

Adam Iqbal

ANALYSIS

PROBLEM

The problem that I am trying to solve is that there are many A-Level Computer science students who struggle with revision because there is a lot of content to go over and students will not know where to start and I shall be trying to help with this. My program will be a Computer Science quiz which will have accounts linked to each student and teachers, with the end goal being it considering where the students are struggling and focus on those areas when asking questions. The program will contain many questions that will be multiple choice to test the knowledge of the topics rather than testing their exam technique. It will count the score of how the student performs and the teacher should be able to see where the student is finding difficulty. The more the student practices, the better the more familiar they will be with the answers and it should hopefully become ingrained in their minds, which will give them a better chance at getting a higher grade.

RESEARCH



"Kahoot!" is a game-based learning platform, used as educational technology in schools, and other institutions. Its learning games "Kahoots"

are user-generated multiple-choice quizzes that can be accessed via a web browser or the Kahoot app.

The user interface has a nice design which is something I admire about it and hope for my program to look like, however, the design is not the most important aspect of my project. The vast range of different quizzes as well as allowing users to create their own quizzes is a very interesting feature that is quite good as it allows for

A screenshot of the Kahoot! website's "Discover" page. The page has a purple header with the Kahoot! logo and navigation links for Home, Discover, Kahoots, and Reports. Below the header, there are four cards, each representing a different quiz. 1. "A-Level Computer Science" by "Ondrej2908" with 45 questions, 510 plays, and an example question: "Which one of these is NOT true about compression?". 2. "A Level Computer Science OCR" by "ad4migual" with 15 questions, 405 plays, and an example question: "In compilation what is the purpose of lexical analysis?". 3. "A Level Computer Science" by "stefanov" with 40 questions, 123 plays, and an example question: "What is the first step in the CPU's cycle?". 4. "OCR A Level Computer Science Computer Law" by "Mr_Colus" with 17 questions, 145 plays, and an example question: "HIPPA stands for...".

multiple quizzes to be made for each particular subject, but I will not include my project shall solely focus on creating a quiz for A-Level computer science students and not making them create it for themselves thus this feature shall most likely not be included. But everything on there is quite easily accessible and not difficult to locate, which is something I would like to be true of my project as well.

Regarding A-Level Computer Science, as can be seen in the above screenshot as an example, majority of these quizzes lack many questions, the 1st and 3rd quizzes seeming to have the most on the website that I can find at this current time. This is something I would like to improve upon as there should be many more questions if I am trying to include questions from each topic within the specification.

Another thing about ‘Kahoot!’ is that it is designed more like a competitive game rather than about self-improvement with whatever topic you choose on the website, but at the same time, competition may cause the students to strive to work harder to achieve better scores than their friends & other classmates. But you are either unable to study/practice any quiz unless you are on the mobile app, or it has just been created in a way that is difficult to find on a desktop which is something else I do not like. This feature should be more prioritised on both platforms. It also gives more points, depending on how quickly you answer each question, this is something I will take into consideration including as if they have answered it rather quickly, it may

suggest they know the topic better and they are less likely to be guessing.

I also like the music and sound effects they have used for the quiz for the countdown timer, when the answer is correct and when the answer is incorrect as it makes it seem more professional and is something I may put into my program.



QUIZLET:

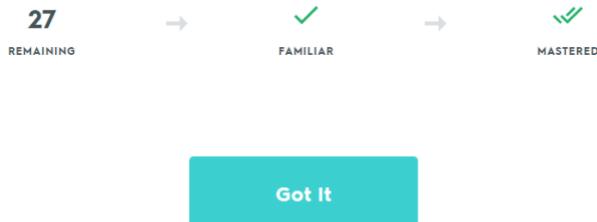
Quizlet is an American online study application that allows students to study information via learning tools and games.

It trains students via flashcards and various games and tests.

