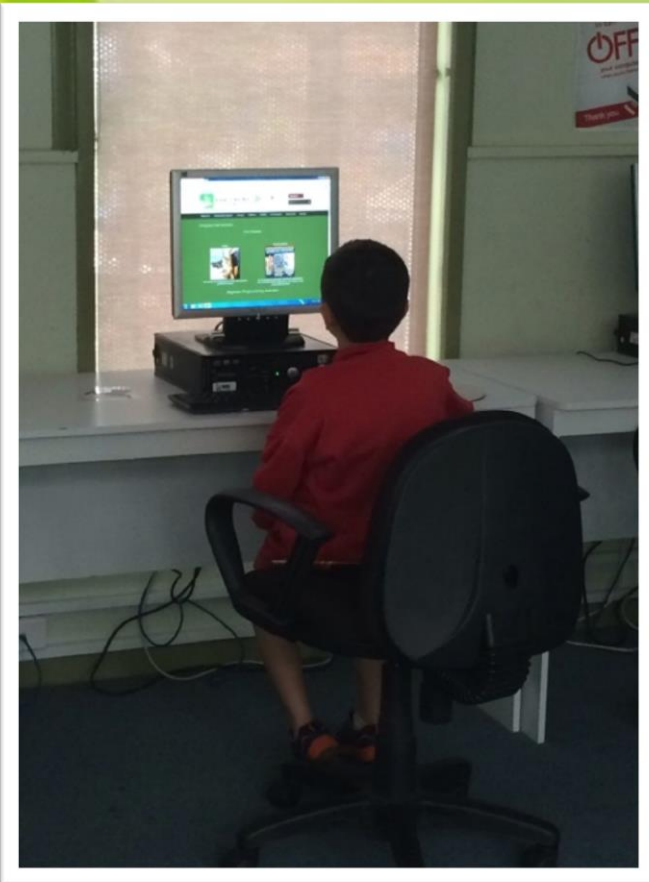




Banksia Gardens
Community Services



Creating Engaging Computer Programs for Children in an After-School Computer Club



A project by:

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15 December 2015



WPI



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Creating Engaging Computer Programs for Children in an After-School Computer Club

Melbourne, Australia Project Center

An Interactive Qualifying Project Submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
Degree of Bachelor of Science by

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Abstract

Banksia Gardens Community Centre is located in Broadmeadows, the most disadvantaged suburb of Victoria, Australia. Disadvantaged communities are at a great risk of lagging behind as the world incorporates more computer-based resources into daily life and the workforce. The goal of our project was to motivate and enable the children at the center to pursue worthwhile uses of technology by providing an engaging way to learn computer science concepts in their after-school club. We also performed a technological needs assessment with solutions to improve the center's services. From our achievements and the center's continued effort to further computer science and technology, the residents of Broadmeadows now have a place to learn technological skills that are necessary in the modern world.

Acknowledgments

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Executive Summary

Background

By 2018, STEM (science, technology, engineering, and mathematics) jobs are expected to increase by 17 percent and nearly half of these involve computer science (Langdon et al., 2011). The Broadmeadows community, a suburb of Melbourne, in Victoria, Australia is one that faces many challenges. It is considered one of the most underprivileged areas in the state of Victoria according to an index of socioeconomic disadvantage created by the Socio-Economic Indexes for Areas (SEIFA), which takes into account factors such as income, employment, and education (*Banksia Gardens Community Connections*, 2013). Although the world is becoming more reliant on the use of technology, computer science is not generally taught in primary or even secondary schools. This is especially true in underprivileged communities that have limited access to certain technology. Banksia Gardens Community Centre in Broadmeadows has noticed that fields such as computer science are lacking the proper attention, and has taken the initiative to familiarize the community with this important aspect of a modern education.

Methodology

The goal of our project was to motivate and enable the children at Banksia Gardens Community Centre, a charitable not-for-profit community services organization, to pursue worthwhile uses of the technology around them by providing an engaging way to learn useful computer science concepts in their after-school club. To do this we provided engaging computer science modules to be used as lesson plans in the after-school computer club. We also found that there were many opportunities to improve the staff's day-to-day operations by integrating technology into the programs they run as well as daily tasks. Our goal was achieved through the following objectives:

1. Determine how much experience the Banksia Gardens Community Centre staff have in computer science and how they currently utilize technology.
2. Explore opportunities to integrate new technological resources into the organization.
3. Gauge the level of interest and experience that the computer club participants currently have in computer science.
4. Determine which characteristics of a computer lesson or activity the computer club participants find enjoyable.

To begin integrating new technology to the center, we conducted semi-structured interviews with key staff members to determine their experience in computer science and how

they currently utilized the technology available to them. We then researched technological resources that could potentially fulfill their needs. Finally, these resources were presented as potential solutions for the staff and provided to them with instruction.

Shifting our attention to the after-school computer club, we began by observing several sessions to gain an understanding of the children who attend the club, the types of activities they were interested in, and the events that transpired in a typical session. Next we conducted unstructured interviews with the children to gauge their knowledge of computer science and their particular interests regarding the subject. After an initial understanding of the children's interests and competency with computers, we compiled pre-existing online resources intended to further inspire and educate the children about computer science. We presented these modules during the after-school computer club and recorded our observations and the varying success of different activities. These observations as well as feedback we received during a test group aided us in selecting the most effective resources that we finally turned into modules of a lesson plan to be delivered by the facilitator of the club.

Findings: The Staff

Banksia Gardens staff has the potential to improve the efficiency with which they use technology. Technology is continuously evolving at a rate that makes it challenging for an organization to keep up-to-date. Adding to the complexity, having a process that works is often preferable to spending time searching for more efficient processes. Even knowing that alternatives exist, it is difficult for them to find time to pursue them when the primary objective of their job is to work on building relationships and community amongst people. We were able to gain a comprehensive understanding of what each staff member does, pinpoint what duties could be enhanced through the use of available technology, and direct them to the appropriate resources to meet their needs.

Findings: After-School Computer Club

The computer club has the potential to be developed into an effective tool of teaching children computer science. Through observation we noted that the club had neither a rigid structure nor regular attendance from participants. We found that instructional activities or videos were occasionally given at the start of a session, but otherwise the participants treated this time as an opportunity to have access to computers for their own recreational pursuits.

The children currently attending the programs come from difficult backgrounds and are a challenging group to teach. We quickly discovered from speaking with the staff as well as from

interacting with the children themselves that these children have difficult home lives and express a range of behavioral challenges, making focused computer work particularly challenging. Attempting to engage the children with unfamiliar activities proved difficult and they needed significant personal attention from the computer club facilitator in order to stay on task.

Educational websites that can teach programming concepts exist on the Internet and can be accessed during the after-school computer club. Our research led us to a multitude of resources designed to teach computer science in a simple and engaging way. This meant it was not necessary to come up with our own resources, but rather evaluate the existing options, select the ones best suited, and synthesize instructional information for each one to be effectively incorporated into the computer club.

Deliverables and Recommendations: The Staff

After interviewing the staff, we took the opportunity to provide them with technological resources and suggestions that would benefit their specific tasks and programs. Through the assistance of a local computer science professional we arranged for a new comprehensive database to be created that will allow the staff to take attendance and generate customized reports without needlessly entering the information in multiple places. We also made recommendations on how they could improve the efficiency with which they use technology. This includes making improvements to the Banksia Gardens website such as making it mobile friendly, including a calendar of events and posting photos from the events.

Deliverables and Recommendations: After-School Computer Club

In order to mitigate the difficulty of keeping the attention of the students while they are using computers, we installed classroom monitoring software called iTALC. This program will help facilitators gain the attention and focus of the students more easily than before by providing control over student computers. We also compiled web resources, designed to teach computer science, into a user-friendly webpage available on the Banksia Gardens website and set it to the homepage on all of the computers. This will make all of the resources easily accessible to the students. Not only did we make the resources easier to access, but we also created manuals for the computer club facilitator to make implementing the resources easier and more effective. These help the facilitator match resources to the student's age, skill and interest in computer science.

The main recommendation that we made is that the center should create a club solely dedicated to teaching students computer science. This will give the teacher a more enthusiastic audience and the opportunity to cater the program to the students interested in expanding their computer science skills without being distracted by open computer lab recreational users. This new course could also develop into a program that teaches more advanced and exciting topics such as game design, robotics and web development.

Conclusions

Overall we found that an increase in the presence of technology throughout the Banksia Gardens Community Centre could have a great long term impact on the organization. Our efforts to integrate technology into the programs and daily operations of the organization and introduce computer science to children in the after-school computer club are an initiative for a larger presence of technology at the community center. From the achievements of our project as well as the center's sustained effort towards furthering the education of computer science and technology, the residents of Broadmeadows now have a place to learn technological skills that pertain to the technology that is becoming more prevalent in the modern world.

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Chapter 1: Introduction

Disadvantaged communities are at a great risk of lagging behind as the world progresses towards incorporating more computer based resources into daily life and the workforce.

Although the world is becoming more reliant on the use of technology, computer science is not generally taught to students in primary or even secondary schools. This is especially true in disadvantaged communities that have limited access to digital resources. Combining this with the fact that many residents of such communities do not pursue higher levels of education due to their lack of interest or economic restrictions, residents are unable to take advantage of the significant growth in computer science and related career fields (Langdon et al., 2011). As a result, a cycle is created where adult residents have even more difficulty establishing successful careers that allow them to support their families. The cycle continues because their children then face obstacles in pursuing the necessary education to obtain stable employment.

The Broadmeadows community is a suburb of Melbourne, in Victoria, Australia, that is considered to be severely disadvantaged when compared to the surrounding areas. Only 8.7 percent of the population reports being enrolled in or receiving a diploma from a university or tertiary institute (Statistics, 2014). Furthermore, a large portion of the Broadmeadows population is comprised of immigrants. According to the Australian Bureau of Statistics, these immigrant groups may only have restricted access to educational tools, such as computers, and are less likely to be interested in science, technology, engineering and mathematics (STEM) fields (2009). Without having basic knowledge in these fields, children will have difficulty finding related work, when compared to students that have been exposed to this type of education.

Banksia Gardens Community Services is an organization located on the Banksia Gardens housing estate in Broadmeadows that is dedicated to improving the quality of life for the members of the community and responding to community needs (Banksia Gardens Community Services, 2012). It currently provides many services to assist the community, such as after-school study groups for both students who are struggling and those who are intending to excel beyond the level of the school curriculum offered. It also offers training courses for adults in areas such as childcare, English as an additional language, and food handling. This is all done with the

intent of providing people with more opportunities (*Banksia Gardens Community Connections*, 2013).

One program available at Banksia Gardens that has great promise, yet is currently underdeveloped is the after-school computer club. With the increasing presence of computer science in many jobs, an effective and early computer science education could yield potentially significant benefits for the community. Banksia Gardens Community Centre has asked us to help in developing such a course.

The goal of our project was to motivate and enable the children at Banksia Gardens Community Centre, a charitable not-for-profit community services organization, to pursue worthwhile uses of the technology around them by providing an engaging way to learn useful computer science concepts in their after-school club. To do this we provided engaging computer science modules to be used as lesson plans in the after-school computer club. We also found that there were many opportunities to improve the staff's day-to-day operations by integrating technology into the programs they run as well as daily tasks. We discovered that by providing the staff with the appropriate tools we would also be assisting them in establishing a solid foundation from which they could expand their organization toward greater success.

In Chapter 2 of this proposal, we discuss background information relevant to the importance of computer science, the Broadmeadows community, and Banksia Gardens Community Centre in greater depth. In Chapter 3, we identify and explain the objectives that helped us achieve our overall goal for this project, and the specific methods we used to complete the objectives. In Chapter 4, we introduce our findings and share our recommendations and deliverables for both the staff and the after-school computer club.

Chapter 2: Background

2.1 Importance of Computer Literacy

Futuristic representations of the world popularized in 1980s and 1990s films such as "Back to the Future" and "Blade Runner" depicted scenes with flying cars, advanced computers, digital billboards and much more. While these films may not have gotten all the details correct, there is one commonality that remains irrefutable; in the modern world, computers and technology are ubiquitous in daily life. Most everyone carries around a smartphone or tablet, owns a personal computer, and passes by digital billboards and other advertisements throughout their day.

With various forms of computers all around us, computer literacy is becoming increasingly important in the modern world. Computer literacy is a term that indicates some level of proficiency in a wide skillset from the most rudimentary computer usage such as creating a word document and browsing the Internet all the way to more advanced computer programming and problem solving (US Congress of Technology Assessment, 1984). The increased presence of technology is tethered to an increase in computer science employment opportunities. By 2018, STEM (science, technology, engineering, and mathematics) jobs are expected to increase by 17 percent and nearly half of these involve computer science (Langdon et al., 2011). This is promising news for those pursuing an education in computer science; however, even the average person benefits greatly from some level of computer education.

Being computer literate is not just important to accomplish computer specific tasks; it is essential when looking for ways to utilize computers and technology in all areas. Basic computer skills are foundational to most professions. There is a consensus by those who are well versed in computer programming and its applications that "all industries have been impacted by technology, and the logic and problem-solving skills learned in computer science are applicable to all majors and occupations" (Huneycutt, 2014). Not only is knowledge of computer science important because the need to interact with computers is present in almost all professions, but also because the problem-solving strategies fostered by a computer science education can be generalized and used in many other subjects where critical thinking is valued.

Companies outside of the computer science realm are demonstrating the usefulness of computers in modern society by deploying computer technology and receiving promising results. One example is that in a manufacturing setting, "plant productivity is higher in

businesses with more-educated workers or greater computer usage by non-managerial employees” (Black, 2001). Some other tools that are very prevalent are the use of social media for advertisement. Businesses are taking advantage of an abundance of options to reach their clients by computer. Websites, social media, email, and instant messenger are just a few of the things that have become commonplace in today’s society. Applied correctly, these methods help a company improve its communication with clients and business partners by making information immediately available across several platforms (Scott, 2012). More and more places are following the trend of increasing the presence of technology in the workplace and in order to do so they are placing a high demand on employees with computer skills.

Employers will be looking for candidates who have some level of computer literacy to contribute to their organizations. As information technology becomes even more integrated into the workplace, the necessity for computer literate employees will serve to put those without sufficient computer skills at a noticeable disadvantage in the hiring pool (Lawson, 2000). Many employers are already demanding certain skills such as "desktop publishing, spreadsheets, database, knowledge of information systems, and interest in the new technologies" for administrative positions (Lawson, 2000). Furthermore, a study by Alan Krueger in as far back as 1993 "found that workers who worked with computers were paid approximately 15 percent more than similar workers who did not work with computers" (Black, 2001). That is a trend that has continued on to the present and the level of computer skills expected now is much greater than that of 1993. As a result, communities with substandard computer literacy rates will find that their members are greatly disadvantaged in the job market: a situation that can have substantial negative effects trickle down throughout the community.

2.2 The Broadmeadows Community

The Broadmeadows community, a suburb of Melbourne, is one that faces many challenges. In an index of socioeconomic disadvantage, created by SEIFA through taking into account income, employment and education, Broadmeadows is considered one of the most underprivileged areas in the state of Victoria. The Banksia Gardens Housing Estate is a public housing estate and the only residential district in Broadmeadows. It also ranks among the worst housing estates in Melbourne in terms of poverty, unemployment, illness, and poor educational outcomes. However, the staff at Banksia Gardens Community Centre notes the ingenuity, diversity, and potential of the community (*Banksia Gardens Community Connections*,

2013). These positive qualities are shrouded by a myriad of dim statistics that do not do the community justice in terms of its potential to improve. Making a change for the better has to begin with the Banksia Gardens Estate because it is the heart of the community (*Banksia Gardens Community Connections*, 2013). In order to allow for positive change, the community of Banksia Estate needs an avenue to remedy some of the pre-existing conditions that are impeding the success of the community. Some of these conditions are derived from the fact that the neighborhood is generally considered unsafe, has a large immigrant population, low education retention, and a high unemployment rate.

Banksia Gardens Estate is considered dangerous enough that parents do not want their children playing outside, for fear of their safety. “Outreach workers had been ordered to stay away from the estate by their organisations” for the same reason (*Banksia Gardens Community Connections*, 2013). During the 1980's, “the Banksia Gardens estate became known as the ‘Bronx’ due to vandalism, violence and drugs in the area” (*Services*, 2013). Such an environment does not do well to foster a community.

