.

The teacher described her experience: "One of the teacher challenges was…the school garden. We talked about that in the classroom, we thought that it was just a really good idea and that it was something that was doable. So when I brought it up to [one of the Champions], she really started the ball rolling, and it really helped as far as jumping off and getting started, the idea of it and how to implement it and to be most cost-effective on the school. So she was really the force behind that as far as, like I said, my biggest incentive for it was to be able to beat the other teachers out of this competition. So that was really what drove me to want to start the school garden, because you received so many points for it, and it was amazing to see how, when the ball started to roll, exactly where it went. It was just out of this world. I would have never thought in a million years my competitiveness would turn into something like that" (teacher_gr_5_id_7).

Grow Pittsburgh, sponsored two staff members to receive Garden Primer Training. The Fitwits team also received a large donation of seed packets from Seeds of Peace and issued the teachers an Eat Smart challenge (mentioned above) through which the garden vegetables and flowers were sprouted. In keeping with the garden theme, April Family Night partnered with Grow Pittsburgh and taught families the basics of home gardening. The School Principal made it possible for school funds to be allocated to the garden, and when the garden was kicked-off in April to an audience of school personnel, parents, neighbors and community groups, the State Senator was there to speak about the importance of the garden for the health of the community.

One of the most popular Fitwits Challenges was one of the first to go out in January. Students were given the authority to police the people around them, issuing Nitwit Tickets to anyone caught in the act of drinking soda or eating chips. These use of these tickets caused teachers to become conscious of their actions, and one of the fourth grade teachers even vowed to stop drinking soda in her classroom. Teachers began to realize that their actions had a direct impact on the students' buy-in to the game. According to one third grade teacher, "The kids were watching your every moment. 'Oh, why are you eating that, you are not supposed to eat that'…so we started to eat more fruit in the classroom in front of the kids, or with them participating" (teacher_gr3_id1). Another added, "The kids are getting me every morning with the Nitwit [Tickets] and so right away I gave up pop. That made a huge impact on me…I think being more aware for the kids helped me be more aware for myself" (teacher_gr4_id2).

This exercise, coded as peer-to-peer Spread the Word, was so popular that the tickets were reprinted and implemented as a school policy by the Principal, who declared every Tuesday in April a "Nitwit-free Day". Soda and chip free days empowered the students to hold for teachers accountable with regards to healthy food choices. The presence of Fitwits messages in the classroom and school environment further created social pressure to participate in the game. Additional work is necessary to understand the social pressure, and environmental messaging on health decisions related change. However, it is certain from the participation levels observed the Fitwits game was able to energize a school to tackle unhealthy lifestyle

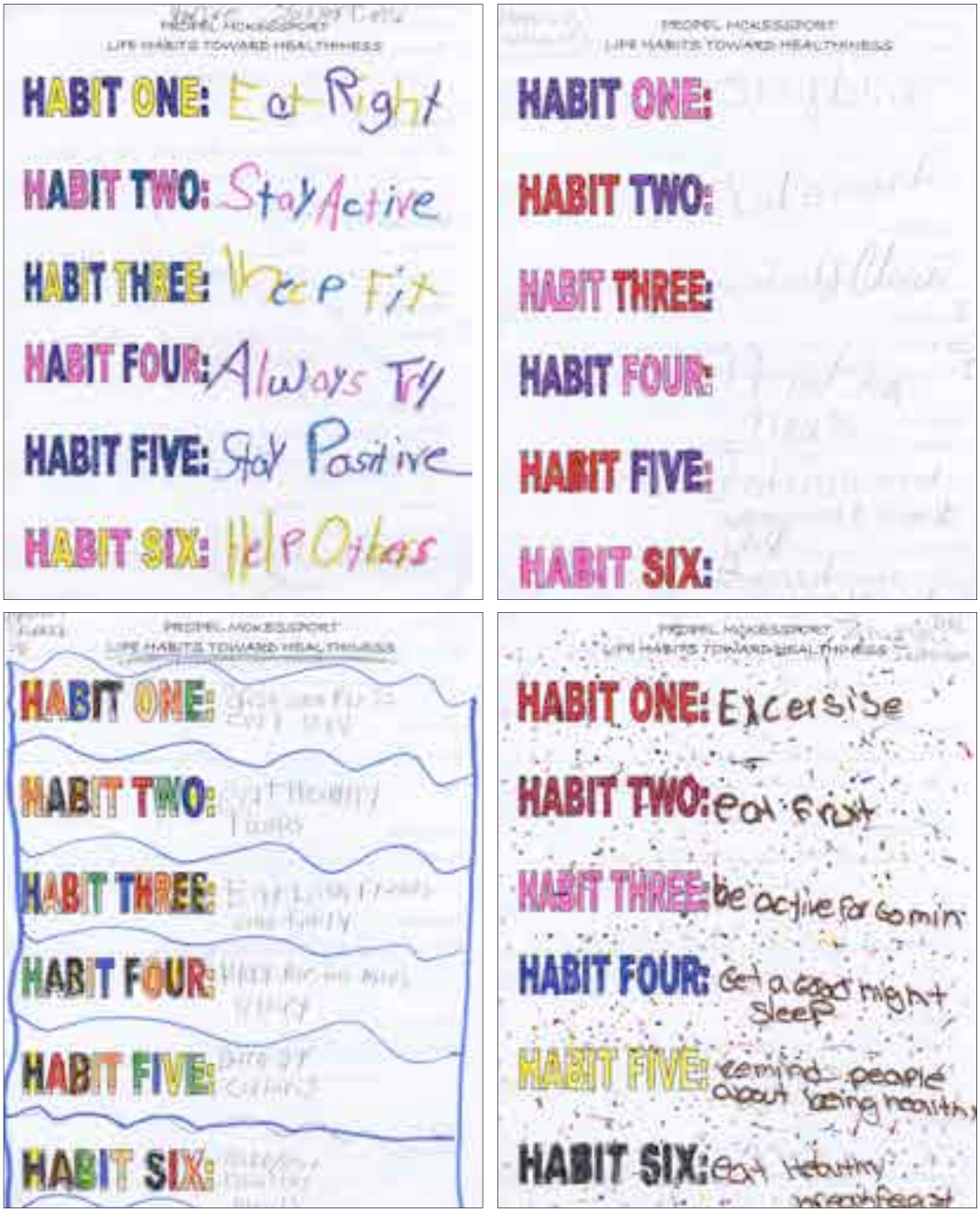
Summary

The *I Am* Fitwits game challenged two assumptions: First, that teachers are off limits because they are too busy to be asked to do one more thing. The uptake of grade level teacher tokens in third and fourth grade suggest that with the proper motivation, game incentives, and encouragement, teachers are very willing to incorporate the healthy message of Fitwits into their classroom activities and curriculum.

We can assume that teachers rising to the challenge may be social pressure. For instance, did teachers feel social pressure from the principal, school nurse, other teachers, and the students? The principal openly endorsed the Fitwits program, as did the school nurse. Teachers often take on the responsibility to be role models for their students and each other. As such, wanting to exhibit healthy lifestyle choices created pressure to live up to the ideals espoused in the Fitwits game.

Second, could the Fitwits Team integrate an engaging and entertaining narrative that would encourage students, teachers and families to try-out and ultimately incorporate healthy behaviors in their daily lives? One challenge we faced was the pressure of developing a large quantity of content; both in terms of generating appropriate activities with correct health information and creating original, fun age-appropriate materials. In the next iteration more time and creative talent is needed in the front-end, additionally user testing and vetting with appropriate audience is key.

Despite the challenges, a testament to the success of the Fitwits narratives was the slow disengagement during May, the final month of the game, when a goal-based system replaced the narrative-based one. While a story line was continued into May through teacher challenges, the narrative took backstage. The goal-focused challenges in May were directly inspired by the teachers' work and school culture, and resulted in a collaborative design process between the core design team and the School Principal.



Examples: Student responses to 4th grade teachers lesson called "Habits for Health."

Propel McKeesport teaches students a system of Life Habits Towards Greatness. “The Habits” include: Actions, Attitude, Behavior & Pride, No Excuses, Do Unto Others, and Teamwork. In March, the fourth grade teachers earned a Shining Bright token by creating a lesson plan in which students would link these habits to what they called “Habits for Health.” This lesson inspired the Design Team to work with the School Principal to design a months’ worth of challenges based around developing healthy habits using the no excuses policy.

Example. **Fitwits responds to 4th grade teachers lesson plan by creating** Daily Habit Challenges (1 of 3)

Two months into the game we noticed a drop in student participation in the challenges that went home in Fitwits Folders. Because of this, the Design Team shifted their strategy and began creating more challenges directed at teachers. Not only did this start to change the earning amount of the game, since completing Teacher Challenges earned more Fitwits cash for all participants involved, it also ensured that the game might have the potential to retain momentum. As outsiders watching the game in play it was important to shift the design strategy to nurture the players and game environment.

At this shift in the game the capacity of the teachers to reinforce Fitwits messages became clear. Without detracting from lesson plans or having any detrimental effect on student performance on standardized tests, teachers incorporated Teacher Challenges into their curricula and developed new activities in unanticipated ways (see next section). The third and fourth grade teachers, for example, integrated the challenge to write a letter to Michelle Obama into their language arts curriculum. Students learned how to write a formal letter, and letters went through an extensive editing process.

Teachers also appropriated Fitwits Folder contents for their own use and integrated them creatively into class time. The third grade discussed the weekly Fit-tips in the morning as part of a routine known as “Circle Time” when students discuss habits in a group before delving into the day’s lessons. When one week the Fit-tip explained possible health benefits of laughter, students went in a circle telling jokes and funny stories and laughing before beginning the day’s lessons.

The Fitwits game was designed to support and build team collaboration that would inspire change on all levels of the socio-ecological model, from the individual level to the school policy level implemented by the principal. However, the challenges and initiatives that grew out of this framework exceeded our expectations, ultimately affecting not just the school, but the surrounding community as well.

Recommendations

When examining the Weekly Fitwits Challenges system, it was important to evaluate whether it had been effective to send health information/game challenges home with students. Taking into consideration the Challenge return rate over time, the information gleaned from

the students' responses and the number of students who were consistently engaged in the weekly challenges suggests that some changes ought to be considered for a future iteration of the game. The Weekly Fitwits Challenges and Folders were the largest design undertaking and budget item; yet, aside from a few key cases, the evidence suggests that that Fitwits material was most successful when integrated into the classroom and school environment.

At the same time, the Weekly Fitwits folders were the primary means for students to communicate directly with the Fitwits team. Through their challenges the team learned information about students' attitude, engagement and interests. Students also used the folders as a means to include extra information not solicited by the challenges, be it fan mail, extra activities, or comments on the back of print material. This type of unsolicited sharing of information and communication was vital to keeping the Fitwits community alive.

Unfortunately, the folder system created too many opportunities for the Fitwits material to go unopened, becoming ineffective in busy family homes. A new system of delivery is critical to any future iteration of the game. One solution would be for an online or digital component that would develop a sense of community around the game and allow for communication between players in the group (and/or surrounding communities). Extending the game into the digital realm (apps, web site, wearable devices) would facilitate the creation of an inclusive, engaging the family. Caregivers could have the option to engage in the game, taking on challenges with extended family members, other families and eventually other communities. The online/digital experience would be coupled with live neighborhood family events. These sessions would allow families to check in, get updates and learn hands-on ways to improve their health at home.

This type of system could easily be adapted for the classroom environment, allowing teachers from different schools to login and track the progress of their classes and competing classrooms. It would also allow the Fitwits Team to minimize confusion and streamline their communication system, by sending out weekly alerts, updates and teasers to all players efficiently.

Finally, in the future, additional resources will be needed to develop an appropriate evaluation plan with experts in the field of informal learning and public health/policy.

Endless Merit Tokens: The Game Changer

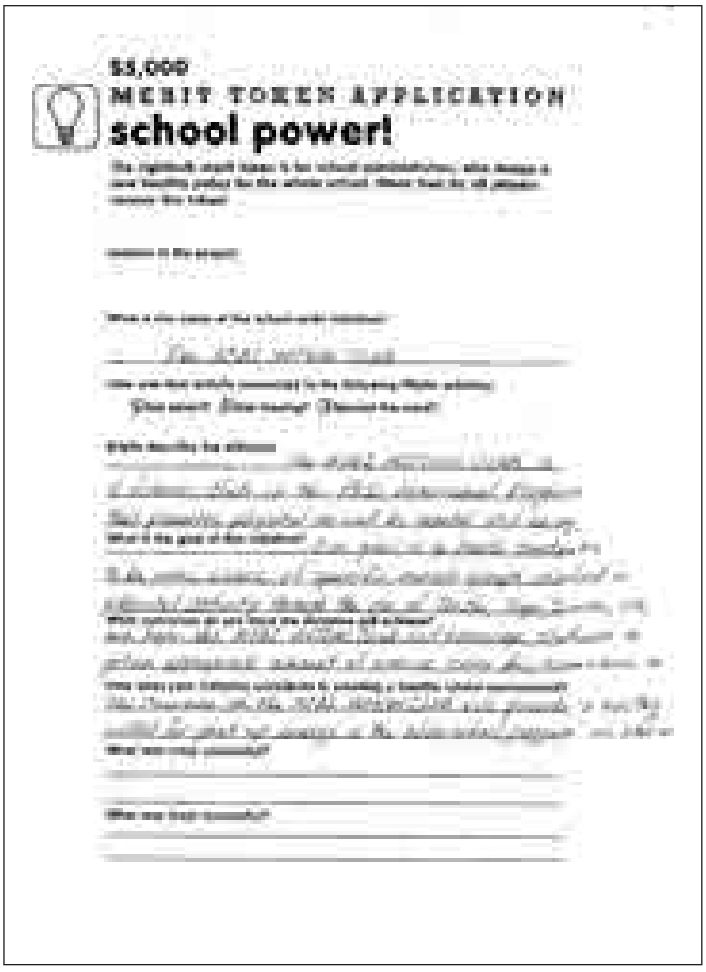
While students received a Character token for their wristbands every month, the five levels of Endless Merit tokens–Friends Helping Friends, Family Business, Teacher's Touchdown, Shining Bright, and Star Power–had to be earned.

Tokens: How they worked

To earn a Friends Helping Friends or Family Business token, students had to fill out an application that asked them to name who they were nominating, and what healthy behavior the person had demonstrated to warrant the nomination. Students submitted this form to the Fitwits Team when they returned their weekly Fitwits folder to the classroom drop-box. At the Fitwits office, a team member processed the nomination form, logging in the points for the appropriate players and issuing a Certificate of Honor that was presented to the students along with their tokens the following week in class.

Coordination and Distribution of Tokens

While student and family enthusiasm for the tokens were high, there were some barriers to integrating them into the school environment. The most significant problem cited by teachers was the management of merit tokens and wristbands, since students tended to lose them quickly. As one teacher described, "I love [the wristbands], but our kids are so terrible about



Examples: Completed Merit Applications (Friends helping Friends, School Power)

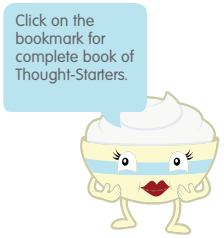
losing everything under the sun. And, when we handed them out, the kids are excited about it, they still want them, but we just go through so many of them."

Third grade teachers responded to the issue by collecting the wristbands and managing the system themselves. Other teachers implemented different strategies for managing the wristbands in their grade. While the third grade teachers labeled each student's wristband individually and kept them secure at school, the fourth and fifth grade teachers allowed the students the freedom to wear their wristbands and continued to distribute the tokens earned by the students whether or not they had misplaced the wristband. While the teachers agreed that the tokens and wristbands were a hassle to manage, they loved the tokens as a reward system. Feedback from one teacher stated, "[The students] love [the tokens]. They love, love, love them, but it just became a distraction…Some sort of reward system like a poster or something that was less of a distraction in the classroom would make it easier to really motivate the kids but still stay focused within the classroom as well." (teacher_gr4_id2). Overall, teachers provided constructive criticism about the system of distribution and were the ones to change the system on the fly when problems arose.

Students did not request merit token applications from the School Nurse as was envisioned. Instead, the Fitwits Team learned that they got a much higher return rate if applications were included in the Weekly Fitwits Folders that went home with students. Soon after altering methods, the team began receiving applications from a large portion of the participating students and had a consistent rate of return throughout the game.

Also, it became clear that teachers were not competing with other teachers within the grade. Instead, they worked as a team. This alerted the Fitwits team to the ineffectiveness of the Teacher Touchdown token. On the first token application turned in by the fourth grade team, the teacher was reprimanded for not including the other teachers on the application, and from then on the fourth grade only turned in Shining Bright applications for the whole grade.

Students enjoyed the token system; participation was high and was sustained throughout the game. Even students who were not playing in the game felt included, through the nomination system, whether they were nominated by their peers or came to a family night and got submitted nominations for their family members.

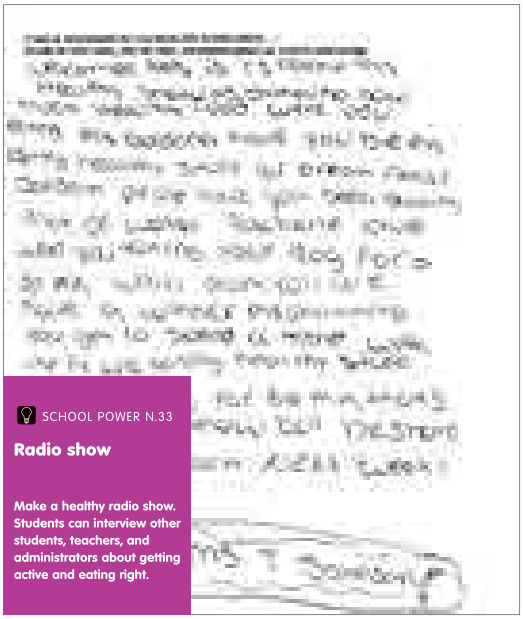


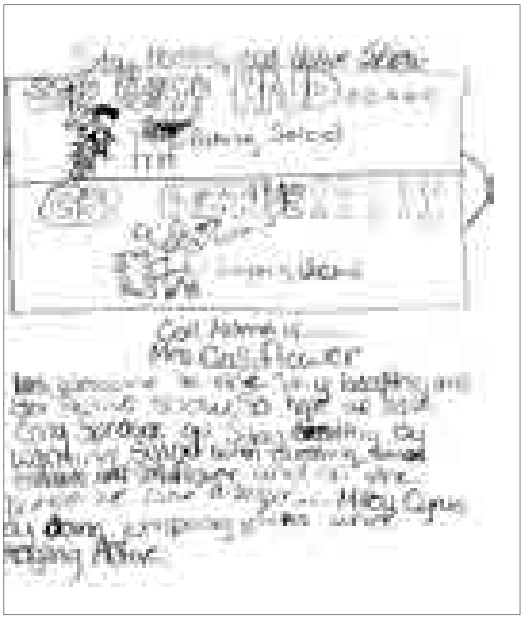
Thought-Starters and Teacher Workshop

An important factor in teacher engagement in the game was the distribution of "Thought Starters". The Thought-Starters were a deck of 110 ideas for healthy initiatives to incorporate into the classroom and school environment. Directed at teachers, the ideas were meant help them develop activities that would earn merit tokens. The ideas on the Thought-Starters functioned as inspiration for teachers, but also could be seen as an educational experience, broadening their expectations for what healthy changes in the school environment could be. At first, teachers cited difficulties in integrating Thought-Starter ideas into their classroom, notably that the activities took a long time to develop for classroom use. It was suggested that future iterations of the game could have Thought-Starters accompanied by a resource library of materials that would already be developed and ready to implement.

Teachers seemed to be confused about certain game procedures, asking frequent questions of the Fitwits Team during school visits. And, although we had given out the Thought-Starters, they had failed to captivate the teachers' interest, perhaps due to lack of explanation of their purpose. The Fitwits Team decided that the addition of a Teacher Workshop was important. Within a brief 30-minute meeting with teachers, the Fitwits Team learned a great deal about what teachers value (helping their students lead healthier lives, adopt healthier practices themselves) and what difficulties they have encountered up to that point in the game (the wristband/token system, score-keeping, timing of game and difficulty of adapting to new

routine, communication with the Fitwits Team, and the time-consuming process of developing new Fitwits curriculum).





Example. Teacher Though-Starter and student response

The workshop resulted in several changes in the game. After the workshop, new channels of communication with teachers were established, most notably through email. Teachers seemed more confident about their role in the Fitwits game and became more engaged. Surprisingly, considering the comments about difficulties developing new lessons, teachers began developing more original activities related to Fitwits content.
Despite the initial hesitation, the Thought-Starters were effective in inspiring teachers to develop unique and original Fitwits-related content for their classrooms. 40 of 90 teacher challenges submitted were derived directly from the Thought-Starters.

A recommendation for a future iteration of Fitwits is to have a similarly engaging workshop session with teachers earlier in the game, or even before the game starts, to clear up any confusion about game procedures, and to encourage creative thinking among teachers. Shifting the launch date to align with teachers yearly fall curriculum planning would allow teachers to get more involved in the game process and take ownership of the game from the beginning.

Reflection: Token reward system

The design of the token system was open enough so that unexpected applications were turned in, which in turn will help shape the next iteration of *I Am* Fitwits. Students nominated teachers, teachers nominated other teachers, and, in one case, third grade of teachers nominated the School Council for providing healthy snacks for students during testing. Teachers were proud that their students had begun to recognize their hard work, and were excited to see who would win the game. They proudly displayed the certificates they earned for all of their Fitwits initiatives throughout the school environment. The tokens encouraged positive reinforcement and peer-to-peer support and integrated these qualities into the school environment in a systematic way.

The teachers displayed examples of classroom activities that earned Shining Bright and School Power tokens. This created a very unexpected, exciting environment in the school. The token system was meant to encourage teachers and students to expand the health lessons throughout the school, and several tokens were earned by creating educational

displays in the hallways, or murals that demonstrated healthy concepts to visitors and other students.

The Fitwits Team developed a Certificate of Honor, an acknowledgement of the token applicants' good work. In the initial design phase, it was unclear that a system of positive feedback would be so important to reinforcing healthy messages and behaviors in the school environment. The certificates earned by students, families, teachers and staff members became invaluable as motivators to be displayed in school and at home. This unanticipated use of the merit token system and certificates showed enthusiasm among players and fulfilled the function of promoting healthy activity.

On an internal level, the system of logging in and preparing the merit tokens required a great deal of unanticipated hours to manage. The time it took to log-in the information by the Fitwits team and the volume of applications that were turned in on certain weeks meant that there were some mistakes in the delivery.

Teacher/student engagement, cooperation and competition

Fitwits Cash seemed to be a primary motivator for both the students and teachers. Enthusiastic about maximizing the amount of cash each of their initiatives could earn them, teachers sought to upgrade as many Shining Bright challenges (worth $2,000 Fitwits Cash) to School Power ($5,000 Fitwits Cash) as possible by engaging other grades or audiences within the school into their Fitwits learning.

The third grade earned two School Power tokens by engaging audiences beyond the game. The hallway outside of their classroom became an educational display about the food pyramid, correct portions, and food groups. They also upgraded a Shining Bright (grade-wide) token to a School Power (school-wide) token by writing books about proper eating habits as a class then reading their books to the kindergarten class. The fifth grade, which works closely with the sixth grade, "hired" several sixth grade students to be their gardeners and help care for the seedlings in their classroom that would be used for the school garden.

Earning cash and tokens were not always primary motivators, as we learned with the fifth grade. For the fifth grade teachers, Fitwits was the ignition they needed to pursue projects and initiatives that were important to them already. Their contribution was the school garden, which was not just a contribution to the game, but also a contribution to school culture and to the community.

The fifth grade teachers did not submit applications for tokens to recognize the enormous amount of work their class was doing. In fact, at the end of the game it was an astute student who realized he should do it himself. Of all the participating students, the fifth graders were the most self-motivated to complete challenges. Despite earning fewer tokens, the fifth grade's Fitwits project will have lasting impact (*See appendix: How fit our are Fitwits, 1 year later?*), and their dedication to the project motivated other grades outside the game to join in.

Game presence in the school environment

The visual environment that Fitwits created in the school was critical as a way to encourage participation, spread the word about Fitwits, reinforce health messages, send messages of positive reinforcement to players, and inspire new initiatives and maintain a sense of dynamism throughout the game. As the attitude of the school changed, the physical environment reflected those changes back with pictures, slogans, merit awards and positive reinforcement.

Though the players were reminded about the game through material sent home every week and activities in class, posters of the Fitwits characters around school alerted everyone that the school was engaged in Fitwits, and that some elements of play would affect those who were playing as well as those who were not directly involved.

Example. Grade specfic posters to serve as reminders that the game was always in "play".

Fitwits character posters in the halls

The teachers were asked to change their classroom environment slightly in anticipation of Fitwits. In each participating classroom, the Fitwits team hung a large color poster displaying the teachers' names and a Fitwits character. Each character on the posters matched a corresponding character on the large Fitwits scoreboards (near the School Nurse's office and in the cafeteria) that tracked each class' progress through the game.

As the game progressed, posters of the Fitwits characters and their stories become more dynamic and integrated into the game. For example, the a poster for March showed an enlarged image of the front page of the "McKeesport Daily News" announcing the arrival of International Fitwits for the 2011 Fitwits G11 Summit. In addition, the space at the entrance of the school became a space for reinforcing the Fitwits narrative not only for the players in the game, but also for the entire school community.

Wall of Champions and Cafeteria Environment

The most significant presence of Fitwits in the school environment was located in the school cafeteria on a blank plaster wall that was slowly taken over by Fitwits images and messages. Known as The Wall of Champions, the wall also displayed a large, colorful scoreboard that the Fitwits team constantly added to and changed throughout the year.

As the game progressed, the images and messages began to take over more space on the wall, new examples of student work was hung as it was received and processed by the Fitwits Team. The Wall began to serve as a reminder to students about the game, and was a place to introduce Fitwits to those not playing the game. As student_38 points out, "The [Wall of Champions is] great because it shows all of the stuff people did during Fitwits and they are proud."