One particular thing that I found quite interesting about Quizlet is how it uses a theme based around the idea of flashcards and thus most questions on quizzes tended to revolve more around definitions and other things

Welcome to Learn mode

Match every term and definition correctly two times to finish

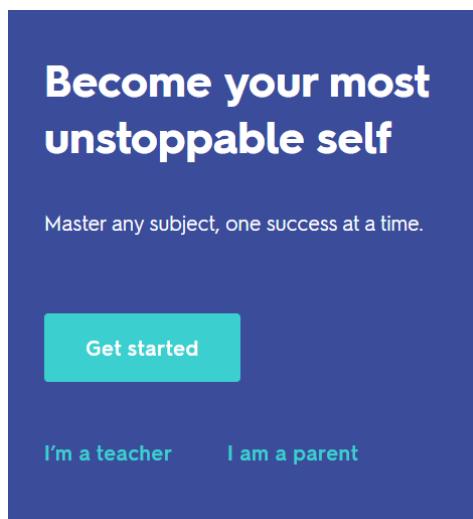


with relatively short answers and this is something I shall consider implementing, not entirely but definitions are important and I like the idea of the flashcards that enable them to revise before and after they test themselves with any quizzes.

As well as this, while using the 'Learn' feature for any given quiz, after testing you with questions, it puts the words or phrases to learn the definition of, into categories: Remaining, Familiar, and Mastered. I intend to have something similar in the regard that I would like my program to take into account which sort of areas the student is better in, so the teacher can have this information for each of their students and can perhaps tailor their lessons, or set homework accordingly.

I don't like that to use it offline, you must pay a premium. I will create a program providing a similar service for free so that students who may not always have unlimited internet access will be able to use this whenever.

A feature I will not be including is parent accounts as this will take extra time and I feel as though it will be completely unnecessary as teacher accounts should suffice.



STAKEHOLDERS

JOSH FRASER:

- A year 12, A-Level Computer Science student, will use the program for their revision of the course and is an appropriate stakeholder as I am making it specifically for students like himself

Interview Analysis:

Said a lives/scoring system would be a good idea.

I do think this is a good way to make it more like a game and slightly more fun for the users, but I am also considering a different mode without the scoring or lives system where it is more similar to a test in case some users would like to be tested on as many questions as possible in one go.

I suggested a way of implementing could be with 3 lives and the score given for each question correlating to how long it takes for the user to choose an answer to which he responded would be appropriate in his opinion.

Therefore, I will proceed with this idea if I am able.

Said he would love if the program could track what topics he is weaker in and stronger in and change the frequency of each topic's questions accordingly and liked the idea of a quiz for each topic in addition to the main quiz.

This is something I shall try to implement by separating the topics and perhaps having a score for each topic and if its within certain bounds, the frequency of the respective questions shall occur more often, but this may be difficult due to my inexperience as a programmer.

Said he liked the idea of music/ sound effects in the quiz and believes the quiz would be more captivating if it was implemented

I will consider this, but it will not have the most priority as it is not essential to the program. However, its importance can be argued is quite high as students will more likely use the program more and revise if they are kept engaged by the music.

Said he likes the idea of a study section within the program and believed it would be helpful.

I will make sure to implement this into the program as it will be essential to allow the students to do well in the quizzes. I may start working on this before the actual quiz as it will be easier for me to make the quizzes based on the same thing that will be in the study section and also makes anything in the study section, for each piece of information, more concise and will save time for the user as it will make the quiz about the most relevant information that they need.

Said regarding the navigation of the program, he would expect a main menu in which the main different sections are easily accessible.

After logging in, I will make this the first form that students see, with the main areas of the program labelled with buttons that will take them to the form that focuses on the particular subject in which the button was labelled. For example, a button labelled "quiz" which will take them to the quiz section of the program and another button labelled "study" which will take them to the section of the program they can revise from, before attempting a quiz.

CRAIG BRIDGENS:

- An A-Level Computer Science teacher is an appropriate stakeholder as the program is designed for his students to aid their learning as well as to help computer science teachers such as himself to get a better understanding of where his students are struggling.

Interview Analysis:

Said he would like a way to track the progress of students, in terms of how many quizzes have been completed by each of his students, where they have been doing best/worst on average and would like the possibility of seeing this information being represented by a graph.

I could potentially have a variable that has its value incremented each time a student starts the quiz, or for each question that they answer as well as something that records the amount of time spent on each question.

This would allow for him to get a better understanding of the level of dedication from each student as well as if they are taking longer to complete the question, which will show it was more likely to be a guess. Another possibility could be for me to set a maximum timer of 10 seconds for each question to keep the student engaged as well as making it less likely that they increase the amount of time shown spent on the quiz by just leaving it open.

The graph could be a bar chart for each topic that is measured from 0% to 100%, showing the average score of each topic.

Said a user sign in / sign up section would be good.

