

# Creating a Tower Defense video game

Supervisor: Mrs.

March 1

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*Inferno Tower Defense*  
*A game by*

Play

Quit

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## Introduction

School’s Personal Project Guide states that “the Personal Project gives the students opportunities to focus on an area of personal interest and to expand their knowledge of a chosen subject” (page 1), and this is a chance for me to show how I develop my skills within a personal interest. The project is conducted over an extended amount of time, and will provide a challenge that tests my ability to research and organize information, apply knowledge and skills, and reflect on my abilities. The Personal Project should be an interesting project that I ultimately enjoy spending time on and working with.

## A: Investigating

### The goal

The goal of my project is to *create a tower defense video game*, in order to *demonstrate my personal technical innovation* within my chosen platforms: python and pygame. I have decided that the product should be completed towards the end of my project after researching, to get an understanding of how to create the game. I have chosen to conduct my personal project in the topic of computer science, as of all the ideas I considered this was the one that I had most passion for, and that had the most opportunities for developing my skills, by learning how to make a game from scratch. Before considering a personal project, I was already somewhat interested in computers and computer science, and I liked to spend my spare time doing activities related to computers and programming. I considered doing a written piece in either english or norwegian, but I chose to not do this, as I did not think I would find it as interesting or enjoyable as creating a video game.

### Global Context

My global context for the project is *Scientific and Technical Innovation*, because my project is about innovating a new game by the means of computer science, using existing tools and resources. By creating an original game I am using computer programming tools at my disposal in new ways, and combining already existing methods to create new ideas, on a broader scale. My choice of global context could also have been *personal and cultural expression*, but I didn’t choose this, as my goal is more about innovating a game using the tools I discover during my research. My goal does not regard expressing myself through creating a game as much, although there is still some level of expression through the visual design of the game, and choices of game mechanics.

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## Prior learning

I had some prior learning before I started my project, and this included limited understanding of the programming language “python”, acquired with an online course through Udemy (Bowers). This learning was somewhat effective, but I found that the course was not properly documented, and therefore did not give a very well understanding of python. I abandoned the course after a couple of lectures because it was not too interesting or informative.

In terms of subject-specific knowledge, what I have learned in mathematics is the most practical for the project, as in my game I will be using a variety of different calculations in order to achieve my goal. One such calculation is for calculating the distance between two points, which will be useful in my tower defense game in order to calculate the distance between a tower and an enemy, and determine whether the enemy is within the given range of the tower. Design has also provided me with experience of how to conduct research and creating a plan, which will be useful for my project to manage my time effectively, and in order to write my personal statement.

Additionally, skills that I have learned in Approaches To Learning (ATL) lessons are widely useful for the project. Self-management skills such as organization will help to create short and long term plans to meet the deadlines, setting challenging and realistic goals, and using technology effectively and productively. Research skills within information and media literacy will help me to make connections between various sources of information, present information in a variety of formats. They will also help to collect and analyze data in order to identify solutions and make decisions, organise and use information from a variety of sources and seek a range of perspectives from multiple and varied sources.

## Research Skills

Before the project started I had some research skills; I was able to identify primary and secondary sources, I could seek a range of perspectives from several sources and collect and record data, as well as make connections between different sources. Also, I could create references and citations to support a bibliography, analyze and evaluate information from different sources, and use critical thinking skills to interpret information.

I further developed these research skills during the project, which can be seen in appendix 1A and C, where I consult similar sources with two different perspectives. Dr. Charles Severance teaches as a Clinical Associate Professor at Michigan State University, and has several degrees in computer science, including a Ph.D., from Michigan State University (University of Michigan, “Charles Severance”), (Severance, “Charles R. Severance Short Biography”). I chose a course on python taught by him, and this course ensures that I get high quality information taught by an expert within the field, and should provide a solid foundation to start my project.

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When I finished this course, I moved on to a series of videos teaching me how to use pygame (Kinsley, "Pygame (Python Game Development) Playlist"). These were taught by Harrison Kinsley through YouTube. This gives a new perspective from a person who teaches programming on a different platform and on varying topics. I demonstrate my ability to make connections between both of these sources in appendix 1H, I and J, by using python and pygame to create my product, and by using critical thinking skills. I then apply the knowledge in unfamiliar situations to create a new and different program. These two sources have helped me the most in creating my product, and was the most important research the I conducted. Additionally, I closely reference these, and other sources I use in my project in my report and journal entries, which shows my ability to construct a bibliography. This can be seen in this paragraph of the report and in appendix 1A, C, H and I, both using in-text citations.