The Wall of Champions eventually grew to take over not only the wall it was intended for, but also other adjacent surfaces in the Cafeteria. Photos from Family Nights were also posted every month. The Fitwits Team perceived the Wall as an important element of personalization for players in the game, who could see their work displayed along with images of themselves and their family members. The constantly changing nature of the material on the wall maintained a sense of dynamism and surprise throughout the game. A story developed through the different elements of the game, and the Wall was a chance for the Fitwits Team to retell that story as it was happening in real time. "I noticed [the Wall of Champions] mainly because the kids would show me [...] at lunch or something and would say, 'Oh, did you see our picture?' or, 'Did you see our certificate?', so I think they brought the awareness to me about the Wall" (teacher_gr4_id6).


Example. Images of taken of the endless Wall of Champions!

Scoreboards

Scoreboards were designed to keep track of the amount of points students accumulated individually through the weekly Fitwits challenges. Every month, teachers received a new scoreboard to display outside of their classrooms. These scoreboards were updated every week without ceremony (although many times the scoreboard-updating process would become somewhat of a spectacle for students walking by). Students would often stop the Coordinator and ask questions about their score; after she finished the updating process, they would swarm the scoreboard to check their progress. It was very interesting for the teachers and students to see participation rise throughout the game; as more students turned in Fitwits Challenges, more spaces were filled in on the scoreboards.

A couple of issues were encountered with the classroom scoreboards that could be taken into consideration for the next iteration of the game. While it was easy to keep track of the individual scores based on Fitwits Challenges, it was not so straightforward to keep track of the tokens turned in every week. There was confusion among teachers as to whether the scores posted on the board reflected the scores that included the token awards; they did not, but could be included in the future to give players a sense of their real standing in the game. During the design phase, the Fitwits Team did not anticipate the surge in token participation, but a future iteration of the game will need to be more flexible to account for this type of participation.

Another possibility would be to create a scoreboard for the entire game that would accompany the school-wide scoreboards. The school-wide scoreboard looked much different from the classroom scoreboards, in that there were no numbers posted, just images of Fitwits characters and a path that represented progress through the game. Unfortunately with this system, many players often expressed doubt about the standings. Therefore, it would be helpful to also list the quantitative scores and tokens earned alongside the qualitative visual representation of overall scores.

Regardless, the playful nature of the school-wide scoreboard helped it achieve its primary goal – to keep a fun and competitive tone in the game. Teachers, in jest, were often accused of manipulating the pieces on the board and someone even suggested installing a security camera so cheaters could be caught! One teacher reported, “We checked [the scoreboard] every day to see who was winning…The teacher competition between us, it was fun, it was healthy, and always tried to switch people’s names on the board… every Thursday we seemed to meet in front of the School Nurse’s office to see who was winning.” (Teacher gr5_id_7)

Weekly Presentations

Weekly presentations were an important component of motivating classes to stay in the

game. The presentations were directed at the classroom or grade as a unit, acknowledging individual achievement by students and teachers while encouraging the class as a team.

Example. Coordinator (Sarah Rafson) awarding 4th grader with merit token and "Going the Extra Mile" badge.

Every Thursday, the Fitwits team was given "in-class" time to give a brief presentation. The basic components of the presentation were: announcements of upcoming challenges in the Fitwits folders, updates on individual and grade scores, merit tokens and certificates earned over the week. Over time, however, the presentation was streamlined to ten minutes by presenting just the names and achievements from the week, and leaving the distribution of the merit tokens to the teachers.

Toward the end of the game the format of the presentations shifted slightly again. Due to the decline in participation in weekly Take Home Challenges, time was mainly used to update students about upcoming Fitwits events and create anticipation about the material going home in the folder that week. The adjustments in the presentations were positive. The Fitwits Team saw increased participation and enthusiasm for the March and April family events, including attendance by teachers. The presentations were important for teachers as well, who were encouraged to continue their high level of participation. Scheduling conflicts (class trips, testing, etc.) often prevented the presentations and some classes went many weeks without a presentation.

Recommendations

Through this experience the Fitwits Team realized the importance of a coordinated approach to visuals in the school environment while simultaneously allowing for teacher and student participation in transforming the school environment. Maintaining an element of surprise and change was important. It was important to show progress and change visually as it happened in real time to keep players motivated. This special attention to detail was critical for an audience who is constantly bombarded with the visual stimulus of today's media.

In terms of creating a presence for Fitwits at school, it was suggested by both players and the school community that Fitwits have a dedicated space at the school. This space would allow teachers, students and parents to check-in, ask questions and make suggestions. This could be a place where inspirational material, Thought-Starters and photographs of the players are

displayed on an on-going basis. It would also show a commitment on the part of the school and help expands kids' notions of what being healthy is all about.

Through Fitwits' visual and physical presence in the school, health messages and reminders constantly surrounded students, teachers and staff. Ascher et al. describes the impact of an information environment that encourages sedentary behaviors and the capacity that exists to reverse it into an environment that makes health messages just as ubiquitous. If the media can be a factor in encouraging unhealthy or inactive lifestyles, perhaps Fitwits signage and readily available information can encourage healthy changes in school.

Community Impact

One component of the Fitwits intervention at Propel was to empower the community to in a way that is most meaningful and effective for the local culture. The merit token system gave teachers latitude to identify ways to discuss health with their students. The fourth grade teachers, for example, were inspired by the Fitwits Thought-Starters to create a Design-a-T-shirt activity with their students to spread healthy messages. Through this activity, teachers identified the importance of t-shirt messages as a means of communication in their community, and an effective means to substitute healthy messages in a channel that has impact for the community. The fact that the community designed the activity and the messages were a product of the students' creativity gives the messages increased impact.

Example: 4th Grade T-Shirt designs

School staff constructed new infrastructure to support healthy messaging on a school-wide level as well. Motivated to earn School Power tokens, the School Principal coordinated a team to create a podcast with healthy messages that was then broadcast to the entire student body during lunchtime. The Principal created a new format for healthy messaging, and a new opportunity for kids to receive messages.

Through the school garden, the players developed a messaging system for the entire community. The sight of a vacant lot transformed into a place of gathering, learning and growth sent a strong message, and the sight of children and families working together in the garden often attracts curious neighbors. Perhaps the strongest example of visual impact on the environment was a mural produced by students and teachers that is displayed in the school garden, announcing the project and projecting a positive message for the future.

At Propel McKeesport, through the *I Am* Fitwits game, the core Fitwits messages were reinforced in different environments within and around the school: at home, in class, in the school environment and in after-school programming and events. This is one step towards postive, life-long lifestyle changes!

Container gardens popped-up in every classroom.

Family Night got everyone out digging in the dirt!

New classroom lessons and activities are developed.

5th graders move their science class out to the garden.

Communication with students and teachers

Communication between teachers and the Fitwits Team relied heavily on the team's physical presence at school. While there were multiple channels of communication throughout the game, face-to-face communication was the most important method of communication with the teachers. The hallway was often a place where important communication happened; teachers would come out of class to discuss challenges, ask questions, and seek advice about their class' standing in the game. A fifth grade teacher says of the Champions, "They made sure that I made deadlines… anything I needed or anything I needed to know, I was informed…As a teacher I could not have done it [without them]…you need people like that to say, 'Okay, this is what I need, this is all I can help you with, this is how I would like you to help me.' So I think that worked out really well" (Teacher gr_5_id_7).

The most significant barrier the teachers encountered was the difficulty adjusting to the merit application submission at the beginning of the game. Their frustration led to the request that the Fitwits Team open email communication with the teachers. One teacher suggested, "a weekly newsletter or an email that will go back and forth between [Fitwits] Headquarters and us… I think that was hard at times, we had to ask [the Champions] a question that would go to [the Coordinator], and then it would come back to us…" (Teacher gr3_id_5). Although email helped facilitate communication, one further recommendation suggested by our teachers for the next iteration of the game is to create an online form that teachers can log onto and submit at their convenience.

Competition

Rivalries were apparent among particular students in the fourth grade who wanted to become the top students in their grade. These students would closely monitor the scoreboards outside of their classrooms, and complete as many extra challenges as they could to pull ahead of the other. One said, "Sometimes I add [the scores] up and see… I didn't get the total for last week yet for April, and I really want to find that out…[he] thinks he is ahead of me but he is not! N-O-T!… He gets more money than me every week. He is like, 'ha, ha, I Am ahead of you,' and I'm like, 'no you're not. I'm ahead still'" (Student_38). Curiously, the Fitwits Team didn't perceive competition between students of different grades.

Despite early confusion among teachers about the game system, they quickly caught on and began implementing important changes that created a very competitive classroom and school environment. The fifth grade teachers submitted the first teacher challenge on March 10 for integrating the Wii into the math curriculum, keeping students active throughout the day. Around this point, teachers begin testing the limits of their involvement in the game. The Champions, sensing interest among teachers, began delivering a Fitwits Folder every week to each teachers to give them a sense of what students were taking home. To the surprise of the Fitwits team, the teachers began turning in the challenges themselves. At the end of February, a third grade teacher asked the Coordinator for extra challenges. She had begun exercising every day and was using the Fitwits challenges to keep track of her progress.

When it was clear at the beginning of the game that the fifth grade was in the lead, it sent a signal to the third and fourth grade teams to step up their level of engagement. Once the third and fourth grade teachers had identified the fifth grade as the common enemy, they began to cooperate. On Propel Pride Day in March, the teachers teamed up to organize an obstacle course in the hallway they shared, "to show students physical activity is important, even in school." The course involved hockey pucks, hopscotch, scooters and rackets.

This event was a turning point when cooperation between grades turned into competition. The hallway changed into the site of the heated conversation between the grades; when the third grade began accumulating certificates for the merit tokens they earned, they conspicuously decorated their hallway with them and often taunted the fourth grade teachers. Competition was accentuated by their side-by-side location. These teachers spent considerable time developing lessons that integrated Fitwits activities into curricula such as math, science and reading, and the number of token applications reached an all-time peak on week eight.

Teachers earned a total of 90 tokens for integrating Fitwits into their classrooms; 47 of them were integrated into lesson plans to teach subject-specific material such as reading, writing, science and math. These tokens represent an important co-creative element of the game. While some of the activities that these tokens represent were Fitwits Teacher Challenges (12 of them), and some were inspired by the Thought-Starters (40 of them), all of the messages and lessons were directed and delivered by the teachers, who were unwittingly becoming themselves champions for childhood obesity prevention through the game. Teachers designed and implemented 38 lessons and activities to teach their students about health.

Standardized testing had an interesting impact on teachers' involvement in the game. The third and fourth grade teachers became engaged during this period, and despite the fact that the students were inaccessible, the teachers were readily available to engage in Fitwits game. We have several examples of how this testing period influenced the climate of game-play. First, the fourth grade, lagging behind the other two grades in individual challenge submissions, shot ahead in the game once the teachers decided to integrate Fitwits activities into the breaks during testing. Free from the constraints of the normal academic schedule, the fourth grade teachers realized the ease with which they could implement small changes in their routine to foster a healthier environment.

During testing, the third and fourth grade teachers extended recess to 60 minutes a day ("It gives students the opportunity to meet daily exercise goals." "It helped relieve the stress of testing." The third grade teachers provided students with healthy snack breaks during testing, and the fourth grade teachers gave students Fitwits challenges to do if they finished their test early. The testing seemed to give the teachers the time they needed to begin developing new activities to use in their class for Fitwits, and the weeks following the testing kicked off a particularly productive period for the teachers in the game.

While the third and fourth grade teams' involvement increased during testing, the fifth grade prioritized test preparation over Fitwits activities. "The PSSA, to be honest, that's when it

hits, March-April is crunch time. Really fifth grade, […] we knew that there was no way that we would only be able to give the time that we need plus academics, so we made a conscious decision to say to [Teacher gr5_id3], 'could you take Fitwits and run with it?'…We continue to focus on math, reading and the writing, and [[Teacher gr5_id3], spearheaded Fitwits…" (Teacher gr5_id8).

Students responded in a more serious way to the teachers' challenges than the take-home challenges, due in part to the difficulties alluded to earlier (lack of time, attention, support by family members). Teachers also earned points for Fitwits by integrating activities into the classroom in a fun way. The game encouraged fun activities to be incorporated into the classroom, incentivizing practices such as snack and dance breaks, extended recess, and trips to the park. As one teacher reflected, "We did a lot of 'Fitwits Days.' We opened the doors [between the two fourth grade classes] and all the fourth grade participated together. It was a celebration-type setting on those days and the kids really enjoyed participating" (teacher_gr4_id2). Another teacher added, "I made up Math activities to go along, with Wii bowling, and everyday a kid would get on there. It's just to move doing math, it forced me to become a better teacher, finding different ways of doing something" (teacher_gr5_id3).

At one point in the game, the third grade teachers decided, after consulting with the students, to plan a sneak attack on the fourth grade. While both the third and fourth grades continued to accrue Shining Bright tokens, the third grade teachers chose to keep their activities secret, allowing the fourth grade score to sneak ahead, the fourth grade teachers thinking they were in the lead, until the very last week of the game when the third grade teachers revealed their "Million Dollar Fitwits Box" securing their place as the Fitwits winners.

Teachers reported very positive reactions from students from various Fitwits activities that took them outside of their classroom. Examples from each grade are: the third grade's field day in Frick Park, the fourth grade's 60-minute dance party, and the fifth grade's use of the Wii and gardening in their curriculum. One fifth grade teacher was blown away by the students' enthusiasm: "We had 25 kids volunteer on hot days to go up and do nothing but weed the garden, just pull weeds for an hour…We didn't force them to do it, we didn't assign them to do it, we just asked for volunteers and they knew what they were getting into" (teacher_gr_5_id_3). One student describes his work proudly saying, "With my teachers we went down to the garden and then we started weeding stuff. We started taking everything out…all of the trash and tires and everything that polluted it…" (student_89).

Every school fosters a unique culture of teaching, and Propel McKeesport exhibited exceptional teamwork and support between teachers. The merit token system was designed with the assumption in mind that teachers would work independently with their class. In practice, the teachers worked together as teams of four among the whole grade. However, would this be the case in other schools? This is an important question to consider for the next iteration, since other schools in other locations may operate differently. Ideally, *I Am* Fitwits will be flexible enough to accommodate various teaching styles and learning environments.

Key participants and their role

Fitwits Coordinator

The role of the Fitwits Coordinator was that of middleman, reporter, cheerleader, and referee. The Coordinator made sure that the Fitwits system would integrate as seamlessly as possible into the school environment and become as successful as constraints would allow.

The Coordinator worked closely with the whole team and school to organize the most effective strategy to get all kids', parents' and teachers' consent to play and devised a plan to collect data throughout the project (surveys, interviews, pictures, etc.). This involved arranging for meetings with school staff and manning a booth at parent-teacher conferences to survey as many parents as possible.

The Coordinator played an important role in engaging and motivating students and teachers, and would carefully collect and process the messages that were presented to them in class. The Coordinator acted as the loudspeaker for Fitwits in the classroom; she was able to deliver messages in a language and tone consistent with the Fitwits Team's message intended for the school environment. The Coordinator was the primary resource throughout the game for staff members at the school; she was available every week in the school buildings and could be reached via email.

The Coordinator's presence was also a motivator to help facilitate new initiatives. According to the Principal, "Throughout the year we kept adding new layers, and I think a lot was because of the Coordinator's enthusiasm and willingness to add new ideas" (principal_id_9). Students came to recognize the Coordinator in school, and she often entered classrooms to the tune of "Fitwits is here!" For the teachers and Champions, the Coordinator was a supervisor and coach, advisor and supporter. One teacher mentioned that "[The Coordinator] has been really supportive in making it so that it was really easy for us to incorporate all the challenges and activities within our classroom" (teacher_gr_4_id_2).

As the Champions began taking on more initiatives, the Coordinator was available to offer advice, even though many of the initiatives fell beyond the realm of the game. To one Champion, "[The Coordinator] is my Fitwits God [...] I would be able to call her and ask her a question, and if she didn't know the answer she'd help find the answer very quickly and get back to us" (champion_id_4).

At the Carnegie Mellon office, the Coordinator was in charge of delegating tasks among the team members and assured the project remained on schedule. Regular weekly meetings allowed the team to monitor the progress of the game, as well as receive updates on different events. In these meetings, the Coordinator was the representative for the Propel school community and was also in charge of monitoring the progress by all team members.

School Principal

The School Principal was an invaluable asset to the game. She was the "gatekeeper" who welcomed Fitwits into the school and facilitated access to school resources. The principal was extremely cooperative in helping the Fitwits Team ensure the success of the program by implementing it in a way that was streamlined with the school culture and schedule. Also critical was her permission granting Fitwits access to classrooms, wall space and resources to reach out to families who might consider attending a Fitwits Family night.

The School Principal was an active participant in the game who earned the players several School Power tokens for implementing healthy policies that would affect the entire school. As principal, she collaborated on projects that reinforced Fitwits concepts in ways that were meaningful and interesting for the Propel School community. The following School Power initiatives would not have been possible without the dedication of the School Principal and school staff:

1. **Fruit and Vegetable Grant**: The principal applied for and was awarded a grant to provide a sampling of fresh fruit and vegetables as snack breaks for the entire student body every week.
2. **The ACAI Action Club**: An after school program that emphasizes physical activity through martial arts, yoga and dance instruction, allowing kids the opportunity to get 60 minutes of physical activity in their day.
3. **Fitwits World News Broadcast at lunch**: A newscast video shown during lunch consisting of three news reporters (7th graders) presenting healthy eating information…to expose the entire school to healthy eating ideas in a fun manner. It instigated discussion of healthy food alternatives throughout the student body and supports the fun, imaginative world of Fitwits characters and exposes students outside of the targeted grade levels [to the healthy messages].
4. **Nitwit-Free Tuesdays in April**: A school-wide effort to spread the word about healthy food and drink alternatives and create an awareness about healthy choices. Every Tuesday in April the school suggests "students and staff choose Fitwits-friendly drinks and food."
5. **Salad Bar**: A salad bar donation from Whole Foods and a $10,000 donation from the Eat 'n Park Life Smiles Initiative to provide fresh fruit and vegetables in the salad bar for students and staff at lunch three days a week for ten weeks.
6. **School Garden**: A plot of vacant land was successfully acquired for a new school garden to be run by students, teachers, parent volunteers and community members. The garden will be (and continues) to be integrated into science curricula, offers students a hands-on learning opportunity, and will even provide fresh fruit and vegetables to contribute to the continuation of the school salad bar program.
7. **Physically Active Music Classes**: Dance and active drumming were incorporated into the music curriculum to make it an opportunity for kids to get moving during the day and work towards 60 minutes of recommended physical activity every day.
8. **Discussing Health at the Elementary School Meeting**: Third grade teachers made a discussion of health and wellness a priority at their meeting, and shared ideas on how to incorporate health into the curriculum.
9. **Healthy Pen Pals**: Students from different grades began to write letters exchanging ideas about how to stay healthy and how to support each other.
10. **Healthy Dream Murals**: Teachers in the third grade designed a mural with their class to teach about the food pyramid and recommended serving sizes. The mural was then placed on display for the entire school community.

The School Principal was an active advocate against the prevalence of unhealthy foods in the cafeteria: "One of the topics we worked on was—our kids always bring Hot Cheetos at lunch-time—and so one of the things that we really wanted to do was to have them recognize that these are not very healthy. And we gave some alternatives during the newscast [during lunch] so that they may know that, 'Okay, maybe baked potato chips are better then Hot Cheetos'" (principal_id_9). *I Am* Fitwits provided the School Principal with a platform to implement her advocacy with humor and fun; she used the Nitwit Tickets to promote "Nitwit-Free Tuesdays in April."

The Salad Bar elicited an overwhelmingly positive response from the school community and was a result of the hard work and dedication of the Fitwits and Propel Teams. The salad bar heeds the CDC's recommendations to not only make healthy food options available, but also to make appealing healthy food options available to the school community. Students reported that the salad bar, "makes us eat healthier foods at home" (student_38) and "gives me energy so I can go around at recess" (student_39). "It's delicious, I love all the vegetables and the fruits, it's just so good and the best part is it's healthy for you" (student_104). As a Champion observed, "The kids went nuts for the salad bar. Every day, darn near every kid had a

salad. Not drenched in salad dressing, with some vegetables and fruits on it… on days that there wasn't a salad bar, you could see that they weren't that excited about lunch." (champion_id_4)

The salad bar had a similarly strong impact on teachers and staff: "I never had salad in my life, I really didn't. I mean, not just a salad with lettuce, but salad with peppers on it and cucumbers, it's just vegetables, looking at it that way, I don't need fried foods… for me it was strengthening" (Teacher gr5_id3).

The School Principal also served as the public face for Fitwits and the related initiatives. When the school garden was ready to be launched, she organized a reception that involved different elements of the creative arts' performances, and invited community members and local politicians to speak. She emerged as an important collaborator for the school. She worked closely with the Fitwits Team in developing a program that would best integrate into the school culture and made it possible to coordinate activities that fit into the school schedule and system.

School Nurse

The School Nurse quickly emerged as the Process Champion at Propel McKeesport. Her friendly and helpful demeanor earned her the trust of the teachers, students, parents, the Fitwits Team and school staff. In addition to monitoring the students' health information, the School Nurse made it easy for the game to operate in the school by providing access to space and other school resources that were helpful in keeping the game moving smoothly. She regularly recruited parent participation for activities like Fitwits Family Night, advised the Champions on the best time or phone number to reach particular parents.

The School Nurse also played a role in helping to run the various initiatives that were established because of Fitwits. The Salad Bar was a major undertaking that would not have been possible without her tireless support. She added the salad bar responsibilities to her role as School Nurse, spending several hours a day preparing, serving and cleaning up the salad bar.

Support Staff

Support staff played a critical role in building a culture in the whole school around health. For example, the Afterschool Coordinator was one of the first to implement a new initiative at school as a result of *I Am* Fitwits. She began the ACAI Action Club to help ensure kids received the 60 minutes of physical activity per day recommended by Fitwits.

The School Supports Specialist was instrumental in supporting creative projects with both his technical expertise and creative ideas. He contributed solutions during our teacher workshops and problem-solving meetings, and supported the School Principal's initiatives to record a podcast about healthy topics and project them during lunchtime.

The Art Teacher supported *I Am* Fitwits initiatives during time spent with students in his art class. In preparation for the school garden, he worked with students to create a mural for the lot, and assisted them in painting bricks with positive messages to line the flowerbeds.

Family and Community

Families were engaged in *I Am* Fitwits directly in three ways: applying or being nominated for Family Business merit tokens, Family Nights, and as Parent Volunteers. Seventy-one *I Am* Fitwits players nominated their family members as health champions for making healthy changes in their home, 190 parents and students participated in Family Night events, and 12 family members volunteered for various events over the course of the game.

Fitwits Family Nights were a chance for families to come to school and connect to the lessons that were being reinforced in their children's classes. It is our core belief that kids need buy-in from their families to be able to make meaningful and healthy changes at home.

Family Nights were a chance for families to learn the health messages with their children through hands-on activities. The Fitwits Family Nights were themed around: core Fitwits content (nutrition, physical education and activity), health promotion, and the importance of family and community involvement. Topics included things like preparing and learning to cook a healthy dinner, portion size, good table manners, and the seed-to-table process.

The topics chosen for Family Nights reinforce different facets of the Fitwits Program. January's Family Night was a festive, carnival-like format, where different stations were set up with games to teach participants basic Fitwits concepts and encourage physical activity. January's Fitwits Family Night drew approximately 60 participants and their families.

February's Family Night was an opportunity to share the Fitwits presentation on health and nutrition. While parents were learning the basics, students were busy learning to make applesauce with a local chef. Champions tested students on their Fitwits knowledge and after the parents had completed their lesson, students and parents competed against each other in the hand portion memory game. February's Fitwits Family Night drew approximately 30 participants and their families.

Whole Foods Market District sponsored March's Family Night, sending two chefs to lead a culinary camp where participants learned how to cook a quick and healthy family meal. March's family night attracted high participation, including teachers and staff members who joined in and shared a healthy meal, family style. March's Fitwits Family Night drew 50 participants and their families.

April's Family Night was a collaborative effort centered on gardening. Drawing from the enthusiasm garnered by the newly opened school garden, this Family Night involved: a home-gardening lesson by Grow Pittsburgh, a cooking demonstration by a local chef who explained how to use fresh herbs, and the Saturday Light Brigade (a nationally-broadcasting radio show) that recorded students' impressions about herbs. Showing an increased level of dedication to Fitwits, the third grade teachers offered incentives (homework passes) to their students for attending the event and integrated the Saturday Light Brigade's story guide into their curriculum. April's family night exceeded expectations for participation, drawing over 50 students and their families.

Recommendations to increase family participation

Interview evidence showed that students were eager to attend Family Night, but there were many factors that prevented their participation. With so many pressures on parents, participation at Family night was dependent on parents' work schedules, availability of transportation and other higher priority activities. Additionally, parents seemed unaware of many events happening at school. One student, when asked why his family only attended one family night responded, "because it was hard to remember, and I kept on reminding my family…most of the time we just forgot" (student_89).

Maintaining stronger communication channels with parents and creating a convenient method for parents to be able to contact Fitwits directly might increase participation. Closer interaction between Champions and parents had a positive impact on family participation in Fitwits. When Champions pledged to recruit 10 families to attend Family Night, they succeeded, and exceeded expectations for participation for March and April's Family Nights.

Many students cited transportation as a barrier to their participation; a future iteration of the game might consider ways to alleviate that barrier. In the Fitwits Community Zone at Wilkinsburg, for example, the Champion took it upon herself to pick up participants from their homes. Although this would be a significant undertaking for a game with over 100 families, there may be an opportunity to meet this need by developing a volunteer network around this area. Working with the community to create safe Fitwits walking zones/routes is also an option and

excellent way to reinforce physical activity and civic mindedness.