While there is a significant population of foreigners living throughout Melbourne, the immigrant population in Broadmeadows is notably even higher than the rest of the city. Over 50 percent of residents have been born overseas and many speak a language other than English at home (*Broadmeadows*, 2014). Adapting to a new culture and language makes it difficult for parents to find a steady job to support their family. A series of case studies by Leuner have found that some foreign workers, even with applicable education and qualifications, have been required to go back to school or take a lesser job due to the language and cultural barriers they face (Leuner, 2007). These case studies also show that highly intelligent and trained professionals face extreme obstacles when trying to integrate themselves into a new community. This research could explain how the high unemployment rate of Broadmeadows could be attributed to the additional challenges that the residents face as immigrants.

The hardship of being accepted into a new society can make it difficult for children to have a good, stable home life. To make matters worse, 70 percent of these families have single parents as the sole source of income for the household (*Banksia Gardens Community Connections*, 2013). Taking all of this into consideration, it is evident why the families living in Banksia Estate face some serious challenges.

Broadmeadows also struggles with education retention in general. Only 8.7 percent of the population has a diploma or is currently enrolled in a University or a Tertiary Institute, compared to the rest of the State of Victoria, which reports over 15 percent (Statistics, 2014). Broadmeadows not only struggles with low numbers of University enrollment, but also with primary and secondary school attendance. Less than two thirds of residents between the ages of 15 and 19 are studying full-time (Statistics, 2014). From the graphs below, it is evident that Banksia Gardens Estate is well behind not only Melbourne, but also the rest of Broadmeadows. Many families in Broadmeadows struggle to find work for either parent (Census 2013). The estate has almost double the unemployment rate of Broadmeadows and only half as many residents with a university diploma or higher (*Banksia Gardens Community Connections*, 2013)

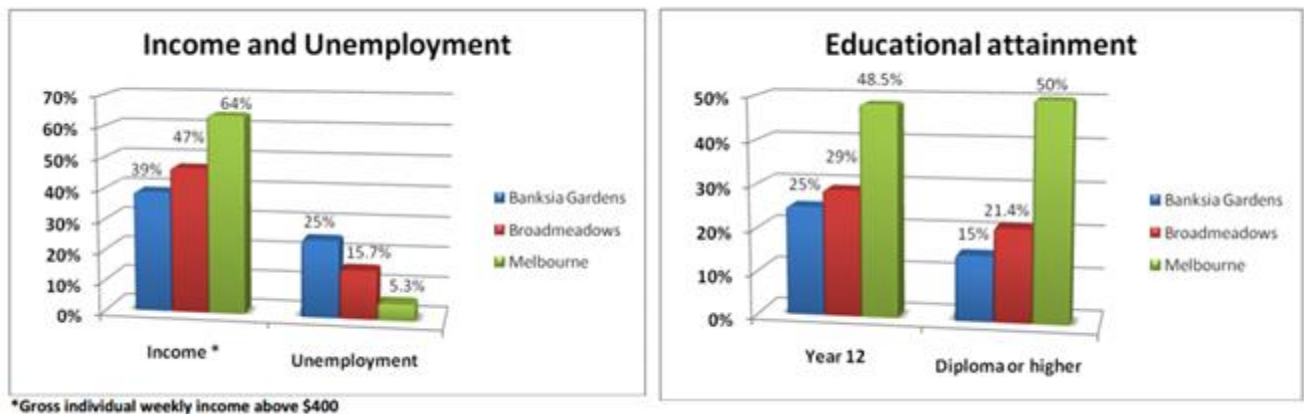


Figure 1 Income, Unemployment and Educational Attainment (Banksia Gardens Community Connections)

The low employment rate of Broadmeadows, and particularly Banksia Estate, are most likely linked to the lack of an educated population. Compared to the rest of Victoria, there is a significantly higher unemployment rate and lower weekly incomes (*Banksia Gardens Community Connections*, 2013). Not only is there a larger percentage of residents that do not work, but there is also a noteworthy difference in the types of jobs the people of Broadmeadows are getting compared to the rest of the state. Workers in Broadmeadows are much more likely to be laborers and machinery operators or drivers than workers elsewhere in Victoria. There is also a substantial decrease in the percentage of people with higher level jobs, such as professionals and managers, when compared to Victoria. This puts many families at a disadvantage because they are less frequently employed in a well-paid field. With most jobs held by the residents of Broadmeadows paying low wages, some parents must work multiple jobs in order to provide

financial security to their family. Children in this situation are more likely to be left alone and unsupervised while their parents are busy working.

The inhabitants of Broadmeadows and Banksia Estate have many established challenges. The high percentage of non-English speaking immigrants, poor education, and high unemployment has put the children at a disadvantage when compared to other, wealthier areas. If everyone works together as a community, they can overcome many of these hardships. Community programs are making the estate a safer place, but there is still “much more to do in order to increase the community’s connectedness and improve the quality of life on the estate” (*Banksia Gardens Community Connections* 2013). The next logical step in helping the community is to give the residents the opportunity to help themselves with an avenue such as education. Providing engaging educational opportunities in a subject area that proves useful for employment will aid the community in decreasing its unemployment and improving its student retention. Ultimately this will spark improvements for the community as a whole.

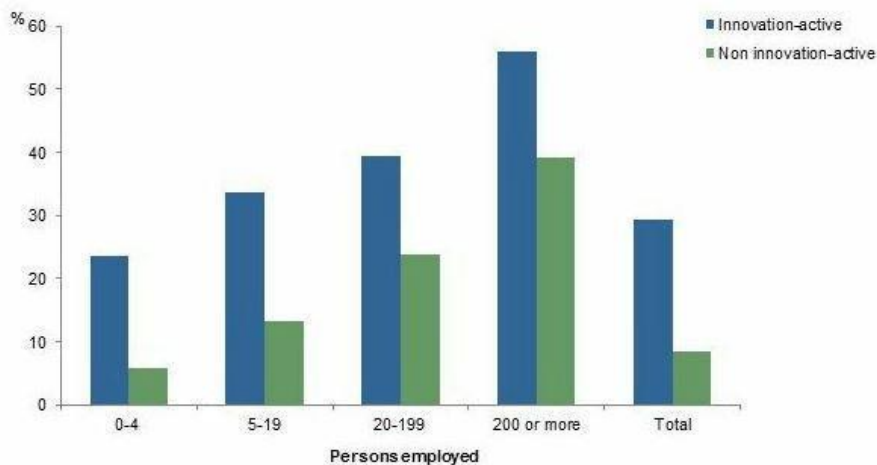
2.3 Benefits of Computer Literacy in the Workforce

Computer science and technology is one such area that promises positive returns for the community of Broadmeadows. With the sharp increase in the dependence on technology in the workforce, it has become more apparent that a computer science education is critical for success in today’s evolving job market. While it is generally accepted that being versed in programming and general computer knowledge will make a student both more desirable to employers and create a wide range of new opportunities, there is a strong correlation between a high immigrant populations and decreased involvement in computer or science education. Generally, minority groups that have only restricted access to computers and books are less likely to be interested in STEM fields (Australia Bureau of Statistics, 2009). This is an unfortunate obstacle considering the booming growth in the availability of STEM jobs could potentially greatly benefit the residents of Broadmeadows. A program where the residents of Broadmeadows could begin to learn some necessary computer skills would open many doors that were previously shut due to their living circumstances. By successfully gaining knowledge about computer science, the people of Broadmeadows will put themselves in a position where they will be more likely to find jobs in an incredibly rich and expanding field.

In the digital world of today, much of the innovation that occurs requires technology on some level and this in turn requires personnel who are adept at computer science. In Australia,

innovation in business is a highly documented statistic that takes into account a wide range of different data. The four broad types of innovation covered in these studies are “goods or services, operational processes, organizational/managerial processes and marketing methods” (Australian Bureau of Statistics 2014). These topics are combined to place businesses into two categories of innovation, innovating businesses and innovation-active businesses. Innovating businesses are those that have introduced at least one type of innovation in the reference period, and innovation-active businesses have undertaken an innovative activity regardless of whether the innovation was introduced, still being developed, or abandoned (Australia Bureau of Statistics 2014). In 2011, the percentage of businesses that were innovation active increased eight percent from the previous year, reaching 47 percent. Likewise, 41 percent of businesses reported that they had introduced an innovation during the 2011-12 reference period. More specifically, 24 percent of businesses in information media as well as 23 percent in professional, scientific, and technical services introduced new services as of this reference period. These facts, linked with the increase in businesses’ need for support in maintenance systems or processes for purchasing, accounting or computing (12 percent) and manufacturing (21 percent) prove that in Australia there is a wide range of computer related jobs (Australia Bureau of Statistics 2009). A large city such as Melbourne is likely home to a significant percentage of some of these businesses that will undoubtedly be looking for computer literate employees.

Businesses with a social media presence, by employment size(a)(b), by innovation status(c), 2011-12



(a) Proportions are of all businesses in each output category.
 (b) As at the end of the reference period 30 June 2012.
 (c) See Glossary for definition of innovation status.

Figure 2: Business with a Social Media Presence by Employment Size (Australian Bureau of Statistics)

The bar graph above shows that the number of innovative businesses in Australia is nearly quadruple that of businesses that are not innovation-active. In many cases, innovation goes hand in hand with the utilization of cutting edge computer resources. For this reason, there is a great need for people who understand information technology (IT), and know how to use it. With the rapid advancement of technology, it has become apparent that the need for specialists is continually increasing. “The demand for graduates and Ph.D.s in ‘Computer Science’ has grown year on year for the last decade or more, and is unlikely to stop (Carter, 2001, p. 78).” This fact shows the great opportunity available for those who seek to understand computer science.

Students in Broadmeadows who pursue an education in computer science would have much more opportunity than those who choose not to. Moreover, the growth in the field and need for employees means they will be afforded a level of job security that many of their current, more labor intensive jobs cannot provide. Additionally, if a student were to go to university already having computer skills, he or she would be able to find on-campus jobs such as teaching assistants and lab assistants (Huneycutt 2014). Sometimes options like these can make the difference between a motivated student having the opportunity to attend tertiary education or not, due to family financial restrictions.

The residents of Broadmeadows will still greatly benefit from a proficiency in computer skills, even if they are not necessarily interested in a computer science career. In general, simply learning to type lines of cryptic code into a program is not the sole objective of most computer science classes. In reality the scope is much broader and programming classes focus on the ideas of programming and problem solving. This creates an environment which effectively allows for the learning of computer science concepts where students can “interact with the concepts, test out theories, [and] are allowed the space to make mistakes” (Huneycutt 2014). The exposure to these difficult subjects of programming and information technology fosters the development of greater concept comprehension as well as sharper critical thinking skills that extend beyond lines of code. For this reason, people who obtain some level of education in computer science but do not want to pursue a career in computer science can use the knowledge gained through programming courses and the critical thinking skills they have learned and apply these to essentially any career path.

Information technology and other computer based fields are exploding with opportunity throughout Australia. With the decline of nontechnical business and the rise of more technology

based organizations, the need for people to be able to effectively function in this evolving job market is critical for future success (Carter 2001). The move to a technology based society can provide seemingly endless opportunities for those people who have the right training and knowledge. The residents of Broadmeadows could have access to the abundance of skilled jobs in the neighboring metropolitan center if they were provided with the necessary skills and education to qualify themselves for these jobs. Providing opportunities for the community to learn key computer science and technology skills will allow this trend to begin.

2.4 Teaching Computer Science to Children

One of the most effective ways to introduce computer science and technology into the Broadmeadows community is to impart the necessary skills to the adolescents of the area. Children learn skills faster and more efficiently than adults. This is due to both the capabilities of their brain and children's instinctive curiosity (McPherson, 2011). Physically, a child's brain has a tremendous advantage over an adult's when it comes to learning. This is believed to be due to the fact that a child's brain is less likely to experience interference between existing memories and new concepts. As the human brain develops with age, it becomes more inclined to experience different interferences, delaying the formation of new memories and making the learning process exceptionally more difficult (McPherson, 2011). This makes children especially adept at learning languages and skills.

Not only do children have remarkable abilities to learn, but they also have a burning desire to do so. All children are curious and subconsciously want to learn. If they are satisfied or pleased with their discoveries, the positive experience will subsequently make them want to further their education. Educational researcher Sugata Mitra states that "children's desire to learn, along with their curiosity and peer interaction drives them to explore the environment in order to satisfy their inquisitiveness" (Mitra, 2005). This essentially means that children learn naturally by exploring anything they have access to.

As previously stated, in today's society there have been significant technological advancements. Technology is becoming more relevant in our daily lives, especially for children. Due to their curiosity, children will naturally venture into the world of technology where they will explore different devices such as computers, mobile phones, and tablets.

The results of an experiment conducted in Kalkaji, New Delhi provide an example of children's curiosity leading them to explore and learn the functionality of computers. In this

experiment, a computer with Internet connection was implanted in a brick wall in a disadvantaged area of the suburb. The results of this study show that a majority of children in the area that came across the computer were able to operate it with minimal help from their peers or anyone with previous computer knowledge. Within a few days, they could successfully browse the internet, play games, create documents, and paint pictures. The children's curiosity led them to explore, and together they managed to teach themselves these valuable skills (Centre for Research in Cognitive Systems).

More often than not, children will do things simply because they want to. For example, a child may pick out his or her outfit for the day. By making their *own* choice, satisfaction is achieved from both the act of choosing and the opportunity to wear the outfit. Children learn more effectively and are able to retain knowledge better when motivated this way rather than being told what to do simply because they are doing something they *want* to do (Carlton, 2003).

Although the use of technology and computers is a valuable tool to help children learn, children use them primarily for enjoyment and recreational purposes. Data from the 1997 and 1998 Current Population Surveys as well as a Roper-Annenberg survey of parents suggested that more time was spent on recreational activities such as e-mail, chat rooms, Web-based games, Web surfing, and listening to music than on school-related work. The data also shows that the growing use of Internet is more driven by children's personal choice rather than teacher directives (Becker, 2013). Using computers and other technology is "fun" for children. If one integrates vital computer and technology skills with the recreational tendencies, a computer can become a unique and fun learning tool. This makes the learning process more exciting than using traditional methods involving just pencil and paper.

Whether for educational, recreational purposes, or a combination of the two, exposure to computers is beneficial for children. It offers them unique and intellectual experiences and opportunities that are not obtainable in the physical, non-digital world (Clement, 1999). Most importantly, the use of computers makes a child feel independent. It gives them opportunity to complete a task on their own, allowing them to develop their thinking skills (Mitra, 2005). They will apply these valuable skills to many aspects in their current lives and in their future.

2.5 After-School Computer Club

Children have the ability to learn computer skills, but they can only excel if given the proper environment and resources. Banksia Gardens Community Centre provides children with

this opportunity. Due to the friendly staff and welcoming environment, children and their families see it as a safe place where they can spend their time, making it a good atmosphere for learning. The youth are willing to attend after-school study groups to guarantee that they are making the most out of their education. Some of the parents of these kids are not able to speak, read or write English, and may never have had the opportunity themselves to finish getting an education. Nevertheless, they understand how important it is for their children to achieve their educational potential (Banksia Gardens Community Services, 2012).

Banksia Gardens provides many engaging programs to the children of Broadmeadows. These programs include youth study groups, a school holiday program, sports programs, and our main focus: the after-school computer club. The ages of the children in the club can range from eight to sixteen years old. In a typical session, the children will present homework and project work, partake in independent research and play, and participate in group games, projects, and competitions (Banksia Gardens Community Services, 2012). The skills that a child can acquire through this computer club directly correlate with the talents necessary to take full advantage of the booming technologically based marketplace. Not only will these children grow into adults that are more appealing to employers for their versatility in technological media, but they will also have other opportunities, such as getting into different colleges and getting jobs at those colleges that they could not get without these skills. Likewise, there are benefits that can be reaped by those students not interested in computer science as a field. The conceptual learning of computer science is something that can be applied to almost all subjects or jobs, and can benefit students greatly. Because Banksia Gardens provides the proper learning environment for the local children, they can effectively be exposed to computer science in a simple, engaging, and rewarding way. The after-school computer club can introduce these children to the basic components of a computer and STEM education. The staff at Banksia Gardens have asked us to develop a course and training manual that teaches these fundamental computer science concepts to the members of the after-school computer club.

2.6 Technology within Banksia Gardens Community Centre

Another important way to introduce computer science and technology in the Broadmeadows community is by making its impact more prevalent in the daily lives of residents. An excellent medium for this is by better integrating it into the Banksia Gardens Community

Centre as a whole where it will have the potential to impact a vast percentage of Broadmeadows residents.