## B: Planning

### Design Criteria

Design criteria are important to measure the success of my product. I have developed detailed criteria for my product where I clearly explain how I will measure the success of my product, see appendix 2B. The criteria are suitable for the project, as it is relevant to the product, with concrete examples of what should be included in the final outcome, such as criteria *including a game over screen* ~~standing the remaining health of enemies~~. There are sufficient criteria to ensure success: if all 14 criteria are met, the product should be functional and of high quality. While creating the product I saw it necessary to add a few more criteria to the list, as by creating some features I found that they were not sufficient for the game. Criteria 12-14 were the ones I added and I did not change any of the other criteria.

### Research Plan

I have created a research plan, see appendix 2A, where I have planned what research should be completed by when, with justifications for each objective and possible a method of completion. This was to help me finish objectives on time. It shows the major steps that were planned to be done in the project, and although I didn't follow all the steps in the project, I attempted to as best as I could.

I provide evidence that I completed objective 1 of the plan in the form of a statement of accomplishment in appendix 1B. Objectives 2 and 3 were postponed to January , because I hadn't completed research in time, and therefore it was difficult to come to a final decision on a goal and global context. I discuss this in appendix 1E and F, and finally achieve both of these objectives along with finishing research, objective 5, in late January, see appendix 1G. This unfortunately meant that I didn't reach objective 4, handing in a first draft, as I had not made any significant progress in my report. I since worked more on the report as well as the product, and handed it in for feedback

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February 3rd, see appendix 1J, achieving objective 6. I handed in my product before the deadline through Managebac, and the finished product is available for download, see section *C: Taking Action, Product documentation*.

## Self-management skills

Self-management skills help with managing things such as time and energy, and even though I had the knowledge of several, I haven't used them a lot prior to the personal project. I already knew strategies for overcoming distractions, I have experience with creating efficient plans, and I am very persistent and perseverant. During the project, I learned how to organize my time and energy for longer periods of time, and I realized how I could use technology effectively and productively.

Although I knew strategies for overcoming distractions, it is apparent that I did not practice them in the start of my project, as I identify in appendix 1F. This halted my progress, but I was able to work more efficiently later on, evident in appendix 1G, H, I and J. Here I make significant progress in my project and finish my product without being distracted. I have constructed a research plan, see appendix 2A, which is logical and effective, and I created detailed criteria that explains what features I have to implement in my product, see appendix 2B. The criteria acted as a guideline and plan when creating the product. I demonstrate my persistence and perseverance when working with my product, as I meet several difficulties, see appendix 1H and I. I show that I refuse to give up and instead I work steadily to find solutions to my problems and make progress towards a finished product.

The start of my project was not as productive as it should have been according to my plan, see appendix 1D, however I was able to organize my time and energy effectively towards the end of the project, and therefore finished my product quickly while maintaining quality, see appendix 1J. There are also similarities between this and my use of technology: It was effective in the start of the project, see appendix 1B, but came to a halt not long after, see appendix 1C, D, E and F. This was when I tried to acquire information through YouTube. After realizing this however, I took actions to make my use of technology significantly more productive, see appendix 1G, and this worked, making it possible to work effectively, see appendix 1I and J.

## C: Taking Action

### Product documentation

The product of my project is a video game, more specifically a tower defense game, which functions on computers with windows. It achieves my goal of creating a tower defense game, in order to demonstrate my personal technical innovation, and responds excellently to the criteria, which can be seen in appendix 3A and B. It is related to the global context, *scientific and technical innovation*, as it is a demonstration of the knowledge that I have acquired through the project. Instructions for how to

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download the game can be found here:

## Thinking Skills

Thinking skills help me in the project during the creation stage. Before the project started I was not using a lot of thinking skills, for the most part limited to considering multiple alternatives, and using knowledge, understanding and skills to create solutions. During the project I started to develop and use several new skills: I demonstrate my ability to apply existing knowledge to generate a new product in appendix 1G, H, I and J, I apply my skills and knowledge in an unfamiliar situation in appendix 1H, I and J, where I use my research of python and pygame to generate a new game that I had not been taught or researched how to create. The game I made shows that I created an original work, and I made connections between my prior learning and experiential learning in order to do so, see appendix 1H. I had to troubleshoot the systems I designed for my product, and solved the issues by creating solutions to the problems, especially in appendix 1H and I.