The Champions utilized phone communication to talk to parents about Family Nights and recruit participation. One Champion mentioned that parent involvement was a challenge, but cited partnerships with groups like Whole Foods and offering incentives towards attendance as a way to draw more participation.

Despite these hurdles, increasing participation throughout the year was a clear indication of the interest and motivation of the families in the Propel McKeesport community. Events were successful, families enthusiastic, and the turnout exceeded our expectations.

Family Nights facilitated a connection between community groups and volunteers and the content being reinforced through Fitwits. In April, the Saturday Light Brigade recording activity not only connected to a Fitwits in-class curricular activity, it also built upon initiatives that had been suggested by teachers and school staff, such as the "Design an Healthy Radio Show" activity implemented by fourth grade teachers, and the Principal's initiative to have a healthy podcast broadcasting during lunch for the whole school. The recording is available on the SLB website (http://neighborhoodvoices.org/grow-pittsburgh-and-fitwits-family-night).

Service personalization is often key to success for adopting new behaviors. Adding a "coach" component to the Fitwits program, someone who could provide personalized advice, encouragement and support to families around the clock could be key to creating real change in the home environment. This coach could be on or off-line. The idea of a 24/7 health coach has been a reoccurring conversation with many of our families over the past few years.

The coach model has been implemented successfully in programs such as Parents as Teachers from SPARK Georgia and Parent Coaches from SPARK Ohio. In these precedent models, parents coach other parents through processes of child rearing and development, offering experiential help. This model shares several qualities of the Champion model in Fitwits, namely that the recruitment of community members creates a sense of trust among participants that increases buy-in into the program.

Parent involvement and interest

There were significant barriers to engaging parents in a volunteer capacity in the game. Streamlining the process and accommodating volunteerism in many ways would be useful for future iterations of the game. Beyond the difficulty of coordinating work schedules, school policy is strict in requiring clearances that are often costly and time-consuming to apply for, often a discouragement for parents.

Increasing parent involvement in Fitwits would be critical in the next iteration of the game, to help support, educate and grow the volunteer network. The Fitwits Team could set up workshops to help facilitate parents' security clearance process. The team would work closely with the Parent Champions, allowing them to champion and grow their role. This would be helpful for the game process and a long-term benefit to the school community.

Establishing Community Partnerships

The Fitwits extended network has been developing since the project began four years ago. While the Fitwits Team facilitated partnerships nationally and in the greater Pittsburgh area, the school Champions were the crucial link between the school and the community groups immediately local to the school.

The Champions were relentless in their outreach to local politicians to garner support for their initiatives, and to raise awareness of the great work underway at the school. One Champion made a surprise visit to the city mayor's office in downtown McKeesport with a supply of Fitwits letters and gifts. She also negotiated with a state senator to secure a site for the school garden; the senator later came to speak about the importance of this project for the

community at the ribbon-cutting ceremony. The Champions connected the project with the local branches of the Boys and Girls Club and Sunshine Ministries locally to help create a critical mass of manpower to keep the school garden running year-round.

The success of the initiatives brought about by Fitwits is a testament to the importance of using Fitwits as a way to connect game players and community resources. This is a sustainable model because there is always a need for groups like Fitwits that can link organizations and corporations looking for volunteer and community service opportunities. Local businesses (such as those which donated material to the school garden) have an interest in seeing their community develop and prosper and charities exist to support initiatives like those at Propel. Fitwits showed that a game can aid in rallying these organizations around a school to become agents of change.

Notable Fitwits volunteers and supporting organizations:

Eat 'n Park Resturant Hospitality Group. Sponsored fresh produce for the school salad bar with a grant through the Life Smiles Initiative. The salad bar was available to students for three days per week for ten weeks of the school year.

Whole Foods Market District. Fitwits has maintained a relationship with Whole Foods since working with them on activities for the Wilkinsburgh Community Zone. Whole Foods continued their sponsorship of culinary camp for participants at McKeesport. Whole Foods also donated the physical unit for the salad bar at Propel.

Venture Outdoors. Together, we developed a unique Fitwits geocaching adventure that made use of Fitwits information in a fun scavenger hunt through a park in McKeesport. Venture Outdoors also prepared a sponsorship package for teachers at Propel to receive outdoor leadership training, certifying them to lead school groups on activities through a local park. Venture Outdoors and Fitwits have established a supportive relationship, and Fitwits has been involved in several Venture Outdoors outreach events (Summer Family Festivals, Venture Outdoors Festival 2011).

Grow Pittsburgh. Was vital in supporting Propel's school garden initiative. Two Propel School staff members were sponsored to attend the Garden Primer class, which prepares beginner gardeners with the basics of starting a garden. Grow Pittsburgh further assisted as a resource for the garden by generously consulting with the teachers who lead the garden initiative. The April Family Night was generously sponsored by Grow Pittsburgh, who grew 30 basil plants in their greenhouse for families to take home and taught an hour-long workshop the basics of home gardening.

Copper Pot Corporation. Chef Dave Gancy from the Copper Pot Corporation worked with kids to prepare nutritious meals at Family Nights, and, as a champion for the cause, reached out to manufacturers to secure donations for Family Night events. Chef Gancy was an important part of the Family Night team.

Seeds for Peace. This non-profit organization that donates packets of seeds to communities recovering from war and natural disaster or experiencing poverty, donated over 400 packets of seeds to jump-start the school garden.

The Saturday Light Brigade. Collaborated on a project developed for Family Night, in which students recorded stories and impressions of different types of herbs. The content was customized to the Fitwits event and was a big draw for students to attend Family Night. The Saturday Light Brigade also created a template for story generation that teachers integrated into their lessons plans to earn a Shining Bright token.

Recommendations

A principal goal of *I Am* Fitwits was to influence families to adopt healthy changes in their lives. To accomplish this, Propel McKeesport was used as a hub and the game as a medium to connect with families and impact the community. Through a game and interactions that accompanied it, *I Am* Fitwits empowered teachers, staff, parents and students to act as advocates for health. Community resources played an important part in this and the success of the game is owed in no small part to the strong community and volunteer connections fostered through the game. However there are recommendations that can be made for future iterations of the game, and to help with the replicability of this model.

Future iterations of the game should open increased venues for parent involvement. Although many schools struggle to involve parents in school affairs (and this was certainly a concern at Propel), being able to accommodate parent talent and enthusiasm is important for maintaining family buy-in to the game, and increases a sense of ownership with game activity. In this iteration of *I Am* Fitwits, several of parents expressed interest in becoming involved as the game progressed. One parent, who is trained as a chef, offered to give cooking demonstrations. Another parent said she was interested in becoming a Champion with Fitwits while yet another offered her expertise in horticulture for the school garden. Despite barriers to parent involvement such as scheduling and security clearance requirements, these parents would have been more successfully involved in the game if there had clear volunteer opportunities established before the start of the game.

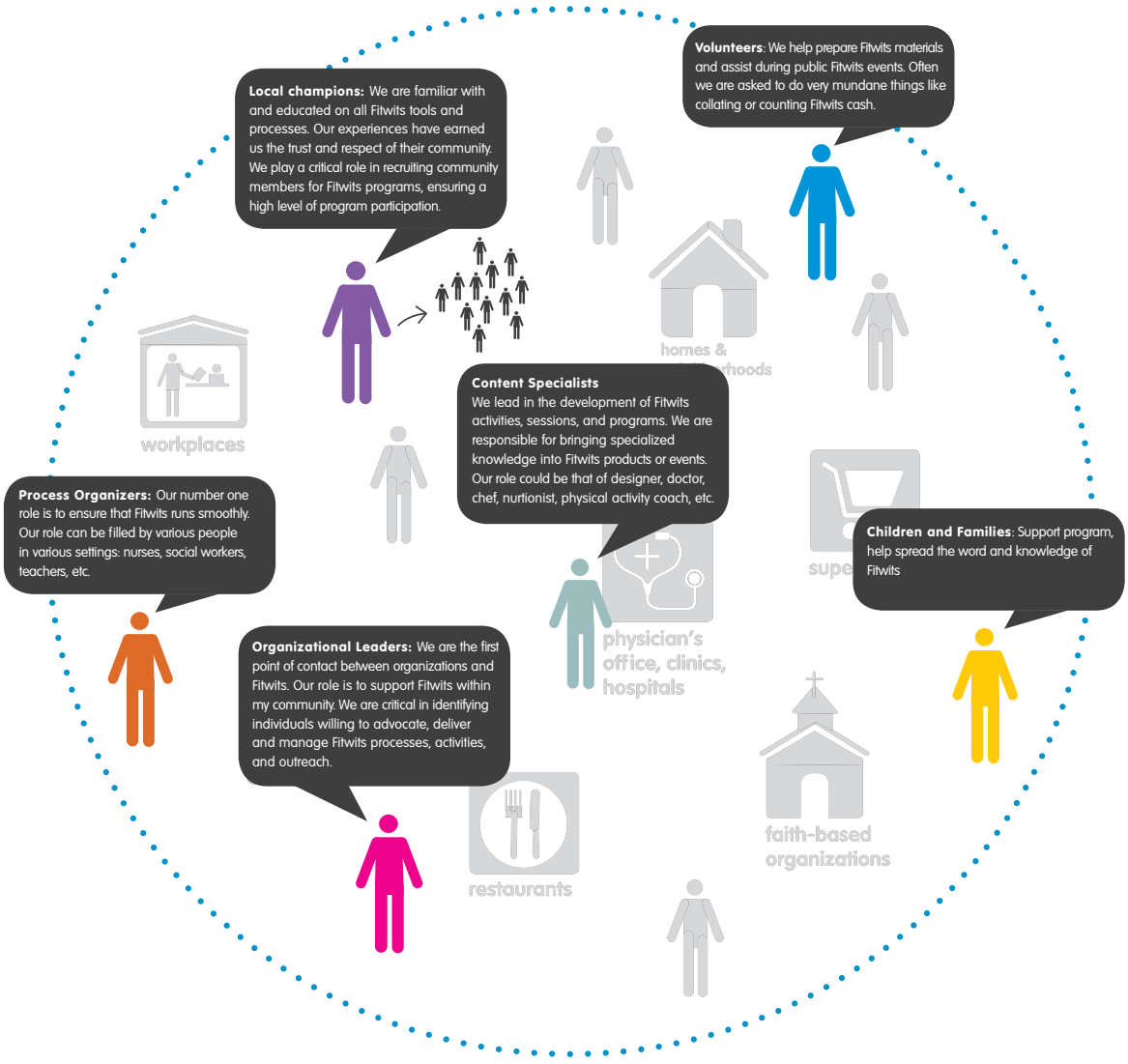
In this vein, a future iteration of the game would benefit from establishing a relationship with a steady source of volunteers prior to the start of game play. Whether by partnering with an organization or through an established network of willing personal contacts, there should be a group of trusted volunteer assistants to help staff events such as Family Nights, school assemblies, and help prepare material every week, especially as the game play intensifies and focus shifts towards emerging projects.

As previously stated, *I Am* Fitwits owes much of its success to the strength of its community resource connections. Future iterations should identify this as a priority in preparing the program. Extensive research both locally and nationally should look for organizations and expertise to draw on for content experts and in-kind donations, especially those that might be culturally relevant to the audience. This needs to be a central role of Fitwits as a facilitator of healthy projects and change in a community.

Champion Model

Parent Champions in schools play a critical role in recruiting people for the *I Am* Fitwits program and ensuring high level of program participation. The parent Champions were selected by an interview process, and emphasis was placed on skills that included: motivated, self-starter, strong sense of ownership, assertive follow-through, flexible time-schedule, ability to provide guidance in a collaborative, positive manner and most importantly were willing to have a leadership role in disseminating and teaching Fitwits to other families in their community.

Two parent Champions were chosen to become leaders in the *I Am* Fitwits game. The Parent Champions were instrumental in helping the design team get to know the culture of the school and the practices of parents, students and teachers. They had intimate knowledge of the school and surrounding community. They quickly proved how critical their role was as problem solvers, collaborators, and ultimately leaders. The Champions exceeded the Fitwits Team's expectations for the position by helping refine the system of delivery, enabling and supporting school initiatives and reaching out to establish partnerships with other organizations in the community to promote a culture of health and wellness in McKeesport.



Example: Fitwits model illustrating system of support

The Champions' almost daily presence at the school was vital to keeping the entire school community interested and engaged in Fitwits. Students and teachers immediately recognized them as members of the Fitwits Team and felt comfortable asking questions about the game. The School Principal mentions that, "They were very inspirational to the students. They also were very important in talking to parents and students... they were very much advocates for the Fitwits program" (principal_id_9). The Champions encouraged several school staff members to become participants in the game who otherwise may not have.

Champion Responsibilities

The Champions' initial job involved three primary elements: organize and distribute weekly Fitwits Challenge material, keep students and teachers up to date on the progress of the game, and recruit parent participation in monthly Fitwits Family Nights. As previously stated, the roles of the Champions lay heavily in problem solving and adjusting the needs of the school environment as the game went on.

The Champions' responsibilities at the school were formally on Thursdays. Thursdays were the days when the Champions stuffed folders and updated the scores on the scoreboards. The Champions also assisted the Coordinator in presenting awards and certificates for players who had earned merit tokens during the previous week. In this way, the Champions were highly visible and active members of the Fitwits team in the school.

The Champions were vital to the planning and running of Fitwits Family Nights every month. Their input significantly altered the way the Fitwits Team planned for the first Family Night. Originally the Family Night at the end of January was going to limit the number of families and would have had an instructional tone (*Propel administration forecasted attendance of 250 families, exceeding our budget*). The Champions sensed, however, that a more carnival-style January family night was more likely to engage families in game play later on. There was a high turnout for this event, but low attendance of February's Family Night brings the effectiveness of this strategy into question.

Low participation in February's Family Night, was a signal to re-strategize the Champions' role in recruiting and supporting family engagement in Fitwits. Family Night attendance benefited significantly from a system of recruitment in which the Champions and School Nurse teamed up to each solicit a commitment of ten families to come to the upcoming event. This introduced a new level of personal contact with families and a sense of trust between parents and the Champions.

The Champions were also the driving force behind the two larger, school-wide projects that became hallmarks of the year: the school garden and the salad bar. Although the school garden was an initiative proposed by the fifth grade teachers, the pre-interview suggests that one of the Champions had been interested in starting a garden prior to her involvement with Fitwits. She was instrumental in developing the project; she worked closely with the fifth grade team and recruited participation from students and teachers throughout the school. This champion worked to establish connections with politicians, community groups and businesses to secure materials and support to get the garden going and keep it growing year-round. As the School Nurse puts it, "They were the day-to-day motor behind making it successful" (nurse_id_10).

By the end of the six months of the Fitwits game, the Champions were working closely with school staff on other new initiatives that promoted physical activity in school, and organized a Fitwits presence at the Jump for Heart fundraiser for the American Heart Association and Field Day in a nearby park at the end of the year.

Cooperation and Competition between Parent Champions

As is the case in many team situations, the differences in work habits among the champions became clear. The roles of the two Champions changed to reflect the difference in work habits, and we achieved the greatest success when the Champions took ownership of separate aspects of the game. Since the two Champions had different work styles, they chose to work separately most of the time, but coordinated their efforts to complete tasks. When there were breakdowns in communication between the two Champions, making coordination difficult, the school nurse was a critical link connecting the Champions to the Fitwits Team.

Lack of a dedicated space for the Champions to work was a source of tension between them. Without a dedicated space in the school to operate the assembly-line preparation for the following weeks' folders, poor organization and limited work area became a barrier to working together successfully. A dedicated a space within the school for a Fitwits office is neccessary. This space could be a base of operation used for a variety of tasks including storing materials, meeting with teachers and students, and tallying data. The dedicated space would serve as constant reminder of Fitwits, encouraging healthy activities on a more constant basis, perhaps enabling greater change. The periodic visits from the Fitwits Coordinator was a reminder to the school community to think about healthy lifestyle changes, a constant presence might also help better influence school/community policy changes and also align with Center of Disease Control (CDC) recommendations for full-time health coordinator in schools.

Recommendations

Difficulties arose as the game expanded in directions that were unanticipated by the Fitwits Team. As the game grew in complexity and intensity, the distinction between the parents' role as paid Fitwits staff, parents playing the game, and school volunteers became increasingly confused. What was Fitwits responsible for paying for?

As the Champions integrated themselves into different aspects of the school environment, they became engaged in projects such as the salad bar and school garden, both related to Fitwits but outside of their job description. In one instance, frustration arose when the Champions felt they should be compensated for their time staffing the salad bar three days a week in addition to the hours that they devoted to Fitwits (which had decreased as their involvement in many projects deepened).

About three months into the game, the side responsibilities that arose as a result of Fitwits initiatives ended up absorbing more and more of the Champions' time. They had less energy to devote to the Fitwits game. The original design underestimated both the amount of time the project would require and the tenacious attitude of the Champions and the school to take on major initiatives. One Champion worked to solicit donations and spent time doing physical labor in the garden site. When combined with the responsibilities of staffing the salad bar and preparing Fitwits materials, many minor tasks assigned to the Champions often went incomplete until assumed by other members of the core Fitwits team.

The process of refining the procedures of delivering Fitwits material every week was taxing to the Champions at first. The first two months of game play required tasks that were often perceived as monotonous and inefficient. Working closely with the School Nurse, the Champions realized that many of their responsibilities could be shared with the school staff. This was something the Fitwits Team was wary of doing, but the trust of the School Nurse made it possible to use many of the school's resources like the automatic all-call system to contact families with reminders about Fitwits events, and work-study students at the school were often able to help the Champions out with their duties.

The system was adjusted in many ways to improve efficiency, but a recommendation for future iterations of the game is to facilitate more volunteer involvement to help expedite these steps in the process. Doing so would free the Champions to perform more of their engagement and outreach duties. As the principal observes, however, "getting more of the parental involvement was harder… getting more parents to do the challenges at home and come to Family Nights, things of that nature, was hard." (principal_id_9). With busy work schedules and a time-consuming security clearance process, it is evident that reducing these barriers will be critical for increasing richer parent involvement.

Conclusion

When Fitwits began in January, there was intention and desire to change Propel McKeesport into a healthier environment. The *I Am* Fitwits game provided a framework, motivation, and a fun, accessible language to make that change possible.

It is important to consider how this game may have functioned differently in a different school environment. There is a culture at Propel McKeesport that made adoption of Fitwits an easy transition. One teacher put it best by saying, "I think it's definitely the Propel culture. You have to worry about so many other things in schools that you don't have to worry about here as far as behavior is concerned… the culture of our school always wants to do better. There's always that initiative to just don't settle for what we're doing now. We have to try to make things better and build on it" (teacher_gr5_id_7). Such a culture cannot be expected at all schools. The team at Propel McKeesport is exceptionally high achieving, and has been recognized for three years in a row for improvement on standardized test performance. This

year was no exception. But teachers pushed themselves further through Fitwits and raised the question: how can health lessons be integrated into students' lives through the school without interfering with academic performance, but, rather, enhancing it?

The competitive culture of the teachers at the school might have affected the teachers' relationship to the game in two ways. First, it encouraged some to devote themselves to winning the game, and they applied themselves to the cause. On the other hand, in the case of the fifth grade, this competitive spirit resulted in the drive to succeed in test scores overriding the competitiveness in relation to Fitwits; these teachers disengaged with a game that might have impeded their progress on the standardized tests.

As interviews from before and after the game suggest, Fitwits came into the school environment at a critical moment. The school principal, school nurse, teachers and parents had identified health as a topic of concern, but had encountered significant barriers in doing so. These pre-conditions at the school allowed for a symbiosis to develop between the game and the school; competition, fun and the non-threatening language of Fitwits took players from contemplating healthy changes to enacting them in the school setting and at home, and the incredible outcomes would not have been possible without a supportive and sympathetic network at the school to quickly integrate the Fitwits messages about health. In this way, Fitwits functioned as a springboard for initiatives which otherwise might not have launched, or might not have launched as quickly. Fitwits was a motivator and also helped shift teacher ideology, making incorporating nutrition into the classroom a priority.

The experience of *I Am* Fitwits at Propel was an exercise in learning about how games can create change in a community. The novelty of the game, of rewards and incentives, challenges and competition, put players in a different mindset when contemplating healthy behavior in their lives. While *Getting Moving*, *Eating Smart*, and *Spreading the Word* may be personal decisions, *I Am* Fitwits made them part of group behavior. And while recommendations for healthy changes may seem daunting, the game encourage players to try out healthy behaviors. What has been shown through *I Am* Fitwits at Propel is a strong enthusiasm for the healthy behaviors that players have begun, which will hopefully become implemented into life-long habits at school and at home.

Moving Forward

As a pilot study, we tested and refined several strategies for impacting the school environment and engaging families in a discussion about health through game play, but a study over a longer time period and over a wider sampling of schools will be important to determining the true potential and impact *I Am* Fitwits can have in creating sustainable change in school and family culture. If a supportive network developed at Propel in the short term, how can that network be maintained into the future? A long-term study will help determine whether the messages and behaviors introduced by *I Am* Fitwits will become practice, or will remain as part of an experience that was "just a game."

A challenge facing Fitwits moving ahead involves questions of change and the communities selected to engage in *I Am* Fitwits. While we recognize the need to serve challenged communities, at what point is a school ready for a game as intensive as *I Am* Fitwits? Not everyone is ready; as we noted, Propel McKeesport had already reached a level of awareness about health and nutrition prior to Fitwits' involvement and that enabled them to be receptive to the Fitwits messages. So, how can other schools reach a level of awareness to become Fitwits-ready?

Evaluation submitted by Peter Scupelli, Design Researcher, PhD

Survey, pre-post results

One of the stated goals of the *I Am* Fitwits game was to: change health knowledge, change attitudes, improve behavior, and assess intent to be healthy. A prepost game survey was used to assess changes in knowledge, attitudes, intent, and behavior.

Method

Student game players filled out a survey before the game started in December 2010 and after the game ended in June 2011. A pre-post survey was conducted with students, teachers, school administrators and parents. All Challenges and Merit Applications were coded to capture visual, verbal and audio responses from the students and teachers. BMI percentage was measured and weight of all students participating pre and post game play. Post interviews were held with select stakeholders capturing post game impressions, influences and desired changes.

Survey

The survey used to evaluate the *I Am* Fitwits program was based on survey instruments used by the WE CAN program (Ways to Enhance Children's Activity & Nutrition). WE CAN is a national program designed to give parents, caregivers, and entire communities ways to help children 8 to 13 years old stay at a healthy weight. Materials are available on the website of the National Heart Lung and Blood Institutes of the National Institutes of Health.

The survey constructs for the Fitwits evaluation are parallel to the WE CAN constructs. The reading level required on the WE CAN survey was deemed too difficult for our participants according to the Coleman Liau index, Flesch Kincaid Grade Level, ARI (Automated Readability Index), and the McLaughlin SMOG index.2 So, the survey questions were rewritten to accommodate for the reading levels of our participants.

The Fitwits program offering compared to the WE CAN is much narrower in scope. For example, Fitwits focuses on getting 60 minutes of activity daily, but does not focus much on reducing screen time. The design evaluator chose to cast a broad net in the survey because should the Fitwits program decide to broaden its offering in the future, such information on the community of use would be useful to inform an expanded offering.

http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan/, http://www.online-utility.org/english/readability_test_and_improve.jsp

The student survey contained 58 questions. It was printed double sided on four 8.5 x 11 inch sheets. The surveys had a cover sheet to match the pre and post game survey by matching participant names to a participant identification number. The Fitwits team read each question to the students in their classroom. The survey was estimated to take approximately 20 minutes to fill out. For the exact wording of the questions please see bookmark "student pre-post survey".

Measures

The survey's 58 items were used to create measures for the following constructs: (a) demographics, (b) Fitwits core messages, (c) eat smart behavior: fat and sugar intake, (d) eat smart behavior: vegetables, beans, fresh fruit, and 100% juice intake, (e) eat smart knowledge, (f) eat smart attitudes: intention to reduce fat, (g) eat smart selfefficacy, (h) get moving behavior, (i) get moving self-efficacy, (j) eat smart frequency, (k) eat smart read labels, (l) screen time behavior. The following section describes the survey items that made up the measures.

Demographics

The demographics of the student population were assessed with four questions regarding grade, age, gender, and race (Table 4-1).

	Question	Measure
1	What grade are you in?	Grade
2	How old are you?	Age
3	Are you a boy or a girl?	Gender
4	How do you describe yourself?	Race

Table 4-1. Demographics measured with four items (i.e., grade, age, gender, race).

Core Fitwits knowledge

The core Fitwits knowledge was measured with fourteen multiple-choice questions. Table 4-2 includes the questions stems, the number of in the survey, and type of measure. Each question had four multiple-choice answers. See bookmark "student pre-post survey" for the complete questions and multiple-choice answers. Student responses were graded accordingly. Correct answers were coded as a 1, and incorrect answers as a 0. An average score of correct answers was calculated for each participant.

	Question	Measure
17	How much pasta is in a portion size...	Fitwits portion size
18	Which of the following food preparations add the most fat?	Fat awareness
19	You should spend about...	Exercise daily
20	Your portion of meat should be the size of your...	Fitwits portion size
21	Your portion of French fries should be the size of your...	Fitwits portion size
22	Your portion of veggies should be the size of your...	Fitwits portion size
23	Your portion of cheese should be the size of your...	Fitwits portion size
24	Your portion of ketchup should be the size of your...	Fitwits portion size
26	What does obesity mean?	Obesity definition
27	If you are obese it could lead to problems such as...	Obesity problems
28	If you are obese it could lead to problems such as...	Obesity problems
30	Body mass index or BMI is a measure of your...	BMI definition
32	Portion size is based on how...	Fitwits portion size
31	Fake foods are made with...	Ingredients

Table 4-2. Fitwits core knowledge measured with fourteen multiple-choice items.

