Worcester Boys and Girls Club

2018 - 2019 STEM Education Center

IQP

Abstract

For our IQP, our team worked to help the Boys and Girls Club of Worcester meet two goals: 1. help students and families learn aout digital citizenship and internet safety and 2. help students increase their Microsoft Office program skillsets. To meet the first goal, our team developed a series of skits, a narrated PowerPoint presentation for families, and a website of resources to help students and families learn about this topic. To meet the second goal, we created a series of puzzles that teach students how to use Microsoft Word and Excel. All of these deliverables were made with sustainability in mind, in the hopes to let the tools be useful to the Boys and Girls Club for a long period of time.

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The Boys and Girls Club of Worcester

BOYS & GIRLS CLUB
OF WORCESTER

Project Development

When our student group was formed, the project we would tackle was not fully defined. We were made aware that the project would be in the STEM field and that it would be fully defined after meeting with the director of the Worcester Boys and Girls Club of Worcester. Prior to meeting with the director, we formed interview questions so we could better understand the culture and available resources at the Boys & Girls Club of Worcester (Appendix). From her answers we developed an asset map to better visualize what we were working with as seen in Figure 1.
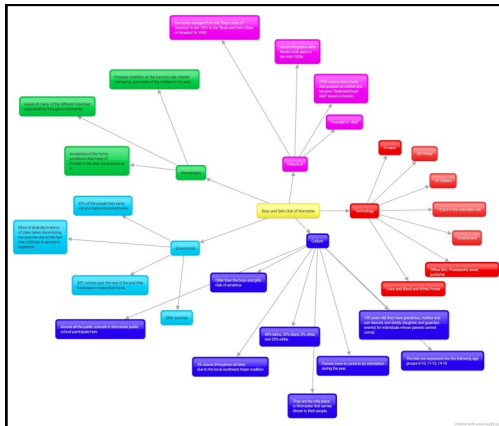

Figure 1: *Asset Map of the Boys and Girls Club (Pfeifer & Stoddard, 2018)*

About the Boys and Girls Club

Quoted from the BGCworcester website "About us" section

"Our Mission is to help youth, especially those who need us most, develop the qualities needed to become responsible citizens and community leaders, through caring professional staff who forge relationships with our youth members and influence their ability to succeed in life.

Our Core Beliefs

- We believe in hope and opportunity for all young people, especially those who need us most.

- We believe in the importance of fun in the lives of children and their right to a happy, joyful childhood.

- We believe in the transformational power of ongoing relationships with caring adults.

- We believe in our kids can BE GREAT, with encouragement and high expectations!

- We believe that service rewards both those who give and those who receive.

We are here for our kids who need us most

80% of our youth are living at or below the poverty line

64% are living in single-parent households

92% are not receiving services elsewhere ("About Us,"2019) "
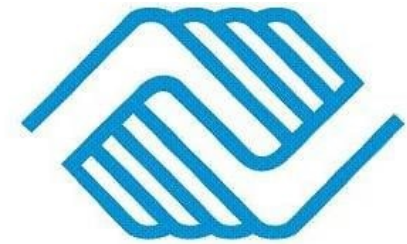
Figure 2: *Boys and Girls Club of Worcester Logo*

The key takeaways the team obtained were:

- Previous WPI IQP's were very successful but unsustainable. The director stated that this was due to the fact that the club mainly relied on an individual/set of individuals that were trained in the IQP deliverables and the fact that non-profits have a high turnover rate. Once the staff that were trained left the Boys and Girls Club, the IQP deliverable would be stopped.

- An area of concern for the Boys and Girls Club is cyber security such as:
  - Positive social media usage
  - Account password security
  - Internet etiquette

- Developing student's skills in Microsoft Office programs is wanted and needed.

Project Goals

After some deliberation, we developed three buckets of focus that the director could choose from: 1) a project fully focused on cyber security, 2) a project focused on hobby/skill development, 3) or a project that had pieces of 1 and 2.