## Communication and Social Skills

My communication and social skills have grown during the project. Prior to the project I was able to listen to other perspectives and ideas, and use a variety of sources to some extent. I have developed those skills further, and also used and interpreted a range of terms. It is evident that I used a variety of sources, such as online videos, text-based documentation, and online activities like quizzes and assignments, see appendix 1C, A, and H and I. I interpret these sources to create my final product with the information I had acquired, see appendix 1H and I. I learned sufficient amounts of terminology specific to python and pygame, see appendix 1A and C, and applied them when I created my product, see appendix 1H and I. The feedback I have received on my product, see appendix 3B, has been taken into consideration in section *D: Reflecting, Evaluating the product against the criteria*. I reflect on how I could improve my product in relation to this feedback, showing how I listen to other perspectives, and how I could act on the feedback.

## D: Reflecting

### Evaluating the product against the criteria

When my game had been finished it, I was able to reflect on the process and outcome. The product has achieved all of my criteria that I initially had, and should therefore be of high quality. These are all strengths of my product, and implementing all of these features gives it major strength in ensuring quality. I have evaluated personally how well the product reaches each of the criteria, see appendix 3A, and I have had four peers assess it as well, see appendix 3B. From these evaluations, one can see that it is evident that my product reaches all criteria I had set for it. It could have been improved

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however, as one of the responses said in appendix 3B: “the only way to improve the game is to add more features like new game modes, new towers and new enemies” and I also identify this in appendix 3A, when evaluating criteria 1. There are not a lot of weaknesses in the product, but more features would make it better, and the lack of these is therefore a weakness. To quote the same respondent as earlier, “Although basic, the game (...) is very functional as a game”, showing that the game can be built upon, which gives it future potential.

## My knowledge and understanding of the topic and global context

By completing the project I have extended my knowledge of my topic and the global context, by using the opportunity to develop a game that shows my technical innovation. I met several different challenges during the project, and I was able to develop different solutions for them. The first major obstruction was the slowness of development during the time between the start and Christmas break, as I did very little work on the project in this period. My solution for overcoming this was to work more regularly, and eventually end my research earlier than anticipated and move on to planning and creation, see appendix 1G. I also met problems when creating the product, as I struggled with “spawning” enemies at the right place, and letting the user build towers, see appendix 1H and J. Here, I had to be open-minded, and approach the problems from a new angle to find solutions that avoided the issues. This worked, but I will admit that other strategies could have been used to find more effective solutions. The reason for not choosing such solutions was that I had already tried to get them to work, but failing, so I chose to move on. In hindsight however, I have thought of a few different solutions that might have worked, but in the end I am satisfied that I moved on, because of the limited time frame I had. There were also smaller hiccups, that were more easily solved. These were often caused by misspelled words or incorrect use of functions in pygame. I solved these by correcting my spelling or looking up the correct use of the function in the pygame documentation, like I briefly mention in the end of appendix 1H, and in the start of appendix 1I.

By completing my personal project, I have learned a lot about my topic, *computer science*, and the global context I chose, *scientific and technical innovation*. I understand that computer science is not only about simply writing a lot of text, troubleshooting it and getting it to work so that some objective can be achieved, by using knowledge one already knows. Instead it is about inquiring into a range of solutions that tackle a problem differently, like I did in appendix 1H and I, through creative thinking and analysis. It is not a static process, but instead a process of constant learning that adapts to different needs and situations. Because problems and obstacles can be solved using a plethora of different methods, more effective solutions can be found continually. Computer science is an interesting field of exploration, that has an infinite number of paths.

When I thought about scientific and technical innovation prior to the project, it seemed just like an established category describing technology and science. I had not given much thought to innovation, but by creating a video game I have begun to innovate. Innovation is making changes to something that is already established, in particular through new methods ideas or products. I have done this by using my knowledge of python and pygame to create a new game, with new functions and



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mechanics, see appendix 1H, I and J. Scientific and technical innovation is not just about science and technology, but rather about changing it. By finding new solutions and ways it is possible to progress to better, more efficient or new products and solutions. This advances what we as humans are able to produce and take in use, and is not a fixed concept, but an ever changing path of obstructions and solutions.