Eat smart behavior: Fat and sugar intake. Bad eating habits were measured for the day before with regards to sugar and fat intake with two items. The response scale ranged from 0, no I did not eat any [French fries or chips; sweets, doughnuts, cookies, brownies, pies, or cake] yesterday to 3, yes I ate [French fries or chips; sweets, doughnuts, cookies, brownies, pies, or cake] three or more times yesterday (Table 4-3). The two items were then summed.

Number	Question	Response scale
5	Yesterday, did you eat French fries or chips? Chips are potato chips, tortilla chips, Cheetos, corn chips, or other snack chips.	0=no, 1=one time, 2= two times, 3= three or more times.
10	Yesterday, did you eat sweets, doughnuts, cookies, brownies, pies, or cake?	0=no, 1=one time, 2= two times, 3= three or more times.

Table 4-3. Average eating habits measured as fat and sugar intake yesterday.

Eat smart behavior: vegetables, beans, fresh fruit, and 100% juice. Eating healthy food the day before was measured with four items (Table 4-4). The response scale ranged from 0, no I did not eat any [vegetables; beans; fresh fruit; 100% juice] yesterday to 3, yes I ate [vegetables; beans; fresh fruit; 100% juice] three or more times yesterday. The four items were then summed.

	Question	Response scale
6	Yesterday, did you eat any vegetables?	0=no, 1=one time, 2= two times, 3= three or more times.
7	Yesterday, did you eat beans such as baked beans, kidney beans, refried beans, or pork and beans?	0=no, 1=one time, 2= two times, 3= three or more times.
8	Yesterday, did you eat fresh fruit? Do not count fruit juice, Jell-O, or fruit roll-ups.	0=no, 1=one time, 2= two times, 3= three or more times.
9	Yesterday, did you drink 100% fruit juice?	0=no, 1=one time, 2= two times, 3= three or more times.

Table 4-4. Eat smart: healthy eating behavior yesterday was measured with four items.

Eat smart attitudes for fat reduction. Participants' attitudes about reducing fat intake were measured with eight questions that asked them to choose between a fat rich option and a low-fat alternative (Table 4-5). The survey answers for each item were scored with 0=fat rich, 1=low-fat alternative. The answers were then averaged to determine a percentage for the total amount of low-fat options chosen.

	Pick one of the two foods that you pick if you had to choose just one.
29a	Popcorn with butter or popcorn.
29b	Whole milk or skim milk.
29c	Candy bar or fresh fruit.
29d	Eat chicken with skin or eat chicken without skin.
29e	Frozen yogurt or ice cream.
29f	French fries or baked potato.
29g	Vegetables with butter or vegetables without butter.
29h	Hamburger or grilled chicken sandwich.

Table 4-5. Eat smart attitudes: intention to reduce fat measure was composed with eight questions where game players had to say what they would choose between a fat laden product and the low-fat alternative.

Eat smart knowledge was measured with seven items that asked participants to say which of two choices was better for their health (Table 4-6). Correct answers were coded as 1, and incorrect answers as 0. For each participant a percentage of correct answers were calculated.

	Which one of the two foods is better for your health?
34a	Whole wheat bread or white bread.
34b	Whole milk or low fat or skim milk.
34c	Candy bar or fresh fruit.
34d	Salad or French fries.
34e	Ice cream or frozen yogurt.
34f	French fries or baked potato.
34g	Hamburger or grilled chicken sandwich.

Table 4-6. Eat smart knowledge was measured with seven survey items.

Eat smart self-efficacy for reducing fat intake was measured with eight items from the survey (Table 4-7). Participants were asked to estimate how likely they were to choose between the fat rich option and the low-fat option. Response scale ranged from 0=unlikely, 1=likely, and 2=very likely. The averages were calculated for the eight items.

	Question	Response scale
	How likely are you to...	
33a	drink low fat or skim milk instead of regular whole milk?	0=unlikely, 1=likely, 2=very likely
33b	eat high fiber cereal instead of a donut?	0=unlikely, 1=likely, 2=very likely
33c	eat fresh fruit instead of a candy bar?	0=unlikely, 1=likely, 2=very likely
33d	take the skin off of chicken (and not eat the skin)?	0=unlikely, 1=likely, 2=very likely
33e	eat frozen yogurt instead of ice cream?	0=unlikely, 1=likely, 2=very likely
33f	eat baked potato instead of French fries?	0=unlikely, 1=likely, 2=very likely
33g	drink fruit juice instead of soda?	0=unlikely, 1=likely, 2=very likely
33h	eat grilled chicken sandwich instead of a hamburger?	0=unlikely, 1=likely, 2=very likely

Table 4-7. **Eat smart self-efficacy with regards to reducing fat intake was measured with eight survey items.**

Eat smart read food labels. Food labels on food packages provide important information regarding the potential impact of food on one's health. Participants were asked how often they read the nutrition labels on food packages. Response scale ranged from 0=never, 1=rarely, 2=sometimes, 3=always.

	Question	Response scale
5	How often do you read the nutrition labels on food packages?	0=never, 1= rarely, 2=sometimes, 3=always

Table 4-8. **Eat smart reading labels was measured with one item.**

Eat smart frequency. Students were asked to assess the frequency with which they ate high fiber cereal, drank 100% juice, eat fruit for lunch, and eat vegetables for dinner (Table 4-9). Response scale ranged from 0=never, 1= rarely, 2=sometimes, 3=always. The average was calculated for the four items.

	Question	Response scale
16a	How often do you... eat high fiber cereal?	0=never, 1= rarely, 2=sometimes, 3=always
16b	How often do you... drink 100% fruit juice?	0=never, 1= rarely, 2=sometimes, 3=always
16c	How often do you... eat fruit for lunch?	0=never, 1= rarely, 2=sometimes, 3=always
16d	How often do you... eat vegetables for dinner?	0=never, 1= rarely, 2=sometimes, 3=always

Table 4-9. **Eat smart frequency of eating high fiber cereal, drinking 100% juice, eating fruit, and vegetables.**

Get moving behavior. Being physically active everyday plays a critical role in people's health. Participants were asked if they exerted themselves physically the day before so much as to be out of breath. This measure approximates who was active the day before. The evaluator chose this measure because participants struggle to remember the duration of their physical activity. More in-depth self-report instruments along with behavioral measures are necessary to determine the duration of the physical activity.

	Question	Response scale
11	Yesterday, did you exercise so much that you were out of breath (For example: basketball, jogging, skating, fast dancing, swimming laps, tennis, fast bicycling, or aerobics)?	0=no, 1=yes

Table 4-10. **Exercise so much that you were out of breath yesterday.**

Self-efficacy for exercise. Self-efficacy is the belief that one can accomplish a particular goal. Self-efficacy with regards to exercise was measured with three survey items. Response scale ranged from 0=unlikely, 1= likely, 2=very likely. To assess self-efficacy with regards to exercise the three items were averaged.

	Question	Response scale
	How likely are you to...	
33i	exercise or play for sixty minutes in each day?	0=unlikely, 1=likely, 2=very likely
33j	run or ride your bike 3-5 times a week?	0=unlikely, 1=likely, 2=very likely
33k	exercise or play until you are out of breath?	0=unlikely, 1=likely, 2=very likely

Table 4-11. Self-efficacy with regards to exercise.

Screen time yesterday. Typically, the greater the time spent in front of TV, DVDs, playing games or surfing the internet the lower the health outcomes. Screen time was measured with three survey items (Table 4-12). Response scale ranged from: 0=none, 1=less than one hour, 2= one to two hours, 3= three to four hours, to 4= more than four hours. The three items were summed to estimate the daily screen time for each participant.

	Question	Response scale
12	Yesterday, how many hours did you spend watching TV or DVDs?	0=none, 1=less than one hour, 2= one to two hours, 3= three to four hours, 4= more than four hours
13	Yesterday, how many hours did you play video games like Nintendo, Sega, or Wii?	0=none, 1=less than one hour, 2= one to two hours, 3= three to four hours, 4= more than four hours
14	Yesterday, how many hours did you use the computer to play games or surf the net?	0=none, 1=less than one hour, 2= one to two hours, 3= three to four hours, 4= more than four hours

Table 4-12. Screen time yesterday spent watching TV or DVDs, playing games, or surfing the Internet.

Results

Survey results for students are presented according to the following sections: (a) knowledge of core Fitwits messages, (b) eating smart, (c) get moving, and (d) screentime.

Knowledge of Fitwits core messages. Students significantly improved in knowledge with regards to portion size, obesity, and healthy foods. These messages were reinforced through the Fitwits take home challenges and activities. Fitwits knowledge was measured with 14 questions before and after the six-month game. On average, students scored thirty-eight percent correct answers before the program and sixty-five percent correct answers after the program. They significantly improved their Fitwits knowledge score by twenty-seven percent [t (96)=-11.15; p<. 005]. Figure 4-1 below represents the pre and post test scores for third, fourth, and fifth grade.

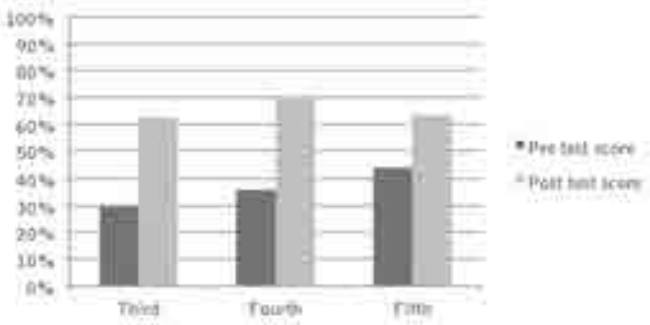


Figure 4-1. Fitwits knowledge accuracy plotted by grade measured with a pre-test and a post-test survey. Fourteen questions on portion size, obesity, and healthy foods were used to assess knowledge.

Eat smart. Eating excessive quantities of fat sugary, fried foods is often associated with increased health problems. Average healthy behavior with regards to fat intake was measured by asking how many times the participants ate fried food and sweets (e.g., cake, doughnuts, cookies) yesterday. On average there was no change in how much fried food and sweets students said they ate. Before the intervention they were eating fried food and sweets on average 2.21 times and 2.14 times on post-test questions [t (104)=.34; p=.73]. Figure 4-2 plots fried food and fat sweet intake for third through fifth grade before the intervention and afterwards. There were significant differences from pre to post between the grades [F (2,88)=22.45; p=.004]. The third graders decreased their fried and fat sugar intake, the fourth graders remained at the same levels, and the fifth graders increased.

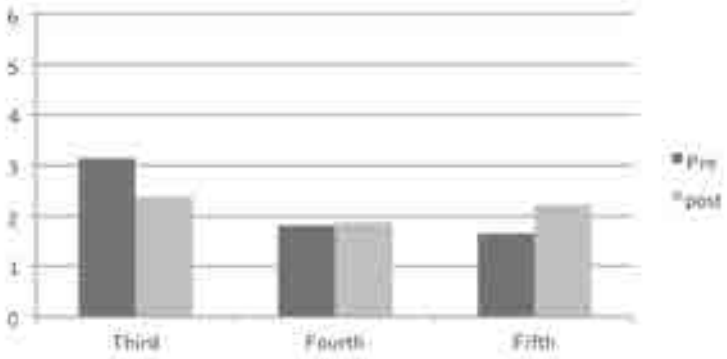


Figure 4-2. Average healthy behavior: reducing fat by grade measured with two items: Yesterday, how many times did you eat [fries, cookies]; response scale 0-3 times.

Healthy eating behaviors were measured in the survey with regards to eating vegetables, beans, fresh fruit, and drinking 100% juice. Healthy eating behaviors were measured with four questions. Overall, there were significant differences between the pre-post measures [t (91)=-2.45; p=.02]. On average, before the intervention students ate 3.37 servings of vegetables, beans, fresh fruit and 100% juice. After the intervention they increased to 4 servings of vegetables, beans, fresh fruit and 100% juice. Figure 4-3 shows the healthy eating behaviors by grade. The lack of significant differences when analyzing the data by grade, but the presence of overall differences pre-post the intervention suggest that there was differential improvement within the grades. This might be explained by different home eating patterns of students across grades. In other words, the number of students that improved varied by grade.

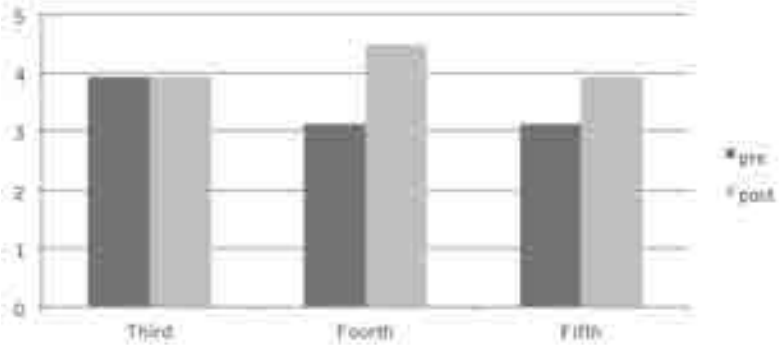


Figure 4-3. Average healthy eating behavior by grade measured with four items: Yesterday, did you eat any [vegetables, beans, fresh fruit, 100% fruit juice]; response scale 0-3 times for each item.

Knowledge about what food is healthier to eat is based on seven questions about what is healthier (e.g., fruit or candy bar). Overall, students chose the healthy option correctly approximately 84% when asked between a pair of items (Figure 4-4). There was no significant difference between before or after the intervention (t [104]=-.24; p=.81) or between grades (F=[2,103]=1.23; p=.30). The high number of correct answers suggests that students distinguish healthy from unhealthy food choices. Three items that students scored above average are:

– Candy vs. fruit (98% correct)
– Fried food vs. salad (94% correct)
– Fried food vs. baked food (87% correct).

Four items where students scored below average are:

– Hamburger vs. grilled chicken sandwich (68% correct)
– Whole milk vs. skim milk (72% correct)
– White bread vs. whole wheat bread (79% correct)
– Ice cream vs. frozen yogurt (82% correct)

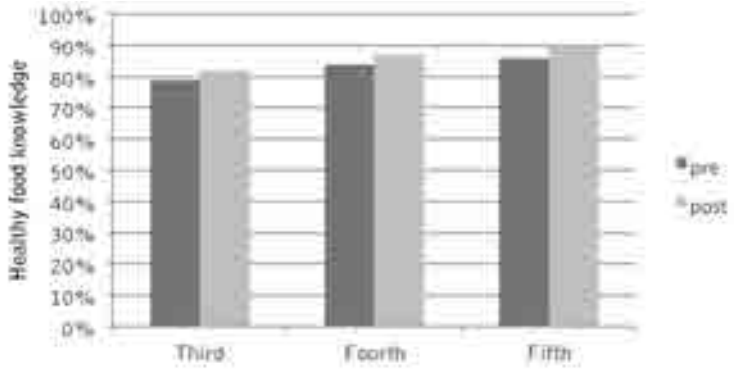


Figure 4-4. **Food knowledge: what food is healthier for your health represented as a percentage. Higher numbers represent greater healthy food knowledge. Measured with seven items: Which food is better for your health? Response scale 0=unhealthy, 1=healthy.**

Attitudes about making healthy choices are linked to healthy behaviors. Attitude about making healthy choices was measured with eight items (If you had to pick just one which would you pick). In Figure 4-4 students correctly distinguish 84% of the healthy food from an unhealthy alternative. Figure 4-5 shows that when given a choice between a healthy and unhealthy alternative, students say they would pick the unhealthy option the majority of the time.

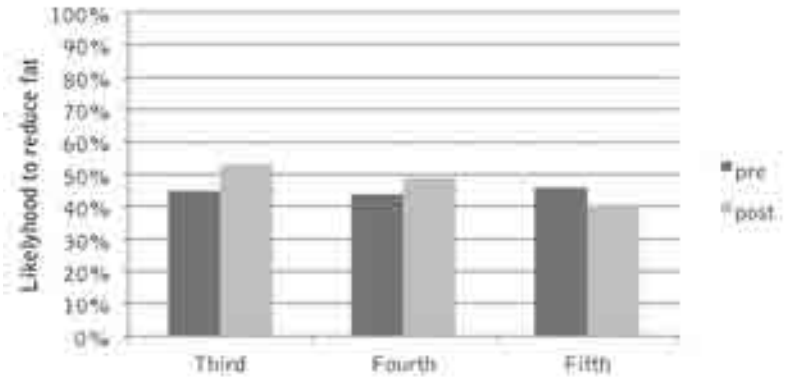


Figure 4-5. **Food attitudes: intention to reduce fat represented as a percentage. The greater numbers represent greater likelihood of choosing the healthy food choice. Measured with 8 items: What foods or drink would you pick to eat or drink if you had to pick just one. Response scale 0=unhealthy, 1=healthy.**

Self-efficacy regards ones beliefs about his or her own competence. In the students' survey, self-efficacy was measured with regards to intention to reduce fat in ones food choices (e.g., drink low fat milk, eat baked potatoes). The response scale 28 ranged from 0=not likely, 1=likely, 2=very likely. On average students said they were likely to choose the healthy low fat option. There were no significant differences between grades or pre-post the six-month game. Figure 4-4 illustrates that students are knowledgeable about healthy foods. In Figure 4-5, students said they chose the reduced fat option less than half of the time. Figure 4-6 represents students' beliefs about making the correct decision when given a choice between fat rich and a reduced fat food options.

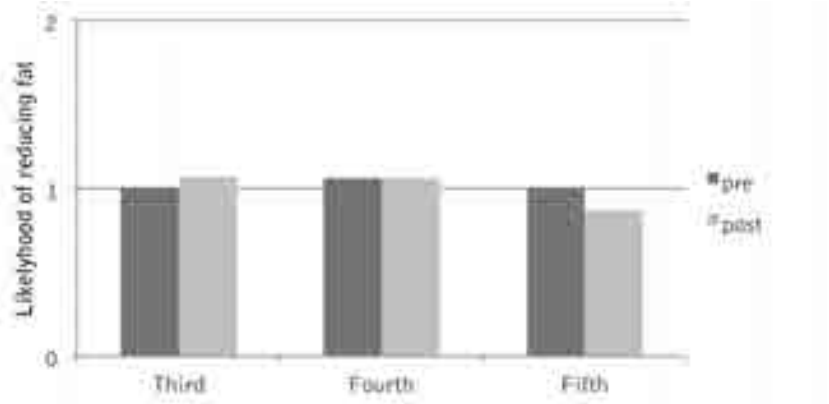


Figure 4-6. Self-efficacy: likelihood of making healthy food choices by reducing fat intake. Measured with 8 items: How likely are you to ….. [e.g., drink low fat or skim milk instead of regular whole milk]? Response scale 0=not likely, 1=likely, 2=very likely.

Eating healthy is less likely when access to such food is limited. While students said they ate more healthy foods the day before (Figure 4-3). Students said they were less likely to eat high fiber cereal, drink 100% juice, eat fruit for lunch, eat vegetables (Figure 4-7) [t(103)=2.49; p=.01]. While these may seem like contradictory responses, the interpretation may be quite straightforward. More than four out of five students receive their meals at the school studied, food provided by the cafeteria is part of the Pittsburgh Public Schools Food Services.

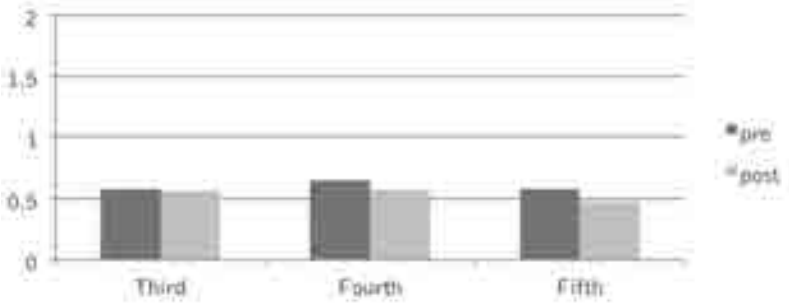


Figure 4-7. Eating healthy food, measured with four items. How often do you … [eat high fiber cereal, drink 100% juice, eat fruit for lunch, eat vegetables for dinner]? Response scale 0=never, 1=rarely, 2=sometimes, 3=always.

Get moving: Being active for at least sixty minutes each day is a core Fitwits message. Figure 4-9 shows yesterday's physical exertion measured with one item: Yesterday, did you exercise so much that you were out of breath? Interestingly, there were significant increases in reported physical activity [t (103)=-3.09; p<.005]. This is encouraging for the Fitwits game overall. Unfortunately, from the wording of the question, the duration of the physical activity remains undetermined. Other questions such as "how likely are you to…30 exercise for sixty minutes each day, run or you're your bike 3-5 five times a week, exercise or play until you are out of breath" were significantly correlated both in the pre and post survey.

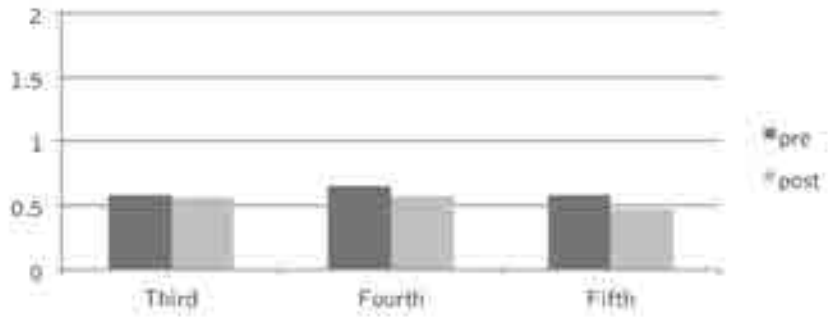


Figure 4-9. Physical activity behavior measured with one item: Yesterday, did you exercise so much that you were out of breath? Response 0= no, 1=yes.

Self-efficacy is the belief that one can succeed at a particular activity. It is difficult to achieve ones goals without believing that something is possible. The student game players in all three grades reported significant increases in self-efficacy related to exercising (Figure 4-10) [t (104)=-1.97; p=.05]. For this cohort, there is increased self-efficacy for exercising and increased self-reported exercise (Figure 4-9).

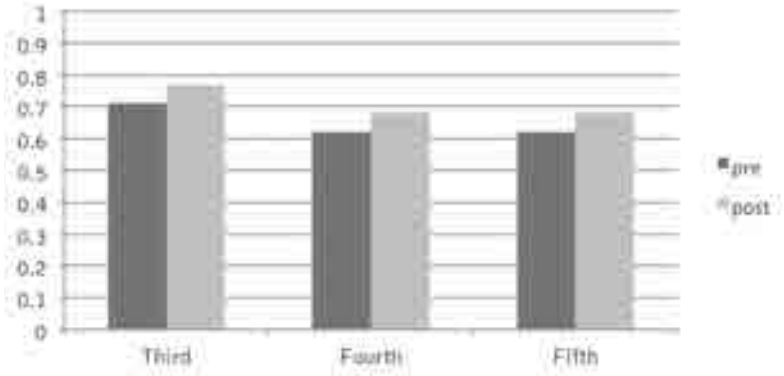


Figure 4-10. Self-efficacy: likelihood of exercising. Measured with three items. How likely are you to... [exercise or play for sixty minutes each day, run or ride your bike 3-5 days a week, exercise or play until you are out of breath]? Response scale 0=not likely, 1=likely, 2=very likely.

Screen time Programs vary in focus. *I Am* Fitwits game focuses on a series of core messages around health and nutrition. There are other themes that it addresses transversally. For example, Fitwits focuses on encouraging children to get at least sixty minutes of active play each day. Surveyed game players said they spent over four hours each day (a) watching TV & movies, (b) playin games, and (c) surfing the Internet (Figure 4-11). There was no change in average screen time from before or after the game [t (104)=.06; p=.95].

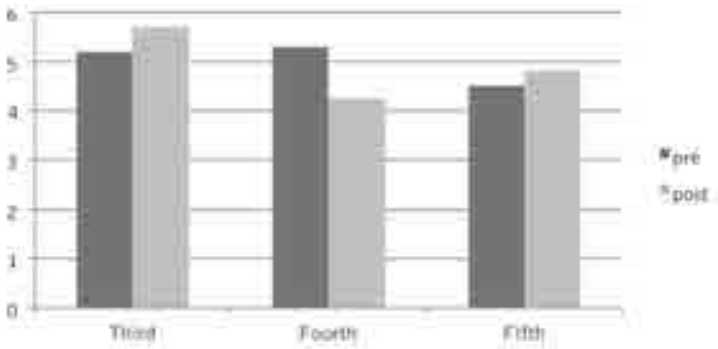


Figure 4-11. Screen time: measured with the sum of three items. Yesterday, how many hours did you [watch TV or movies, play video games, use the computer to play games or surf the net]? Response scale 0=none, 1=less than one hour, 2=1-2 hours a day, 3= 3-4 hours a day, 4= more than 4 hours a day.

Discussion: Survey in Four Parts

The survey to evaluate *I Am* Fitwits was developed using the Ways to Enhance Children's Activity and Nutrition (WE CAN) program survey as a model. By basing the Fitwits survey on the WE CAN survey, the design evaluator chose to cast a broad net in the survey, should the Fitwits program decide to broaden its offering in the future, such information would be very useful to inform an expanded offering for the Fitwits program.

Evaluation occurs through measures that allow one to assess relevant outcomes. While demonstrating that there was a change in outcomes may be of interest, the process through which the changes occurred is of interest as well. As such, measures for an evaluation are specific to the goals and theoretical framework. Thus, one of the challenges for a design evaluator is to make sure the measures collected map to the program and theory being assessed.

In the fall of 2010, the design evaluator with support from Diane Helsel, PhD, RD, CSSD Coordinator of Graduate Studies in Nutrition, Department of Sports Medicine and Nutrition University of Pittsburgh was asked to create a survey tool prior to the game being fully developed. The evaluation goal was to collect pre-game measures in December before the January 2011 game kick-off. Important to note in behavioral research type studies, survey measures are carefully crafted and piloted to measure specific constructs directly linked to the theory that is being tested. For example, if the stages of change theory (Prochaska & Velicier, 1997) are being used inform the behavioral change aspect of a project, then the survey questions are tailored to measure the relevant theoretical constructs. To create tailored survey, the design team and evaluator must articulate how a particular behavioral theory and the design strategy connect prior to developing the survey questions. However, in early iterations of design projects, the design theory may emerge as the project is designed, and iterated upon. In such cases, the theory emerges as the design is being implemented. Since this was the first iteration of a program pilot the actual design theory and strategy was being worked out and modified throughout the game itself.