Regardless of the director's choice, we made sure that sustainability would be a major factor in our project so that the project deliverables could be continued even after they were fully handed over to the club.

Through deliberations with the director, we ultimately determined that the project would be most beneficial if it were split into two smaller projects in as described in option 3. One project would be focused on spreading awareness of what digital citizenship is and the dangers involved with it. The other project would focus on improving the students' skills and knowledge in Microsoft Word and Excel.

Cyber Security & Digital Citizenship Research

Through our research we learned that cyber security falls under digital citizenship. The general model for digital citizenship goes over internet safety, etiquette, and accessibility (Wang & Xing, 193). We decided that digital citizenship better captures what we want to explain.

- Higher socioeconomic status (SES) and greater parent involvement tend to have a more positive effect on teens' digital citizenship (Wang & Xing, 2017)

- Teens from lower SES tend to use the internet less (Wang & Xing, 2017)

- Teens from lower SES tend to experience frustration at their parents' lack of experience and/or actions in regards to their internet usage (Wang & Xing, 2017)

- Parents from higher SES tend to do more active mediation of teens' online safety (Wang & Xing, 2017)

- Parental experience/awareness and involvement in teens' digital technology usage has been found to be more effective than parental restriction (Wang & Xing, 2017)

- While kids tend to have a better handle on accessibility (learning new apps/programs/etc.), there is generally a lack of understanding of the consequences their actions online can have (Young, 2014)

- Younger kids especially don't necessarily understand what a "digital footprint" is and that posting private information online can put them at risk (Young, 2014)

- There are some suggestions that parents should be involved with their children at home as that is where a lot of kids spend their time online (Wang & Xing, 2017)
- However, there is a large variance in what educators believe a policy/curriculum implementation should look like (Kim & Choi, 2017)
- Most schools currently just focus on cyber-safety (Kim & Choi, 2017)

Internet Impression

Kaplan Research

There was a survey that was done where 388 admissions officers from across America's top, national, regional, and liberal arts colleges and universities were survey by phone from July 2017 to August 2017. The results of this work were (Kaplan, 2018)

- "More than two-thirds of colleges (68-percent) say that it's fair game for them to visit applicant's social media profiles like Facebook, Instagram, and Twitter."

- "Admissions officers who say it's 'fair game' reasoning:
  - Employers do it all the time so college should be able to do it as well.
  - If the things are publicly accessible without undue intrusion, it's OK. If it's searchable, it is fair game."

- "Out of 68% that are okay with the practice at looking at student profiles; only 29% have actually done it."

- "Yariv Apher, executive director of research for the Kaplan Test prep noted that some of the decline can likely be attributed to changing social media habits."

- "Teens are migrating from Facebook to other social media platforms."

- "Students are harder to find on social media."

- "Your test scores, GPA, letter of recommendation, and other personal statements still overwhelmingly decide a applicants path."

Password Management

Password management is how an individual organizes and maintains their passwords for their online accounts. There are a variety of methods that people use to maintain passwords such as memory, paper or online services. Also people may have a number of passwords or only a few.

- "When people reuse their passwords across multiple platforms they increase their vulnerability; compromising one password can help an attacker take over several accounts." (Gaw & Felten, 2006, 44).

Reason	Frequency
Easier to remember	35
Have Too Many Accounts	8
Same Category/Class of Websites	7
Unimportant website	4
Too Difficult Otherwise	3
Only Use One Password	2
Other	3

Figure 3: *Reasons Cited for Using the Same Password. Multiple responses allowed. (Gaw & Felten, 49)*

Reason	Frequency
Didn't know the account password	46
Didn't know the account username	42
Discovered didn't have an account	15
Needed multiple attempts	6
Didn't know the account number	6
Needed the registered e-mail address	4
Entered with typographical error	3
Couldn't access browser stored password	2
Other	6

Figure 4: *Reasons Cited for Failed Logins. Multiple responses allowed. (Gaw & Felton, 47)*

- In this study, 49 Undergraduate students quantified the amount of passwords they possessed and the amount of times that the passwords were reused. (Gaw & Felten, 2006, 46)

- Most users had 3 or fewer passwords and most passwords were reused twice. (Gaw & Felten, 2006, 46)

- "Password reuse rates increased because people accumulated more accounts but did not create new passwords (Gaw & Felten, 2006, 47)."