This will be at the very beginning so that new users will be able to make accounts and users being able to sign in to their own accounts is a way of separating teachers and students so that the screen the teachers are presented with, which will hopefully contain information about how the students are performing, will not be what the students see as that will not be relevant to them.

Said there needs to be a certain level of professionalism in the system, especially considering this will be something for teachers to access as well as older students, and that it is important to maintain a professional and consistent colour scheme throughout to not be too distracting or jarring to look at.

I will consider this and try to make sure it looks appropriate for the target audience and not use a colour scheme that would convey the impression that this is something targeted towards younger children.

COMPUTATIONAL METHODS

The problem is solvable with a computer, as a computer performs tasks that will enable me to create a program that tests students on their knowledge of the course.

THINKING ABSTRACTLY:

This project shall use abstraction throughout the program.

It will use the idea of abstraction by generalisation, grouping users by the common characteristics they have, where users that are teachers will be grouped separately from regular students using it for their education.

Also, abstraction, where it will be establishing a level of complexity for the person that interacts with the system, suppressing the more complex details that are unnecessary for the users to see, when hiding information that would not be of use to specific users. For example, in relation to the grouping teachers separately, teachers will hopefully be able to see all the activity of each student, but this information is not needed by other students, therefore it is hidden from them.

In addition to this, I would like to implement a random topics quiz, and within the program shall be a feature which calculates how good or bad a student is doing on different topics, and if they are very good at a particular topic, I would like that to come up less frequently for them. This will be calculated based upon the number of questions they have ANSWERED WRONG, HOWEVER, THE USER DOES NOT NEED TO SEE HOW MANY OF THESE QUESTIONS THEY HAVE GOT WRONG OVERALL, BUT PERHAPS A GRAPHICAL

REPRESENTATION AS SUGGESTED BY CRAIG BRIGDENS, A STAKEHOLDER, THAT SHOWS THE COMPARISON BETWEEN THEIR SUCCESS RATE ON EACH TOPIC WOULD BE MORE SUITABLE. And perhaps only taking the past 50 questions into account, using abstraction yet again, to give a more accurate representation of how they are doing, in case they were particularly bad in the beginning so that their potential improvement will not be completely overshadowed by their mistakes in the beginning and cause the algorithm to repeatedly bombard them with questions they may be quite good at. This will also help to not demotivate students.

Another example of this is within the 'study' section of the quiz program, as well as with the questions and answers, I will try to not overload any part with information and attempt to keep it concise, while still retaining all information relevant to that fact or answer.

PROBLEM DECOMPOSITION:

The project can be decomposed into smaller sections, making the task of creating it, testing & maintaining it, and making changes to the program, easier:

The form in which the user can create an account or log in to their existing account

The main menu which will present the other sections of the program

Each section of the main program:

Quiz – a main quiz which shall be random multiple-choice questions from any topic

Topic quiz - here they can answer multiple-choice questions on any topic they desire

Study – where they will be able to choose a topic and then for each topic, there will be different flashcards with information that will be used for the questions in the quiz with the information required to know by the computer science a level specification

Stats – this shall show the highest score they have got on the quizzes and a graph which shows how well they are doing in each topic.

SELECTION

An instance of selection within the program is during the client's sign up/ sign-in process. At the point when first starting up the program, the client will be told to make an account. Once created they will then be able to sign into their account. After entering their required information, the program will experience selection: If the username and password entered are valid, it will log the client into their account and the main menu should show up with a message that welcomes them. If the username and pass entered are invalid (meaning either they are yet to create an account, they have incorrectly entered their details or they are attempting to access an account that does not belong to them), a message box will appear prompting the client to re-enter their details.

Selection will also be present in the actual quiz. If the user answers a question correctly, it will display a message telling them that the answer was "Correct" and perhaps their score will increase, but if the question was answered incorrectly, it may decrease their amount of lives and/or score.

ITERATION

It will use iteration during the quiz with a loop of a random question, either from a specific topic or the topic will be randomized each time as well, depending on their choice of quiz and within this loop shall be selection which makes the program do a different thing depending on whether the question was answered correctly or not, however it is within the loop and therefore this is an example of iteration. It will have the conditions of the number of lives being > 0 and running until a certain amount of questions has been answered.