Overall, Banksia Gardens truly has the best interest for the residents of the Broadmeadows in mind. It is no surprise that it is the core of the community. There are over 30 groups and associations based there, and it was used by more than 80,000 people in 2012. These people attended playgroups, study groups, classes, training courses, workshops, celebrations, meetings, and other events. Although the organization is rather small, it has managed to recruit some of the most inspiring and dedicated staff. A wide range of local residents are attracted by the amazing staff and get involved in the services offered. People of the community feel welcomed by the staff and are impressed with what they have accomplished (Banksia Gardens Community Services, 2012).

Their mission statement includes “responding to community needs”. Their goal is to transform lives, strengthen communities, and reduce disadvantage. Currently, the Banksia Gardens Community Centre is open to anyone working, living or studying in Broadmeadows. The organization is all inclusive and does not discriminate against age, race, religion, political beliefs, gender, sexuality or abilities and is open to different beliefs, cultures and opinions.

By helping the center use technology more effectively in delivering their programs, a large group of residents will have the benefit of being exposed to various applications of technology that could prove inspiring and also useful for them outside of the center. To augment the computer club, we will also be working towards integrating and expanding the use of technology into the organization and staff of Banksia Gardens. In our next chapter we go into detail about the methods we will use to accomplish this goal.

Chapter 3: Methodology

The goal of our project was to motivate and enable the children at Banksia Gardens Community Centre, a charitable not-for-profit community services organization, to pursue worthwhile uses of the technology around them by providing an engaging way to learn useful computer science concepts in their after-school club. To do this we provided engaging computer science modules to be used as lesson plans in the after-school computer club. We also found that there were many opportunities to improve the staff's day-to-day operations by integrating technology into the programs they run as well as daily tasks. Our goal was achieved through the following objectives:

1. Determine how much experience the Banksia Gardens Community Centre staff have in computer science and how they currently utilize technology.
2. Explore opportunities to integrate new technological resources into the organization.
3. Gauge the level of interest and experience that the computer club participants currently have in computer science.
4. Determine which characteristics of a computer lesson or activity the computer club participants find enjoyable.

Throughout this chapter, we discuss in detail the different methodologies we have chosen to complete each objective.

3.1 Objective 1: Determine how much experience the Banksia Gardens Community Centre staff have in computer science and how they currently utilize technology.

When we first came to the center, it was important to observe the Banksia Gardens day-to-day operations of the staff to evaluate how much experience they have in computer science and how they applied it to their daily work. Throughout our time in the center, it became apparent that the organization had ample opportunities for improvement in their use of technology. In order to identify the best uses of technology that would maximize the efficiency of the work done at Banksia Gardens, we conducted interviews with key staff members whose jobs could be enhanced through the use of technology. Through the interviewing process we were able to target several instances where the organization could be improved through more efficient and expanded use of technology.

Interview Banksia Gardens Community Centre Staff

In order to collect this information, we conducted semi-structured interviews with a list of key members of the Banksia Gardens staff provided to us by our sponsor, deputy CEO at Banksia Gardens, Jaime de Loma-Osorio Ricón. Before beginning the interview process, we wanted to get an understanding of each staff member's position and what they were required to do, so we conducted some background research. The interview questions can be found in Appendix A.

Overall, there were eight key staff members that we worked with. Three of the staff members that our sponsor suggested that we focus on were Mandy Ellis, Rachel Wood, and Shane Cooke. They are the center's community staff leaders. Mandy is the Education and Youth Development Coordinator. She is the head of the after-school study sessions. Rachel is the Community Developer Officer. Some of the programs she coordinates include the Good People Act Now project, a disability support program, Same-Sex Attracted Friendly Environment (SSAFE) projects, and the girls circle. Shane is the Youth Justice and Family Support Coordinator and is in charge of informal engagement and building up a trust with the kids as well as offering assessment, support, and referrals. Another important staff member was Igor Pejic who is the Computer Club Facilitator. Other staff members included Jonathan Chee, Rana Tbaileh, Samantha Donaldson, and Chris Murphy. Their job descriptions can be found in Appendix B.

Once we had the necessary background information, we were able to conduct semi-structured interviews. We met with each of the eight staff members individually asking questions relating to their position, daily activities, overall use of technology, and any particular challenges they face on a consistent basis that could be fixed with technology. This was the best option for us to gather the information we needed because the casual nature of the semi-structured interview is highly conversational and not having a strict question order allowed us to explore different topics as they presented themselves. The relaxed structure of semi-structured interviews allowed us to clarify the answers and information they provided us with so we were able to create the most appropriate plan to improve their operations (Berg, 2004).

3.2 Objective 2: Explore opportunities to integrate new technological resources into the organization.

In order to motivate the children at Banksia Gardens to use their interest in technology productively, we first had to investigate a way to better integrate computer science and technology with the staff and throughout the center as a whole. Our intentions were to investigate new information technology tools that could increase the efficiency, effectiveness, and reach of the organization's operations, programs, and services. We accomplished this by interviewing and observing the staff at Banksia Gardens.

Throughout the first two weeks, we met with the staff members individually and conducted semi-structured interviews in which we talked to them about what they do at the community center, how they currently use technology in their work at the center, and ways they think new technological knowledge could improve the efficiency in which they do their job, as mentioned in 3.1. Once the interviews were completed, we observed the staff to see how they used technology in their day to day tasks. After interviewing and observing the staff at Banksia Gardens, we determined which projects we thought would be most beneficial to the center and also if they were feasible to accomplish given our time restraints and resources. If we thought we would not be able to execute our plan due to the time restriction, we made recommendations that the organization could implement later. These recommendations can be found in the recommendation section of the report.

3.3 Objective 3: Gauge the level of interest and experience that the computer club participants currently have in computer science.

Participant Observation

After getting to know the staff and what they do at Banksia Gardens, we needed to observe the children in order to see the clientele we were trying to reach. We first did this by attending the after-school study group program. This was to get a better understanding of the children who visit the center and use this information to determine the best way to integrate computer science related activities. We did this by observing how the children interact with the facilitators and the other children, and also by directly interacting with the students while helping them with their particular studies. While working with the children we were able to ask them questions regarding computer science and the after-school club.

We also took time to observe the children while at the computer club, and how it operated during a typical session. Doing this allowed us to see how the children behave and

interact while in the computer lab and how it varied from the study group when they had access to computers and the Internet.

Unstructured Interviews

Prior to arriving at the community center, we determined that giving the computer club participants a survey on their interest and background in computer science would be the best method to collect this data. After observing the computer club and talking to the children, it became apparent that this would not be the case. It would have been too difficult to keep their attention for long enough to collect the information. The method of surveying the children was also limited by the fact that many of them have difficulty reading and writing. We decided that the most effective method of collecting this data would be to have individual unstructured interviews with the participants.

We conducted the unstructured interviews by speaking to each participant individually to find his or her overall interest and experience in computer science. The computer club facilitator, Igor, introduced us to the participants and once they felt comfortable enough talking to us, we began asking questions pertaining to our project. The goal was to first find out if they knew about computer programming or if they had any knowledge about computer science. Then we wanted to determine if they were interested in computer science and, if so, what aspects they would want to explore. Finally we introduced each participant to a few web resources designed to teach computer science to children. After they used the resources for approximately half an hour we asked them about which ones they enjoyed and what areas of computer science they were most interested in learning.

During the after-school computer club we interviewed ten participants, ages six to twelve. A majority of these children are from the Banksia Gardens Estate. It is within walking distance making the community center more accessible to these children than to those that live further away and require their parents to drive them to the center.

3.4 Objective 4: Determine which characteristics of a computer lesson or activity the computer club participants find enjoyable.

After an initial understanding of the participants' interests and competency with computers, we compiled some resources intended to further inspire and educate them in computer science. We wanted to determine which activities the participants would respond to best and how to tailor them to their specific needs. To do this we spoke with Jaime and Igor, both

key staff members at the center who are familiar with the children attending the computer club. We also delivered modules during the after-school computer club and recorded our observations and the varying success of different activities. Additionally, we held a focus group with the members of the computer club to receive their feedback on some of the modules we found to be best suited from our initial evaluation.

Interview Banksia Gardens Community Centre's Staff

In order to present the computer science modules to children in an engaging way, we had to first identify their interests and learning habits. We obtained much of this information through our interviews with the staff at Banksia Gardens. The teaching staff is experienced and passionate about working with children, and already has strong relationships established specifically with the children that visit the center. We asked them questions pertaining to the overall learning atmosphere in the computer club as outlined in Appendix A.

We spoke with Jaime about the demographic of participants in the computer club. This was to determine information such as their general age range, their level of schooling, and also anecdotal information about many of the challenges they face in and out of their homes. We then spoke with Igor, the instructor of the after-school computer club, to find out what their interests are and the methods with which he currently has success in engaging them and keeping them on task. A key component of this conversation was also to determine the areas needing improvement.

Develop Computer Science Learning Modules

We developed a series of computer science modules to cater to the various ages and abilities of the children attending the after-school computer club. Specific information about determining which modules would be most successful is outlined in the deliverables section. We had five criteria when selecting resources to build the modules around. First, we searched for easily available and free resources. Next, we conducted preliminary research online to determine the learning outcome of each resource and whether it was within the scope of what we intended to teach in the computer club. Then, we tested the resource ourselves to evaluate whether we found it appropriate and engaging enough. Finally, we collected some accompanying material to package the resource into a small module to be part of a curriculum for the club. Creating the modules was an iterative process where we tried many different resources with the students in

the computer club and observed the outcome and used the students' feedback to tailor the list into those best suited for them.

Perform Test Group

In order to determine the overall effectiveness of the different online resources, we conducted test groups. To do so we determined a suitable resource for each individual child according to our resource manuals. We provided these modules to a group of ten students. After a brief period of only observation, we helped the students when needed, and asked them questions to help us determine the effectiveness of each resource. This provided valuable information to include in the lesson plans and to take into consideration when selecting the final group of modules so that they could be as clear and effective as possible.

In chapter 4 we outline our findings from working with the staff of Banksia Gardens Computer Centre and the after-school computer club. We also share our recommendations and conclusions for both aspects of our project.

Chapter 4: Findings, Deliverables & Recommendations

The goal of our project was to motivate and enable the children at Banksia Gardens Community Centre to pursue worthwhile uses of the technology around them by providing an engaging way to learn useful computer science concepts in their after-school club. Our findings are divided into two main sections. In the first section we present what we found from attending the after-school computer club. Based on findings pertaining to the structure of the computer club and the children who attend it, we researched pre-existing educational websites that teach computer programming concepts. We used this research to create a series of deliverables along with long-term recommendations for the computer club. The second section presents our findings derived from interviews with the Banksia Gardens staff. Based on the results of these interviews, we provided the staff with recommendations about how technology could improve their programs and daily procedures.

4.1 The Staff

In this next section, we first describe the findings we established from our interviews with the Banksia Gardens staff. Then we identify the deliverables we provided the staff members as well as our recommendations for them to further the integration of technology throughout the organization.

Findings

Banksia Gardens staff has the potential to improve the efficiency with which they use technology.

Our first two objectives for this project were to determine how much experience the Banksia Gardens staff has with technology and how they currently use it, then to explore new opportunities in which we can integrate technological resources into the organization. Through interviews with the staff, we found that while they do use technology in their daily operations and programs, they expressed dissatisfaction with some of these resources and the efficiency with which they were being used. They also expressed an interest in finding new ways to incorporate technology into their programs.

Some technological resources that the employees currently utilize include email, Facebook, Twitter, the Google suite of products, the Banksia Gardens website, and the organization's database. Currently, social media is intended to be used as a tool for advertising

the organization's programs, although the staff expressed that they would like their programs to be advertised better. The problem with using Facebook and Twitter as a medium for advertisement is that in order for it to work effectively, it must be updated regularly. The current Facebook and Twitter pages are rarely updated due to the employees' lack of spare time.

The staff has also expressed that they need an efficient way to take attendance. Presently, attendance is taken on a piece of paper and later entered into the organization's database. While this method works, transferring the data from paper to computer is both time consuming and inconvenient. One suggestion from the staff was to find a way to use Google forms (a program readily available to the Banksia Gardens staff) to take attendance. We found that this would not be an ideal program for taking attendance because it is difficult to add new names to the attendance list, it is not iPad compatible, and it does not fix the inconvenience of transferring the information to the database.

We found that there are many valuable resources available to the staff at Banksia Gardens, but many of them could be more fully utilized. One such resource is Mr. Andre Dumitriu, the technology guide at the Hume Global Learning Center. In a phone interview with Andre, we found that he has a long history of working with organizations similar to Banksia Gardens. The Hume Global Learning Center helps organizations by lending them resources such as laptops, iPads, printers and webcams, and also providing technology trainers. We found that some of the staff members could benefit from a trainer who could teach them how to use certain technology that the center currently has. For example, there is a new projector that has a lot of new and useful features that many of the staff members don't know how to use. The few that do know how to operate the projector don't have time to teach others how to use all of the features. Andre would be a valuable resource in this situation by arranging for the necessary training that Banksia Gardens requires.

Deliverables & Recommendations

In our interviews with the staff in the first couple of weeks of our project, we asked them how they currently use technology at work and if they have any needs that have yet to be met. Based on their needs, we researched possible solutions and provided them with some suggested resources that could help with their daily work. A complete table of the staff members, their need for technology, and our recommendations can be found in Appendix C.

Rachel Wood is the center's Community Development Projects Coordinator. She runs many programs including the Good People Act Now Project (GPAN), a Disability Support Program, Same-Sex Attracted Friendly Environment Project (SSAFE), and the Girls Circle. The GPAN Project is a prevention of violence against women program that focuses on gender differences, equality, and stereotypes. For this program Rachel wanted to find or create a technology tool to educate people about bystander intervention.

For this, we worked with Rachel and came up with the idea that we could create a bystander awareness activity to be completed on the computer. The activity would include several videos on a website with a question or prompt for each and selectable responses. We created a skeleton of the website where five videos could be embedded, each with a place to include a prompt and four multiple choice options. Rachel plans to work with the Girls Circle to create the situational skits involving gender differences, stereotypes, or inequality, and come up with the prompts and responses as a group. The prompts are meant to questions people's perceptions of the videos and how one could intervene in the given situation. Once the responses are completed, the percentage of the total participants that selected each response is shown. The intent of this is so that people who would find themselves as a bystander in a situation that makes them feel uncomfortable can see, hopefully, that the majority of people agree with their line of thinking and therefore may encourage them to intervene and do the right thing.

For the Disability Support Program as well as the SSAFE Project, Rachel wanted to find a way for the people who attend the programs to coordinate social gatherings outside of the program meetings. We recommended Meetup which is a website that helps groups of people with shared interests plan events. For the Girls Circle, Rachel wanted to get girls interested and involved in science, engineering, and computer science. We recommended that she does a technology related activity with the group. A link to a suggested activity is provided in the table in Appendix C.

Rana Tbaileh is the Training and Employment Manager. She teaches an English as an additional language class and wrote the course textbook. The textbook contains links to websites and listening activities. Because she distributes the book as a paper copy, it is difficult and time-consuming for the students to type in all the links. In the future Rana is hoping to have an online version of the textbook, but for now she just wants a simple way to access the links straight from a computer and possibly offline. We provided Rana with a USB drive containing the pages

linked to in the textbook. This way they can be easily accessed offline and without typing out a long hyperlink. We also provided Rana with a guide on how to update the USB drive as well as how to burn the material onto CDs. This guide can be found in Appendix G.

As mentioned in the Staff Findings, the staff has expressed a need for an improved database system that generates detailed reports and records attendance more efficiently. While this task was not feasible for our time here and our skillset, we made it possible for the center to get the help they needed to accomplish this. We contacted Andre Dumitriu, who then put us in contact with Mark Angrish, a local computer programmer with his own startup company. We met with Mark and our sponsor, Jaime, and provided our suggestions that Banksia Gardens should take to create a new database that makes attendance easier to report. Rather than using several different pre-packaged software products to meet each need, we recommended a more all-inclusive and personalized approach.

This database can be moved to the cloud and accessed from either home or other community centers. Other advantages include being able to input data from mobile devices, making attendance much more convenient. Finally, they would be able to automatically generate custom designed reports to submit when applying for program funding. This would be a big step for the organization in terms of streamlining their operations. Mark has generously offered to oversee this project for little to no compensation.

Also mentioned in the findings, one problem the Banksia Gardens staff faces is their difficulty with advertising their programs. Due to a lack of spare time at work, their Facebook page and Twitter account are rarely updated. When utilized effectively, social media can be a powerful advertising tool. Regular posts to Facebook or Twitter, posting pictures of events, and encouraging people to “like” the page are all effective methods of advertising that we recommend that the staff use to their advantage.