- "Users viewed the most capable attackers to be humans; in particular humans who were close to them (Gaw & Felten, 2006, 46)."

- "They did not separate the human attackers from their potentially automated tools. (Gaw & Felten, 2006, 46)."

- "They sometimes failed to realize that personalized passwords such as a phone numbers can be cracked given a large enough dictionary and enough tries (Gaw & Felten, 2006, 44)."

- "Of the 56 responses, 51.79% of 56 responses viewed friends as the ones that were most likely to attack. When looking at the ability rankings (Gaw & Felten, 2006, 51)".

- "35.19% thought that an unaffiliated stranger would be the least likely to hack into their passwords (Gaw & Felten, 2006, 51)".

- "In the motivation ranking, 62.5% indicated that a competitor or hacker was the most motivated to attack and that a friend or acquaintance without technical experience would be the least motivated (Gaw & Felten, 2006, 51)."

- One respondent said "Anyone who wants to [compromise a password] can, you don't need to know them, and the shield of anonymity may make it less morally reprehensible to do so (Gaw & Felten, 2006, 51)."

For the cyber security project we wanted to deal with parent involvement/awareness of digital citizenship, showing teens some consequences of their actions online, and to make sure that the project would be sustainable for future use. We decided on developing:

- An in-depth resource page about digital citizenship on the Boys and Girls club website

- A set of short skits dealing with online actions and consequences

- A narrated PowerPoint that can be added to the club's parent orientation
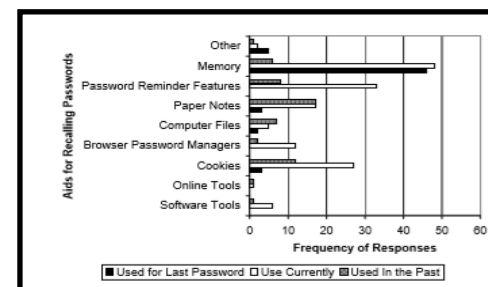

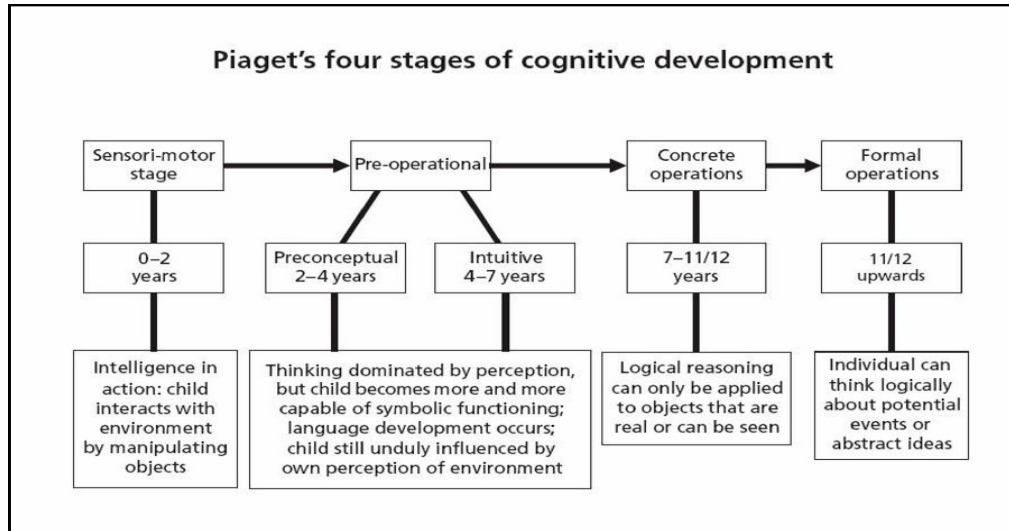**Figure 5:** *Aids Used to Help Recall Passwords (Gaw & Felton, 50)*