MODULARITY

I will make it a 2nd priority, however, I would like for there to be a separate form for the teacher, where they will be able to view all the information about their students. They could perhaps add more notes in the study section to what I have put in as a feature as well, both of these being features that would not be accessible to students as it is not needed by them and if only the teacher has access to this, they will be more likely to give reliable information. If a student entered false information and revised from it, the program would be counterintuitive

MODELLING

To a certain extent, this program will be modelling the 2 quiz programs I researched, however, this will be specifically tailored to the OCR A-Level Computer Science specification. The objective of this program is to help Computer Science students to have an online revision tool that is reliable and is connected to their teacher, so it will assist with their overall learning experience, helping their teacher to plan lessons and help students in areas where they are struggling. It will also make for an easy way of setting revision homework and, the teacher will be able to see the amount of activity to prove if it was done, further differentiating it from the other quiz programs

ESSENTIAL FEATURES

LOG-IN

A feature that will be very important is a login system as it will create a more individual experience for each user by saving the scores of each user as well as separating teachers and students so the features they can access are different which is something stakeholder Craig Bridgens said he wanted.

MAIN MENU:

There needs to be a main menu for the user to navigate the program that makes all the different sections easily accessible from it. Each button on the main menu will be clearly labelled to indicate where they take the user to, making it also an important usability feature as it makes the task of the user identifying which button takes them to which form very simple.

QUIZ SECTION

The most important feature of this program is an actual quiz that asks the user questions for them to respond to, whether it be a regular quiz with the completely random selection of questions or a topic quiz. Either way, this is the utmost essential feature and is the main idea behind the entire program, to be able to test their knowledge and help them to improve through their repetitive use of the program.

RETAINED PROGRESS:

This will require the use of an MS Access database.

I intend to have a log in/out system wherein for each user, their progress will save automatically at given intervals (perhaps after each quiz) to retain the progress of the user. This allows the incorporation of certain straightforward features that consequently make utilisation of the product much simpler and to personalise their account to them and make them feel like they are advancing the more they continue to use the software. In addition to helping the teacher to view how much time students spend on the quiz and which topics in which they are struggling – by doing this, I can ensure that the idea of each user having their own account is utilised and create a better experience for both students and teachers, therefore increasing the likelihood that a user will continue to use the software.

STUDY SECTION

This section shall be divided into different topics that shall each have a button that shifts the user to a new form which holds different flashcard-like boxes, with words and phrases along with their definition as well as different questions that students will be required to know the answer to, along with a general answer, for the OCR A-Level Computer Science specification. The idea of flashcards was inspired by the way Quizlet presents the information used for users to study from. They will be able to use this to revise without the need for physical flashcards or could perhaps use this to help with the creation of them. This will be related to each of the questions that will appear in the quiz so they can be completely prepared for it as long as they remember the information and the overall objective is for them to eventually memorise it.

LIMITATIONS

I am pretty sure that visual basic and visual studio has provided sufficient resources to enable me to complete the task of creating this to its full potential, but the main problem lies with my programming skill.

A limitation will be the idea of a multiplayer quiz game, such as that you would see in Kahoot! Initially, I quite liked this idea as an extra mode for the program, but I quickly realised the amount of time and effort that this would require to set up, and I do not believe that, with my ability to program, something this complex can be easily done within my time constraints. This is not essential to the program and was only supposed to be an extra mode to make the program more fun for users, but it is not entirely needed for the main purpose of the program, therefore it would be fine to leave out.

Another limitation I will face is how I will be able to link the results of the quizzes to each individual user's account so that it is stored in the system even after the application is closed, but I will try my best to find a solution to this problem as this is quite an important feature for the program to be as good as possible. I will first prioritize the actual quiz and study sections first and try to make the connection to their accounts afterwards. If I am unable to do this, the quiz and study sections will suffice to aid with revision but not to the extent in which I intended for it.