### My development as an IB learner

The personal project has challenged me to become more of an IB learner through independent learning and various challenges. I have developed to become more balanced in my spare time, I have found new ways of thinking to solve problems, which has also led to a more open mind. Although it can be hard to see in the report, I balance my life considerably better now compared to prior to and during the project. My balance was clearly not the best before Christmas break, and although I tried to get back on track several times, see appendix 1D, E and F, I was not really able to. I learned from this when experiencing the time pressure after the break, and so I changed my working environment and attitude towards how I do homework, see appendix 1G. This helped drastically, and as I explain in appendix 1J, I was able to work effectively, which led to balance. I have had to think a lot during the creation stage, trying to find new solutions and approaching problems from new angles. In appendix 1H and I, I describe how I went about this, and I was able to successfully complete the product in time. It taught me that there are several solutions to every problem, and that when I'm stuck I should try to zoom out, and get a new view on the task. By finding new solutions I have become more open-minded to different perspectives, as it was required for succeeding in the product and project. I have had to use different sources of information, and it has shown me different approaches, that are each useful in their own way.

I completed my project far from perfectly, but this has added to the learning experience. My lack of work in the Autumn months, see appendix 1D, E and F, damaged by inability to get feedback, see section *B: Planning, Research Plan*, and it meant that I had an increased workload in the winter months. This is not ideal for a project that lasts for an extended period of time, but it meant that I could experience how it feels to have to work efficiently and intensely. This has taught me to manage my time better through deadlines, objectives and plans, but also how to work effectively when under a large workload. These are both positive outcomes that came from a negative experience, although it would have been preferred to spend less time in the winter, close to the deadline, and more time in Autumn, further away from the due date. This all originated from my weak planning and poor working surroundings, but resulted in a strengthened ability to manage time and resources in several areas, instead of a failure to meet deadlines.

As a whole, I think the project will have significant impact on my future learning capabilities because of the lessons I have taken away from it. I now value planning a lot more than what I used to, because I have experienced the massive influence it has on my ability to work with effectiveness and focus. I have learned that if I set myself clear goals in life it is a lot easier for me to work towards something instead of being distracted. This means that if I move on to the diploma program, and

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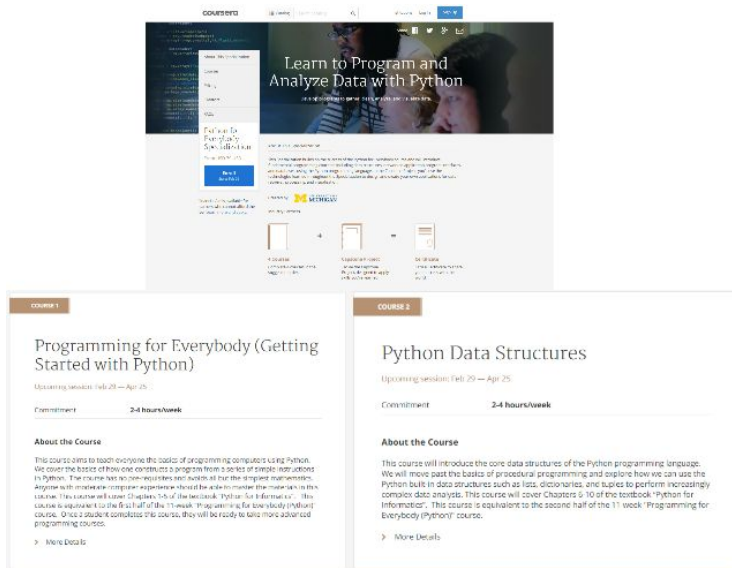
even further, I can apply methods that I know helps me focus and work effectively, because I have tested them in this project. Even if I don’t plan correctly, and I get caught up with a lot of work, I have practised how to work well under pressure, as I did in appendix 1G, H, I and J. These journal entries were only 11 days apart, but I made four entries because of how effectively I was able to work, even if it was under pressure.

## Appendices

### 1: Journal Entries

#### A: June 4th

Today I started with a course from coursera.org about computer programming in python<sup>1</sup> taught by Dr. Charles Severance (“Programming for Everybody (Getting Started with Python)”), which was recommended to me by Mr. Marius. It seems like a good way to learn, as it is structured with video lectures to teach the material, and assignments and quizzes to document my learning. It has an app along with the website, which makes it easier to follow the course wherever I am. I have decided to start my learning before school starts in order to get a head start on the personal project, which I think will help me with my time management.