Figure 6: *Piaget's Four Stages of Cognitive Development ("Developmental Stages, 2011")*

Developmental Research

Psychological Development

Since the Boys and Girls Club serves a wide range of ages, we wanted to make sure that our project could relate to as many students as possible. We decided that the ages of 11 and upwards would be our audience focus. The reason we decided on this range of ages is because at this stage of cognitive development they "can think logically about potential events or abstract ideas (Developmental Stages, 2011)" as stated on the right side of Figure 5.

In the skits we developed, a few have hypothetical situations that they could see happening to themselves. Below the ages of 11 to 12 years old, the lessons may pass by them due to the hypothetical and abstract nature of the content. In addition to this, some of the topics discussed, like social impression, is less relevant to the students that are under 11 years old. Technically speaking, many websites and social media "require" the user to be at least 13 years old or to have a guardian with them.

Attention Span

In the modern age maintaining an audience's attention can be difficult. A study from Treepodia showed that over half of your audience stop paying attention after only one minute ("60 seconds more, 2010"). We wanted the students to actually get something from our skits and not leave them in a daze from long drawn out performances. We tailored our video to have multiples skits that were under a minute so we could refocus the audience's attention in between scenes.
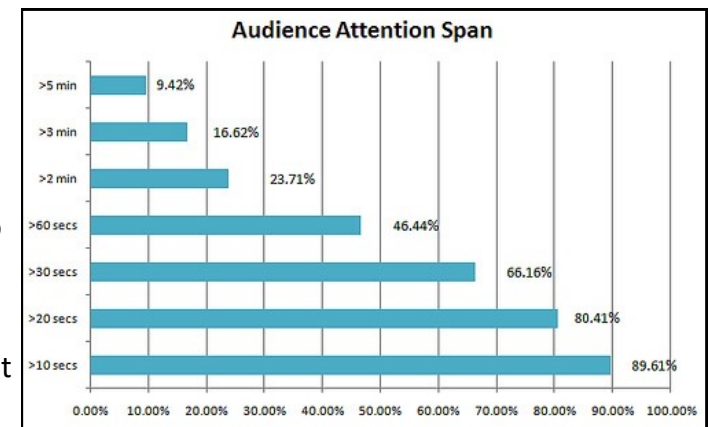

Figure 7: *Graph of Percentage of Audience Paying Attention to an Online Video ("60 seconds more, 2010")*

Deliverables

Skits

Instead of a plain and dry lecture on digital citizenship, we opted to create skits comprised of examples of real world dangers involving the internet and talks similar to "TED Talks" that are light hearted in nature but still covers the seriousness of digital citizenship. The skits contain the following:

Figure 8: *Image taken from video deliverable*

- Skit 1) This skit starts with a teen posting a public photo on Facebook of a park they went to and then a stranger starting a conversation with them. Through the conversation the stranger gets the teen to agree to a 1 on 1 game of basketball at the park the next day. In the second part of the skit, we have what the conversation would look like in real life. The conversation is the same and with the same teen but the stranger is now our labelled "creepy mustache guy." The point of this skit is to showcase that a stranger behind a computer may not be what someone expects.
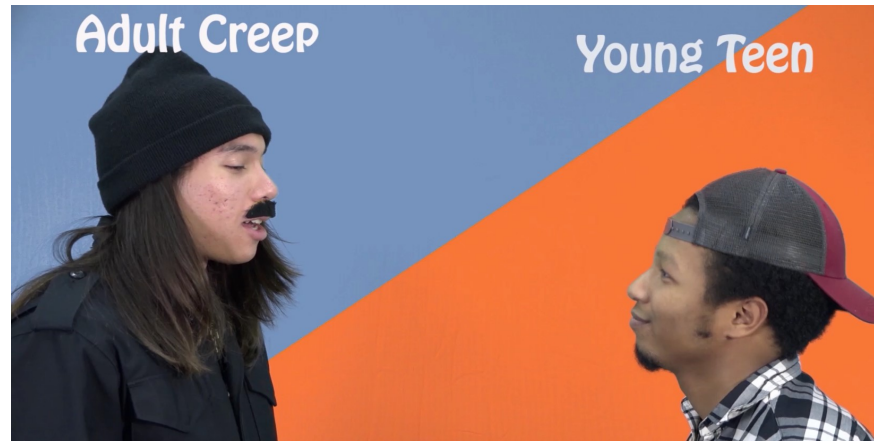
- Josh Talks 1) Following the first skit is a "Josh Talks" reiterating the idea of being careful of who you talk to online. Josh goes on to say that one should not put personal information on social media and explains that it makes them an easy target for people that have bad intentions. He finishes his part by going over some precautions that people should take.

- Skit 2) This skit contains an example of what a phishing attempt may look like. The result of the phishing attempt is the hacker getting into a person's email and stealing a package that arrived at the victim's house. At the end we explain this example is based off a real life event that happened to one of the project members.

- Skit 3) This skit has two friends having a friendly conversation then one individual seeing a comment on YouTube and aggressively antagonizing the commenter. Unknowingly to the aggressive individual it is shown that it his friend across from him that is the commenter. At the end of the skit the friends reveals himself as the commenter. This revelation shows the viewer that, like real life, people should try to be civil even in arguments.

- Josh Talks 2) Josh Talk goes over online impression management. He explains how one's image can be skewed by what you post and explaining how supposedly private info can easily become public info.

These videos can be reused by the club to teach the students about cyber security, however, we also recommended that the Boys and Girls Club have their drama club create additional skits. This allows the students of the drama club to create something of their own and also improves the sustainability of the skits.

Parent PowerPoint

The parent PowerPoint is an overview of what digital citizenship is, what the students will be doing with our project, and making them aware of the resource page. This PowerPoint is narrated so that no one has to be trained to explain the PowerPoint. For the club, the PowerPoint has speaker notes for them to see the details of what is being narrated.
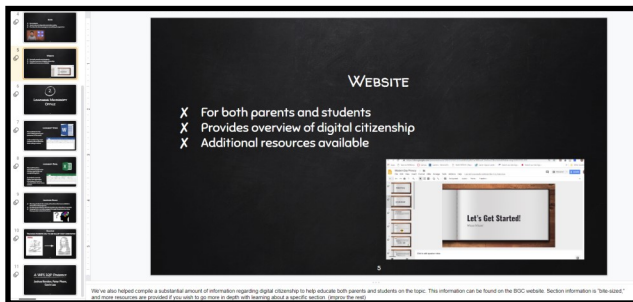
Figure 9: *Parent PowerPoint made for the*

Boys and Girls Club

The purpose of this PowerPoint is to spread awareness about digital citizenship the parents and guardians of the Boys and Girls Club. By providing awareness of the digital citizenship it can lead to them having greater involvement in their children's digital citizenship.

Microsoft Office

To develop the students' Microsoft Office skills, we wanted to create something that would be engaging for the students and also be sustainable. The idea we came up with was to create puzzles within Word and Excel that use their functions to solve the problems. Our goal in doing this is to replace traditional learning methods with a recreational activity.

Microsoft Office Research Compilation

Looking through an assortment of websites (listed in the bibliography) that had listings of functions and functions definitions, we compiled our own list of functions for Word and Excel that we thought were useful for the students. With those functions we created a functions overview sheet akin to a manual. In this sheet, each function is given a definition, an example, their respective shortcut keys, and location of the function on the toolbar.