In the case of a six-month game, the game changes are made based on contingencies observed in actual gameplay. For example, if the game is too difficult or easy, the game may be adjusted accordingly. Likewise, if there are too many take-home challenges, fewer may be given in the next weeks. As such, the link between a particular behavioral theory associated with behavior change, the narrative structure, and game strategy shifted while the game was designed and implemented.

Developing survey questions before knowing exactly how the game would unfold posed many challenges, and questions if a survey at this point in the process was an appropriate means for assesment. While it was clear to both the design team and the evaluator that at a high level, knowledge, attitudes, and intent would be measured as they relate to obesity prevention programs, it was unclear what theoretical framework should guide the survey questions with regards to the behavioral change aspects of the game.

Thus, from an evaluation perspective the challenge was how to design a survey instrument to assess a program before the program has been fully designed, piloted, and tested? Not discouraged by the challenge, the design evaluator decided to evaluate the *I Am* Fitwits game with widely cited survey measures already used to evaluate national scale obesity prevention programs. The risk of course, was that the questions from a different program might cover both relevant and irrelevant aspects for the new program being tested. However, what was relevant and irrelevant would not emerge until after the game was concluded.

One must note, after the fact, that the *I Am* Fitwits program offering is much narrower in scope when compared to the WE CAN program. For example, *I Am* Fitwits focuses on getting 60 minutes of activity daily, but does not focus explicitly on reducing screen time.

As mentioned earlier, there were significant increases in physical activity reported, but no significant differences in screen time were found. Thus, what emerges is that in addition to increasing exercise, future versions of Fitwits should also encourage decreasing total screen time.

Eat smart

Eating excessive quantities of fat sugary, fried foods is often associated with increased health problems. Average healthy behavior with regards to fat intake was measured by asking how many times the participants consumed fried food and sweets (e.g., cake, doughnuts, cookies) yesterday. It is unclear if this measure is too sensitive to the daily variations in students diet (e.g., birthday party in class). Future research can ask children to fill out a food journal for a week and provide more reliable measures pre and post intervention. Regardless of the sensitivity of the current survey measures, the variation between the grades suggests that the message of reducing fat sugary foods, and fat fried foods may require reinforcement in future programs. The significant differences between the grades suggest the need for more work in future programs targeted at helping students reduce fat and sugar intake.

In terms of significant increases in eating vegetables, fresh fruit, and drinking 100% juice, improvement varied by grade. One possible explanation may be that students, parents, and teachers participated in the program to varying degrees over time. Overall some children improved and others did not in each grade with regards to healthy eating and drinking choices. Given that close to 82% percent of the students are eating meals at school, greater gains in healthy eating are more likely to occur when the cafeteria food offers healthy foods (e.g., fresh vegetables, fresh fruit, 100% juice).

The Fitwits program in partnership with Propel Schools, Whole Foods, and Eat-n-Park increased access to healthy food through the salad bar program. As such, some improvement was made, but without changing the overall cafeteria food offering for breakfast, lunch, and snacks in the cafeteria, further gains are limited to the one meal that students eat at home. In other words, changing the offering in the school cafeteria can affect snacks and two of three meals a day for most students.

Parents and caregivers enthusiastically participated in the family engagement nights for cooking healthy meals and gardening. Such active participation may suggest that parents and children are interested in bringing healthy meal options to their home life. The gains in healthy food consumption for both parents and students suggest that the home is a promising area to focus on in the future through the Fitwits program. More work with parents is necessary to help them learn about health food choices, providing healthy food at home, and being able to sustain healthy eating habits at home over time.

Future programs that aim to reach this student demographic population should address the four healthy food knowledge items where students scored beneath average: hamburger vs. grilled chicken sandwich (68% correct), whole milk vs. skim milk (72% correct), white bread vs. whole wheat bread (79% correct) and ice cream vs. frozen yogurt (82% correct). Becoming knowledgeable about health is insufficient; people must be able to act in healthy ways as well. A promising trend emerged from the survey data since students said they ate significantly more vegetables, beans, fresh fruit, and drank 100% fruit juice after the Fitwits game (Figure 4-3). Changing the food choices in the school cafeteria is likely to significantly increase the opportunities for students to make healthier choices.

The gap between healthy food knowledge and healthy food attitude indicates an area that future programs should address. Further work is necessary with the students to uncover their perceived barriers to making healthy food choices. There was no significant difference between grades or before or after the six-month game. Future iterations of the game should help students become aware of their barriers and develop strategies to overcome them.

From the survey data it is unclear why the students had low self-efficacy with regards to reducing fat. Possible explanations include: students may believe that they have no control over what food is offered to them from the school cafeteria or at home. As such, the low self-efficacy may be linked to low agency with regards to food choices. Future iterations of the Fitwits program should conduct user research to uncover students' barriers to self-efficacy with regards to reducing fat in their diet. Furthermore, self-efficacy should be reinforced through activities to help students reduce fat in their food choices.

The new school salad bar increased opportunities to eat vegetables, fresh fruit for lunch. But in the home, the likelihood of eating vegetables for dinner or drinking 100% juice is linked to family decisions. Perhaps, the game increased the students' awareness about the foods they were eating and the students' responses reflect the reality of the cafeteria's offerings and their family life. Future programs should focus on increasing the availability of healthy foods in the cafeteria and at home. Increasing healthy choices in the school cafeteria and snack offerings can significantly impact 2 of 3 meals for the 82% of the students that are on assisted meals.

Why did third and fourth graders say they read food nutrition labels more than fifth graders? One can only speculate that perhaps the co-location of the third and fourth graders in the same wing of the school and the commitment of their teachers to the game created an environment filled with knowledge about healthy choices. As such, perhaps in class activities or a series of hallway posters taught the third and fourth graders about the importance of reading food nutrition labels. Perhaps, the fifth graders did not benefit from learning from other grades as much given their location in the school. The fifth graders shared hallway with the sixth graders, but the sixth graders did not compete in the game.

Change towards a healthy lifestyle may require long-term change at multiple levels of the socio-ecological model. In other words, people need knowledge, opportunities to act on that knowledge, organizational choices that support healthy choices, and an environment that supports such healthy behavior, and so forth. As game players: (a) learn more about being healthy, (b) put into practice healthy habits through the game, and (c) eat healthier meals during school change becomes possible within the school environment. Such change increases the likelihood that game players may encourage their families to eat healthier meals and snacks in the domestic environment.

Such change within the framework of the game can occur at multiple levels of the socio-ecological model, when knowledge, actions, and environment are aligned to support it. The game provides encouraging results with regards to change during the game. From a practical and theoretical perspective long-term change requires for game players to continue after the game is over. In other words, long-term change requires long-term behavior. While the game was successful in getting players started in healthy behavior, long term effects after the game is over need to be studied. Future iterations should study how to get game players started with healthy behavior, and also put into place long-term strategies that allow for life-long health (See Appendix: How Fit Are Our Fitwits One-Year Later).

Get moving

Game players said that they significantly increased their physical activity. A behavioral measure of self-reported exercise pre-post the six-month game would be of interest to assess the real impact of the game on student exercise behavior. While pre-post behavioral measures are a good first step in a follow-up study, such a study design does not exclude alternative explanations in the media, and community environment.

Alternative explanations can easily be controlled for with study design that uses pre-post measures for the game population and a control group outside of the study group. The con-

trol group would be tested for pre-post measures as well to determine the impact of external factors such as media, community environment, popular culture, and so forth. With such an experimental design it is possible to control for other variables that are not part of the game intervention, but may still have impact on behavior on the general population. For instance, if self-efficacy around exercise increased in the game population, but not in the control group, stronger claims can be made about the effectiveness of the game. At least, one could say that it was the game, and not some third variable in the media, community, or popular culture.

In future game iterations, behavioral measures for daily exercise activity may be of interest to collect. The WE CAN program determines how much people say they exercise corresponds to what they actually do. Some examples include pedometers, pocket calorie counters (e.g., Philips Activity Monitor) or biometric measures that can measure calories burned (e.g., BodyMedia Fit). There is a broad range of devices on the market that can measure physical activity. Particular care is necessary to determine something likely to work with children. Advantages of devices such as the Phillips Activity Monitor are that the device is waterproof and can be carried in a pocket, or worn as a necklace, making it easier to remember. There are many other devices that can be used to measure activity.

Of particular interest are devices that can be networked and may automatically update individual scores online. For example one's physical activity measure could increase one's score in a Fitwits game, increasing one's own motivation and one's competitors as well. Challenges with such devices to measure activity include participants remembering to wear it and not lose the device itself. Some strategies may include having students wear the device for a day or week in school. While not perfect, it may give students an idea of how much exercise they should get before and after school to meet the recommended daily sixty minutes of exercise.

Screen time

The American Academy of Pediatrics (AAP) recommends no more than two hours of screen time daily. The *I Am* Fitwits game players reported twice the daily recommended screen time. Having children be active in theory may reduce available screen time, sending and reinforcing a message that encourages to reduce screen time. Fitwits should explain the maximum time children should spend in front of screens (e.g., watching TV or movies, video games, surfing the internet).

Student survey summary

In summary, the analysis of the survey given to students before and after the *I Am* Fitwits six-month game suggests that the program was successful in multiple ways. For each group of survey measures, based on current trends, new strategic areas are suggested for future program expansion. Results regard: (a) Core Fitwits knowledge. (b) Eat smart: fat intake behavior, fat food attitudes, healthy eating behavior (e.g., vegetables, beans, fresh fruit, 100% juice), healthy food knowledge, healthy food attitudes, healthy food choice self-efficacy. (c) Get moving: physical activity behavior, physical activity attitude, and physical activity self-efficacy. (d) Screen time.

Fitwits knowledge

Students significantly improved their knowledge with regards to the core Fitwits messages (e.g., cut down on fat and sugar, be active 60 minutes daily, portion size, obesity, healthy foods, definition of obesity). Knowledge of third, fourth, and fifth graders was tested with fourteen questions. Students scored 36% of correct answers before the six-month game and 65% correct after the game. While the improvement is statistically significant, there clearly is room for improvement.

Eat smart

Fat and sugar intake varied significantly by grade. Third graders reported eating significantly less sugar and fat, fourth graders remained unchanged, and fifth graders reported increased sugar and fat intake in the survey. Further work in future iterations is necessary to help children reduce sugar and fat intake. Participants said that their healthy eating habits increased with the game. Questions in the survey covered eating vegetables, beans, fresh fruit, and drinking 100% juice. On average, before the intervention students ate 3.37 servings of vegetables, beans, fresh fruit and 100% juice. After the intervention they increased to 4 servings of vegetables, beans, fresh fruit and 100% juice. Future work should focus on increasing healthy eating habits and gather behavioral measures of healthy eating habits. According to the survey responses, the improvement in healthy eating varied by grades. Future work is necessary to determine how to better support healthy eating habits in all grades.

What barriers played a major role in each grade?

Some easy ways to increase healthy eating may include increasing the offering of healthy food offerings in the cafeteria and school environment. While the new salad bar certainly improved the fresh vegetables available, more gains could be achieved by increasing access to healthy food in all the school cafeteria meals.

Students were quite knowledgeable about what food is healthy and unhealthy. On average they scored 84% correct. Areas where students had below average performance on healthy food knowledge include: (a) hamburger vs. chicken sandwich, (b) whole milk vs. skim milk, (c) white vs. whole-wheat bread, and (d) ice cream vs. frozen yogurt. Sadly, knowledge is not enough. When given the choice between a healthy and unhealthy option, students said they preferred the unhealthy options most of the time. This can be interpreted to mean that the problem is not lack of knowledge, but rather, the ability to put into action healthy food choices. The gap between healthy food knowledge and healthy food attitude is an area that future programs should address. Further work is necessary with the students to uncover their perceived barriers to making healthy food choices. Future iterations of the game should help students become aware of their barriers and develop strategies to overcome them.

Self-efficacy regards one's beliefs about his or her competence in a particular area. In the survey, students were asked how unlikely, likely, or very likely they were to drink low fat milk, eat baked potatoes and so forth. There were no significant differences in self-efficacy before or after the six-month intervention with regards to reducing intake of foods high in fat. While students said they were only likely to opt for the low fat option, as previously mentioned, they did not significantly decrease fat and sugar intake. One might interpret these findings to mean that future iterations of the game should aim to increase self-efficacy to very likely with regards to reducing fat intake and decrease fat food offerings in the school cafeteria.

Physical activity

Being physically active sixty minutes is one of the core Fitwits messages. Game participants reported increased physically activity after the game was over. Other questions such as "how likely are you to… exercise for sixty minutes each day, run or you're your bike 3-5 five times a week, exercise or play until you are out of breath" were significantly correlated both in the pre and post survey. Future work should go beyond what game players say in a survey and actually measure physical activity with behavioral type measures and employ devices that can easily be integrated into the game as well. Future work should consider an experimental design with a control group and pre-post measures for both treatment and control groups.

Body mass index measures for game players

Body mass index is a measure that relates weigh and height (BMI). BMI is considered to be a proxy for body fat percentages among ratios of weight and height. Typically BMI is used for population studies and is inappropriate for individual diagnosis (Keys, et al., 1972). In this evaluation, BMI was measured as a commentary on the state of the student population in the study as a whole. It provides a snapshot of the health context in which I Am Fitwits operated for six months.

Method

The school nurse measures BMI every year. The school nurse provided the Fitwits team with height, weight, and birthday for each student involved in the study on three dates for September 2009, October 2010, and June 2011. The design evaluator then calculated the BMI for each student with the Centers for Disease Control and Prevention (CDC) children's BMI tool for schools.

Measures

BMI was calculated for game participants twice before the game began, once in September 2009 and another time in October 2010. The BMI was measured in June 2011 after the six-month game was over. The BMI percentiles are reported by gender and overall for the student study participants.

Results

The results that follow are based on two pre intervention measures and one post intervention measure for the study group. While pre-post data for students that participated in the I Am Fitwits game can provide some insight into the student population, the conclusions that can be drawn from such a study design are limited. To make broader conclusive statements, pre-post measures from the same time points in a control group school with similar student population is necessary. Having made that premise, the results from the study are promising.
http://www.cdc.gov/healthyweight/assessing/bmi/childrens_BMI/tool_for_schools.html

For instance, Figure 5-1, can be interpreted to mean that the Fitwits program corresponded with slowing of the negative trends with regards to weight gain in 2011 compared to the gains from 2009 to 2010. The number of normal BMI participants (i.e., 5th -85th percentile) decreased by 5% between 2009 and 2010 from 61% to 56%, and the number of overweight or obese (i.e., greater than 85th percentile) increased by 8% from 35% to 43%. After the *I Am* Fitwits game in 2011, the number of students in the normal range (5th-85th percentile) was 55% only a 1% decrease; in the overweight and obese range was 45% only a 2% increase. In other words, after the *I Am* Fitwits game, the decrease of students in the normal BMI range was five times lower, and the increase in BMI for the overweight or obese students (i.e., greater than 85th percentile) was four times less than before the *I Am* Fitwits game.

Table 5-1. BMI percentiles for boys and girls in third-fifth grade before the *I Am* Fitwits Game in September 2009, October 2010, and after the Fitwits game June 2011.

	September 2009			October 2010			June 2011		
	boys	girls	total	boys	girls	total	boys	girls	total
Number of children assessed:	42	38	80	62	59	121	62	59	121
Underweight (< 5th %ile)	5%	3%	4%	0%	2%	1%	0%	0%	0%
Normal BMI (5th - 85th %ile)	69%	53%	61%	65%	47%	56%	66%	44%	55%
Overweight or obese (≥ 85th %ile)*	26%	45%	35%	35%	51%	43%	34%	56%	45%

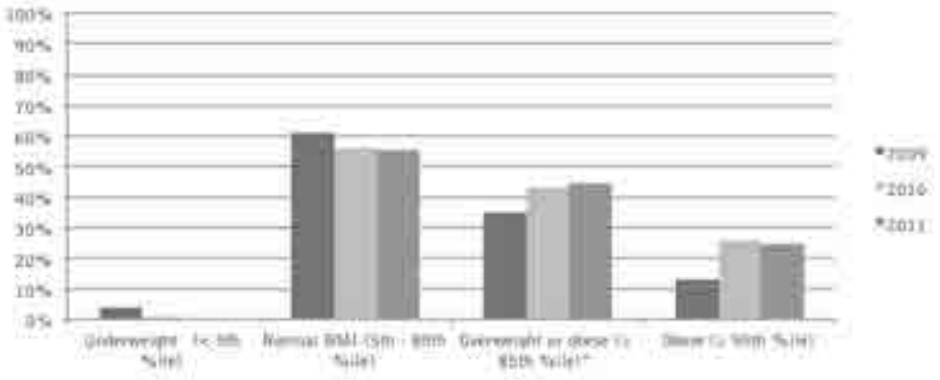


Figure 5-1. Percentage of male and female students in grades 3-5 plotted underweight, normal BMI, overweight or obese, and obese boys measured in before the *I Am* Fitwits Game in September 2009, October 2010, and after the Fitwits game June 2011.*

* Terminology based on: Barlow S.E and the Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. Pediatrics. 2007;120 (suppl):s164-92.

Figure 5-2, can be interpreted to mean that the *I Am* Fitwits program corresponded with slowing of the negative trends even though weight trends differed for boys and girls. In general for both boys and girls, the number of normal BMI (5th-85th percentile) for participants decreased by 5% between 2009 and 2010, and the number of overweight or obese (‹85th percentile) increased by 8%. Those in the overweight and obese range (‹85th percentile) continued to increase between 2009 and 2010 for boys by 9% from 26% to 35% and by 6% for girls from 45% to 51%. The increases slowed between 2010 and 2011, for boys decreasing by 1% from 35% to 34% and for girls increasing by 5% from 51% to 56%. Some may interpret this last number to signify that girls benefited less from *I Am* Fitwits with regards to obesity prevention compared to boys. While the percentage of obese (‹95th percentile) boys and girls and for the doubled from 13% in 2009 to 26% in 2010, they remained similar between 2010 and 2011 decreasing by 1% from 26% to 25%. Boys doubled the percentage of obese (‹95th percentile) from 10% in 2009 to 21% in 2010; they decreased by 2% to 19% in 2011. Girls doubled the percentage of obese (‹95th percentile) from 16% in 2009 to 31% in 2010; they decreased by 1% to 30% in 2011. These last averages for obese (‹95th percentile) children can be interpreted to mean that *I Am* Fitwits likely benefitted the obese more than the overweight range girls.

Table 5-2 shows the distribution of healthy weights for children (5th-85th percentiles). The number of underweight boys and girls (‹5th percentile) decreased both in 2010, and 2011. Boys with normal BMI percentiles from 5th -25th doubled from 7% in 2009 to 13% in 2010; and decreased by 3% to 10% in 2011. Girls with normal BMI percentiles from 5th -25th increased from 0% in 2009 to 7% in 2010; and decreased by 2% to 5% in 2011. The percentages of normal BMI for 26th-45th percentiles decreased for boys and girls in 2010 and 2011. The percentages of normal BMI for 46th-65th percentiles increased for boys and girls in 2010 and 2011. The percentages of normal BMI for 66th- 85th percentiles decreased for boys and

girls in 2010 compared to 2009 and increased less than 1% for boys in 2011, and decreased by 6% for girls in. The percentages of overweigh or obese BMI for ‹85th percentile increased for boys and girls in 2010 and 2011.

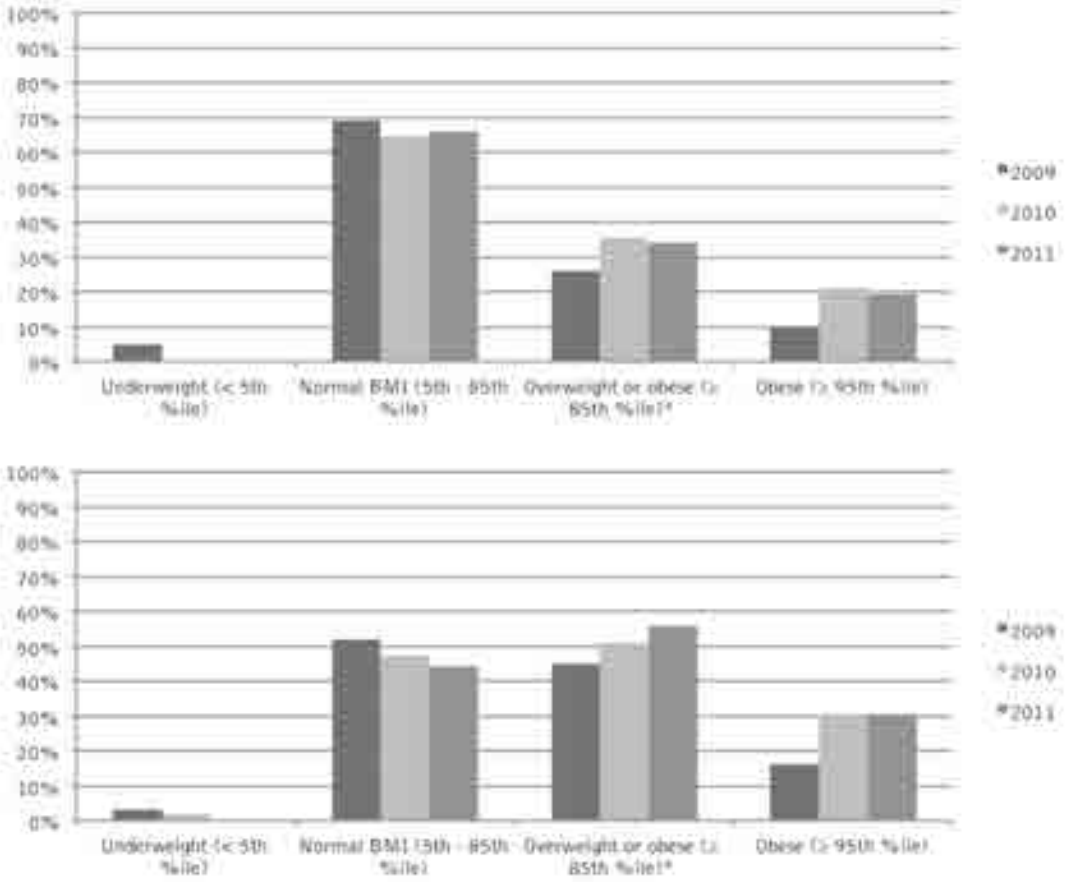


Figure 5-2. Measures of BMI percentile by age for 3-5 graders before the Fitwits Game in September 2009, October 2010, and after the Fitwits game June 2011. (top) Percentage of boys in grades 3-5 plotted as underweight, normal BMI, overweight or obese, and obese boys (bottom) Percentage of girls in grades 3-5 plotted underweight, normal BMI, overweight or obese, and obese*.

	September 2009			October 2010			June 2011		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Underweight (< 5th %ile)	5%	3%	4%	0%	2%	1%	0%	0%	0%
Normal BMI (5th - 25th %ile)	7%	0%	4%	13%	7%	10%	10%	5%	7%
Normal BMI (26th - 45th %ile)	14%	16%	15%	13%	14%	13%	10%	10%	10%
Normal BMI (46th - 65th %ile)	17%	18%	18%	18%	19%	18%	26%	27%	26%
Normal BMI (66th - 85th %ile)	31%	18%	25%	21%	8%	15%	21%	2%	12%
Overweight or obese (> 85th %ile)*	26%	45%	35%	35%	51%	43%	34%	56%	45%

Table 5-2. BMI percentiles above 85th percentile and 95th percentile for boys and girls in third-fifth grade before the *I Am* Fitwits Game in September 2009, October 2010, and after the *I Am* Fitwits game June 2011. *

* Terminology based on: Barlow SE and the Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. Pediatrics. 2007;120 (suppl):s164-92.

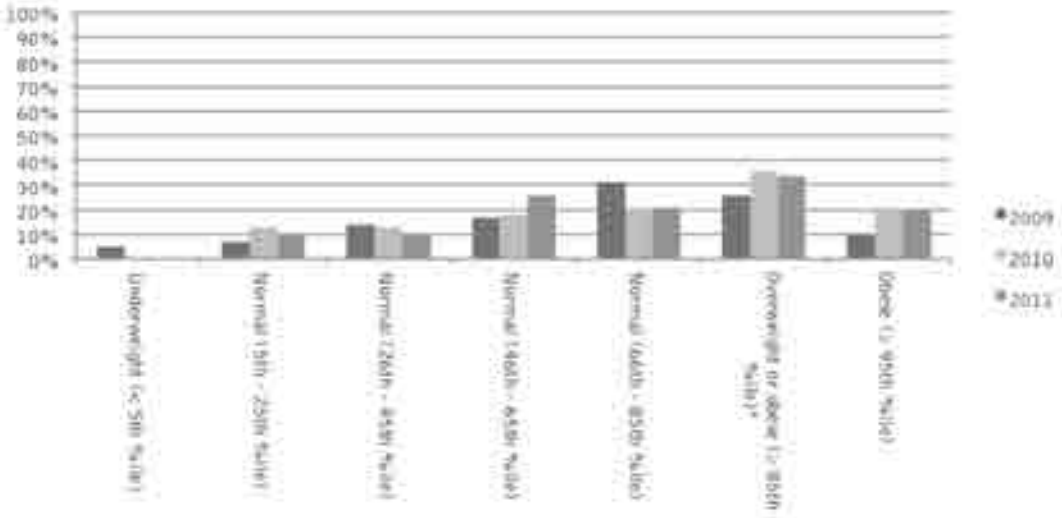


Figure 5-3. Percentage of male students in grades 3-5 plotted by BMI percentiles. All measures collected by the school nurse before the Fitwits Game in October 2010, and after the Fitwits game June 2011.