<sup>1</sup> This course has since been extended, and parts 1 and 2 of the course currently being offered on coursera.org is equivalent to the course I took.

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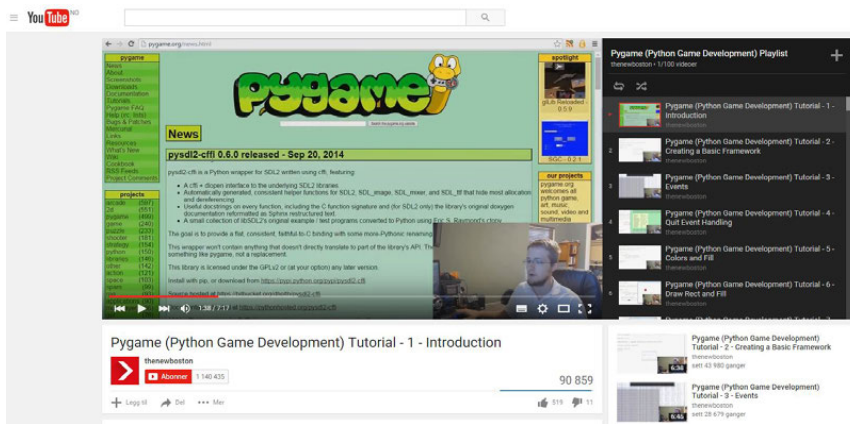
**B: August 11th**

I have completed the “Programming for Everybody (Getting Started with Python)” Coursera course that I started in June, and it has taught me the basics of python. I now know some of the different possibilities with using python are, and although I have far from mastered python, I know how to do a few simple things. An example is a program that opens a file and finds out certain information about it, such as the most commonly used word, and then presents it to the user.

**C: August 20th**

After speaking to my friend \_\_\_\_\_, who has some previous programming knowledge, about my personal project I have decided that I will be creating a game with python using 'pygame'. Pygame is an extension to python designed for creating games, and would allow me to focus my efforts on how to make the game, and not on the technical sides of python, such as trying to figure out how to make a screen appear or handle user inputs such as keyboard interaction. I will be following a 100 video YouTube playlist (Kinsley, "Pygame (Python Game Development) Playlist"), which might be a bit long, but allows me to get a wide and wholesome understanding of pygame.

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**D: September 12,**

Last week's meeting was useful for me to get me back on track, as I have not been actively working on my project since the formal introduction of the project, after starting with the pygame tutorial. I will attempt to work more regularly from now on, and to make it easier I have created a plan for when I should complete certain tasks. This should help me to focus on one task at a time. Today I added two previous journal entries to ManageBac to make sure that my learning had been documented, and I will aim to work on defining a goal and global context, and possibly the criteria for my product before the next meeting. I will also attempt to keep my Journal more up to date.

**E: November 20,**

I Discussed my progress so far with my supervisor, and we agreed that there is currently one bottleneck in the project that is holding me back. This is that I have not acquired all the skills I need to create a game with python and pygame, I still need to learn how to fully use pygame, and this halts my progress. I can't come up with the idea for the final game, as I do not know what opportunities I have with pygame, and my goal, criteria and global context are all reliant on this aspect. We agreed that my priority now should be completing the tutorial I am following, so that I can move on. I was also recommended to check out other sources of information for my project, and I have thought that I can contact previous students of AIS who have done their personal projects, to get an interview or similar. I thought of \_\_\_\_\_ and \_\_\_\_\_, who have done similar projects to me, and also \_\_\_\_\_, to get a different perspective as well.

**F: January 7th**

It has been some time since I last made a journal entry, and I realize that I am somewhat behind on how much work I should have done by now. I hope to pick up the pace from now on by working more regularly on my project, in order to catch up and finish on time. Currently I am still in the process of acquiring skills, which means important parts of my project, such as my final goal, have to wait until I have completed this. I do however have some idea of what kind of game I want to create and I have begun to think of ways to overcome possible challenges. I think that the type of game I will be making

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is probably going to be a tower defense game, as I think it will be enough challenge, but still achievable within the limited time left.