Figure 10: *Microsoft Word Functions Sheet Table of Contents*

On the first page of the Word and Excel sheets are a Table of Contents that students can use to jump to any specific function that they are unfamiliar with. This can also be helpful to Boys and Girls Club staff and parents.

Alongside these manuals we also created a shortcut reference sheet that is a single page in length. These shortcuts sheets are used as a quick reference by the students that know the functions but want to remember what the shortcut keys are for them.

Puzzles

During one of our groups' brainstorming sessions to figure out an engaging way to teach Microsoft Office, we were inspired to make puzzles our medium for teaching. Puzzles are an engaging way for the users to use their brain without necessarily being drained by a lesson.
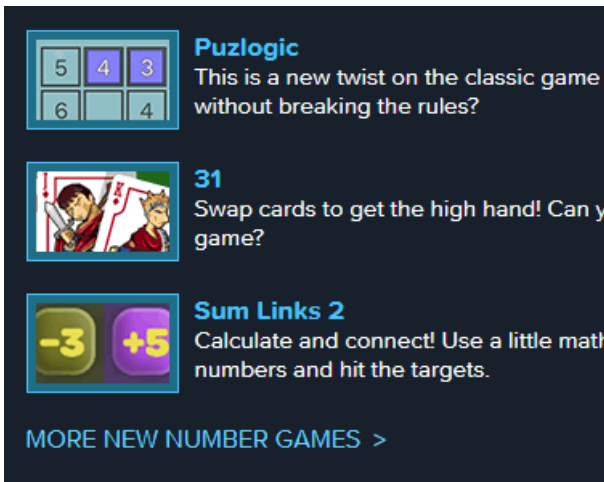

Figure 11: *Math Puzzles Games from coolmathgames.com*

Similar to lesson puzzle games such as www.coolmathgames.com, we wanted to make our puzzles something students can enjoy in their free time. Anecdotally, our group had fond memories of this style of learning in the classroom. For each puzzle we made there are

instructions defining the problem, the puzzle itself, and a blank page made to be a buffer for the hints on the final page.

For each puzzle there is a solutions manual version for the instructors that reveals the final solution and gives instruction step by step to solve the puzzle.

Microsoft Word Puzzles

Puzzle 1 goal: To get the student to use the find function and to use the various text formatting options.

Puzzle 2 goal: To get the student to use left and right indentations on bullet points to fix a picture.

Puzzle 3 goal: To fix the text formatting of a professional letter.

Puzzle 4 goal: To get the student to use left and right indentations on bullet points to fix a picture. This is same type of puzzle as puzzle 2 but we believe it is worth doing again since paper indentation is a very useful skill that is not often showed.
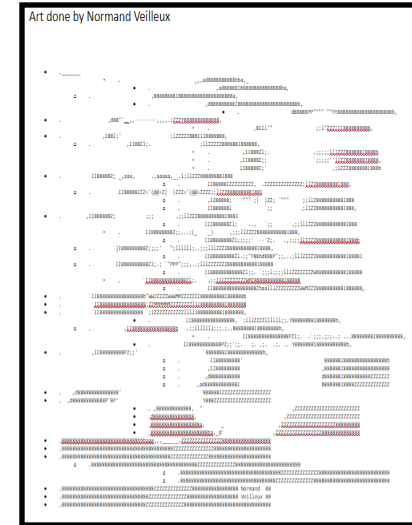

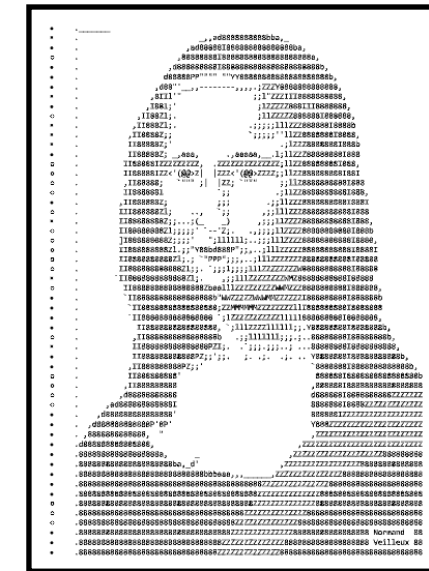**Figure 12:** *Puzzle 2 Before Being Solved*

Figure 13: *Puzzle 2 Solved*

Puzzle 5 goal: To get students to use and be aware of headers, footers, and page numbers. Also getting the student to create a table and to make them look through the manual.