We have a few recommendations for the Banksia Gardens’ website that would benefit the organization. To help the staff and community members more easily access information about Banksia Gardens’ programs, a calendar can be hosted on the website containing links to all of the events. This not only helps keep the staff members informed, but it also functions as a form of advertisement for the center. People who attend one event may see another program on the calendar that catches their interest. Another suggestion is to post photos of events on the website so people can visualize what goes on in the events. Also, a mobile version of the website would

be beneficial because it would allow people to access Banksia Gardens' updates directly from their phones.

4.2 The Computer Club

In the next section, we discuss our findings from observing the computer club and interviewing the children. We also describe the deliverables we gave Banksia Gardens and the recommendations we have for the future.

Findings

The computer club has the potential to be developed into an effective tool of teaching children computer science

When we first arrived at Banksia Gardens, we had very little information about the after-school computer club. We had yet to determine the programs, number of students, and the facilitator of the club; and for these reasons, we did not know what to expect. From our observations of a typical computer club session, it was apparent that the computer club held a considerable amount of potential for further development and the inclusion of a computer science component.

The environment of the club was difficult to facilitate. Some of the children were exceptionally difficult to engage and they would wear headphones and play their music loudly to avoid any interaction whatsoever. Others were very difficult to keep on task. Some children had remarkably short attention spans and even waiting for a game or video to load was beyond the capacity of their patience so they would leave before it finished. It was difficult to introduce better activities for them to try because they were not very receptive to trying new things. For the most part they only wanted to stick to what they knew or what their peers were doing. It required considerable effort to convince them to try something new, especially something educational, and results varied greatly upon whether the activity spoke to the particular child's interests. Children that could not find anything interesting would detract from the entire learning atmosphere by inciting fights amongst their peers, being generally loud, and demanding attention from Igor, the computer club facilitator. Igor spent much of his time individually directing the children to remain on task.

We noticed that it was very difficult for Igor to moderate the children with the tools he was given. There was no content filtering or administrative software on the computers. This gave

the children the freedom to access almost anything available on the web, making Igor's job as moderator quite difficult. Although a rudimentary filter was in place to block some content such as Facebook, the children still had access to explicit music videos and violent games. Some of their common favorites were music videos to songs such as "Freaks" by Timmy Trumpet and "Anaconda" by Nicki Minaj; both that are generally only acceptable for mature audiences and not the children in the computer club. Other popular YouTube videos were of fighting, wrestling and "trampoline fails." Each educational lesson Igor planned to deliver was made difficult because he had to constantly go from person to person and divert them away from unsuitable content. As a result of Igor's efforts being primarily focused on moderating the children's Internet use, very few educational resources were used during the club.

Additionally, the educational activities Igor planned for the club were difficult to initiate. He would regularly find valuable websites with educational content that he wanted the children to use. Sometimes these were anti-bullying videos, games to teach spelling, or other useful resources. He would write out the URL to these pages on the whiteboard in the room and instruct the students to type it into their address bar. We observed this to be challenging because many of the students could not read or type well and had very short attention spans. Igor would have to assist them all individually. This process took quite some time in a room with ten computers. Many children would get frustrated and lose focus before the process was over and find their own way to familiar sites such as Youtube.com.

The children currently attending the programs at Banksia Gardens come from difficult backgrounds and are a challenging group to teach.

The staff at Banksia Gardens provided us with insight into the difficult home life of many of the children. Drug abuse, poverty, and neglect are not uncommon themes in the neighborhoods surrounding the community center. Some of the worst circumstances are found in the housing estate just across the street. The numbers of people we saw attending the after-school computer club dwindled as the summer holidays approached; pretty soon the only participants were the regulars who walked over from the housing estate. Many of these children attend simply because the center is located nearby and provides a better alternative than being at home. On the other hand, someone who made an effort to attend from further away were more invested in attending the club. This became evident in our observations during the computer

club as many children would casually come and go without much purpose in being there, providing Igor only a small window of opportunity to engage them in a structured lesson.

We were also able to note that many of the children read and write below their grade level. Many of them needed help spelling simple words to search for the content they desired. As a result, they became quickly disinterested in any activities that required reading or typing.

Getting these children interested in computer science would prove to be a difficult task because the majority of them simply attended the computer club to access content on the web and escape from their home life. Overall there was a strong tendency towards content deemed inappropriate at the community center. A major part of Igor's job was simply turning the children away from the worst of the content towards more appropriate content. Fortunately, Igor has built an excellent relationship with the children who attend the computer club. We see this relationship as a potential pathway to positively impact young participants with educational lessons.

Educational websites that can teach programming concepts exist on the Internet and can be accessed during the after-school computer club.

After determining the target audience in the computer club, we researched and compiled a list of relevant resources that would provide Igor with the material necessary to teach computer science to children. Throughout our research, we found many different resources designed to teach children computer programming using a variety of methods. Unfortunately, many of these either required a fee, were too advanced, or not engaging enough for these children. For example, several were text heavy, involving considerable reading or typing. However, we were able to find some excellent resources that easily and effectively presented relevant computer science information. From these, we determined that the best applications to introduce to the computer club included Gamestar Mechanic, Tynker and Code.org.

Gamestar Mechanic is a game that was created to direct the user's enjoyment from merely playing video games towards actually designing them. This is a great resource because it can be used to introduce students to computer science gradually in a non-intimidating environment. This is especially useful for children that would rather play computer games than spend their time learning more traditional programming. We found that after introducing Gamestar Mechanic to approximately ten participants, three of them independently began to use it in subsequent computer club sessions.

Tynker is a website that has an immense collection of activities that incorporate visual programming to accomplish an overall goal. Visual programming involves dragging and dropping blocks to form logical sequences similar to a flow chart. This is a preferred alternative to typing the code and having to worry about syntax errors. We determined that this would be a good resource for children that show potential interest in learning programming. Tynker has introductory lessons that teach children the very basics of visual programming and allows them to move towards more advanced concepts if they desire to do so.

Finally, we established that Code.org is a great resource for participants who wish to take their computer science education to the next level. This website is also designed to teach children computer programming using a visual programming language, but lacks some of the entertainment found in Tynker. This website includes numerous course plans that teach everything from simple concepts covered in Tynker to how to build your own game from a visual programming language called Scratch. We determined that this resource would most likely be used for older participants that excelled in Tynker and want to try more advanced programming. It was not quite as engaging as the activities provided with Tynker but it included a much greater volume of educational material and would allow a motivated student to progress quickly.

While researching appropriate resources, we came across many that can be used in the future and others that are not worth looking into further. A complete annotated table of the resources can be found in Appendix D.

The children who attend the after-school computer club require personalized activities to get them motivated to learn.

A wide range of children, ages six through fourteen, attend the after-school computer club. They also vary in their experience and interest in computer science. Through unstructured interviews with ten students, we discovered that only two had ever heard of computer programming before, and none had actually tried it. One of the more cooperative and interested students had a friend who designed a few small video games using Scratch, and because of this was interested in trying to learn Scratch and other ways to easily make his own videogame.

Only five students in total were interested enough in programming to try the simple visual learning style on Tynker or Code.org. After introducing these resources to the interested students, the majority of the five became bored after about twenty minutes and switched to using

the computer as they normally do, or to playing the easier and more entertaining Gamestar Mechanic.

The students that were not interested in programming were more open to try Gamestar Mechanic because it was presented as a fun game to play that can teach them how to make their own. We quickly noticed a snowball effect with this resource: as soon as two students were playing it and having fun, almost all of the others wanted to play too.

While observing the students using Gamestar Mechanic, it was apparent that many of them are naturally competitive; as they would constantly ask each other what level they were on, to see if they were farther in the game than their friends. Even though most of them quit playing before thirty minutes had past, at least a majority of the students were receptive to playing it, even if only for a little while.

A few of the students clearly did not have any interest in learning more about computer science, so we found an online resource that is a collection of physics and puzzle based games for the children to play. This resource provides an easily accessible alternative that, while not programming focused, is appropriate and can help keep children from watching inappropriate and violent videos.

Deliverables and Recommendations

iTALC

After observing that the children at the computer club regularly access inappropriate content on the internet, we determined that software designed to monitor a classroom would help keep the students appropriately engaged. After researching, we found free software that is designed to assist teachers in moderating how students use computers. This program, iTALC, is a perfect fit for the computer room in Banksia Gardens because it is free to use and is intended for small computer labs, such as the computer club. One of the main features available on iTALC is the ability to view all of the students' screens from one computer. This is great for the computer club because it allows the facilitator to monitor each screen without having to look over the shoulder of each student. This is a more effective method of regulating inappropriate content.

With iTALC installed, the facilitator also has the ability to temporarily lock all or some of the computers. This prevents the students from being distracted by their computers,

encouraging them to focus on the instructor. The program also lets the facilitator take control of a student's computer remotely. This will help the facilitator assist struggling students, or close any windows containing explicit content

We successfully installed iTalc on the computers in the computer club. A single computer is set up as the master computer near Igor's workstation and the remaining nine computers are set up as student computers. Igor has the ability to view and control the other nine computers from the master computer. After installing and setting up iTALC, the staff should not have to modify the software and will be able to use it indefinitely. A guide of the installation process and use of iTALC can be found in Appendix F.

Resource Manuals

During our experiences, it became apparent that there was potential to improve the computer club with additional lessons and resources. There was little direction for each session, and there were rarely any set lessons or activities planned to keep the students occupied during their time in the club. The lack of structure hindered the operation of the computer club. For this reason, we compiled a list of different online resources that could be used to enhance the computer club and teach introductory computer programming concepts to the participants. We organized the resources we found into a manual that will provide different activities for each participant based on his or her needs and abilities. In these manuals, we organized the different resources based on the user's school year and level of interest in computer science. Because the resources contain a vast collection of content, it was critical to provide the staff with details on navigating the site and identifying the most effective games

The resource manuals that we provided Banksia Gardens with break down each site into specific information about the different activities. We detail information such as level of engagement, educational content, effective uses, and a recommended lesson plan, all of which is organized by the target age of each game as well as the student's level of interest. For example, in Tynker's manual we identify games such as Pixel the Puppy and Sketch Racer as the best options for young children who are interested in computers and reasonably motivated. We then identify which programming concepts are present in each game, and suggest ways to move forward based on whether the child responded positively or negatively. A complete list of resource manuals can be found in Appendix E.

Website

We created a new web page to be used as the home page for all of the computers in the computer club. The purpose of the page is to provide a simple and visually appealing format for the students to access the resources we compiled for the computer club.

The page is divided into three distinct sections. The first of which includes resources that are more fun than educational and directed towards the younger and less motivated members of the computer club. The second section includes resources intended to be an easy introduction to computer science and programming. These resources are ideal for those students who are just getting started and also those who do not have long attention spans or strong reading or writing skills. The third section includes some more advanced resources that are still age appropriate but directed towards students who are highly motivated to learn computer science. These activities are slightly more challenging and some require typing, but they are also much more educational and beneficial to the students who were interested in learning the content.

We created the webpage because we found that it was difficult to direct the students to content on the web. With the new homepage in place, every resource is titled, has a large image that serves as a direct link to the resource on the web, and includes a short description so that the students can select something they are interested in. This greatly improves the accessibility of educational content over the inappropriate content they were previously familiar with.

Additional Software

Installing additional software to the computers in the lab could be beneficial to the club. One game that we recommend installing is Minecraft. This game presents a world where the student can build almost anything, including castles, mines, traps and circuits. Some of the building blocks can be used to represent the logical operators that are fundamental to computer science. Introducing Minecraft into the classroom could have many different applications, and can be used as a teaching tool in some classes.

Although Minecraft has to be purchased, older versions of the game are available to download for free. Even if it is not used as a teaching tool, Minecraft still allows the children to create their own worlds, which allows them to exercise their imaginations and creativity.

Game-making programs, such as Stencyl and Construct 2 could also be installed in the computer rooms. Both of these are free to download, and have online tutorials that can help

students learn to design and program games. If this type of software is readily available, then the students that are interested in game design could use it freely. The programming style in both of these is extremely similar to the visual programming found in Tynker and Scratch. It would be possible to use one of these as the focus of a new computer science class.

A New Computer Science Club

If Banksia Gardens chooses to continue to move forward with the computer science initiative, we recommend that they create a computer science club that is totally separate from the current after-school computer club. Throughout our time in Banksia, we have discovered that the current computer club is primarily used for leisure and many of the children attend the club for this reason. Because of this, there is not a large enough population of students who are interested in computer science to make implementing a programming curriculum a realistic goal. Many of the children currently attending the computer club are either not interested in computer science at all, or simply expecting to use the computers freely as they always have.

Creating a new class solely focused on computer science would allow focused students to get the most out of their time, while also keeping students who do not want to explore computer science from having to sit through a class they are not interested in and becoming disruptive. This specialized club would also give the students involved a chance to explore a wide range of opportunities available through the world of computer science. This course could have a lesson plan that builds into a substantial project that the children could be proud of, such as building a personalized website, designing a videogame or programming a simple robot. All of these different activities would introduce them to the world of computer science.

We highly recommend looking into the possibility of hosting a computer science specific event in the computer room. The “Hour of Code” initiative is well known worldwide as a way to get young people interested in computer science. It involves providing an hour of kid friendly and engaging activities to inspire young people in computer science. Banksia Gardens would be able to host their very own “Hour of Code” in the computer club using the resources we have provided them. Turning this into a special day and making it more significant than just the typical after-school computer club session. This could potentially attract a larger number of interested youth and the resources we have included would be sufficient to provide an excellent introduction to computer science.

Chapter 5: Closing Remarks

An increase in the presence of technology throughout the Banksia Gardens Community Centre could have a great long-term impact on the organization. Our efforts to introduce computer science to young children through the after-school computer club and integrate technology into other programs and daily operations are a starting point for increased technological presence at the community center. Further incorporating technology in other simple ways such as having a TV in the front lobby showing a reel of photos or using iPads in the classroom could be very influential in the future. It would give the people who visit the center the exposure to technology that they may not have otherwise. From the achievements of our project as well as the center's continued effort towards furthering computer science and technology, the residents of Broadmeadows now have a place to learn valuable skills pertaining to the kinds of technology that are becoming ever more necessary in the modern world.

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Appendix

Appendix A: Staff Interview Questions

Staff member being interviewed:

Position at Banksia Gardens:

Technology related questions:

1. What is your position at Banksia Gardens? What do you do here? Describe your day to day tasks.
2. Are there any things you notice that you'd like done differently?
3. How do you currently use technology for your job?
4. What are some typical tasks you use a computer for at work or at home?
5. What are some of the applications/programs you use most often?
6. What are some ways you think technology could benefit your department?
7. Do you know of any software or equipment that could be helpful that you want us to look into?

After-school computer club questions:

1. Can you tell us about the kids who attend the after-school computer club?
2. How prevalent is computer science in the schools and the community?
3. Why do they attend the after-school computer club?
4. What types of lessons are taught in the after-school computer club?
5. How much do the children know about computers and computer science?
6. What is difficult about working with the children in the computer club?
7. What do you find works well to engage the children?

Appendix B: Banksia Gardens Community Center Staff Members

Name:	Job Title:
Mandy Ellis	Education & Youth Development Coordinator
Rachel Wood	Community Developer Officer
Shane Cooke	Youth Justice and Family Support Coordinator
Igor Pejic	Computer Club Facilitator
Chris Murphy	Environmental Education Officer
Samantha Donaldson	Manager of Administration, HR & Communications
Rana Tbaileh	Manager of Training & Employment
Jonathan Chee	Project Coordinator Aiming High VCE Support Program

Appendix C: Staff Deliverables & Recommendations

Employee: Job Title	Need(s) for technology	Recommendation(s) & Deliverable(s)
Jonathan Chee: Project Coordinator Aiming High VCE Support Program	More efficient way of taking attendance. i.e using an iPad or other device rather than paper.	We arranged for computer programmer Mark Angrish to create a new online database that can transfer attendance records directly from iPad to database. See Chapter 4.1 for more details.
Mandy Ellis: Education & Youth Development Coordinator	Computer Club & Study Group: encourage kids to use computers for educational purposes rather than Youtube and Facebook.	Computer Club homepage changed to include links to Tynker, Code.org, Gamestar Mechanic, and more. See Chapter 4.2 and Appendix E for more details on links.
	Holiday Program: attendance is currently done on paper and lacks detail, school holiday excursion program.	Attendance: See Deliverable/Recommendation for Jonathan Chee. Holiday Excursion Program: Focus a Holiday Excursion program on technology and computers to get kids interested.
Rana Tbaileh: Manager of Training & Employment	English as an Additional Language Book: book contains websites and links to listening activities.	Compiled the activities and videos from links in book onto a flashdrive. We recommend downloading the links from the flashdrive onto CDs for the people in the class. Created a guide on how to update the flashdrive and download material onto CDs. See Appendix G for more details.
Rachel Wood: Community Development Projects Coordinator	GPEN (Good People Act Now) Project: technology tool to educate people about bystander intervention	Created an example website where bystander intervention videos can be posted and responses are polled. See Chapter 4.1 for more details.
	Disability Support Program and SSAFE (Same-Sex Attracted Friendly Environment) Project: A way to coordinate social gatherings.	We recommend that they use a website called Meetup which helps groups of people with shared interests plan events.