**G: *January 24***

Today I decided that even though I have only watched through about 80 of the hundred tutorials I had originally planned, I am done with researching for the most part, and I will not be watching any more of the videos. I have decided on my global context, scientific and technical innovation, and goal, demonstrate my personal innovation through the creation of a tower defense game. I have also started planning for the creation of my product, and I expect any more research I will be doing will only be to check how certain functions within python and pygame works, and not focused on learning new features of the programs. I chose to not watch any more of the tutorials as I think that I may have spent too much time researching already, and my time now should not be focused on that. I think the understanding I currently have of the programming language is enough for creating the game I want to make, and I don't think I will spend a lot of time planning, as I have a clear understanding of how I want to create the game. This also means that I can begin to work on my report, as I now know for sure what my product will be. I do realize how little time is left, but I have recently made changes to my working environment in order to increase my focus on school work and to lessen distractions. This has meant moving my computer and my workspace into another room entirely. So far it was worked great, with minimal distractions and a boost in productivity.

**H: *January 27***

In the past few days I have started creating my product, by using parts of the knowledge that I learned specifically when following the video tutorials. This has made sure I have a foundation to work from, but there is still a lot of work left to do. While trying to implement some of the remaining parts into my program, I have met both solutions and problems. Some of the features worked easily when I wrote the code for them, such as the intro screen to the game, and the algorithm for creating the background. However, I have encountered a problem when trying to "spawn" enemies, and this feature didn't work as I had hoped it would. It was relieving to see that some of my functions did in fact work, but frustrating that not everything worked.

By carefully examining the code that I was using to spawn enemies, I have been able to overcome the problem, as I found out that the problem was that I used the wrong variable when updating the position of each of the enemies. This resulted in the "spawn point" changing position to the same position of an already existing enemy. When I then tried to spawn another enemy, instead of spawning at the initial spawn point it would be placed on top of the existing enemy, which is not what I intended. This required me to spend extra time on thinking through how different parts of my code worked, and seeing if the values or other variables were the ones that I intended to use. In this case solving the issue was as simple as replacing a few words, and then the function worked as I wanted it to, although finding the specific words did take some time.

I used the Pygame documentation on the official website when I encountered some smaller problems in order to verify that I used the functions correctly ("Pygame V1.9.2 Documentation").

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**I: January 30**

At the end of this week I have Implemented several new features, and I am nearing completion of my product. I have had to check the documentation of pygame ("Pygame V1.9.2 Documentation") to make sure I used some features correctly, and after checking it was easy to fix the smaller problems. The one major challenge has been how to let the user build towers in order to stop the enemies. My original idea was to have the user click where they want to place the tower, then have them confirm the placement in a menu, but because of the way I register user mouse clicks this does not work. I had to approach the problem from a new angle: Instead of clicking where on screen the user wants to place their tower, they have to press a button and then click where they want to place it. This works around the issue I had with detecting clicks, and solves the issue in a different way than how I tried to solve it at first. The user can also upgrade and sell their towers in a similar fashion. The remaining work to be done is minor, and at this point I have mostly achieved my goal.

**J: February 3**

Today I have finished my product, and I am satisfied with the result. By working effectively every day since January 24, I have used only about ten days in total for the 'Taking Action' stage of the personal project. Even though it may seem like the product was a quick and easy task, I would still consider it highly challenging. This is due to my extensive research and determination to finish the product before the deadline while still maintaining quality, meaning I have been able to use my time very effectively. Even though the workload was densely packed in a short amount of time, I would not consider this to have a negative effect on the quality of the product. The time I spent was used effectively and well, and I did not get bored of working with the project which allowed me to work considerable amounts of time each day. Additionally, I had a meeting with my supervisor, showing my finished product and reviewing my report for feedback.

**2: Planning****A: Research Plan**

No.	Deadline	Objective	Why	How will I achieve this
1	Aug	Have finished Coursera course on python	To get a basic understanding of python, so that I have a starting point for my product	By working every week in the ten week period of the course
2	11 Oct	Decided on a topic and hypothesis	To ensure that I can start researching the topic to make progress in the project	By evaluating my personal interests, and brainstorm potential ideas, and deciding which I think is the most suitable

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3	Nov	Decide on final product.	To be able to focus on research relevant to the product	By researching into different opportunities, and deciding which one suits my project the best
4	14 Dec	Hand in first draft of my personal statement	In order to get feedback on my personal statement so far.	I should work on my report regularly
5	29 Jan	Have completed all research that needs to be done	To have at least 3 weeks to focus mostly on the product	Make sure that I have decided what research to do, and regularly progress in learning the skills I need
6	9 Feb	Hand in second draft of my personal statement	In order to get more feedback on my personal statement so far, and the changes made since the first draft	Progress my report from the first draft, working with the feedback from my supervisor
7	16 Feb	Product Due	Official deadline for completion of product	Work regularly on the product once research has been completed.