Microsoft Excel Puzzles

Puzzle 1 goal: To get the student to use the find function and make them aware of column lettering and row numbering.

Puzzle 2 goal: To get students to use the functions that highlight cells that are referenced by each other.

Puzzle 3 goal: To get students to use row/cell color changing and text color changing.

Measuring Impact

To gauge the impact of our deliverables we created a survey for the students to take. A sample of five students were given surveys asking their understanding of digital citizenship and Microsoft Office programs. Afterward the students were shown the digital citizenship skit compilation and the process of how to solve the Microsoft Office puzzles. Optimally the students would have been able to attempt the puzzles themselves but at the time of surveying the computer lab was not available for them. After being shown the skit and puzzles the students were given another survey asking for their opinions of the skits/puzzles and asked again for their understanding of digital citizenship and Microsoft Office.

Overall, the students enjoyed the skits and had an overall increase in understanding of what digital citizenship is. Four students initially answered having little to no understanding of digital citizenship then answered having good to excellent understanding of digital citizenship. For the Microsoft Office programs, the students on average enjoyed the puzzles. The changes in the students understanding of Microsoft Office programs were mixed. Three students answered that they had an increased understanding of the Microsoft Office programs after being shown the puzzles as expected. However there were two students that answered saying their understanding decreased. This can possibly be attributed to an overestimation of their previous assumed understanding of Microsoft Office but requires further study.

That said, it should be noted that the surveys are limiting in that we only had five students in our sample size. A larger sample size may yield different results.

Resource Page

The resource page will be a place for parents that have further interest in cyber security to learn about the facts, laws, and history associated with it. Added to the BGC website, the resource page has pulled information and research from many different reputable studies and websites, some of which are linked on the resource page itself. Parents will be able to get a broad understanding of the various aspects of digital citizenship and cyber security by visiting the resource page. If they so choose, they can follow any of the links provided to get a more detailed overview of the topic of their choosing.
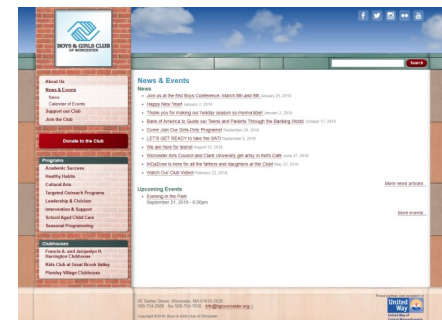

Figure 14: *Boys and Girls Club Website Page Taken from https://www.bgcworcester.org/news-events*

Conclusions and Recommendations

Our small pilot research we did on the impact our skits and puzzles had on student learning showed that our project was received positively by the students of the Boys and Girls Club. Both the students' understanding and awareness of the topics in digital citizenship and Microsoft Office programs were shown to be slightly broadened. Based on the five students who we showed the video to, we have high hopes that our approach to increasing student and faculty understanding of digital citizenship and Microsoft Office will be effective. To truly understand the work's impact, we recommend the following: Implement a larger pilot study of the project with proper implementation of the Microsoft Office puzzles. Review the impact of the project after the pilot is finished and if it is shown to be effective, fully implement the project:

1. Implement a larger pilot study of the project with proper implementation of the Microsoft Office puzzles. Review the impact of the project after the pilot is finished and if it is shown to be effective, fully implement the project

2. Show parents the developed parent Power   Point and survey them on their understanding of digital citizenship. If results are shown to be impactful implement the PowerPoint into their yearly orientation

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