REQUIREMENTS

Hardware requirements

Hardware	Justification
1.8 GHz or faster processor. Quad-core or better recommended	This is required to have the graphics and forms run smoothly with visual studio
2 GB of RAM; 8 GB of RAM recommended (2.5 GB minimum if running on a virtual machine)	2GB+ of RAM is enough to run the program, store all the data from it and for the minimum Windows OS version required, however, a higher amount would be preferred so that everything can run smoothly and quickly
Hard Drive: only 100MB of available space	<p>It is unlikely the program will require any more than this as I do not intend for it to be a very large program at all, however having this amount of space will ensure there is enough for any necessary data and leaves some space for future updates.</p> <p>Hard disk speed: to improve performance, install Windows, Visual Studio and the program on a solid-state drive (SSD).</p>
Mouse/touchpad	A two-button USB mouse or laptop touchpad is required, the left button will be used to select options within the program, such as the buttons to navigate through the program and can be used for answering the questions in the quiz, and the right button may be used to access the options.
Keyboard	A physical keyboard or an on-screen keyboard will be required to enter the details for each user, in the login screen and I hope to allow for questions in the multiple-choice quiz to be answered with a button on the keyboard as a usability feature
Video card	A video card that supports a minimum display resolution of 720p (1280 by 720); Visual Studio will work best at a resolution of WXGA (1366 by 768) or higher.
Monitor	Will be needed to view and use the program, it could either be a laptop screen, computer monitor, or any other type of screen that can be connected to the computer.

Software Requirements

Software	Justification
Supported Operating Systems: <ul style="list-style-type: none">• Windows 10 version 1703 or higher: Home, Professional, Education, and Enterprise (LTSC and S are not supported)• Windows Server 2019: Standard and Datacentre• Windows Server 2016: Standard and Datacenter• Windows 8.1 (with Update 2919355): Core, Professional, and Enterprise• Windows Server 2012 R2 (with Update 2919355): Essentials, Standard, Datacenter• Windows 7 SP1 (with latest Windows Updates): Home Premium, Professional, Enterprise, Ultimate	One of the following operating systems will be required for the users to be able to run the program as these are the OS' that Visual Studio is compatible with, without one of these operating systems, you may not be able to use Visual Studio and run the program
.NET Framework	.NET Framework 4.5.2 or above is required to install Visual Studio. Visual Studio requires .NET Framework 4.7.2 to run so is essential, but this will be installed during setup.
Visual Studio 2017 or higher	You will need this to obtain the code, run and use the program. Older versions of Visual Studio may work but may affect how it runs so the 2017 version or higher is recommended.
Microsoft Access 2016 or higher	Microsoft Access is a database management system that will be used by the program to store given information into a table-based format. This will allow me to store user's details for login and hopefully will be able to store information on how well they perform in the quizzes and link it to their teacher's user. It would be possible for me to use a CSV file, but it is not suited for appropriately handling larger amounts of data in an organised way.

SUCCESS CRITERIA

Must

Success Criteria	Justification	Reference
Menu	<p>It will need to have a working menu that's designed to look professional (which I will see if I have met this target by asking the opinion of the stakeholders) and is easy to use to navigate around the program, by having buttons on the screen that are labelled for the user to know where each will lead as it is essential for the user's experience.</p>	<p>Stakeholder – Josh Fraser, who said he would expect a menu like this</p> <p>Stakeholder – Craig Bridgens, who desired a professional design for the program</p>
Log in page.	<p>If I can make sure that data is linked to specific accounts, there must be a secure log in page first to separate each user and prevent others from accessing data they should not have the right to. This is a must as it is something that must be done at the very start before attempting to link it to any data.</p>	<p>Relates to stakeholder Craig Bridgens request to be able to track students' progress, as it will require each student to be separated by their individual usernames and he thought a sign in/ sign up section would be good.</p>
An actual quiz	<p>A quiz that asks the user questions for them to respond to, whether it be a regular quiz with the completely random selection of questions or a topic quiz.</p>	<p>Relates to the solution of the problem; is the main idea behind the entire program.</p>
Study section	<p>In this section will be different topics, and for each, will hold different words and phrases along with their definition as well as different questions that students will be required to know the answer to, along with a general answer, for the OCR A-Level Computer Science specification.</p>	<p>Stakeholder Josh Fraser said he liked the idea of a study section and commented on how it would be quite helpful.</p>
Back/Exit to menu button	<p>Makes using the program easier: does not require them to finish the quiz before exiting, if they choose the wrong option in the menu by mistake, they can easily go back and choose the correct one. Also makes navigating the program easier, perhaps after using the study section and</p>	

	wanting to go to the quiz, they can go back to the menu and choose the quiz.	
Score system	There will be a way of a score being counted for each question answered correctly as part of the quiz, the highest score hopefully being saved for each user and can be seen somewhere in the program	This relates to stakeholder Josh Fraser agreeing that a lives and scoring system would be a good idea. Also relates to stakeholder Craig Bridgens wanting to be able to track students' progress as it will allow for how well each student performs to be measured