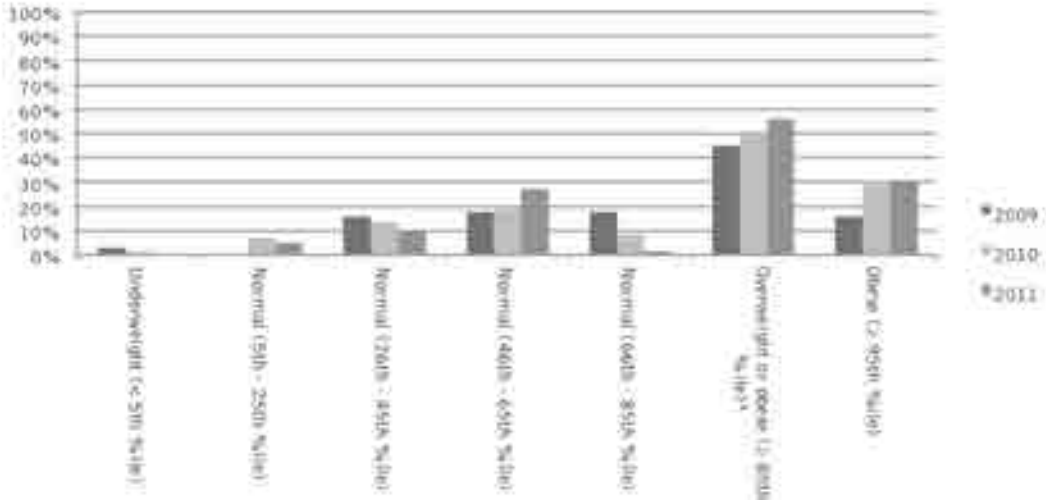


Figure 5-4. Percentage of female students in grades 3-5 plotted by BMI percentiles. All measures collected by the school nurse before the Fitwits Game in October 2010, and after the Fitwits game June 2011.

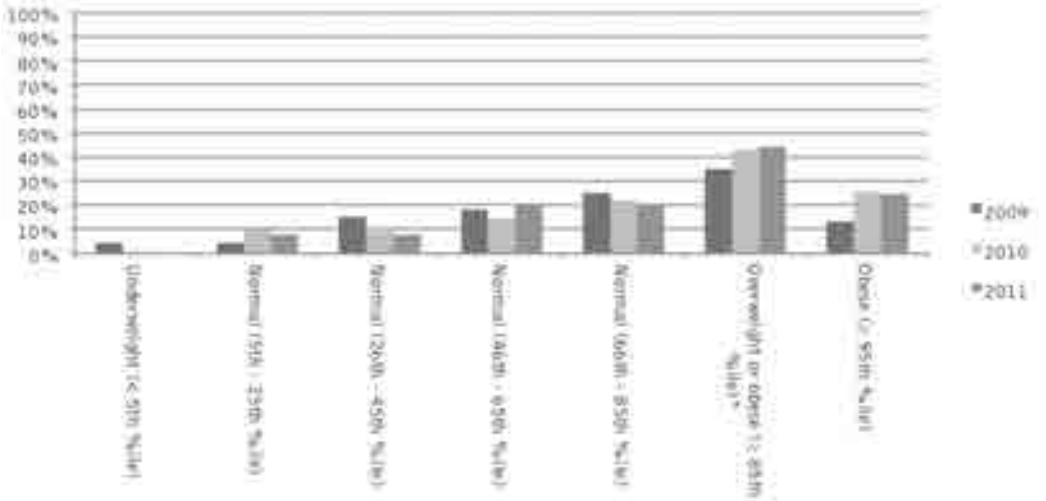


Figure 5-5. Percentage of male and female students in grades 3-5 plotted by BMI percentiles. All measures collected by the school nurse before the Fitwits Game in October 2010, and after the Fitwits game June 2011.

Discussion and Summary of BMI data

As mentioned earlier without BMI data from a control group school, it is unclear if these observed trends are a result of the *I Am* Fitwits game or an alternative explanation. For instance, the sample size was smaller in 2009 compared to 2010 and 2011. Some may argue that the 41 students for whom there is no 2009 data, differ from the 80 for whom there is data in 2009. While this is a possible explanation, it seems unlikely that students from same demographic area might differ so significantly. A second alternative explanation may be that the positive trends showing a decreased rate of increase in BMI are not specific to the school with the *I Am* Fitwits game but apply more generally to other schools as well. However, it seems very unlikely that the obesity epidemic is reversing itself in schools without any specific intervention. Anyway, comparing with BMI data from other schools with similar demographics to the study site can easily test this possible explanation.

In summary, based on the current BMI data collected in the Propel McKeesport School where the *I Am* Fitwits game was conducted, encouraging results emerged. Further work is necessary to determine if these positive findings can be attributed to the *I Am* Fitwits game.

I Am Fitwits game report cards from students, parents, and staff/teachers

Students, parents, teachers, and staff evaluated the *I Am* Fitwits game with nine survey questions at the end of the game in June 2011.

Survey

Table 6-1 contains the nine question concepts for the surveys given to students, parents, teachers, and staff. Five evaluation questions on the game measured: feelings, fun, difficulty, time spent on the game. Three questions measured how people felt about the family nights, salad bar, and school garden. One question asked if people would consider playing the game again. The wording of the questions was modified accordingly to make to the respondents (e.g., students, parents, teachers and staff).

	Question	Response scale
1	Overall how do you feel about Fitwits?	1=very dissatisfied, 2=dissatisfied, 3=neutral, 4=satisfied, 5=very satisfied, 0=did not participate
2	How fun or boring were the Fitwits challenges for you?	1=very boring, 2=boring, 3=neutral, 4=fun, 5=very fun, 0=did not participate
3	How easy or hard were the fitwits challenges for you?	1=very hard, 2=hard, 3=neutral, 4=easy, 5=very easy, 0=did not participate
4	How much time, if any, did you spend on Fitwits challenges at home?	1=far too little, 2=too little, 3=about right, 4=too much, 5=far too much, 0=did not participate
5	How much time, if any, did your family spend on Fitwits challenges at home?	1=far too little, 2=too little, 3=about right, 4=too much, 5=far too much, 0=did not participate
6	Overall, how did you feel about Fitwits family nights?	1=very dissatisfied, 2=dissatisfied, 3=neutral, 4=satisfied, 5=very satisfied, 0=did not attend
7	How do you feel about the salad bar during lunch at school?	1=very unhappy, 2=unhappy, 3=neutral, 4=happy, 5=very happy, 0=do not know
8	How do you feel about the School garden at Propel?	1=very unhappy, 2=unhappy, 3=neutral, 4=happy, 5=very happy, 0=do not know
9	Would you play Fitwits again?	1=very unlikely, 2=unlikely, 3=neutral, 4=likely, 5=very likely, 0=do not know

Table 6-1. I Am Fitwits evaluation questions for children participants.

For most participants, *I Am* Fitwits was rated easy (Figure 6-4). The difficulty and ease was measured with the following question: How easy or hard were the Fitwits challenges for you? [1=very hard, 2=hard, 3=neutral, 4=easy, 5=very easy, 0=did not participate]. On 49 average, students scored the Fitwits easy of use to be 4.13 out of 5; parents said *I Am* Fitwits scored 3.42 out of 5 between neutral and easy; teachers rated *I Am* Fitwits to be fun on average 5 out of 5.

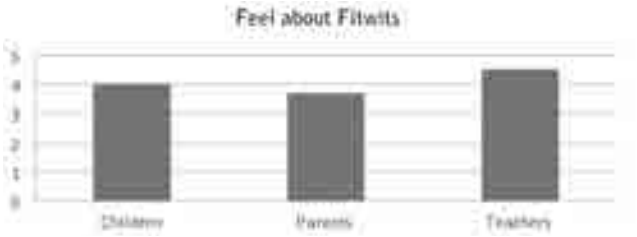


Figure 6-2. Average response to: Overall how do you feel about Fitwits? . [1=very dissatisfied, 2=dissatisfied, 3=neutral, 4=satisfied, 5=very satisfied, 0=did not participate] Children=96, Parents=24, Teachers=10.

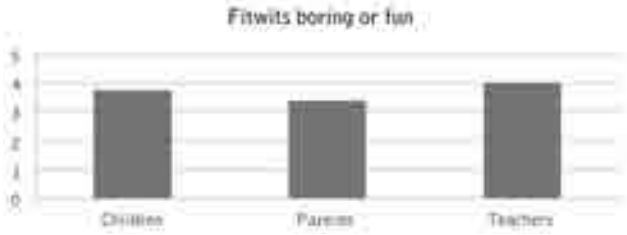


Figure 6-3. Average response to: How fun or boring were the Fitwits challenges for you? [1=very boring, 2=boring, 3=neutral, 4=fun, 5=very fun, 0=did not participate] Children=96, Parents=24, Teachers=10.

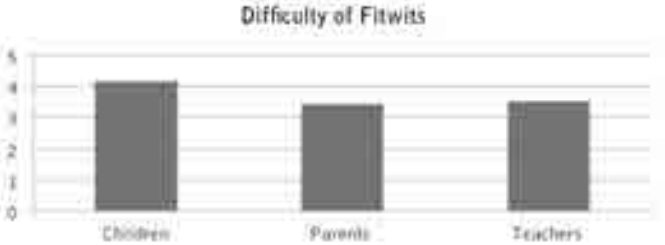


Figure 6-4. Average response to: How easy or hard were the Fitwits challenges for you? [1=very hard, 2=hard, 3=neutral, 4=easy, 5=very easy, 0=did not participate] Children=96, Parents=24, Teachers=10.

Most participants said they did not spend enough time on *I Am* Fitwits (Figure 6-5). Time on Fitwits was measured with the following question: How much time, if any, did [you, your child, your students] spend on *I Am* Fitwits? [1=far too little, 2=too little, 3=about right, 4=too much, 5=far too much, 0=did not participate]. Students said they spent too little time on *I Am* Fitwits on average 3.11 out of 5. Parents said that their children spent close to too little time on *I Am* Fitwits on average 2.53 out of 5. Teachers said that students spent too little time on *I Am* Fitwits on average 2.63 out of 5.

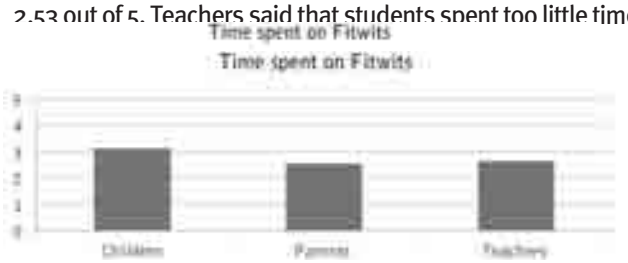


Figure 6-5. Average response to: How much time, if any, did [you, your child, your students] spend on *I am* Fitwits? [1=far too little, 2=too little, 3=about right, 4=too much, 5=far too much, 0=did not participate] Children=96, Parents=24, Teachers=10.

Most participants were either satisfied or very satisfied with the salad bar (Figure 6-6). Satisfaction with the salad bar was measured with the following question: How do you feel about the salad bar during lunch at school? [1=very unhappy, 2=unhappy, 3=neutral, 4=happy, 5=very happy, 0=do not know]. Students said they were very satisfied on average 4.71 out of 5, parents said they were close to very satisfied on average 4.58 out of 5, and teachers said they were very satisfied on average 5 out of 5.

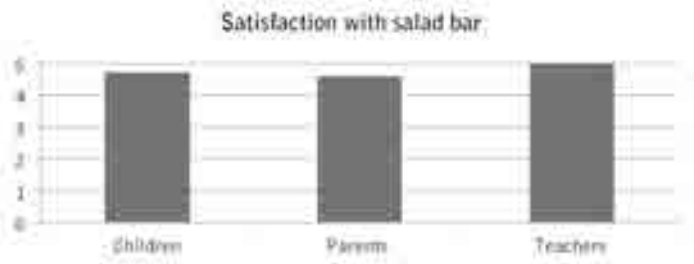


Figure 6-6. Average response to: How do you feel about the salad bar during lunch at school? [1=very unhappy, 2=unhappy, 3=neutral, 4=happy, 5=very happy, 0=do not know] Children=96, Parents=24, Teachers=10.

Most participants were either satisfied or very satisfied with the school garden (Figure 6-7). Satisfaction with the school garden was measured with the following question: How do you feel about the School Garden at Propel? [1=very unhappy, 2=unhappy, 3=neutral, 4=happy, 5=very happy, 0=do not know]. Students said they were very satisfied on average 4.58 out of 5, parents said they were close to very satisfied on average 4.58, and teachers said they were very satisfied on average 5 out of 5.

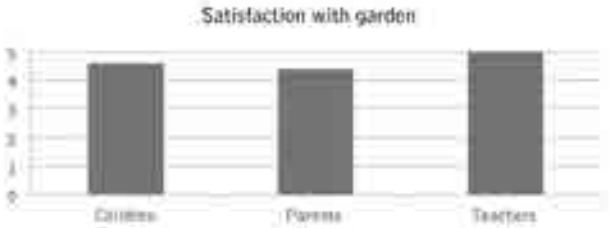


Figure 6-7. **Average response to: How do you feel about the School Garden at Propel? [1=very unhappy, 2=unhappy, 3=neutral, 4=happy, 5=very happy, 0=do not know] Children=96, Parents=24, Teachers=10.**

Parents and teachers said they were very likely to play Fitwits again (Figure 6-8). Likelihood of playing Fitwits again was measured with one question: Would you play Fitwits again? [1=very unlikely, 2=unlikely, 3=neutral, 4=likely, 5=very likely, 0=do not know]. Students said they were between neutral and likely on average 3.30 out of 5. Parents said they were likely to play again on average 4.00 out of 5. Teachers said they were between likely and very likely to play Fitwits again, on average 4.38 out of 5.

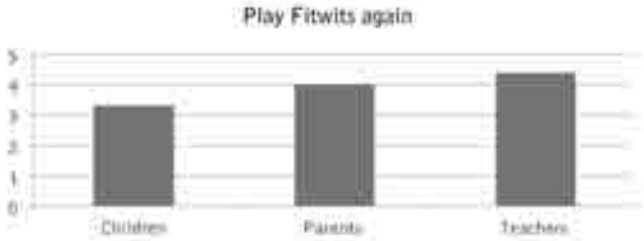


Figure 6-8. **Average response to: Would you play Fitwits again? [1=very unlikely, 2=unlikely, 3=neutral, 4=likely, 5=very likely, 0=do not know] Children=96, Parents=24, Teachers=10.**

In summary, students, parents, and teachers enjoyed *I Am* Fitwits. They found it to be fun, easy enough, and not too time consuming. They were satisfied with the salad bar and school garden. If given a chance they considered themselves likely to play the game again.

Summary of survey resutls

The *I Am* Fitwits game operated at multiple levels of the socio-ecological model (e.g., students, friends, families, teachers, and school administrators). Third, fourth, and fifth graders game-play followed different rhythms, each opting for their own strategies. For instance, the third grade players focused on grade tokens and peer-to-peer tokens. Fourth grade focused their activity on family tokens, peer-to-peer tokens, and grade tokens. Interestingly most energy in the game emerged in the interpersonal levels (e.g., peer-to peer, family), and at the grade level under the guidance of teachers.

Teachers likely played a critical role in engaging the children in playing the grade tokens at school compared to parents take home challenges. Fifth grade game players rallied around family tokens in the beginning of the game, peer-to-peer tokens and completed many individual challenges. The game players focused on peer-to-peer nominations throughout the game. The low participation on the individual level challenges and grade challenges suggests that parents and teachers weren't as engaged as in other grades.

These game patterns challenge two of the assumptions: First, children can nag their parents into being healthy through take home challenges (virtuous cycle). Second, that teachers are off limits because they are too busy to be asked to do one more thing. The uptake of grade level teacher tokens in third and fourth grade suggest that with the proper motivation, game incentives, and encouragement, teachers are very willing to incorporate the healthy message of Fitwits into their classroom activities and curriculum.

One can only speculate that perhaps greater theoretical issues underlie the observed patterns. For instance, the stages of change theory hypothesizes that people undergo a series of stages before being able to change behavior. The stages are commonly believed to be: pre-contemplation, contemplation, planning, action, and maintenance (Prochaska & Velicier, 1997). Could it be that the teachers were more willing to participate in Fitwits because they were further along on the stages of change model than parents? For those teachers, the game presented an opportunity to plan and put into action healthy lifestyle activities with their classes?

Another possible explanation regarding the teachers rising to the challenge relates to social pressure. For instance, teachers felt social pressure from the principal, school nurse, other teachers, and the students. The principal openly endorsed the *I Am* Fitwits program and encouraged participation, as did the school nurse. Teachers often take on the responsibility to be role models for their students and each other. As such, wanting to exhibit healthy lifestyle choices created pressure to live up to the ideals espoused in the Fitwits game. Furthermore some activities in the *I Am* Fitwits game, such as soda free days and chip free days empowered the students to hold for teachers accountable with regards to healthy food choices. Lastly, the presence of *I Am* Fitwits messages in the classroom and school environment further created social pressure to participate in the game. Further work is necessary to understand the impact of the stages of change model, social pressure, and environmental messaging on health decisions on healthy lifestyle related change. However, it is certain from the participation levels observed at Propel McKeesport that the *I Am* Fitwits game was able to energize a school to tackle unhealthy lifestyles.

Student survey summary

In summary, the analysis of the survey given to students before and after the *I Am* Fitwits six-month game suggests that the program was successful in multiple ways. Students significantly improved their knowledge with regards to the core Fitwits messages (e.g., cut down on fat and sugar, be active 60 minutes daily, portion size, obesity, healthy foods, definition of obesity). Participants said that their healthy eating habits increased with the game. Questions in the survey covered eating vegetables, beans, fresh fruit, and drinking 100% juice. On average, before the intervention students ate 3.37 servings of vegetables, beans, fresh fruit and 100% juice. After the intervention they increased to 4 servings of vegetables, beans, fresh fruit and 100% juice. While the new salad bar certainly improved the fresh vegetables available, more gains could be achieved by increasing access to healthy food in all the school cafeteria meals. Students were quite knowledgeable about what food is healthy and unhealthy. On average they scored 84% correct.

We know that knowledge is not enough, when given the choice between a healthy and unhealthy option, students said they preferred the unhealthy options most of the time. The gap between healthy food knowledge and healthy food attitude is an area that future programs should address. Being physically active sixty minutes is one of the core Fitwits messages. Game participants reported increased physically activity after the game was over. Other questions such as "how likely are you to… exercise for sixty minutes each day, run or you're your bike 3-5 five times a week, exercise or play until you are out of breath" were significantly correlated both in the pre and post survey. Self-efficacy with regards to physical activity significantly increased in the post game survey measures.

Body Mass Index (BMI)

Based on the current BMI data collected in the Propel McKeesport School where the *I Am* Fitwits game was conducted, encouraging results emerged. Further work is necessary to determine if these positive findings can be attributed to the *I Am* Fitwits game.

Success of game play

Students, parents, and teachers enjoyed *I Am* Fitwits. They found it to be fun, easy enough, and not too time consuming. They were satisfied with the salad bar and school garden. If given a chance they considered themselves likely to play the game again.

By the end of the school year, the team was able to look back and see that many of the intentions expressed before the game (without having any idea of what was to come) had been implemented successfully. In 162 days, with 129 players (including teachers).

Students completed a total of 2,442 take-home challenges

- 963 were Eat Smart.
- 749 were Get Moving
- 790 were Spread the Word

Students earned 221 Family Business and Friends Helping Friends merit tokens

– 71 were Family Business
– 50 were Friends Helping Friends.
– 190 students and parents attended the 4 Family Nights

Teachers and school administrators earned 90 Teacher Touchdown, Shining Bright and School Power tokens

– 1 Teacher Touchdown
– 79 Shining Bright
– 10 School Power

Quotes on impact on families' lives

"We pay more attention to what we eat…We incorporate the Wii at home. We try to have half an hour of Wii every night with a bottle of water." (Parent_id_80)

"I think we look at labels more for salt and sugar content." (Parent_id_8)

Quotes on impact on teachers' lives

"I think it showed me as far as portion sizes—my father has worked for Heinz for years. So we are ketchup fanatics. Lots of ketchup. And it was interesting to see, wow, the amount of ketchup we use is not healthy." (teacher_gr_5_id_7)

"When Fitwits program came in for me, it made me so much more aware of how much portion size was a big thing… using your hand to measure things was a huge thing for me at home and making sure to have a balance there." (teacher_gr_3_id_1)

"It just strengthened what I'm already doing, I tried to eat healthy as best I can, I don't eat out. My girlfriend and I cook in a lot, I mean since Fitwits I have three to four salads a week now." (teacher_gr_5_id_3)

"I think for me, personally, with my two children, I think I looked at food and portion size in a different way. So using some of the cards and helping my children understand that, you know, you have to have things in moderation and just learning this, you know, different portion sizes I think was helpful for us." (principal_id_10)

"High blood pressure, this runs in our family and so reading labels, I think for myself, and sodium content, that's what Fitwits really did for me." (teacher gr5_id7)

"Well, the first big change in my life once [Fitwits] started was that I gave up pop… The kids were getting me every morning with the Nitwit coupon and so right away I gave up pop. So that made a huge impact for me. But I think just awareness, again. I think being more aware for the kids helped me be more aware for myself." (Teacher gr4_id2)

"I have a ten-year-old and a five-year-old. We started walking on a daily basis and so thinking about exercise and the importance of staying healthy." (principal_id_9)

Quotes on impact on Champions' lives

"We're all more conscious of our portion sizes as we're making things. Kids are helping to make it into the right portion sizes for their hands, things of that kind of nature… The kids are very moderate on their sodas these days. They do everything in moderation, which is wonderful. And they don't ask for sweets as much. They'd rather have a piece of fruit." (champion_id_4)

"I mean it never hurts to hear or be educated over and over again about things. I mean I have a long way to go personally with my own life, as far as fitness is concerned. But it definitely resonates with me. What we learned listening to some of the chefs and how thy cooked healthy and there were just certain things that I'll take with me." (nurse_id_10)

Case study: Player 064 Profile

Player 064, a fourth grader, won the "I Am Fitwits" game at Propel McKeesport. Following Player 064's path to success illuminates the intricacies of the game and the support systems in place. Supportive social networks, such as family and friends, as well as the school environment, composed of teachers and the principal, created an atmosphere that aided in the success of Player 064.

Social Networks

Two groups played a key role in the structure of Player 064's social network: his family and his peers. Both family and friends supported Player 064's engagement in the Fitwits game, which helped him continue with the challenges and lifestyle throughout the course of the game.

Player 064's family supported his involvement in the game and contributed to the network of support necessary for him to succeed. Player 064 considered his family an integral part of his success, as seen in his nominations of both his father and mother for game awards. He nominated his father for a "Family Business" merit token "because he always is getting exercise" and recognized his family for "always trying to eat healthy. His mother functioned as a motivating force throughout the game and was nominated twice for a "Family Business" token.

It should be noted that his mother expressed interest in becoming a Parent Champion, but ultimately could not because of time constraints. This is an example of one of the many barriers that Propel McKeesport students and families faced. Many players struggled with family related obstacles, such as time constraints and perceived financial difficulties, which inhibited their success in the game.

Family support is well documented in many of the individual challenges Player 064 completed at home. When interviewed during the game, Player 064's father reported that the mother often completed the challenges with Player 064 and his siblings. For example, one challenge asked players to trace a family member's hand in order to create a hand-portion guide, and Player 064 traced his sibling's hand and labeled it with her name. In another challenge, Player 064 expressed the need to "keep going over" the hand-portion guide in order to learn it, and near the end of the game, he even set the goal of always using the hand-portion guide at breakfast when getting cereal. Player 064 displayed mastery of the hand portion guide. In another challenge, he drew french fries, a favorite food, in the correct portion size of three fingers. By making an effort to find value in the Fitwits materials, Player 064 and his family created a supportive environment that enabled him to succeed.

Friendship also played an important role in fostering a support network that led to the success in the game. The continued interest and positive reinforcement of peers motivated the player to continue with the game. The "Friend Helping Friends" merit token allowed students to acknowledge fellow players who were following the Fitwits program. Player 064 was awarded a "Friends Helping Friends" merit token by a peer "because he turned in every Fitwit paper." Player 064, in turn nominated a friend for the same merit token because "she is always staying fit." While peer-to-peer encouragement and family involvement created an atmosphere of achievement, the school created an environment that pushed and bolstered the Fitwits materials.

School

In the school environment, there were two levels of support and reinforcement of the Fitwits materials: teaching within the classroom, and organizational policy changes. Each of these levels served a key role in building a network of support for all students, especially those playing the game. The fourth grade teachers at Propel McKeesport worked to create an engaging and informative environment within the classroom. Of the 26 challenges the fourth grade completed during the course of the game, 15 classroom activities were influenced by

the Fitwits "Thought Starter" cards, and 11 of the challenges were integrated into the school curriculum. When learning how to make bar graphs in math class, the students made graphs about people's favorite vegetables. Not only did the teachers introduce the mandatory math requirements, but they also stressed the importance of good nutrition and health. The continual reinforcement of healthy lessons in the school setting promoted him and other players to make health conscious decisions outside of the classroom.

The teachers also modeled healthy examples for the children; many teachers gave up soda or ate fruit in place of unhealthy snacks in the classroom. This created an environment that took the game seriously and facilitated learning. Player 064 recognized his teachers with nominations for "Friends Helping Friends" merit tokens on three separate occasions for drinking water, eating healthy, and encouraging others to also eat healthy. Evidenced by his nominations, Player 064 held his teachers in high esteem and emulated their healthy habits encouraged by Fitwits. Player 064 also recognized his teachers in a class Fitwits assignment. When creating an outline for a radio show about eating healthy every day, he planned to interview his teachers. He also planned to interview the same peer that he had previously nominated for the "Friends Helping Friends" merit token. Player 064's consistent observation and recognition of those living healthy lifestyles around him enabled him to learn the Fitwits material and succeed in the game. The teachers formed the support network that taught about the healthy lifestyle changes promoted by Fitwits. The organizational and policy-making level, the principal, took action in order to implement school-wide changes.