	The Girls Circle: get girls interested and involved in science, engineering, & computer science.	We recommend doing a technology related activity such as creating an LED flashlight with a tic-tac-box. A link to this activity is followed: http://www.grynx.com/projects/tictac-flashlight/
Chris Murphy: Environmental Education Officer	Radio Station: advertising	We recommend putting a link to the podcast on the Banksia Gardens website.
	Bike Hub: advertising	We recommend using a website like Gumtree to advertise the bike hub.
Samantha Donaldson: Manager of Administration, HR & Communications	Working from home	Currently the server is hosted at the center so it can't be accessed from home. We arranged for the creation of a new database. When the database gets migrated to the cloud then content will be accessible from anywhere. See Chapter 4.1 for more details.

Appendix D: Table of Resources

Key

Green	Recommended and Tested
Yellow	Recommended, not Tested
Orange	Could be used as a good resource in the future
Red	Not Recommended to use

		Free	Online (No Software)	Teaches CS	Engaging	Teaches Logic	Skill Level	Notes
Gamestar	Lite	x	x	x	x		None	Fun for children, teaches gameplay and design. Used to keep children away from unwanted internet resources and introduces to CS
Tynker	x	x	x	x	x		None	Fun to introduce, but can become boring. Used for younger children interested in programming
iphysics	x	x		x	x		None	Online collection of games that are physics/puzzle based. This can be used to keep children away from inappropriate content
Code.org	x	x	x		x		Beginner-Intermediate	For children who want to learn programming through scratch, slightly more difficult, but still fun
Light Bot	x	x	x	x	x		None	Similar to Tynker, but uses a robot to turn on certain lights
robotmaze	x	x	x	x	x		None	Much like Tynker, but with a robot
Code Combat	x	x	x	x	x		Intermediate	Teaches a real language by going through a game, needs to be slightly more advanced than Scratch and Visual Programming (Tynker)
codeacademy	x	x	x	x	x		Intermediate	Can teach actual programming languages, for self-driven students

		Free	Online (No Software)	Teaches CS	Engaging	Teaches Logic	Skill Level	Notes
Code Avengers	Trial	x	x	x	x		Intermediate	Teaches Java by making a game. Child needs to be patient and self-driven to get through the tutorials.
Codepupil	x	x	x				Beginner	For students that want to teach themselves programming (HTML/CSS)
Stencyl	x		x		x		Intermediate-Advanced	Can bring students that want to bring programming to a level that Tynker and other online resources can't reach. Build, and publish to the internet for free with the starter download.
Construct 2	x		x		x		Intermediate-Advanced	Very similar to Stencyl
Udacity	x	x	x	No			Intermediate-Advanced	Videos to further programming knowledge, not a starting point, but could help further an interest in CS
Khan Academy	x	x	other class	x				Also helps with other classes
Code and Conquer	N/A	N/A	N/A	N/A	N/A		N/A	Not developed yet, but seems like a good thing to look into later. Should be ready mid 2015

		Free	Online (No Software)	Teaches CS	Engaging	Teaches Logic	Skill Level	Notes
Codemonkey		x	x	x	x			Costs money, probably not worth it. Seems like it puts everything together into a lesson path
Algo.org	x		x	x	x		Beginner	Requires software and does not seem worth the effort of designing a curriculum around this
Treehouse								Expensive, monthly cost
Learn Street				No			Intermediate-Advanced	Could be used to further knowledge in CS
CodeHS			x	x	x			Good learning progressions, but has a monthly fee
Betathegame								Requires a download and only has a small demo for free
Robo Demo	x	x		x	x		No Programming, Advanced Logic	Similar to Robotinmaze, but has much more difficult puzzles
Run Marco!	x		x	x	x		Beginner	Similar to Tynker, but more of a storyline and continuous play. Currently only has about 30 minutes of play. Unfortunately it requires Unity Player to use

	Link
Gamestar	Gamestarmechanic.com/quest
Tynker	Tynker.com/hour-of-code
iphysics	lphysicsgames.com
Code.org	Code.org
Light Bot	Lightbot.com/hocflash.html
robotinmaze	Robotinmaze.net/en/Maze/Index/0
Code Combat	Codecombat.com/play
codeacademy	Codeacademy.com/courses
Code Avengers	Codeavengers.com
Codepupil	Codepupil.com
Stencyl	Stencyl.com
Construct 2	https://www.scirra.com/construct2
Udacity	https://www.udacity.com/courses#!/all
Khan Academy	Khanacademy.org
Code and Conquer	codeandconquer.co
Codemonkey	Playcodemonkey.com
Alice.org	Alice.org
Treehouse	Teamtreehouse.com
Learn Street	Learnstreet.com
CodeHS	Codehs.com
Betathegame	Betathegame.com
Robo Demo	http://www.wizards.com/avalonhill/robo_demo/robodemo.asp
Run Marco!	Marco.allcancode.com

Appendix E: Resource Manuals

Grades 1-4

Students interested in computer science

Tynker



<http://www.tynker.com/hour-of-code/puzzle>

Uses:

Tynker is a website that offers computer programming games best suited for younger children that are interested in computer science and how computers work. This resource provides children with the chance to create very basic actions using scratch.

It is important that these children have a reasonably long attention span. Although these games require some focus from the children, the games are geared towards a young audience, and could potentially be boring for those children who are a little older.

Overall, Tynker is a good way to introduce the basic computing concepts and the critical thinking related to programming needed before moving forward onto more advanced concepts.

Tynker does offer pre-made modules that children can choose from. It will be best if the instructor monitors which games are played based on their difficulty rating.

Recommended Lesson Progression:

Begin with either Pixel the Puppy or Sketch Racer. Initially start with only a few levels. If the child expresses more interest, continue to the more advanced levels. These are good games to introduce because they cover the very basics of visual programming, and require children to think critically in order to complete different levels.

If students enjoyed the preliminary games and are interested in experiencing more complex coding, Lost in Space is a more difficult, yet more interesting game to try. This game has more coding information to offer than Pixel the Puppy or Sketch racer, and also requires a more proficient understanding of coding.

Other Scratch based Activities

Robot in Maze

Robot in Maze is a simple scratch based game that takes basic programming commands and uses them to help Jolly the Robot find his way through a variety of mazes.

Light Bot

Light Bot is a game that uses scratch based software, and provides different puzzles that must be completed in order to turn on a light. This game is best for exercising problem solving and logic.

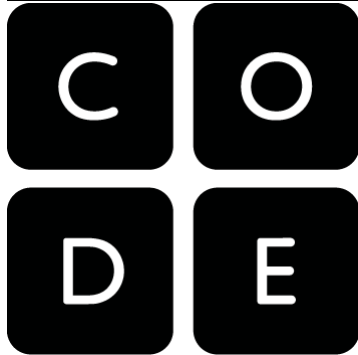
Flappy Bird from Code.org

This activity takes children to the back end of the game flappy bird, shows how the game was coded, and allows students to write their own code to modify different aspects of the game to make it their own. This game is great for those both interested in programming as well as game design.

Angry Birds from Code.org

This game applies the popular game Angry Birds and uses various aspects of coding to complete different levels. Children must use different aspects of programming, critical thinking, and problem solving in order to get the pigs.

Hour of code: course one



<https://learn.code.org/s/course1>

Uses:

Course 1 is designed to allow early readers to create computer programs that will help them learn to collaborate with others, develop problem-solving skills, and persist through difficult tasks. By the end of this course, students create their very own custom game or story that they can share. Recommended for grades K-1.

Recommended Lesson Progression:

Stages 1 and 2 teach basic problem solving skills. This is geared towards introducing children to basic computer science concepts.

Stages 3 through 4 introduce elementary programming concepts such as creating drag and drop commands, and how to effectively use them to reach a desired goal.

Stage 5 presents situations where the code currently written is incorrect, so the student is required to think critically and use various problem solving methods in order to fix the problem and successfully complete the task at hand.

Stage 6 contains basic pattern recognition exercises such as filling in the missing pieces to sequences.

Stage 7 and 8 introduce the sequences, a basic structure in programming. Sequences are actions or events that lead to other actions or events in a predetermined order.

Stages 9 and 11 require critical thinking and pattern recognition in order to complete the basic tasks of drawing different shapes and sequences as well as spelling various words in puzzles.

Stages 12 through 14 and 18 introduce another basic concept of computer programming- loops. There are basic exercises that introduce what a loop is, why it is helpful, and how to effectively and efficiently use them in order to write less repetitive code.

Stage 16 is an activity that gives the students the freedom to create their own story using code. It takes samples of concepts previously learned throughout course one to use their imagination to create what they want.

Students who want Games: **Gamestar Mechanic**



Uses:

Gamestar Mechanic is an excellent alternative game for those children who are not interested in computer programming, want to play games, and have a short attention span. This is a positive alternative to the violent games that children generally enjoy playing, because it is both fun and teaches children the basics of game design.

This game offers a progression of levels in which students playing have the option to complete puzzles and mazes. As the game progresses, it allows players to make minor changes to allow a level to be successfully completed. This way, the elements of game design are gradually introduced, keeping it fun and enjoyable.

Since the game is primarily used for fun, it can be used for older students.

Recommended lesson progression:

This lesson can be started with no prior experience. The only help that may be necessary is initially when students are setting up the account they will need to save their progression. Once this is done, students can play through the sequential levels freely.

<https://gamestarmechanic.com/register>

Methods to Motivate:

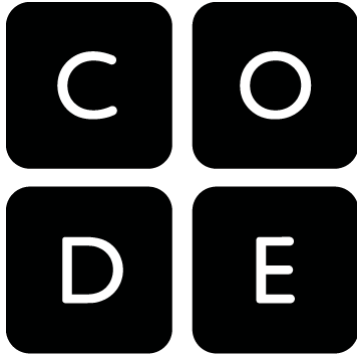
Competitions between different students playing the game to see who can get through the most levels in the shortest amount of time. The competition will engage the children most effectively.

Similarly, creating a competition to see which student can create the best game can also be an effective way to keep the children focused on the game design aspects of the game.

Grades 4-6

Students interested in computer science

Hour of Code: Course 2 Flappy Bird



Uses

Course two is designed for students who can read. In this course students will create programs to solve problems and develop interactive games or stories they can share. IN particular, the Flappy Bird exercise available is the perfect activity for children who are older and interested in programming. This applies the concepts learned previously, and allows the students the creative freedom to create the game as they wish. It effectively shows exactly how much fun programming can be and how there are many ways to complete tasks.

Recommended Lesson Progression:

The best way to have the students complete these lessons is to have them follow the predetermined order the lesson plans are arranged. This way, students will be able to learn the different programming techniques they will need in order to create and customize their game as they wish.

<https://learn.code.org/s/course2>

Methods for Motivating:

A good way to hold the students interest in this game is to have a competition to see who can create the most difficult game. This way, students will focus on the task as well as think of different ways to make the game difficult.

Tynker: Intermediate and Advanced Lessons



Uses:

The more advanced stages of Tynker are suited for children that have a more serious interest in computer science and how computers work. This resource allows students to create more complex commands using scratch.

These students will need to be attentive and focused in order for them to successfully complete the presented tasks. These are geared more towards the older children, as opposed to the more basic Tynker activities.

These activities present children who are serious about learning coding. The activities present more complex coding concepts and applications, in a fun game.

Recommended Lesson Progression

Based on the children's interest, they can play either Brick Breaker, 2-Player Cannon Game, or Arcade Shooter. All of these games require an intermediate understanding of programming concepts and applications to complete.

Methods for Motivating:

The best way to motivate the children to complete these is to provide rewards after students are able to successfully complete different levels they experience. This will entice them to continue learning.

Students not interested in computer science

This is a list of games that can be played by children not interested in computer science. Although these games are not computer science related, they are still good alternatives to the violent games the children in the computer club tend to play. These games include:

RoboDemo: This is a difficult game to reach so go to http://www.wizards.com/avalonhill/robo_demo/robodemo.asp. Then select Examples of Play, and finally “Mini Rally Training Ground”

iPhysicsgames.com: Offers a range of fun and reasonably engaging games for children to play. Some of the best games include:

Eat My Axe

Sports Head Soccer

Shine

These programs are for students that want to learn programming languages. The resources are listed in increasing difficulty

Code Combat



Uses:

This game requires the player to use various programming languages to help his or her character save villagers, slay ogres and find treasure chests. This requires typing and knowledge of syntax in order to have your player act as you wish.

Due to the complexity and challenge presented in this game, It may require some effort from the facilitator to get a student interested enough to play through a couple levels and show them it is actually an enjoyable game. Helping the children through a few levels is an effective way to engage the children.

The student does need an account to be able to save their progress.

This is an ideal program to introduce students to programming languages because it is similar to visual programming software such as Tynker, and similar resources, but is slightly more advanced because instead of dragging premade blocks in the correct order, the student has to type in the commands.

Recommended Lesson Progression:

This game has a built in level progression, and after the child completes a level it asks if it was too easy, just right or too hard and will direct the student to the most appropriate level. For this reason, along with the required account, the best way to carry out a lesson plan is to let each student conquer each level at their own pace, asking questions where needed.

Methods for Motivating:

Providing rewards after students complete levels initially is a great method to motivate the children to continuing their learning. Since this is a difficult program, positive reinforcement is required to keep students playing long enough to begin enjoying the game.

Code Avengers



Uses:

This website gives tutorials on various programming languages, including JavaScript, HTML and CSS. There are easy-to-understand directions for each language. However, since this is more challenging information, the student will have to be self-motivated to read and understand the instructions.

This is an excellent resource for students who want to build websites, apps or games. The way this website works is it requires students to select what they would prefer to learn, and then they are directed to the site tailored to what they choose to learn, and here they are taught the basics. Since this resource has difficult information in it, there are built-in hints to help students as they progress.

Lesson Progression:

Code avengers has pre-made tutorials. For this reason, students can be introduced to HTML/CSS or JavaScript. This is a good alternative to Code Combat, if the children are not interested in the adventure game-style of learning found there.

Motivation:

The students will have to be self motivated, but a reward after completing every few lessons would help them stay interested.

Codecademy



Uses:

This is a good website for students who wish to learn different programming languages. It has tutorials that show how to make a website. In addition it also teaches languages such as Ruby, Python, JavaScript, JQuery, PHP and HTML/CSS.

Although the homepage of this website is uninviting, the tutorials available are well-developed and informative. This does require the student to be exceptionally motivated and a desire to learn the different skills available.

The best place to start if the student does not know which language they want to learn would be the goals of animating their name (JavaScript), making a website about themselves (HTML/CSS) or creating a solar system (HTML/CSS).

Lesson Progression:

The lessons are already made.

Motivation:

Providing students with a reward for attempting the more advanced sites is a great way to expose them to more advanced programming concepts. It would also be helpful to offer even more reward if they successfully complete a lesson.

Stencyl



Uses:

This software offers programming information similar to Tynker, just more advanced. It is a visual programming based software that allows students to design and program their own games. A Crash Course on how to build a game using Stencyl is available on their website, and other tutorials can be found on YouTube.

This program would be best if implemented in a more developed computer club, where students learn programming in a more formal setting.

Software similar to Stencyl, such as Construct 2, Scratch, GameMaker and Unity 3D could be implemented in a similar way.