Should

Success Criteria	Justification	Reference
Sign up feature in the program	This will make it easier for the user to create an account, so it can be done from within the program, and not through Microsoft Access	Stakeholder Craig Bridgens said he thought a sign in/ sign up section would be good
Teacher page	A form that only teachers will be sent to, in which they will be able to see their students' progress and data. This will also help with the solution to the problem the program is trying to solve as by teachers knowing where their students are not performing particularly well, they can adjust lessons accordingly and this will hopefully help the students to do better in their exams.	Stakeholder Craig Bridgens would like to be able to track the progress of his students, preferably in graph form and by making a separate form for teachers, we can have a page for teachers to show this. Helps with the entire solution to the problem the program as stated in the justification.
Data of each user saved	Makes utilisation of the product much simpler and to make them feel like they are advancing the more they continue to use the software. In addition to helping the teacher to view how much time students spend on the quiz and which topics in which they are struggling.	Stakeholder Craig Bridgens wanted to see students' progress and that will require each user's data to be saved
Feedback at the end of the quiz	At the end of the quiz, shows a list of all the questions answered both correctly and incorrectly and shows the answers for those that	Will help with the solution to the problem as this will be good for the student's revision

	were answered incorrectly. Showing them their mistakes, allowing them to improve by helping them to not repeat them.	
Lives system	In the main mode for the quiz, a 3 lives system so if they answer 3 questions incorrectly, the quiz ends. This will make the quiz more engaging and help students to be more focused on revision, helping with the problem	Stakeholder Josh Fraser believed this would be a good idea
Countdown Timer	Makes sure there is only a limited amount of time for the student to answer so it is more likely they are not simply guessing or searching for the answer on the internet.	Will help solve the problem as it will force them to learn the information to answer most of the questions correctly.

Could

Success Criteria	Justification	Reference
Sound Effects/ Music	Will make the quiz more engaging and is used in most modern programs. It helps deliver information, it increases the production value, it evokes emotional responses, and it emphasises what is on the screen. Concerning quiz programs, one of the more notable uses is the way Kahoot! uses sound in its countdown timer which is something that I will consider replicating the idea of, however, just any sound effects for the purposes stated would probably be good for the program.	Stakeholder Josh Fraser said that he liked the idea of this and believed it would be beneficial to the program
Total of time spent on quizzes	Having something that tracks the total time the user spends practising the quizzes could give an idea as to how dedicated the students are and how much they are engaging in revision, if perhaps this was set as homework, to the teacher, who	Also relates to how Craig Bridgens wanted to be able to track his students' progress

	can then deal with the situation in whatever way they deem appropriate or necessary. Also gives the student a better understanding of how much time they have spent on the program.	
Topic Quizzes	Separate the quiz questions by topic and have a topic quiz mode where there are only questions from the chosen topic as they will be able to focus on topics where they have been struggling.	This would help solve the problem the program is being made for, assisting with revision
A score for how well the student is doing on each topic	This will allow the student to know which topic quizzes they can do and which topics they should be studying. Also, gives a measure on the performance of the students that the teacher should be able to see, who can then help with the topics as well.	Craig Bridgens requested to be able to see the progress of his students who are using this program
Coloured Feedback	Would make the feedback look nicer and make it easier to differentiate from the questions answered correctly to the ones answered incorrectly, perhaps using green and red respectively	
Provide mock test papers	Students can use this to practise actual exam questions, which this program will likely not be able to test them on.	
Keyboard usability	Allow the user to press keys that correspond to different buttons in the form, for example in the quiz, to quickly choose the answer, they can press either 1,2,3, or 4 rather than having to click the option each time. This would save time and effort for the user.	
Forgot Password	Allows for users to have a selection of personal questions, which if answered correctly, will allow access to their account & allow them to change their password in the case they forgot what they set as their password.	Would be a helpful feature as users may decide to stop using the program if they lose access to their main account

Would

Success Criteria	Justification	Reference
Multiplayer quiz	Creating an online multiplayer quiz in a way similar to Kahoot! or Quizlet Live, using a LAN connection is quite beyond my current skillset and would require a lot more time than I have but it would add to my proposed solution, making it more fun	
Leaderboards	To see how their scores compare to others in their class, which may motivate them to try harder, but this might be complicated to put in.	
Teachers can create quizzes for students	Anything important that I might miss that the teacher believes is important can be added and help with the students learning	Relates to the solution of the problem
The teacher can set work to be completed	Where the students will see a section of topics that the teacher may want them to cover or practise for homework perhaps.	