In addition to working as instructors, the fourth grade teachers also made policy changes to support Fitwits. They insisted on healthy treats when celebrating a student's birthday in class. Instead of just nurturing a healthy environment through teaching, they also created a rule that would enforce healthy decisions. The principal also made changes within the school in order to assist the Fitwits material. In April, the Principal enforced "Nitwit Free Tuesdays." On these days, students were not allowed to bring unhealthy foods to eat during lunchtime; Nitwit tickets were issued accordingly if students and/or staff broke the rules. The principal made another change to lunchtime in order to enforce healthy changes. A salad bar, donated by Whole Foods and Eat-n-Park, was made available to students and teachers Tuesday through Thursday. This change made it easier for the school to promote healthy lunches. Another way the school worked to promote healthy eating was through the school garden. By growing their own fresh vegetables, the school found another way to integrate healthy eating into the school policy. Before the planting of the school garden, teachers found a way to connect Fitwits, the garden, and school curriculum by doing the vegetable bar graph exercise in class. The continual dialogue between the individual player, friends and family, and the school system created a supportive network that encouraged change.

Content experts

Kristin Hughes is an Associate Professor in the School of Design Carnegie Mellon University. Recurring themes in her research and professional practice focus on utilizing design methods as a catalyst for community and civic engagement. She is currently looking at the design of products that allow participants agency over their own learning space. They are invited as co-creators in the design process, a process that they may eventually engage and sustain on their own. Most recently, this question has led her to explore game design, examining learning processes and ways that play spaces provide a powerful platform for uninhibited learning.

Diane Helsel, PhD, RD, CSSD, is a registered dietitian and assistant professor in the department of Sports Medicine and Nutrition in the School of Health and Rehabilitation Sciences at the University of Pittsburgh. She is a Certified Specialist in Sports Dietetics (CSSD) with the Commission on Dietetic Registration, a Certified Health/Fitness Specialist (HFS) with the American College of Sports Medicine (ACSM) and a licensed dietitian/nutritionist (LDN) in the Commonwealth of Pennsylvania. She received her bachelor's degree in Clinical Dietetics and Nutrition from the University of Pittsburgh, master's degree in Food and Nutrition from Appalachian State University and doctoral degree in Exercise Physiology at the University of Pittsburgh.

Megan Montag, is a registered dietitian. She graduated from the University of Pittsburgh in 2005 with a Bachelor's Degree in Clinical Dietetics and Nutrition. In 2007, she received her Masters Degree in Health Education and Promotion from East Carolina University. She has a certificate of training in pediatric and childhood weight management.

Sarah Rafson earned her Honors Bachelor of Arts from the University of Toronto in Architecture Studies and Spanish, but found her passion lied in designing games, not buildings. She co-founded Conversation for Change, a group that collaborated with the Canadian Urban Institute to develop a board game as a tool for public engagement in problematic urban planning issues that was implemented in several locations throughout the city. As Coordinator of the Fitwits Zones, Sarah brings her expertise in games as tools for engagement and change, and her personal commitment to encouraging healthy lifestyle choices.

Nathan Mazur is a graduate of The Art Institute of Pittsburgh. His skills include cartooning, animation, illustration, graphic design and web design. His work has been described as everything from cute and funny, to somewhat unnerving. He's done work for Disney Television, American Greetings, Carnegie Mellon University and numerous smaller companies, film makers, and individuals. Examples of his work can be found at www.scaredofbees.com.

Peter Scupelli, PhD, is a designer and a researcher. He is a visiting instructor in the Human Computer Interaction Institute at Carnegie Mellon University. As a design researcher, he uses human centered design methods to uncover people's wants, needs, and desires in the context of use. He focuses on problems with broader reach than individual products and seeks design solutions – whether a product, service, or environment – that are integrated into a designed system. Peter joined the Fitwits team in September 2009. He is researching obesity prevention in the five levels of the socio-ecological framework (i.e., individual, interpersonal, organizational, community, and public policy). His Ph.D. dissertation in human computer interaction focused on how the architecture of the built environment around schedule displays support coordination. He has a master's degree in interaction design from the School of Design at Carnegie Mellon University, and an architecture degree from the Universita' di Genova in Italy.

CMU School of Design students: Kelly May Nash, Carson Beyl, Alie Ruqian Zhou, Wes Johnson, Chongho Lee, Sarah Calandro, Julia Pellicciaro, Sophia Chan

Fitwits Summer Outreach Initiatives 2011-212

Summer Youth Camps
YMCA and Childrens' Hospital youth obesity prevention initiative
June 14, 2011
Contact: Gretchen North

Heart Healthy Kids Camp on Pittsburgh's Northside,
Allegheny Center Alliance Church
Contact: Krista Mueller

Jerome Bettis Children's Asthma Sports Camp
July 2011
Heinz Stadium

Deshea Townsend Football Camp
June 18, 2011 9:00am-2:00pm
Sto-Rox High School

Summer Camp in Beulaville, North Carolina
July 2011
Contact: Melanie Houson

Summer Braddock Youth Project
July 2011
Contact: Margaret Martone and Steven Janofsky

Healthy Family Home Training Camp, YMCA
May, 2012
Homewood, Brushton YMCA

Allentown Academy Summer Camp
June, 2012
Allentown, PA

Festivals
Venture Outdoors Festivals
June 25
Mellon Park

American Heart Association
June 22, 2011
Homewood-Brushton YMCA

International Children's Festival
May, 2012
Schenley Plaza

Bibliography

Beckhard, R. (1969). Organization development: strategies and models. Reading, Mass.: Addison-Wesley.

Bitner, M. J., Faranda, W. T., Hubbert, A. R., & Zeithaml, V. A. (1997). Customer contributions and roles in service delivery. International Journal of Service Industry Management, 8(3), 193-205.

Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Cambridge, MA: Harvard University Press.

Centers for Disease Control and Prevention. (2009) Recommended community strategies and measurements to prevent obesity in the United States. Morbidity and
Mortality Weekly Report, 58 (RR-7) 1-32.

Centers for Disease Control and Prevention.Children's BMI Tool for Schools. (n.d.). Retrieved November 19, 2011, from http://www.cdc.gov/healthyweight/assessing/bmi/childrens_BMI/tool_for_schools.html

Green L.W., Richard L. & Potvin, L. (1996). Ecological foundations of health promotion. American Journal of Health Promotion 10(4) 270-281.

Green, L.W., & Kreuter, M.W. (1999). Health promotion planning: An educational and ecological approach. Mountain View, CA: Mayfield Pub. Co.

Haslam, D.W. & James, P.T. (2005) Obesity. Lancet, 366(9492) 1197-1209.

Hughes, K., Scupelli, P., Fidler, S., & McGaffey, A. (2010). Think, Make, Evaluate, (Evolve): Designing participatory tools to better understand how to help physicians communicate with families about obesity. A case study in sustainable co-design. Challenges and Opportunities for Design Research, Education and Practice in the XXI Century. LeNS Conference, Bangalore, 29th September to 1st
October 2010.

Fisher, D. V. (1984). A Conceptual Analysis of Self-Disclosure. Journal for the Theory of Social Behaviour, 14(3), 277-296.

Flegal, K.M., Carroll, M.D., Ogden, C.L., & Curtin, L.R. (2010) Prevalence and Trends in Obesity Among US Adults, 1999-2008 JAMA. 303(3):235-241.

Han, T. S., van Leer, E. M., Seidell, J. C. & Lean, M. E. J. (1995). Waist circumference action levels in the identification of cardiovascular risk factors: prevalence study in a random sample. British Medical Journal, 311, 1401–1405 Institute of Medicine. (2001).

Health and Behavior: The Interplay of Biological, Behavioral, and Societal Influences By the Committee on Health and Behavior: Research, Practice, and Policy, Board on Neuroscience and Behavioral Health, Institute of Medicine. Washington, DC, National Academy Press, 2001.

Keys, A., Fidanza, F., Karvonen, M. J., Kimura, N., & Taylor, H. L. (1972). Indices of relative weight and obesity. Journal of Chronic Diseases, 25(6), 329-343.

Kopelman, P. G. (2000). Obesity as a medical problem. Nature, 404(6778), 635-643.

Lau D.C., Douketis J.D., Morrison K.M., Hramiak I.M., Sharma, A.M., & Ur, E. (April 2007). 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. Canadian Medical Association Journal 176(8) S1–13.

Levene, H. (1960). Robust Tests for Equality of Variances, in Contributions to Probability and Statistics, ed. I. Olkin, Palo Alto, CA: Stanford Univ. Press.

Macdonald, G. (2000). A new evidence framework for health promotion practice. Health Education Journal, 59(1), 3-11.

McGaffey A., Hughes K., Fidler S.K., D'Amico F.J., & Stalter M.N. (2010) Can Elvis Pretzley and the Fitwits improve knowledge of obesity, nutrition, exercise, and portions in fifth graders? International Journal of Obesity (London)

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. Health Education Quarterly, 15, 351–377.

Prochaska, J.O., & Velicer, W.F. (1997) The transtheoretical model of health behavior change. American Journal Health Promotion 1997 Sep-Oct;12(1):38-48.

Ogden, C.L., Carroll, M.D., & Flegal, K.M. (2008). High Body Mass Index for Age Among US Children and Adolescents, 2003-2006. JAMA, May 28, 2008; 299(20):2401 – 2405.

Peerson, A., & Saunders, M., (2009) Health literacy revisited: what do we mean and why does it matter? Health Promotion International, 24(3):285-296.

Ratzan, S. C. & Parker, R. M. (2000). Introduction. In C. R. Selden, M. Zorn, S. C.

Ratzan, R. M. Parker, (Eds.), National library of medicine current bibliographies in medicine: Health literacy. NLM Pub. No. CBM 2000-1. Bethesda, MD: National Institutes of Health, U.S. Department of Health and Human Services.

Ratzan, S. C. (2001) Health literacy: Communication for the public good. Health Promotion International, 16, 207–214.

Sanders, E.B.-N, (2006) Scafolds for building everyday creativity, in Jorge Frascara (ed), Designing Effective Communications: Creating Contexts for Clarity and Meaning, Allworth Press, New York.

Sawilowsky, Shlomo S. (2002). Fermat, Schubert, Einstein, and Behrens–Fisher: The Probable Difference Between Two Means When $1 \neq 2$. Journal of Modern Applied Statistical Methods, 1(2) 461-472.

Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. American Journal of Health Promotion, 10, 282–298.

Tudor-Locke, C., & Bassett, J. D. R. (2004). How many steps/day are enough?: Preliminary pedometer indices for public health. Sports Medicine, 34(1), 1-8.

Wheeless, L. R., & Grotz, J. (1977). The Measurement of trust and its relationship to self-disclosure. Human Communication Research, 3(3), 250-257.

Willett, W. C., Dietz, W. H., & Colditz, G. A. (1999). Guidelines for Healthy Weight. New England Journal of Medicine, 341, 427-434.

Appendix

Encouraged by the overall enthusiasm expressed in the first iteration of the I Am Fitwits game, Propel McKeesport decided to run their own modified version of the six-month game in the spring of 2012 using a "convention grant" from the Propel School District. During this time the community garden that began as in the first iteration of the *I Am* Fitwits game continues to thrive, and teachers work to find creative methods for integrating health and nutrition content into the daily curriculum. Becasue of this the Fitwits team felt is was vital to follow up with the teachers. We presented a series of workshops held at Propel McKeesport, where we had the opportunity to communicate directly about the progress of the Fitwits game, and how the program has fared one year out from the first iteration.

Through our follow-up discussions with teachers, we were able to identify specific potential barriers to health education based on post-game interviews with students, parents, and teachers, both in the classroom and in the home, which provided us with invaluable information for future iterations of the Fitwits game. We learned what, if any, knowledge from the first iteration of *I Am* Fitwits has been retained by students who participated in the game. Through a series of moderated activities, teachers and parents provided specific insight into the lives of students during school and home hours.

Note: In the context of this appendix, the modified game of I Am Fitwits is referred to as the "second iteration" of the game. It is important to indicate the funding for the modified version of I Am Fitwits came from a modest stipend on behalf of Propel McKeesport, and was not directly affiliated with the Carnegie Mellon University School of Design or other I Am Fitwits partners. As such, this is not a true "second iteration" in a literal sense.

Getting started

In the initial activity, participants were given a list of thirty-three overarching key terms (both positive and negative) derived from the previous 2011 post-game interviews. Participants then ranked the terms, choosing their "top five" most pertinent. Inadequacies in the school lunch program-namely, serving students pre-packaged, re-heated meals, emerged as the most important, followed by lack of a school kitchen or cooking facilities to prepare food. Lack of adequate kitchens and equipment is a major obstacle in changing the infrastructure of school cafeterias (Cooper & Holmes, 2006).

Body-image was ranked third, with considerable discussion of cultural and societal impact on self-perception, particularly with female students. As current research suggests that dissatisfaction with one's body can begin as early as six years old, particularly among African Americans (Davis, Sbrocco & Williams, 2009), early intervention initiatives for health education and nutrition are imperative.

Cost was ranked fourth; a common sentiment in post interviews was the perceived "expense of eating healthy." Although overall cost- per-calorie metric reveals a healthy diet is, in fact, more economical, lower levels of socio-economic status have been associated with increased rates of childhood obesity (McDermott & Stephens, 2010).

Finally, motivation, changes in thinking, difficulty in measuring success, cutting through red tape, physical activity, knowing how to make healthy choices, and maintaining impact and creating impact were ranked as equally important to participants. Participants were also given the opportunity to identify the elements of an ideal healthy community. Using paper and crayons, the group worked together to design a community centered on health, fellowship, physical activity, and the arts.

Recommendations

- Look at potential opportunities to partner with funders to help schools apply for renovation grants to improve school kitchens and cafeterias as part of the I Am Fitwits initiative.
- Incorporate gender specific information about body–image with an age-appropriate discussion of eating disorders.
- Create health communications that visually illustrate the true cost of poor eating habits.

Image: Teachers participating in workshop identifying barriers and concerns

Identifying barriers to health and nutrition in the lives of students

As is the case in many schools, there is a contradiction between policy and practice. Although all schools that participate in the National School Lunch Program (NSLP) are required by federal law to develop a wellness policy, research reveals that sixty-eight percent of policies sampled were consistent with the mandates set forth in the law; thirty-two percent did not address one or more goal areas set by the federal mandate with fifteen-percent not addressing goals for evaluation and monitoring. None of the policies addressed all components of Action for Healthy Kid's Fundamentals (Moag-Stahlberg, Howley & Luscri, 2008). While the intentions for procedures and policy are clearly well-intended, most schools are missing the mark in terms of health and nutrition practice in our schools.

Educational research finds that "breaks" after periods of intense focused learning improves cognitive function, yet school schedules are changing to maximize instructional time and minimizing non-instructional time (such as recess) with the goal of improving student performance (Pellegrini & Bohn, 2005). Some schools are utilizing a Balanced School Schedule, which allows for two recess breaks (one morning, one afternoon), with students eating two partial meals during each break as well as opportunities for physical activity, instead of one full lunch period in the middle of the day. Potential benefits to a Balanced School Schedule include: improved concentration, more time to eat, and improved classroom behavior overall (McLeskey, Waldron & Redd, 2012).

It is clear that there are many well intended programs set in place by National and State polices but why are there so many barriers when it comes implementation? This led us to a robust and colorful discussion with our teachers and parents. They were given the

opportunity to explain, challenge and reflect on their own actions and attitudes as parents and teachers when it come to adapting healthier behaviors for their families and themselves.

Using a copy of the school schedule, participants discussed the nuances of students' daily routine to identify opportunities for incorporating health education and exercise into the school day. The discussion began with the breakfast served at school, one teacher described as a "quick fix"—meaning, children are at least fed, but not optimally nutritious meals. Participants agreed the current lunch program was not ideal in terms of fresh foods—instead, meals arrive pre-packaged and re-heated, as discussed in the first activity. As stated before and important to note that eighty-three percent of Propel McKeesport students are on free and/or reduced breakfast and lunch. All teachers agreed the perimeters of the school day are "what we are able to control" in the lives of students and could be doing a better job if time and money allowed for it.

To further extend the discussion, the group discussed what many students encounter outside of school hours. For both students and their parents, mornings are hectic. We were surprised to learn that some students are in day care as early as 5:30am prior to arriving at school. Lack of sleep for students was identified as a critical barrier to both academic success and physical well-being. Sleep duration is directly related to both cognitive and emotional functions, as well as body weight. In a recent study, pediatricians noted that inadequate sleep may mediate changes in the levels of neuropeptides that regulate appetite, leading to increased food intake and obesity (Spruyt, Molfese & Gozal, 2011).

Teachers noted that some parents regularly use caffeine as a stimulant (such as energy drink Red Bull) to keep their children alert during the day as a response to excessive tiredness. It is important to note the necessity of parents working multiple jobs, or working late evening hours, as a means to providing for their family. Indeed, many students are awake in later evening hours to spend time with their parent, as this may be the only opportunity for family time. Children and parents alike feel rushed, overscheduled, and stressed (Galinsky, 2011).

Late afternoons and evenings are equally chaotic for students and parents. While critically important for student engagement, after-school sports create a sense of exigency. Organized sports for children and pre-adolescents provide an opportunity for increased physical activity and the chance to learn team-building and negotiation skills, competition, and trust—all important components to physical and mental development (American Academy of Pediatrics, 2001). But for many cost prohibitives their children's participation. Parents also expressed frustration over the loss of free intramural and league sports in many neighborhoods. One parent noted the importance in developing a parent network to supervise outside play-time for kids in order to balance safety concerns with the need for children to be active outdoors in their neighborhoods.

Time, or lack thereof, was also cited as a primary barrier to incorporating physical fitness into the school day. Propel McKeesport is unique in not having a designated physical education program. Participants suggested alternating between arts and physical education to strike a balance. Other suggestions increasing the length of recess to give students further opportunities for activity and movement during the school day. The Fitwits Program follows experts recommended sixty minutes of daily physical activity, yet one study indicated that nearly sixty-two percent of children do not participate in any organized non-school physical activity, and nearly twenty-three percent do not engage in any non-structured physical activity (McKenzie & Lounsbery, 2009).

In considering the importance of healthy parents and caregivers, many adults are only able to decompress and relax much later in the evening hours. This anecdotal discussion with participants suggests the cycle of exhaustion felt by many parents and caregivers, and how this ultimately perpetuates decision-making in relation to health and nutrition. Research

states that in households with the mother, in particular, working full-time results in fewer family meals, lower fruit and vegetable intake, less time on food preparation, and overall less encouragement for healthy eating habits among adolescents (Bauer, Hearst, Escoto, Berge & Neumark-Sztainer, 2012).

Teachers repeatedly noted the use of food as a means of reward in the classroom. Besides being detrimental to student's sense of intrinsic motivation for learning, a recent study suggests a correlation between increased body-mass index (BMI) and school cultures that promote the use of food and snacks to reward students (Kubik, Lytle & Story, 2005).

Recommendations

- Incorporating 3-5 minute "Fitwits" breaks would be an opportunity to support student fitness during the course of the school day
- Intramural sports and other organized physical activity should be an important component of Fitwits to assist children of all physical and athletic abilities
- Parent workshops on stress
- The role of daycares for as an opportunity for health and nutrition education , particularly at the preschool level
- Policy mandating that participating schools reduce instances of food as reward

Teacher's take on the redesign of "Fitwits Challenges"

In order to better understand how the core messages of *I Am* Fitwits were embedded into the daily classroom lessons and curriculum, we asked teacher participants to take home folders with different Fitwits classroom challenges, and assess each to 1.) Determine their alignment with Pennsylvania State Academic Standards 2.) Assign each activity a grade-appropriate level and 3.) Solicit suggestions for potential modifications to enhance integration into existing curriculum or alignment with state academic standards. Teachers also shared their own lesson designs for health and nutrition education to help us identify how content can be (and is) embedded into the daily curriculum by teachers themselves outside of the *I Am* Fitwits game.

We determine this to be integral, particularly after the decrease in participation of the 5th grade teachers and students during the initial game that was openly attributed to a conscious decision to focus on standardized testing. Based on the teacher's feedback, we are confident that existing content will be modifiable, and creating new content based on the testing areas (Reading, Writing, Math, and Science) is an achievable goal.

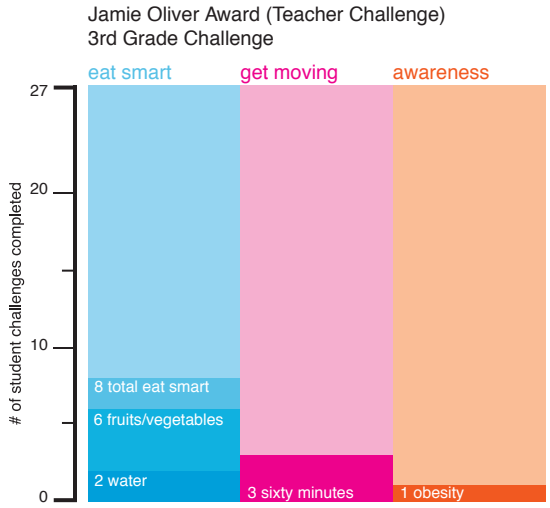
It is also important for us to understand where (and how) teachers search for health education and nutrition information in order to create lesson plans. Popular lesson planning sites are abundant and convenient—however, content is not vetted in relation to the most current research and information regarding best practices for health education and nutrition. One example discovered was the creation of a "food pyramid mural" created by the third grade teachers during the first iteration of the game and displayed for all the grades to see. Based on the most recent information available from the United States Department of Agriculture (USDA), the food pyramid model is no longer the current standard nutrition education, having been replaced by the "Choose My Plate" model in 2011. This example clearly demonstrates a need for a comprehensive but adaptable curriculum and system for access information that provides best practices to help teachers better educate our students.

As stated above the Fitwits Team assigned each teacher a random sampling of nineteen of the fifty challenges designed for the *I Am* Fitwits game. We learned that eighteen of the nineteen Fitwits challenges directly aligned with the Pennsylvania state academic standards. Teachers also assigned a grade-appropriateness ranking to each challenge, with eleven of the nineteen

sampled appropriate for grades first through fifth. Only one of the nineteen was classified as appropriate for the lower ages (first and second grades) than initially presented in the first iteration. The remaining seven were ranked as appropriate for third through fifth graders. Key areas of alignment were: health, safety, and physical education, math, and language arts.

We also discussed the challenges created by the teachers themselves in the 2011-2012 school year, based on their knowledge of both the core *I Am* Fitwits message from the first iteration of the game as well as their own understanding of their grade level and curricular objectives within the classroom. Below are several key challenges self-designed by teachers that reference key learning and student's ability to transfer knowledge gain from the Fitwits Program (categorized by Eat Smart, Get Moving, Spread the Word) into other aspects of their learning.

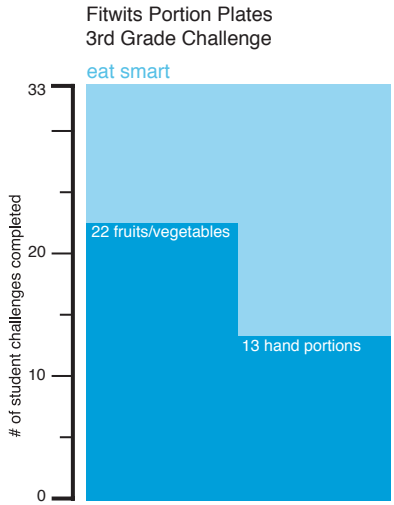
One example of many teacher challenges, the 3rd grade teachers asked their students complete this challenge in order to win the Jamie Oliver Award. The students were required to list ways they would start a "food revolution" in their school, based on the popular Jamie Oliver "Food Revolution" program. Unsolicited, three of the twenty-seven challenges mention exercising sixty minutes day. Eight of the challenges have an Eat Smart message, and six of the challenges referenced eating fruits and vegetables and two mentioned drinking water. One of the twenty-seven challenges mentions obesity, which reflects students ability to retain the information presented to students during the 60-Minute Fitwits School program and reinforced by teachers and the public messaging placed throughout the school during the game.



Graph: **Jamie Oliver Award (3rd Grade) developed in April, 3 months after the start of the game.**

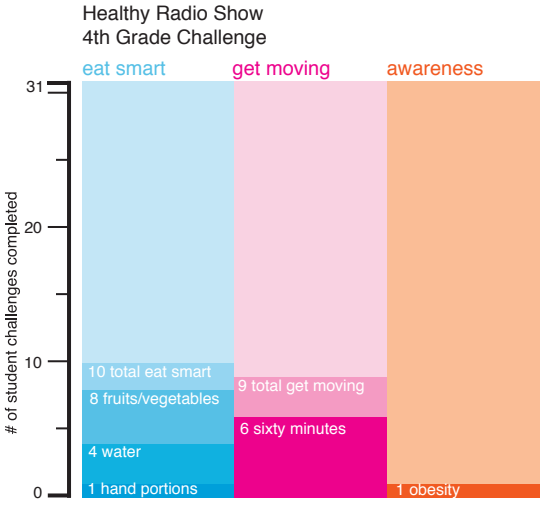
Example. **Sample of** plates designed by 3rd graders, referencing literal hand portions and amounts of food.

During the exercise below, the students were asked to draw a meal on a paper plate. Out of the thirty three plates turned in, thirteen referenced portion size when drawing the meal. In fact, some references to the hand-portion guide were so clear that foods were drawn in the shape of the corresponding hand portion, such as ketchup in the shape of a thumb tip or fries in the shape of three fingers. Twenty-two of the thirty-three plates referenced eating fruits and vegetables. This content was taught to the students during the 60-Minute Fitwits School program, introduced to students the first week of January.