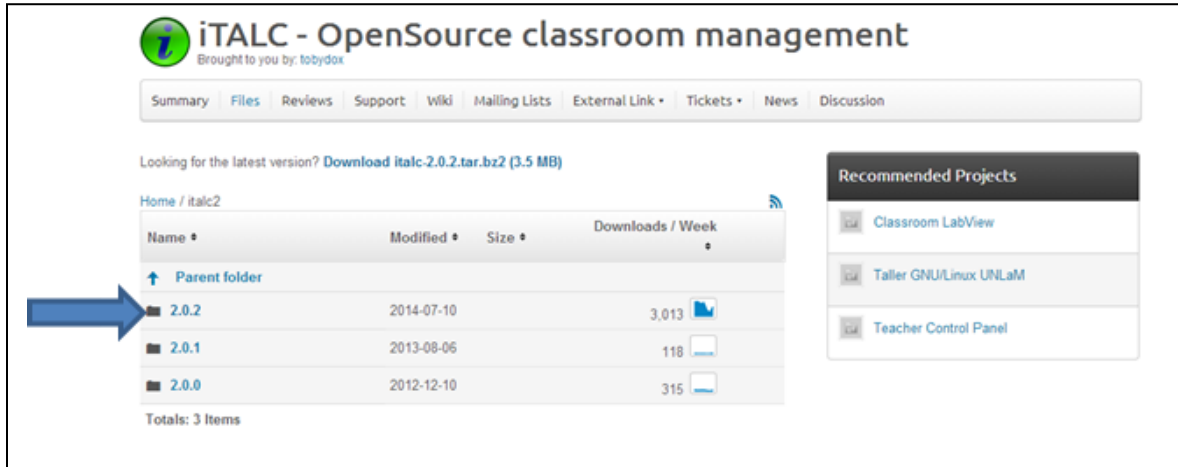
Lesson Progression:

Students should start with Crash Course 1, followed by Crash Course 2. Once these are completed, they should begin with the exploring online tutorials that they find interesting.

Appendix F: iTALC Guide

Installing iTALC

1. Go to <http://sourceforge.net/projects/italc/files/italc2/>
2. Click on the folder with the most recent folder



The screenshot shows the SourceForge project page for iTALC. The page title is "iTALC - OpenSource classroom management". Below the title, there are navigation links: Summary, Files, Reviews, Support, Wiki, Mailing Lists, External Link, Tickets, News, and Discussion. A link for "Download italc-2.0.2.tar.bz2 (3.5 MB)" is visible. The main content area shows a file list for the "italc2" project. The list has columns for Name, Modified, Size, and Downloads / Week. The entries are:

Name	Modified	Size	Downloads / Week
Parent folder			
2.0.2	2014-07-10		3,013
2.0.1	2013-08-06		118
2.0.0	2012-12-10		315

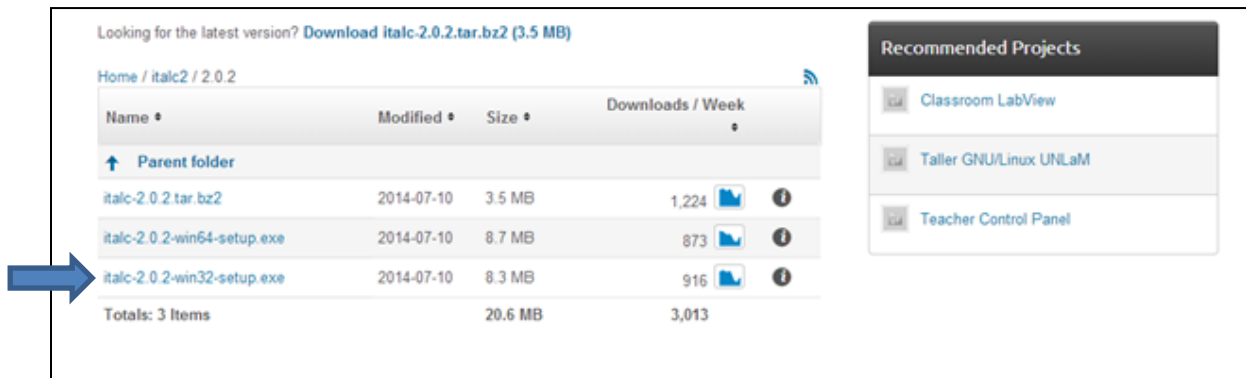
Totals: 3 Items

A blue arrow points to the "2.0.2" folder.

Recommended Projects:

- Classroom LabView
- Taller GNU/Linux UNLaM
- Teacher Control Panel

3. Next click on the win32 setup executable



The screenshot shows the SourceForge project page for iTALC, specifically the "2.0.2" sub-page. The page title is "Looking for the latest version? Download italc-2.0.2.tar.bz2 (3.5 MB)". The main content area shows a file list for the "italc2 / 2.0.2" project. The list has columns for Name, Modified, Size, and Downloads / Week. The entries are:

Name	Modified	Size	Downloads / Week
Parent folder			
italc-2.0.2.tar.bz2	2014-07-10	3.5 MB	1,224
italc-2.0.2-win64-setup.exe	2014-07-10	8.7 MB	873
italc-2.0.2-win32-setup.exe	2014-07-10	8.3 MB	916

Totals: 3 Items

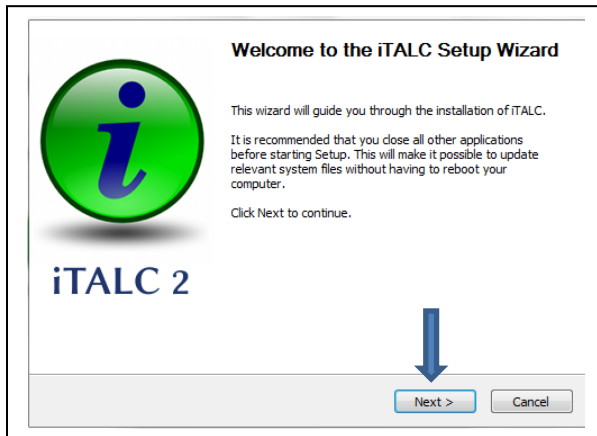
A blue arrow points to the "italc-2.0.2-win32-setup.exe" file.

Recommended Projects:

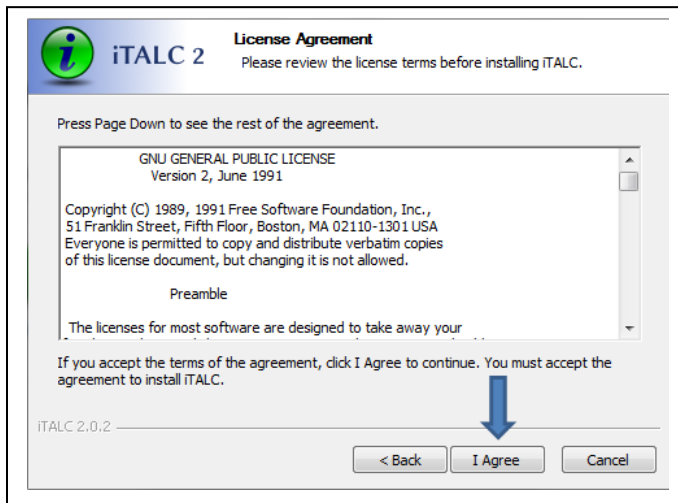
- Classroom LabView
- Taller GNU/Linux UNLaM
- Teacher Control Panel

4. This will start the download automatically, then save the file. The Downloads folder is generally a good place.
5. Open the file when it has finished downloading.
6. Allow the program to run.

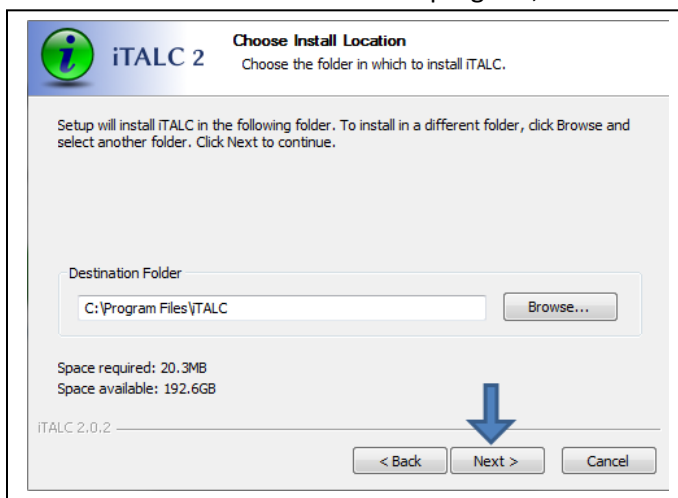
7. Click Next to continue installing.



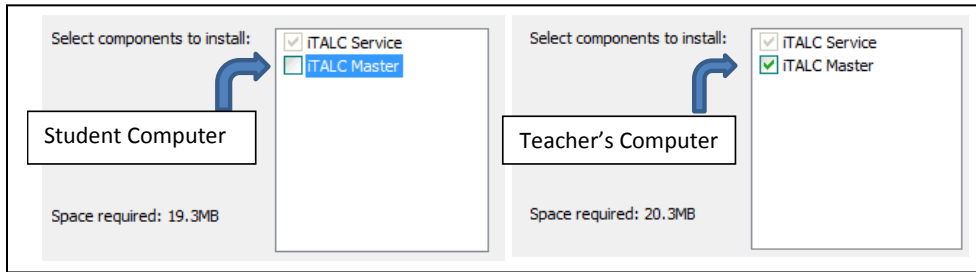
8. Then read and agree to the License Agreement.



9. Choose a destination folder for the program; the default is the best choice.



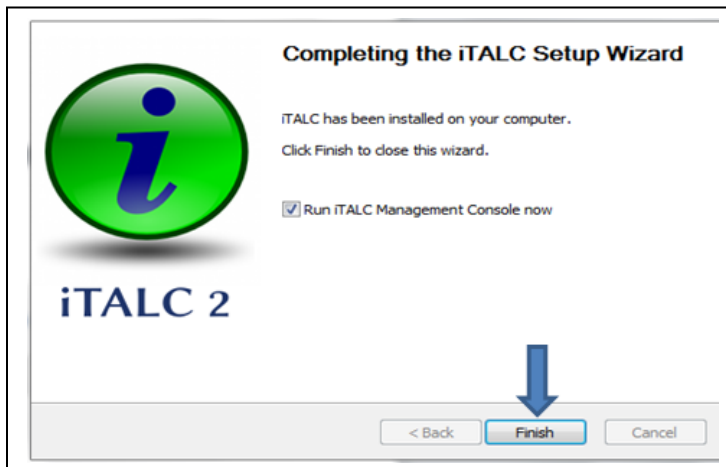
10. This next step is critical. If this is the computer that should be in control of the others, leave iTALC Master checked off. If it is just a student computer, make sure that box is blank.



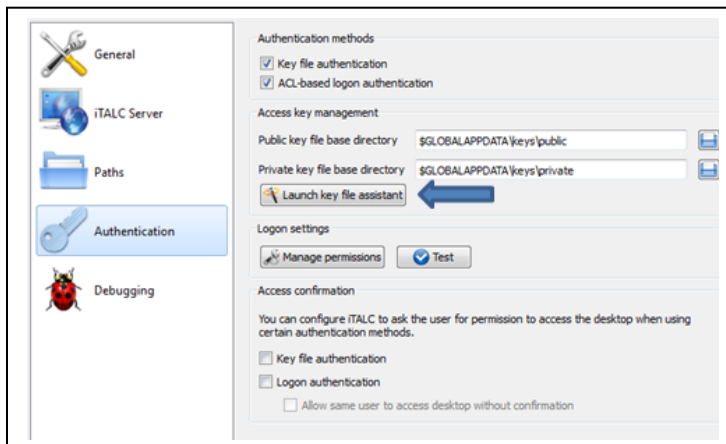
11. Press Install

Master Computer Set-Up

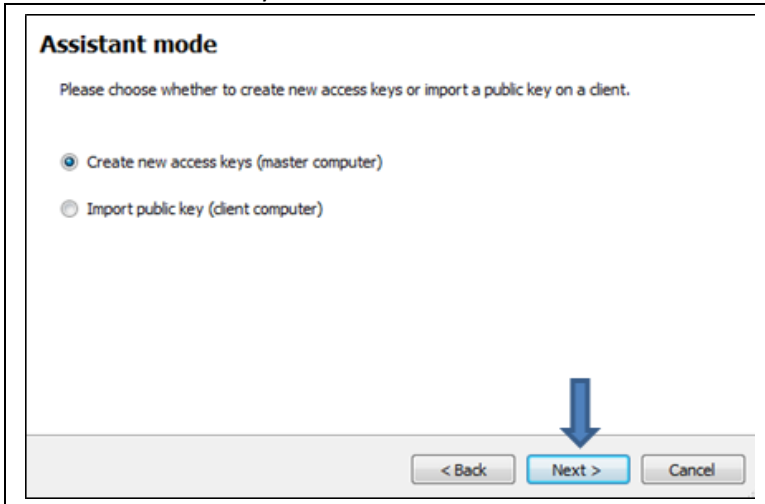
1. After installing the iTALC Master computer program, click Finish and run the Management Console.



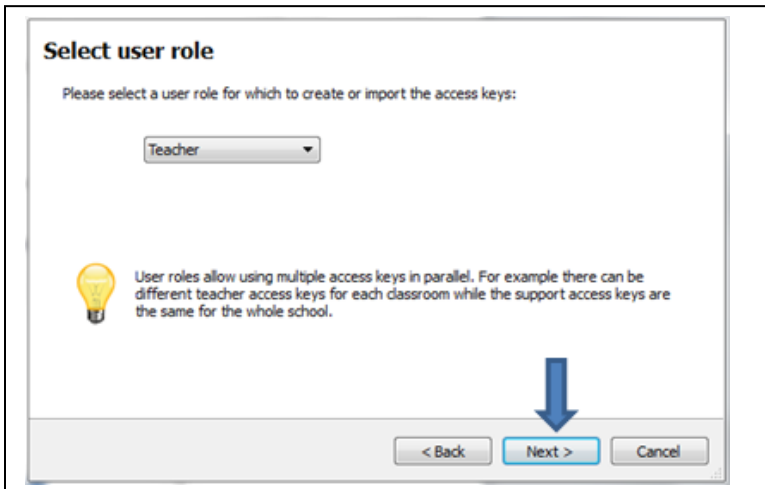
2. Launch the Key File Assistant under the Authentication tab.



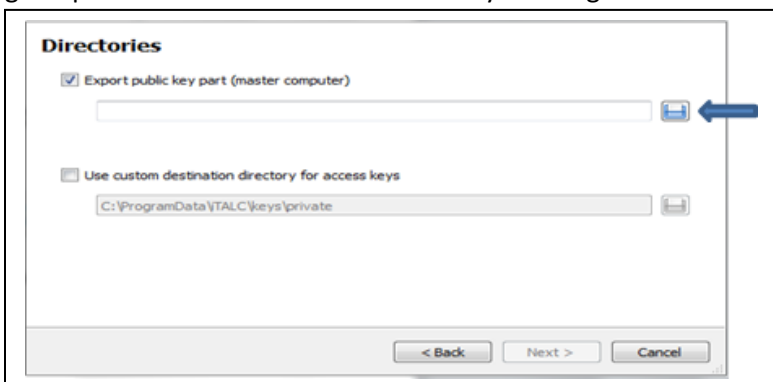
3. Read how the keys work, then press Next.
4. Create new access keys.