## B: Design Criteria

***To measure the success of the product***

No.	Specifications My product should...	In detail My product should...
1	Be a tower defense game	Be a game, where the objective is to stop enemies from getting to the end of a path by the means of building towers.
2	Include an introduction and game over screen	Present the user with an introduction screen that teaches them how to play, and two separate screens when the game is over or the game is won.
3	Let the user build, upgrade and sell towers	Let the user build tower in the game screen, but not on the path. Let them upgrade their built towers with money, or sell them for a refund of money.
4	Have a system in place that aligns values to ‘tiles’	Have a system that ensures that the positions of towers, enemies, etcetera are aligned to ‘tiles’ with a chosen interval.

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5	Display important values to the user	Have a means of communicating to the user how health they have left, how much money they have and what round they are currently on.
6	Let the user spawn rounds of enemies	Let the user decide when they want another round of enemies to spawn, by clicking on a button or in a similar way.
7	Detect if enemies reach the end of the path	Be able to detect if enemies reach the end of the path, and then deduct an amount of health from the user according to the amount of enemies.
8	Let the user exit the game at any time	Let the user have a way of exiting the game at any point; in the introduction, the game itself and in the game over screen.
9	Detect if the game is lost	Be able to detect if the user has no more health left, and end the game, switching to the game over screen when another enemy reaches the end of the path.
10	Detect if the game is won	Be able to detect that there are no more rounds left, and switch to a “game over” screen, telling the user they have won.
11	Achieve my initial goal	Demonstrate my personal technical innovation within python and pygame, through the creation of a tower defense game.
12	Show the range of towers	Display the range of built towers to the user when they hover their mouse over them.
13	Show the remaining health of enemies	Have a means of showing the remaining health of all enemies independently to the user.
14	Let the user pause the game	Let the user pause the game while they are playing it, stopping all actions except exiting the game or resuming it again.

### 3: Evaluation

#### A: Personal evaluation against criteria



## Personal Statement, March 1, “Creating a Tower Defense video game”

<b>No.</b>	<b>Specification</b> My product should...	<b>Evaluation</b> The specification is...
<b>1</b>	Be a tower defense game	Partly achieved, as it is a game where the user can place down towers to stop enemies from reaching the end of the path, but it lacks other elements commonly found in tower defense games, such as different types of towers and enemies.
<b>2</b>	Include an introduction and game over screen	Fully achieved, the game has four separate screens, that presents the game to the user, teaches them how to play the game and how to win, and two separate screens for a game over scenario and a game win scenario.
<b>3</b>	Let the user build, upgrade and sell towers	Mostly achieved, the game lets the user build, upgrade and sell towers, but the user is limited in some sense by having to click a button, and then click where they want to build, upgrade or sell. This limits the user, as they have to move their mouse pointer a lot if they want to interact with several towers at once.
<b>4</b>	Have a system in place that aligns values to ‘tiles’	Fully achieved, the game has two functions that can round any value to the middle of a 30 by 30 pixel ‘tile’.
<b>5</b>	Display important values left to the user	Fully achieved, the game displays health left, money and the current round at the top of the screen, where it is easily seen by the user.
<b>6</b>	Let the user spawn rounds of enemies	Mostly achieved, the game lets the user spawn new rounds of enemies when they finish the previous one, but does not allow them to spawn multiple waves at once.
<b>7</b>	Detect if enemies reach the end of the path	Fully achieved, whenever an enemy reaches the end of the path, one health point is deducted.
<b>8</b>	Let the user exit the game at any time	Fully achieved, the user can at any time click the “close window” button in the top right to exit, or in the pause menu exit with a separate button.
<b>9</b>	Detect if the game is lost	Fully achieved, the game detects when the user has run out of lives and switches to a game over screen.
<b>10</b>	Detect if the game is won	Fully achieved, when the final round is completed, the game switches to the game win screen, telling them they have won the game.
<b>11</b>	Achieve my initial goal	Mostly achieved, my product is of the tower defense genre and includes several different features. This demonstrates that I have learned how to make a game that performs such tasks, thus demonstrating what I have learned. Some of the features however, are not necessarily apparent to the user, and can therefore be