Graph: **Portion Plate, 3rd grades ability to reference content from the 60-Minute Fitwits Program**

This 4th grade challenge designed by the teachers required the students to write a plan for a healthy radio show. All of the thirty-one total challenges referenced spreading the word. Nine of the thirty-one radio shows mentioned specific ways to exercise or be active, and of these nine, six mentioned exercising for sixty minutes a day. Ten of the thirty-one challenges were in the Eat Smart classification. The challenges mention: eight eating fruit and vegetables, one portion, and four drinking water—all core Fitwits concepts.



Graph: **Fourth grade content assessment from radio show**

This challenge required the students to create a Fitwits anthem, again designed by the teachers. Out of the thirty-four total challenges, one focused on the Spread the Word message. Twenty of the activities referenced the Eat Smart category. Out of these twenty activities, fourteen mention fruits and vegetables, six mention drinking water, and five mention hand

portions. Out of the total thirty-four activities mention the importance of exercise, or the Get Moving category. One of the seven named sixty minutes of exercise:

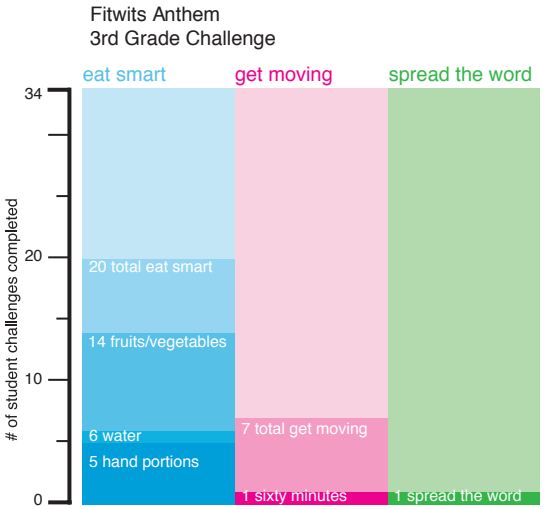
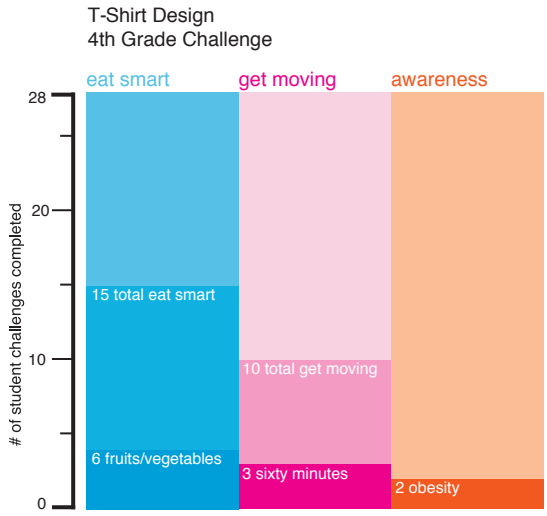


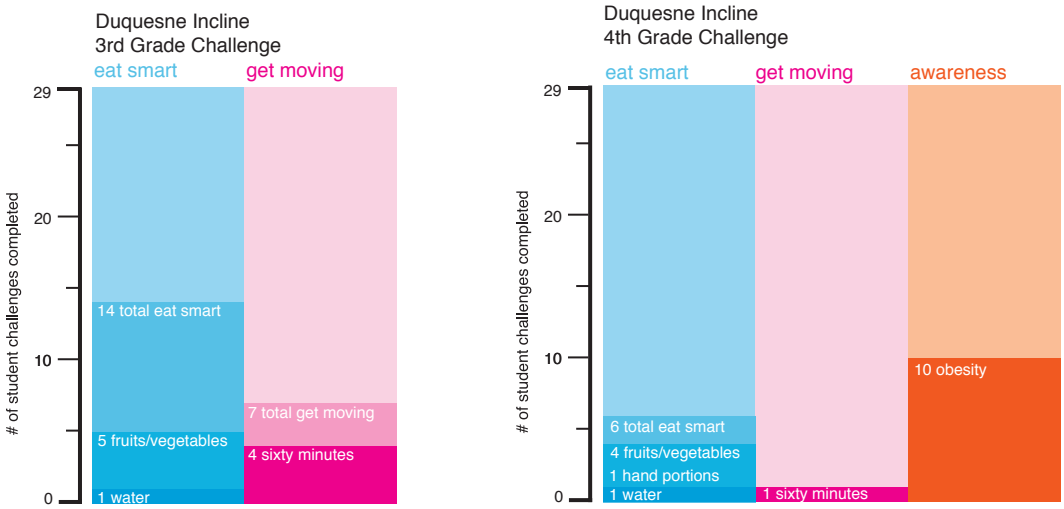
Chart: **Illustrates core Fitwits concepts embedded in anthem.**

In this challenge, teachers asked students to design T-shirts with a healthy message. The overall challenge was classified as Spread the Word, but the individual students shirts could focus of any of the three Fitwits categories. Out of the twenty-eight total t-shirt designs, fifteen mentioned eating healthy, and four of the fifteen focused on eating fruits and vegetables. Of the twenty-eight total shirts, ten mentioned exercise, and three recommended sixty minutes of exercise a day. Obesity was also mentioned twice, along with heart disease:



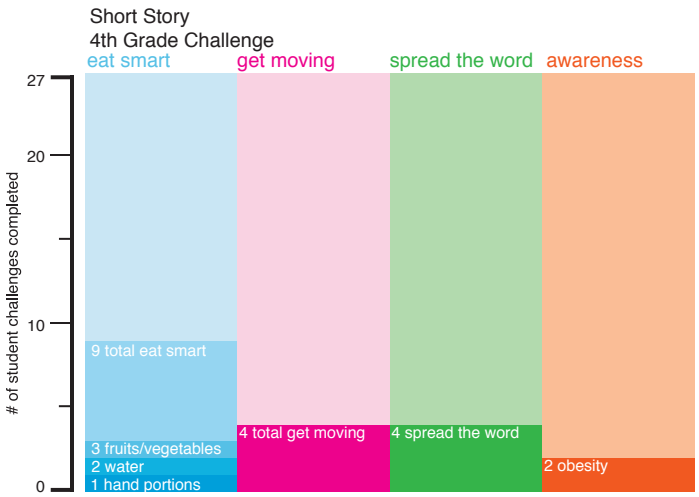
Graph: **Fourth grade content assessment from radio show**

This challenge was repeated in the 3rd and 4th grades, which asked students to create a healthy message to put on the side of the Duquesne Incline. Six of the twenty-nine total challenges have Eat Smart messages. Four of these recommend eating fruits and vegetables, one mentions drinking water, and one mentions portion control. One of the twenty-nine challenges mentions sixty minutes of exercise a day. Ten of the twenty-nine challenges mention obesity, and out of the ten, eight demonstrate an understanding of obesity as a health problem and how to avoid it.



***Graph: Third and* Fourth grade healthy messaging challenge**

For this challenge, the teacher asked the students to write a short story about being healthy. This challenge combined the Fitwits material with the school's writing curriculum. Out of the twenty-five total stories, nine centered on Eating Smart; one story referenced the hand-guide portions, two were about not drinking soda, and three included eating fruits and vegetables. Four of the twenty-five stories have a Get Moving story line. While none of these stories specifically mention sixty minutes of exercise a day, they all take place at school, which may show the importance of the school atmosphere. Four of the twenty-five stories focus on the Spread the Word category and center on sharing healthy lifestyles with friends or family. Two of the twenty-five stories' plots are about overcoming obesity in order to become healthy and both mention eating vegetables.



***Graph:* Fourth short story challenge**

Recommendations

- Co-develop methods and tools for teachers that better integrate health and nutrition education into the existing curriculum that will complement, rather than detract from, performance on standardized testing.
- Develop in collaboration with teachers and health experts content for age appropriateness and alignment to state academic standards
- Design a platform or system for teachers, parents, and students to access the most current information and best practices in relation to health and nutrition information.

Ideas for designing the ideal online environment for Fitwits

One of the biggest challenges designing the I Am Fitwits game was the distribution of the game challenges and rewards. And although our main goal is reach vulnerable communities we have recognized the need to develop a system to enable families to join the Fitwits (Virtual) Zone. This would serve as an on-line community designed to help players measure their success and accountability of their personal/family/community fitness goals. It would also be used as a training tool when running local events in communities.

The Fitwits on-line multi-player gaming community will be a virtual world containing a range of online games, activities and eventually "apps" downloadable. Players can use existing Fitwits/Nitwits avatars or create their own and play in a community with embedded health/life challenges. The Fitwits Virtual Zone will operate with a 'freemium' revenue model, with initial access through free memberships, while paid membership will provide access to additional features (coupons to gyms, group-on discounts, virtual in-game currency, game rewards offering real discounts on healthy purchases, fan club, "safe chat" service, free game apps for smart phone or I-Pad, coupon discounts to be used on Fitwits gear (T-shirts, DIY recipe kits, plush toys, community cooking events) available at local retailers.

Another one of the sub goals for the workshops was to have participants help the Fitwits team better understand the current, popular visual culture and media their family currently engages in. We also learned what children, parents, and educators look for in a multi-modal gaming and application ("apps") environment. Workshop attendees provided a wealth of suggestions for designing the future "virtual" world of Fitwits.

As reiterated previously, participants are looking for a one-stop information portal that provides a place where players can share success stories, offer each other support, highlight player accomplishments, and spotlight child, parent, teacher, or community champions. Similar to the current website, an "app" would allow players to build, print, and color Fitwit and Nitwit characters, play the portion memory game, and answer Fitwits games. Other suggestions included creating your own virtual puppet shows, sing and dance-a-longs, character pop-ups, and hands-on activities for families. The customizable nature of the current *I Am* Fitwits challenges could be further extended in an "App" allowing any (city, town, school, community group) the opportunity to build their own challenge workbook, including their name, friends names, etc. The nature of these applications allows for built-in reminders, words or songs or encouragement and other devices to encourage lifelong healthy behavior changes. Other components such as recipe ideas, healthy eating on a budget, food options, Fitwits-approved meals, and personalized menus may appeal to parents and caregivers while also tracking their child's progress.

Teachers offered the I-X-L Learning Company format as a model for future design, which allows students to choose a grade level and desired skill set for mastery of mathematical concepts that is useful as a teaching tool in the classroom as well as guided practice at home, with comprehensive progress tracking built in. Programs such as Study Island allow teachers the opportunity to customize lessons in direct correlation to grade and state

standards, print worksheets, and give students a chance to practice test-taking. Study Island is available through a school subscription, students are given a unique logon, and the platform supports both web connectivity and mobile applications. Finally, teachers suggested that take-home challenges become part of the grading procedure, in order to achieve a higher return rate (as discussed in the Final Report). Fitwits believes the school needs to share the responsibilities of health and nutrition education with the community at large. To reiterate the importance of creating and maintaining community partnerships, the suggestions of an Fitwits Club Card that would offer discounts and special deals on local attractions and businesses was given unanimous approval by the group as a potential reward or motivator for game players. This suggestion ties all elements of the Fitwits Community Zone together.

In discussing optimal places for impact and incentivizing students, such as physical and digital environments that support cross-generational learning, both in school and out, workshop participants offered many concrete suggestions for future iterations of *I Am* Fitwits. Teachers suggested partnerships with entities that already support teachers and classroom learning, such as Scholastic Books. An example would be to allow parents the option to buy books for the classroom, which provides teachers with "points" that would allow the teacher to purchase additional materials relating to health and nutrition.

Teachers stressed the *I Am* Fitwits program needs to be a complete, comprehensive, full-service program, as teachers regularly pay for a good deal of their own classroom materials out of their own money. Materials should also include supplementary multi-media materials for the school library/media center that students can borrow to enhance their learning of *I Am* Fitwits content. This will also promote cross-curricular collaboration between classroom lessons and information literacy objectives.

Teachers also suggested using a micro-unit model, in which a specific lesson is presented; students pass a test to gauge proficiency, students move up levels, with the expectation of "expert" mastery. This mirrors the intrinsic motivation in gaming that will be discussed in detail below. The importance of utilizing students themselves as "experts" to present *I Am* Fitwits content to peers—in particular younger or at-risk students—should be given primary consideration. The success of peer-to-peer presentation of content was evident during several *I Am* Fitwits events where children explained the portion game to other children in Propel *(see teacher challenge: Design a book you can read to the kindergarten class about Fitwits food portions)*.

Recommendations

- Content should be customizable according to city, community, school, grade level, with ready-made game challenges (lesson plans).
- Collaborative partnerships with entities that support teachers and student learning should be explored.
- Peer-to-peer presentations should be explored as part of the multi-media experience (eg. videos clips, songs, and narrative by children for children).

What are the necessary components of an engaging digital platform?

Workshop participants also outlined different methods for rewarding students who participate in the *I Am* Fitwits game. Many online gaming platforms reward students with virtual points and awards, which sufficiently motivate children to keep playing. In relation to physical prizes, participants offered many suggestions for rewards that may motivate children and their parents, such as passes to local attractions (which can often be donated in-kind to offset program costs) or grocery and gas perks. Teachers, or entire classrooms or grades, could compete for classroom prizes, visits from Fitwits/Nitwit characters, or earn field trips. Another suggestion is to merchandize the Fitwits characters into stuffed toys with a user

code to log in and play games as their characters (similar to the Webkinz™model)

In the discussion, workshop participants defined the devices that students are using to access content, both in-school and at home. Teachers and parents listed the following: Kindle Fires-Droid market, phones, Ipad- Droid or Apple market, Internet, Ipod, laptops, Wii, Kinect, Xbox, Sony PSP (Play Station Portable), and Nintendo DS. By identifying the ways children are utilizing technology, future iterations of the game should take multi-platform functionality into consideration.

During the second workshop, the children of the parent participant were in attendance. Recognizing the opportunity to speak directly to students, the second facilitator initiated an impromptu discussion with the two children (females, ages 11 and 7). Using screen shots from three popular online games and virtual communities for children—Angry Birds, Web-Kinz, and Club Penguin, the children explained the reasoning for what made each respective site popular. It is interesting to note the children immediately recognized each screenshot, although there was a wide variety presented, and in no particular order.

Characterized by vivid colors and infectious up-tempo music, Club Penguin offers levels of membership. Players may join for no cost; however, those who are not paying members are designated by a particular color penguin. A part of the Club Penguin experience is customizing your penguin character; the color designation is immediately obvious to other players and serves as an identifier of lack of status. Also, as much of Club Penguin's functionality is based on a paying-membership model—players that are not able to pay the fee are limited to a very basic online experience.

Club Penguin has announcements and messages embedded into the community—the children stated they typically "ignore and delete" messages and updates from Club Penguin. Periodically, Club Penguin will generate ``Field-Operations (Field Ops)" for players for the purpose of earning points. While this is viewed as "fun" by the children, in order to complete these challenges players must be paying members. Club Penguin is still fairly popular with students under fifth grade.

Webkinz is an interesting model for Fitwits to consider in relation to merchandising and the online community. Based on the purchase of a physical toy character, players receive an access code to the Webkinz site in order to register their character. Webkinz is a bit unusual in that players must continually log in to the community and play, as the access code does expire, and the pet will "die." This necessitates return traffic to the website, and creates a sense of urgency in the young players to, as the children put it, "check constantly." Webkinz users are able to play games within the platform to earn Webkinz dollars, which in turn can be redeemed for virtual merchandise for the care and comfort of the virtual pet.

Angry Birds is generating the most excitement with children (and adults). With multiple variations and the ability to play on multiple platforms (PC, web, mobile phone) Angry Birds is affordable and available. The children love the special effects, the play on words within the game. During the discussion, the children noted they will often do extra research outside of the game (via commercials embedded in the game as well as general web searching) to learn hints and strategies to improve their score. Motivation for playing is related to higher levels of proficiency and scores. In relation to merchandising, the market is saturated with all manner of character apparel for all ages and sizes, plush characters, and other logo items.

Merchandising of the Fitwits characters can greatly contribute to the visibility of the brand, and offer the players both a physical and virtual reminder of the Fitwits game. The platform should be compatible on multiple devices. Designers should consider the relevancy of in-game messaging to players. The ability to customize avatars, and multimedia content should be given primary consideration. Children also respond to "play on words" and

nuanced humor, which meshes well with the Fitwits characters.

To conclude the workshop, all teacher participants reiterated the importance of the Fitwits game, and the residual effect on the Propel McKeesport school culture. All offered support and encouragement in moving the game forward, and reiterated the suggestions for future iterations mentioned earlier.

Bridget Dye—Story of a Parent Champion one year later

During the 2011-2012 school year, Parent Champion Bridget Dye was the primary Parent Champion during the second iteration of the Fitwits game in Propel McKeesport. Using a $2500 grant sponsored by Propel schools, Ms. Dye was the primary facilitator for the second iteration of *I Am* Fitwits at Propel McKeesport. When the design team realized Ms. Dye was highly motivated to continue the *I Am* Fitwits game, she was allotted ten hours per week as part of the Carnegie Mellon grant. It is important to note that Ms. Dye is employed full-time; often working late evening shifts, yet maintains a high level of energy, enthusiasm, and involvement in Propel McKeesport, the school garden, and Fitwits.

During this iteration of the Fitwits game, 210 students in grades Kindergarten-4 participated. Ms. Dye noted there was more impact and excitement in the K-2 grades for the game. At the conclusion of the game, Ms. Dye anecdotally noted there appeared to be more evidence of lasting knowledge with the younger players. As a parent herself, she noted that learning about portion control and the importance of physical activity earlier in a child's development is integral to creating sustained change. "This is the age where they are developing autonomy, trying new things and creating habits" (B. Dye).

The take-home challenges were not specifically Fitwits related—while this drastically reduced the printing costs for the game, it "definitely lessened the Fitwits brand" (B. Dye). Teachers in grades K-4 adapted the core messages of *I Am* Fitwits into their curriculum, implementing the over arching themes into their daily lessons by searching popular lesson planning websites that focus on health education and nutrition. As such, each teacher was able to create age and grade appropriate content, inspired by the previous year's game challenges.

In the 2011-2012 school year, Ms. Dye is still the driving force behind the school garden. By creating and maintaining relationships with local agencies such as the McKeesport YMCA, Ms. Dye has ensured the perpetuity of the project. This resonates with the fundamental Fitwits belief in creating community zones that directly understand the needs, values, attitudes, interests, and expectations of the residents, and work in tandem to create desired outcomes. By approaching area residents, Ms. Dye was able to recruit a registered dietician as well as a zumba instructor for Family Nights. "Most people are willing to give their time and resources. You just have to ask" (B. Dye). Again, this aligns with creating community partnerships for the common good. This also proves that with effort and creativity, the *I Am* Fitwits game can be cost-effective for participants while still offering dynamic content and programming.

Not everything was ideal in the second iteration of the *I Am* Fitwits game. Ms. Dye notes that lack of parental involvement continues to be a barrier, in terms of work schedules as well as the difficulty and expense of obtaining clearances (child-abuse, criminal background). Identifying parent volunteers who are as dedicated as Ms. Dye to the school and community at large is paramount in replicating the success of *I Am* Fitwits at Propel McKeesport and other school communities.

In addition, the use of unhealthy food as a means of rewarding students continues to be an issue in classroom, fund-raising efforts, and school events. Breakfast and lunch offerings in the cafeteria are not ideal in terms of optimal nutrition, which often directly conflicts with the core message of Fitwits. Without the aid of a grant to support the purchase of fresh produce

on a weekly basis, the popular salad bar sat empty.

During the 2011-2012 school year, Propel McKeesport also welcomed a new principal. While he supported the second iteration of Fitwits, the principal was "too new" in his position to help Fitwits flourish on the same level as in the first iteration (B. Dye). As many of the most successful School Power tokens in the first iteration of *I Am* Fitwits was the result of Initiatives from the former principal, the importance of buy-in from the highest levels of administration cannot be stressed enough.

Fitwits Champions—School Nurse one year later

In a discussion with Sharon Young, Propel McKeesport school nurse, the Fitwits team received constructive feedback regarding the second iteration of the game in the 2011-2012 school year. Comparing the initial game to this year, Young noted this year was drastically scaled-down, simpler, and more practical. The Fitwits characters were not utilized in the take-home challenges—while this reduced the printing costs of the game, the Fitwits brand was not as prevalent in the second iteration of the game. Elvis Pretzley did visit the school; students were given character cards and utilized the Fitwits website. Teachers created independent lessons on health and education topics.

For the Fitwit evening events, both a dietician and a zumba instructor graciously donated their time and services to the school. Ms. Young reiterated that people are usually willing to help school programming for little or no cost, if one is willing to invest the time in seeking out potential volunteers. This may be a remedy to overcoming lack of parental involvement. Sadly, the health coordinator position for the Propel School districts has been eliminated for the 2012-2013 school year. What impact this will have on health and nutrition education for Propel students remains unclear.

Differentiated instruction, or adapting content to address intellectual and physical differences in students, has not proven to be difficult at Propel McKeesport for those participating in Fitwits. Only one game player has a physical disability, and Young was confident the student did not at any time felt excluded from the Fitwits game.

Despite the simpler structure of the game, student participation remained static from the previous year. Young did note higher participation and excitement in grades K-2 than grades 3-5. Anecdotally, this points to the flexibility of classrooms that are not preparing for state assessment. During this iteration of the Fitwits game, 210 students in grades Kindergarten through 4th grade participated.

Young also noted that game participation was contingent on the individual teacher and their own priorities in the classroom culture, which may or may not be open to "one more thing on their plate." Young did note that starting the Fitwits game in Kindergarten made a difference, as children are just forming health and nutrition habits. Grades 4 and 5 are "too late."

A recurring suggestion from both Young and the Propel McKeesport teachers was a year-long program that is fully integrated into the daily curriculum of all classrooms. Students need daily physical activity (30 minutes, 5 days a week). As a busy school nurse, Young often sees students only when they are sick or injured, which leaves little time for discussions with students or parents about health or nutrition issues.

Other barriers are the continued decrease in funding, which results in personnel cuts. School staff, according to Young, "does not know what next year will be like." Budget cuts are not endemic to Propel McKeesport. Ms. Young states that it would be nice to keep Fitwits going, but it needs to be "top down" from the highest levels of school administration, to the principal, teachers, and ultimately the classroom.

Students in grades 3-5 who participated were required, as grades, to co-design two school challenges and present them at the elementary school meeting. These allowed the students to plan, present, and actively seek to implement change in their school culture. Moving forward, Fitwits needs to address the role of student advocacy as an agent for sustainable change.

Family nights, held once a month during the game, were better attended during the previous year, possibly because of the cooking demonstrations. Young stated: "People don't realize the problem of childhood obesity. People don't want to be educated. Day to day life is a struggle for students and parents. The key is to find what works for the parents—what gets their attention, works with the reality of their schedules."

During the 2011-2012 school year, the popular salad bar remained empty. While this was an offshoot of the Fitwits game, it is important to follow through with complimentary programs to maintain momentum of health and nutrition education. Without continued support and reinforcement, health education initiatives, no matter how successful initially, will not result in sustained change. She suggested that in the future, Fitwits should try to work one-on-one with at-risk students and their parents. This reaffirms the idea of a personalized health coach component of the Fitwits game.

When asked if the Fitwits program has changed the lives of students at Propel, Young affirmed that it has to some degree, and that "every little bit counts."

References

American Academy of Pediatrics. (2001). Organized sports for children and adolescents. Pediatrics, 107, 1459-1463.

Bauer, K. W., Hearst, M. O., Escoto, K., Berge, J. M., & Neumark-Sztainer, D. (2012). Parental employment and work-family stress: Associations with family food environments. Social Science & Medicine, 75(3), 496-499.

ChooseMyPlate.gov. (2012). United States Department of Agriculture. Retrieved from http://www.choosemyplate.gov/

Cooper, A., & Holmes, L. M. (2006). Lunch lessons: Changing the way we feed our children. (pp. 80-81). New York, NY: HarperCollins Publishers.

Davis, D. S., Sbrocco, T., & Williams, J. (2009). Understanding body image in African American and Caucasian first-graders: a partnership with the YMCA. Progress in Community Health Partnerships: Research, Education, and Action, 3(4), 271.

Galinsky, E. (2011). Mind in the making, the seven essential life skills every child needs. New York, NY: Harper Paperbacks.

Heymann, S. J., & Earle, A. (2000). Low-income parents: How do working conditions affect their opportunity to help school-age children at risk? American Educational Research Journal, 37(4), 833-848.

Kenney, E., Henderson, K., Humphries, D., & Schwartz, M. (2011). Practice-based research to engage teachers and improve nutrition in the preschool setting. Childhood Obesity, 7(6), 475-479.

Kubik, M. Y., Lytle, L. A., & Story, M. (2005). School wide food practices are associated with body mass index in middle school students. Archives of Pediatrics & Adolescent Medicine, 159(12), 1111-14.

McDermott, A. J., & Stephens, M. B. (2010). Cost of eating: Whole foods versus convenience foods in a low-income model. Family Medicine, 42(4), 280-84.

McKenzie, T. L., & Lounsbery, M. A. F. (2009). School physical education: The pill not taken. American Journal of Lifestyle Medicine, 3(3), 219-225.

McLeskey, J., Waldron, N. L., & Redd, L. (2012). A case study of a highly effective, inclusive elementary school. Journal of Special Education, 1-12.

Moag-Stahlberg, A., Howley, N., & Luscri, L. (2008). A national snapshot of local school wellness policies. Journal of School Health, 78(10), 562-568

Pellegrini, A. D., & Bohn, C. M. (2005). The role of recess in children's cognitive performance and school adjustment. Educational Researcher, 34(13), 13-19.

Spruyt, K., Molfese, D. L., & Gozal, D. (2011). Sleep duration, sleep regularity, body weight, and metabolic homeostasis in school-aged children. Pediatrics, 127, e345-352. DOI: 10.1542/peds.2010-0497