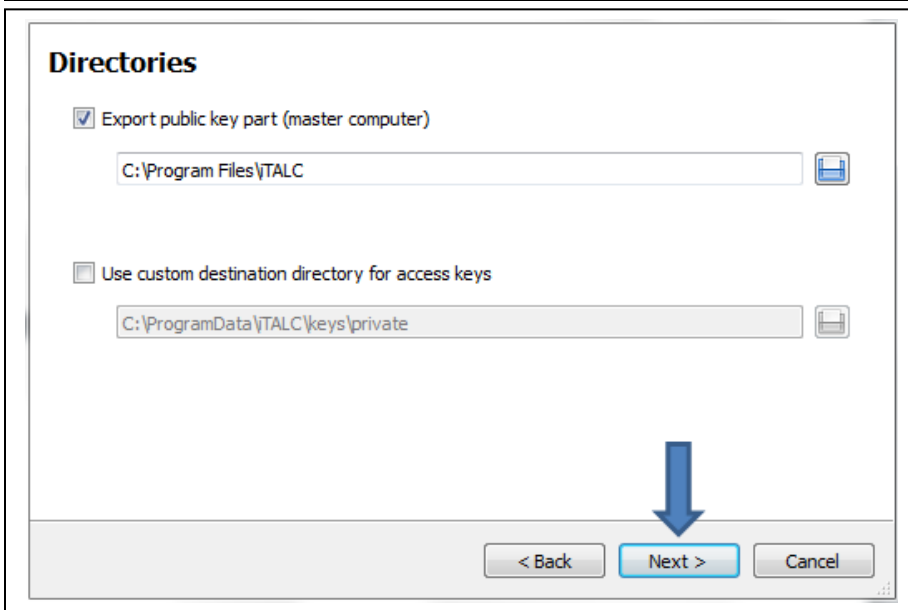
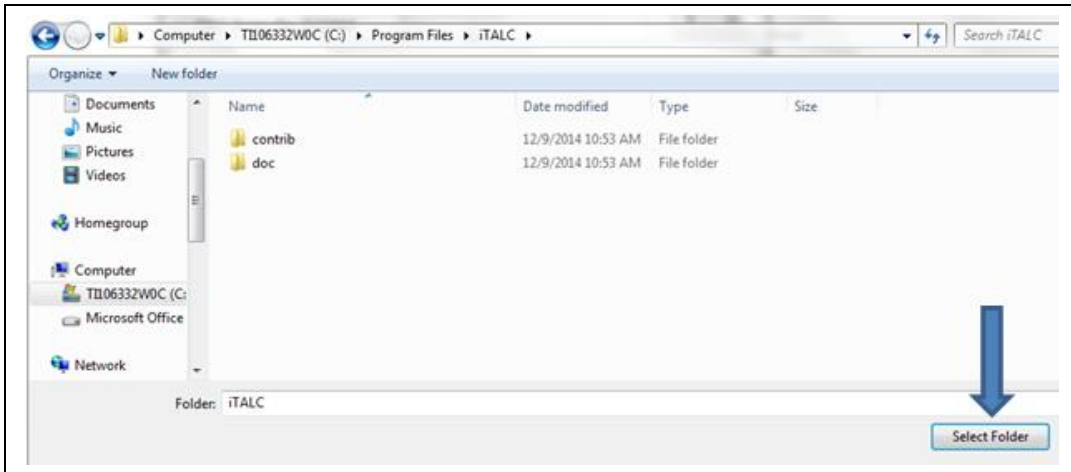


5. Set the role as Teacher and click Next



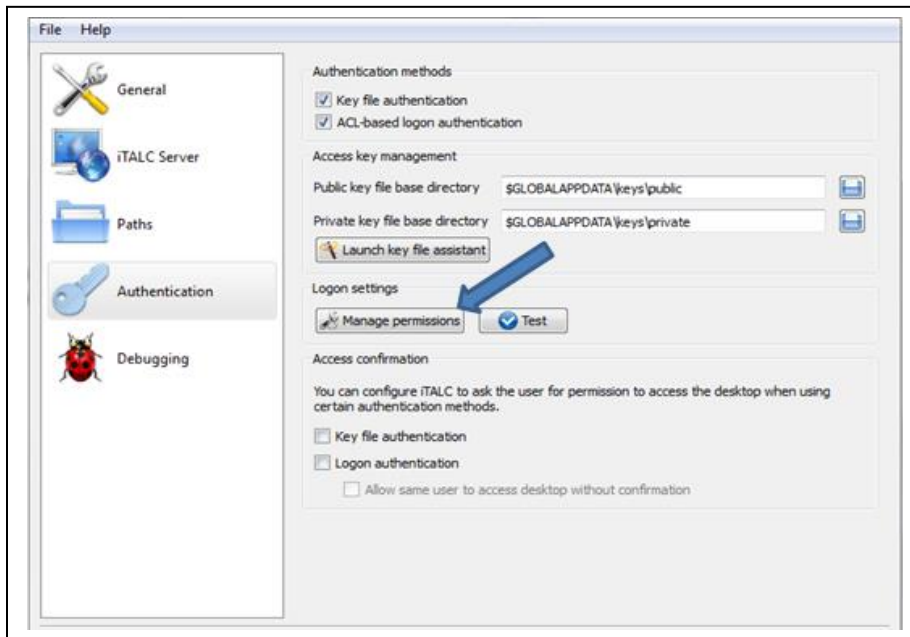
6. Export a public key to your computer. It is important to remember where you save this file. A good place to save is the iTALC folder in your Program Files.



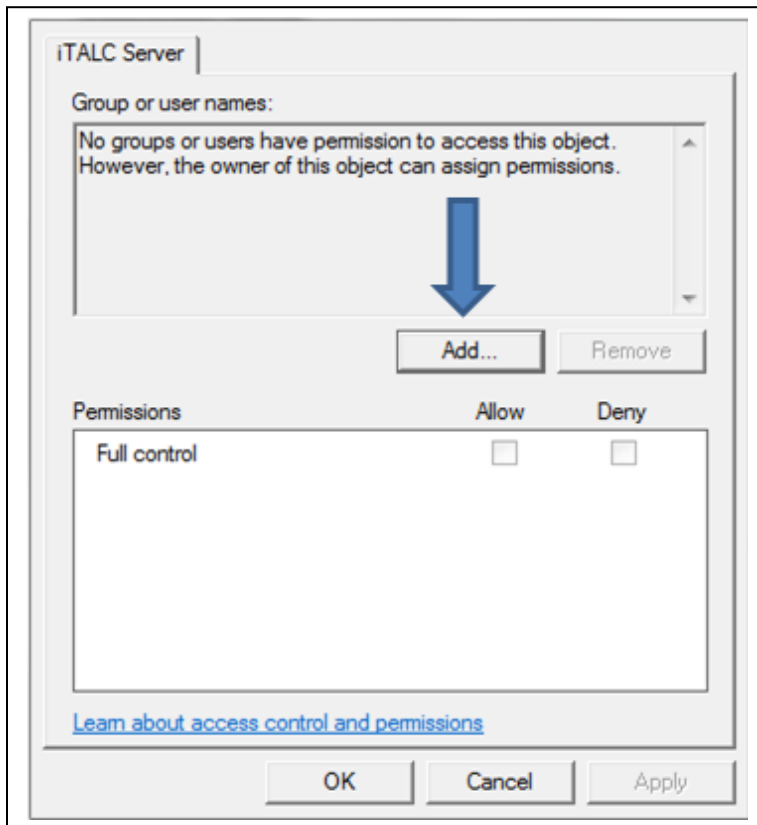


7. Read the Summary and finish creating the keys.
8. The next section requires the computers to be password protected, if they are not, go to the **Creating a Password** guide. That guide also includes how to set the computer to auto-login, so the user does not have to take the time to type in the password.

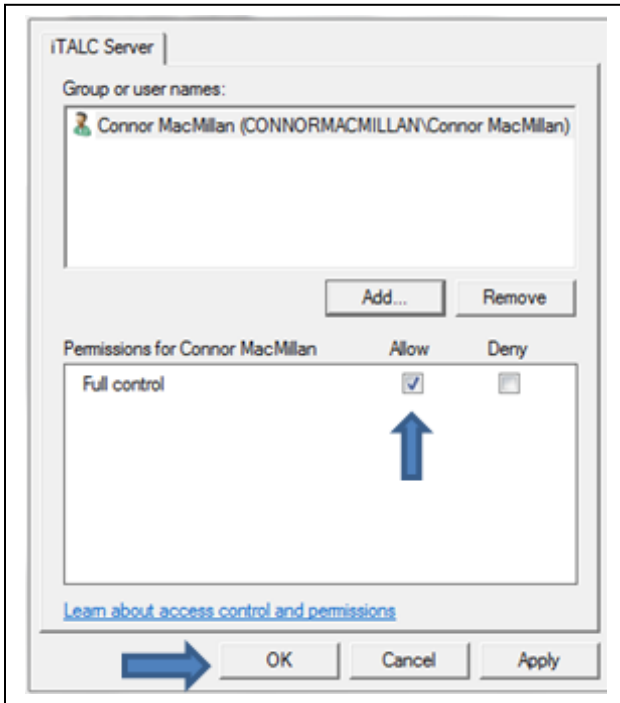
9. After confirming the computer has a password, go to Manage Permissions, under the Authentication Tab.



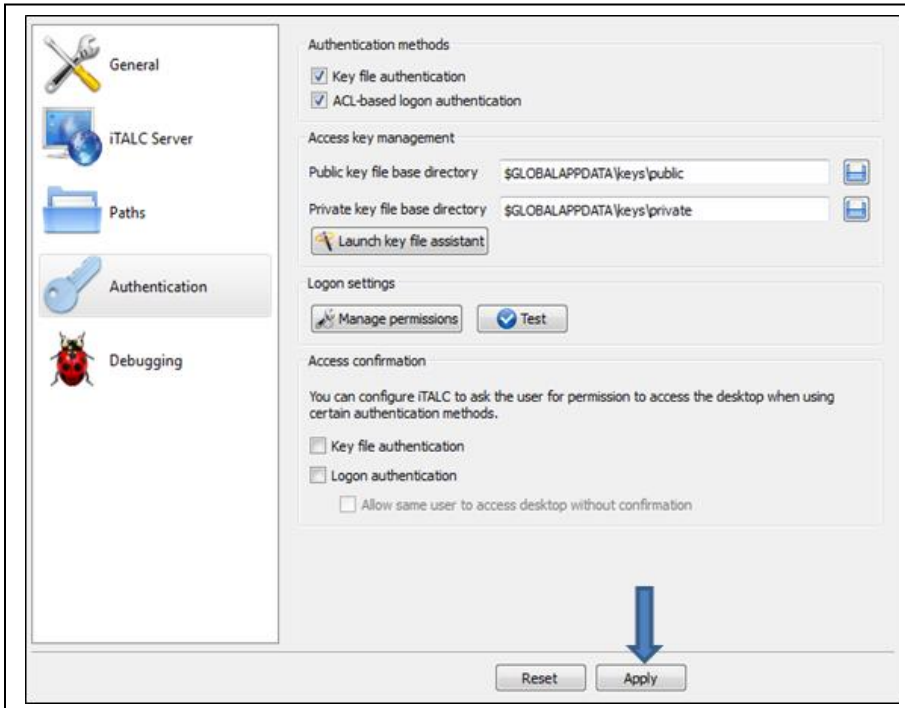
10. Add a new username to be able to have full control of the program.



11. This new user name will be the same as the one on the computer, which can be found by looking at the top –right of the start menu, for many computers this name will be Student. Click Check Names and the rest of the information should be filled in automatically.
12. The new user should show up on the permissions page, confirm that it is given Full Control and press OK.

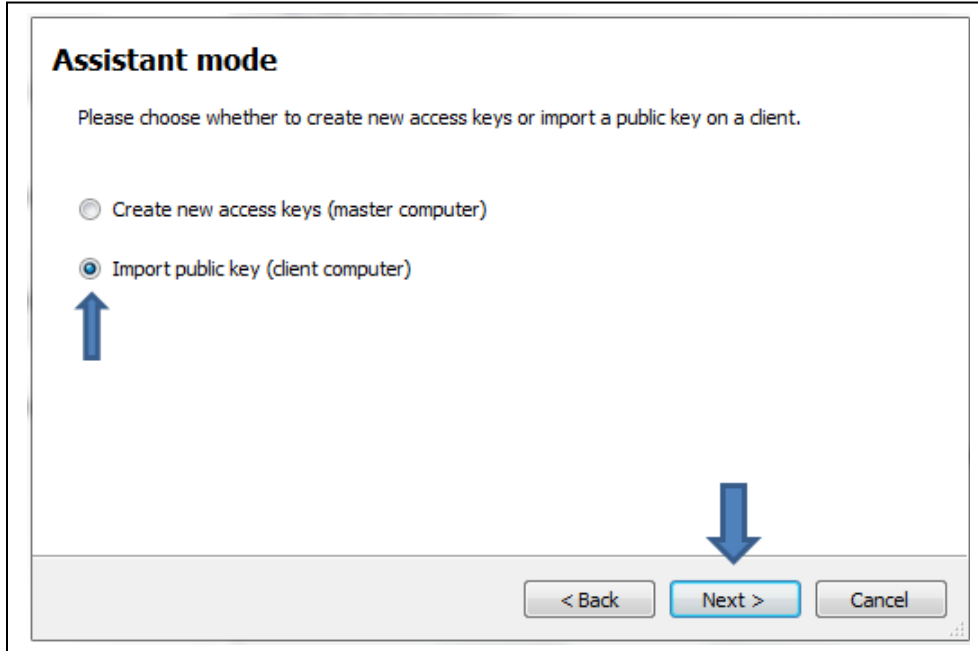


13. Run the Test, enter the password for the account and if it works successfully, the teacher account is ready to run, just make sure to hit apply. This will automatically restart iTALC.

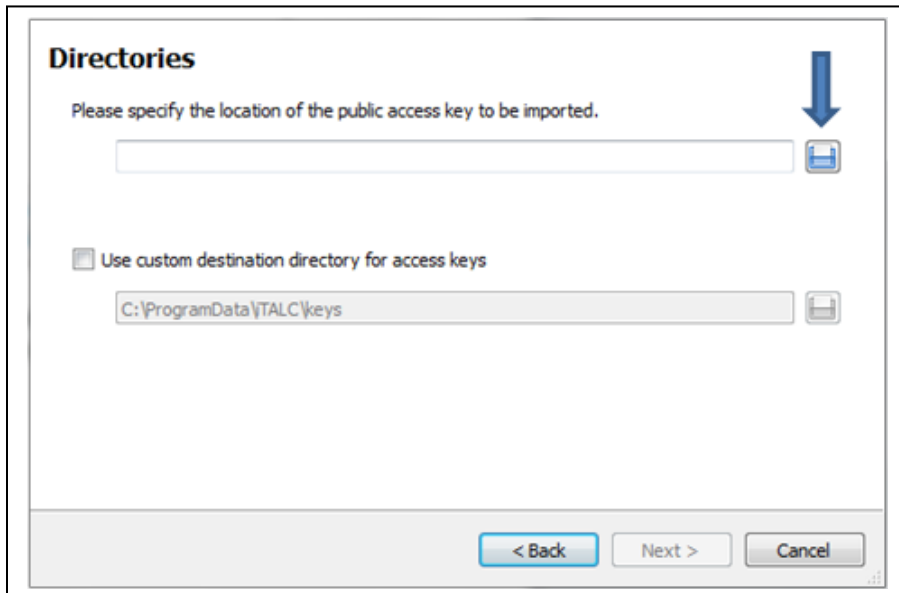


iTALC Student Computer Set Up

1. After setting up the Teacher Computer, put the public key created by the Key File Assistant onto a flash drive. This flash drive will be necessary to get each student set up with iTALC.
2. One iTALC is installed onto the student computer, launch the Key File Assistant the same as the Teacher Computer, but instead of creating a new key, import one.



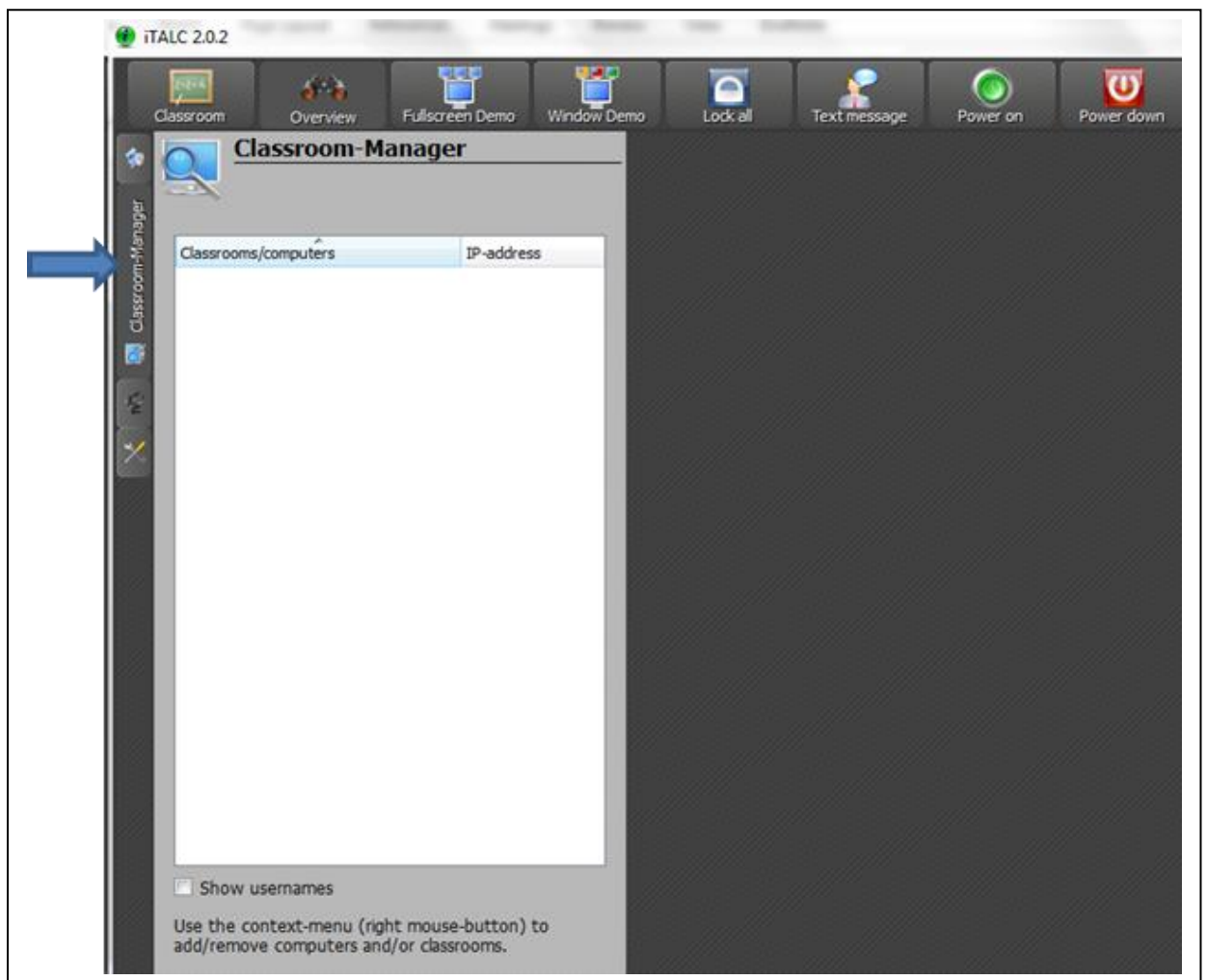
3. Select the same role as the one made for the Teacher Computer, which should be Teacher.
4. Then specify the location of the key as the one placed on the flash drive. Finally finish importing the key.