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		harder to demonstrate. Although this may limit how much my innovation is demonstrated, I still consider the product capable of demonstrating most of my innovation. This is because my goal was to do this through the creation of a tower defense game, which is what my product is.
12	Show the range of towers	Fully achieved, the range of towers is displayed when the user hovers their mouse over any tower, and additionally shows the increased range of an upgraded tower before the user upgrades it, and the range of a new tower before the user chooses to build it.
13	Show the remaining health of enemies	Fully achieved, the remaining health of every enemy is displayed directly above them in the form of a line proportional to the amount of remaining health.
14	Let the user pause the game	Fully achieved, the user can press a pause button to bring up a menu and stop all actions. They can choose to resume or quit the game.

## B: Peer evaluation

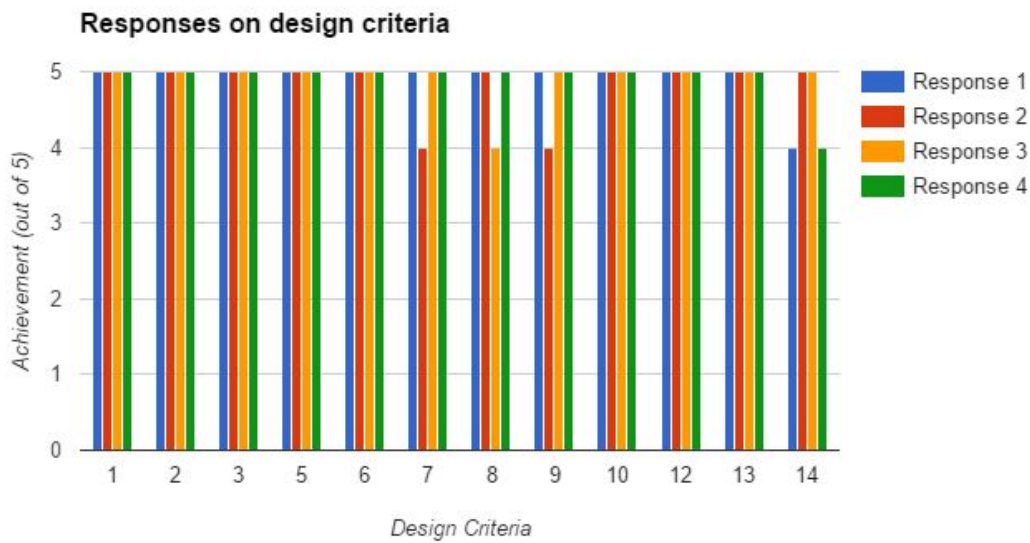
***Evaluation against the criteria***

How well does the game achieve each of the design criteria?	Response 1	Response 2	Response 3	Response 4
Be a tower defense game	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Include an introduction and game over screen	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Let the user build, upgrade and sell towers	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Have a system in place that aligns values to ‘tiles’	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Display health, money and round number	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Let the user spawn rounds of enemies	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Show the range of towers	Fully achieved	Mostly achieved	Fully achieved	Fully achieved

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Show the remaining health of enemies	Fully achieved	Fully achieved	Mostly achieved	Fully achieved
Detect if enemies reach the end of the path	Fully achieved	Mostly achieved	Fully achieved	Fully achieved
Let the user pause the game	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Detect if the game is lost	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Detect if the game is won	Fully achieved	Fully achieved	Fully achieved	Fully achieved
Demonstrates my personal technical innovation.	Mostly achieved	Fully achieved	Fully achieved	Mostly achieved

**Evaluation against the criteria, visualized**



**Comments**

## Personal Statement, March 1, "Creating a Tower Defense video game"

## Any comments regarding how the product met the criteria? (3 responses)

The game definitely hit most criteria. Although basic, the game shows great technical skills and is very functional as a game.

The product met the criteria as it did what it was supposed to do-

Nope.

## Any comments on the product in general? (3 responses)

The base game is good, and the only way to improve the game is to add more features like new game modes, new towers and new enemies.

The game is very good and creative and many people would love to play the game.

Say which wave you made it to instead of how many you completed.

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