5. Then the student computers will have to be given Full Access to control the computer. This can be done the same way as with the Master Computer (Steps 8-13 in the **Master Computer Set-Up**)
6. After applying the changes, iTALC is ready on the Student Computer. Repeat this guide for each computer in the class.

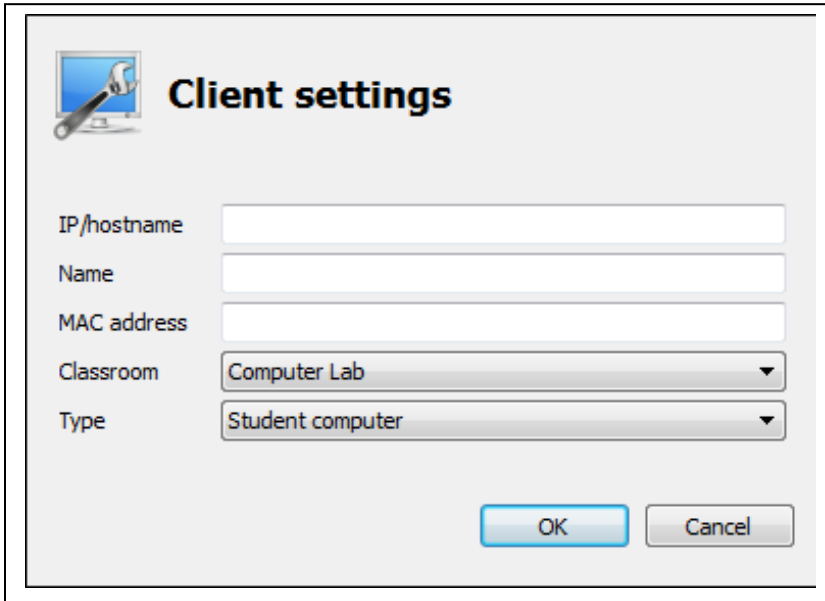
Creating a Class and Adding Computers

1. Once the Master and Student computers are set up with iTALC, and linked through with the keys a classroom has to be set up in iTALC. Open the iTALC program on the Master Computer (This is different than the management console)
2. Enter your password to logon and open the Classroom Manager located on the left side of the screen.



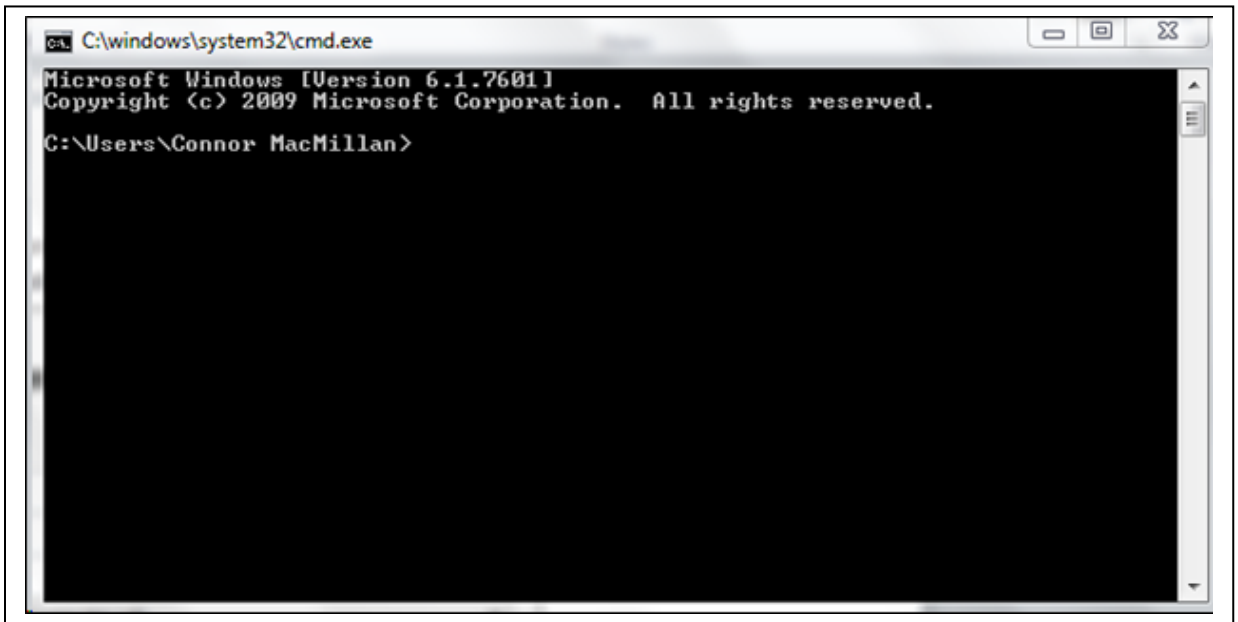
3. Right-click inside of the Classroom Manager and add a new Classroom

- After creating a classroom, add a computer to the classroom by right-clicking again.



The image shows a dialog box titled "Client settings" with a wrench and screwdriver icon. It contains several input fields and dropdown menus. The fields are: IP/hostname, Name, and MAC address. The dropdown menus are for Classroom (set to "Computer Lab") and Type (set to "Student computer"). At the bottom right, there are "OK" and "Cancel" buttons.

- Confirm that the computer is in the correct classroom and type. Then find the IP and MAC address for the computer being added, these can be found by using the student computer.
- To find the IP addresses of the student computers, open the command prompt by searching CMD on the start menu.
- This window should open.



- Type in the following phrase: "ipconfig" and press enter.

- A lot of text will appear on the screen, scroll back up to where you entered ipconfig and the IP Address of the computer can be seen. Use the IPv4 Address.

```

C:\windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Connor MacMillan>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::999b:873:d2d7:e0ec%12
    IPv4 Address. . . . . : 192.168.1.177
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::ac6a:dff:fe54:ae17%12
                                192.168.1.1

Wireless LAN adapter Wireless Network Connection:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::b5b8:2394:f770:7186%11
    IPv4 Address. . . . . : 192.168.1.151
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::ac6a:dff:fe54:ae17%11
                                192.168.1.1
  
```

- Enter this number into the IP/Hostname section on the Master Computer as it appears on the Student's Command Prompt
- Next to find the Student's MAC Address, use the same Command Prompt and type in this phrase: "getmac"
- The MAC Address will appear on the screen, use the address that has a device connected.

```

C:\windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Connor MacMillan>getmac

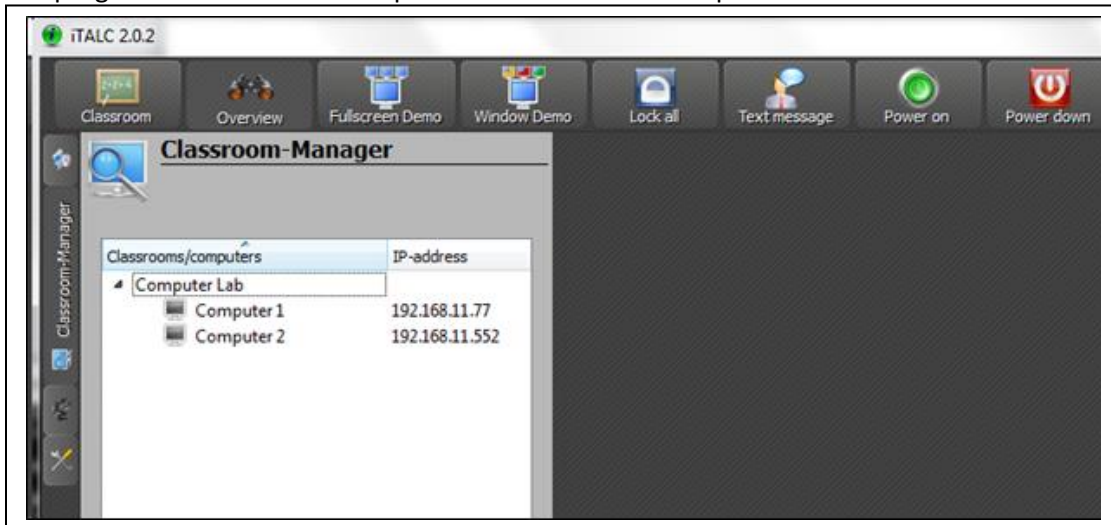
Physical Address      Transport Name
=====
E0-94-67-02-D5-FE   \Device\Tcpip_{369407AA-31D1-4AF9-AB0C-21E84DFF082A}
B8-88-E3-15-7D-77   Media disconnected
  
```

This is the MAC Address. In this case the top would be used

- Enter this address to the section labeled MAC Address on the Master Computer.
- Finally Name the computer, which is used for the teacher's reference, and add the computer to the class.
- Repeat steps 4-14 for each Student Computer on the network.

How to Use iTALC

After Setting up, linking and creating a classroom, iTALC is ready to use. Open the iTALC program on the Master Computer and this screen will open.



Overview Function: This is used to see all of the computers connected to the Classroom. To add or remove a computer from this screen, double-click on the computer in the Classroom Manager.

Fullscreen and Window Demo: These features currently have glitches and do not work consistently. This is most likely due to the amount of computers on the network or in the software. Look for a newer version of iTALC in the future and this might be fixed. Ideally these should allow the teacher to show a demo of whatever they are doing to the students in either a fullscreen version so the students can only watch or the windowed version which allows the students to follow along.

Lock All: Clicking on this causes iTALC to lock all of the computers in the class. This could be used if the students are supposed to be focusing on the teacher rather than the computer.

Text Message: This can be used to send a message to the computer screens of all the students

Power On: This allows the entire class to be turned on from only the master computer, unfortunately this function also does not work properly in this version of iTALC.

Power Down: Clicking this will turn off all of the student's computers simultaneously.

All of the functions work either for the entire class, or for individual students. To use these for single computers, right-click on the desired computer and select the desired function.

Remote Control: This function is only available for one student at a time. It allows the teacher to take direct control over the student's computer.

Creating a Password and Auto Login

1. Go to the Start Menu
2. Press Control Panel

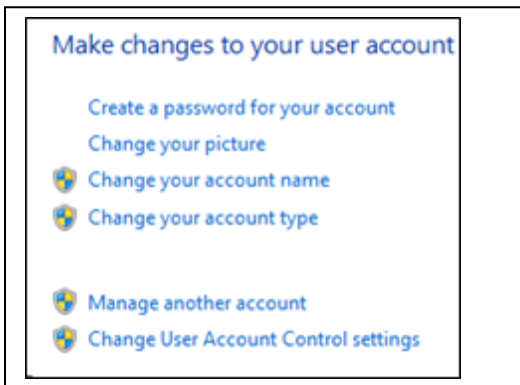
3. Click on User Accounts



4. Go to Change Windows Password.



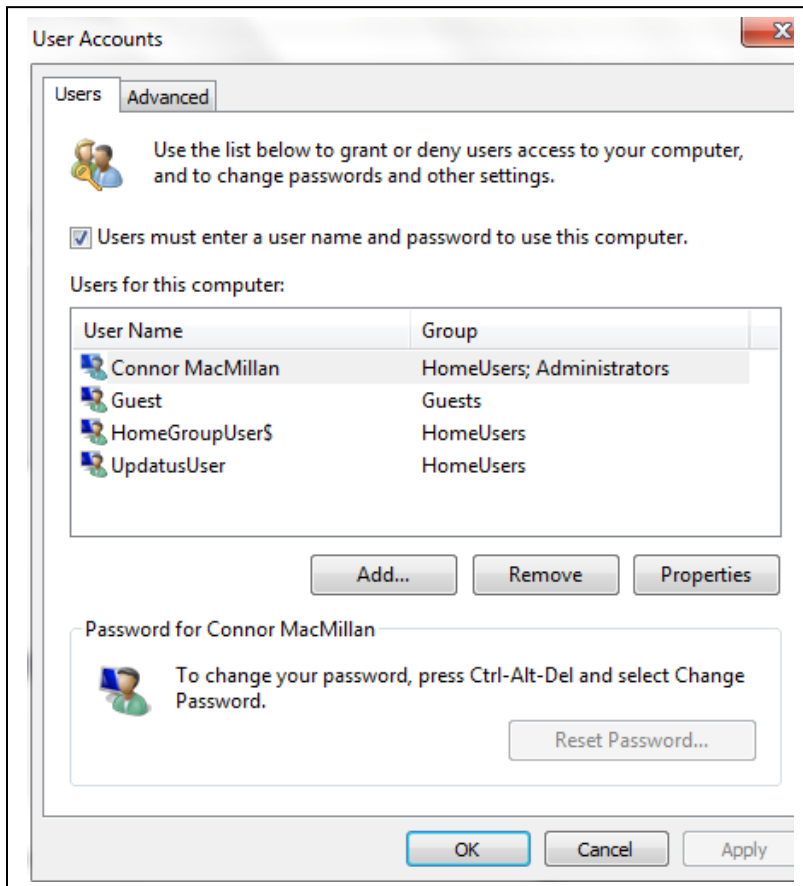
5. Create a new password for your account



6. Enter a password that is easy to remember. Adding a hint may be a good idea, too.

Auto-Login

1. After creating a password, the computer can be set to auto-login to the account. Search netplwiz on the Start Menu.



2. After unchecking the box the account will autologin. Finish by clicking OK.

How to Save Web Pages

In Google Chrome, simply open the file drop down menu that can be accessed from the icon to the right of the address bar. In this menu there is an option to "save web page as." Saving the page in this way will save all of the text, layout, and formatting of the page as it appears as well as any images included in the page. Please note however, that embedded video files will not be saved, and neither will flash applets nor interactive PHP enabled content.

To save embedded video files:

If the videos are hosted on Youtube then a simple service such as ... can be used. First click the YouTube logo on the video to be brought to the YouTube page for that video, then copy the address of that page. Input the address of the video page into the video downloading service and the download should begin.

To save flash applets:

Right click on the flash applet on the page and a save option should appear. Depending on the browser being used it should state something along the lines of "save as," "save target as," or "download target as" etc... This should save a file ending in extension .swf. This can be accessed offline at anytime and to open the file simply direct your computer to open it with your web browser of choice.

Regarding PHP enabled content:

This content cannot be easily recreated offline. Examples are certain quizzes or interactive pages on web sites. It is generally indicated by the presence of "PHP" in the web address of the page. Simply saving the page as previously outlined will recreate as much of the page as possible. If the end user is offline, this is all that will be available. If they are connected to the internet at the time, then missing content will be filled in automatically as they connect to the web version of the page.

Miscellaneous content:

Any links on pages that directly open PDFs, audio files, or video files can be right clicked and "download target as" or "save target as" will download the file associated with that link. This was the case in many of the BBC "Words in the News" pages. Note that the "Video Words in the News" videos are not easily saved but the links to the audio transcript and text are still available for those pages.

To Put on CD

To get the content onto a CD, locate the folder it is all contained in or create a single folder to contain it all in. Right click this folder and mouse over the "Send to" tab and select "Disc Creator (data)" or similar.