DESIGN

INTRODUCTION

Attempting to deal with many stages all at once would make the task difficult, thus I will be using the idea of decomposition by breaking this project into smaller parts. This will make it easier to understand and so simpler to work with and therefore easier to find a solution to each problem that will occur when creating it, testing & maintaining it, making changes to the program as well as how it will be easier to design each section individually.

I will break it down into the 6 main sections of

The form in which the user can create an account or log in to their existing account which would be necessary to save the data of each individual and to differentiate between teachers and students

The main menu which will present the other sections of the program as suggested by stakeholder Josh Fraser.

Each section presented in the main menu:

Quiz – a main quiz which shall be random multiple-choice questions from any topic

Topic quiz - here they can answer multiple-choice questions on any individual topic they choose. (Questions from a single topic as opposed to the main quiz which incorporates questions randomly without concern for topic) as suggested by stakeholder Josh Fraser.

Study – where they will be able to choose a topic and then for each topic, there will be different flashcards with information that will be used for the questions in the quiz with the information required to know by the computer science A-level specification as suggested by stakeholder Josh Fraser.

Stats – this shall show the highest score they have got on the quizzes and a graph which shows how well they are doing in each topic as suggested by stakeholder Craig Bridgens.

Prototypes

I shall also be breaking this program into prototypes throughout development. The reason for this is that it simulates the real and future product. It can help me to discuss ideas of what I shall do with the product before moving on to the next stage of development and I can make changes if the stakeholders make a good suggestion that I will be able to implement.

The 1st prototype will have a log in system completed connected to a database.

The 2nd will have a stats section

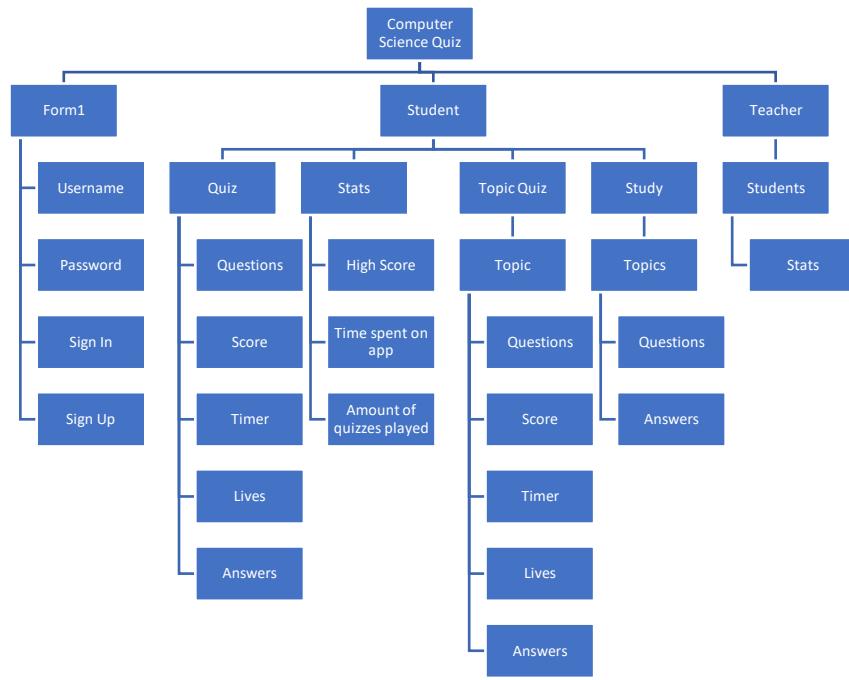
The 3rd will have a working quiz

The 4th prototype will have a functioning link between the students and something to save their scores

The 5th will have all the students linked to their respective teacher to enable the teacher to view their progress

I have broken the problem up in this way because I have considered the difficulty to achieve each prototype stage and have chosen this order accordingly, so that I do the easier things first and the more I break it up, the more the problem becomes more manageable and I will be able to focus on a specific aspect at a single time which will hopefully result in a better quality final product.

SYSTEM DIAGRAM



FORM1 (LOGIN FORM)

Sign In – If the user has already signed up and has an account, they can now use the quiz program properly as signing in gives access to the main menu

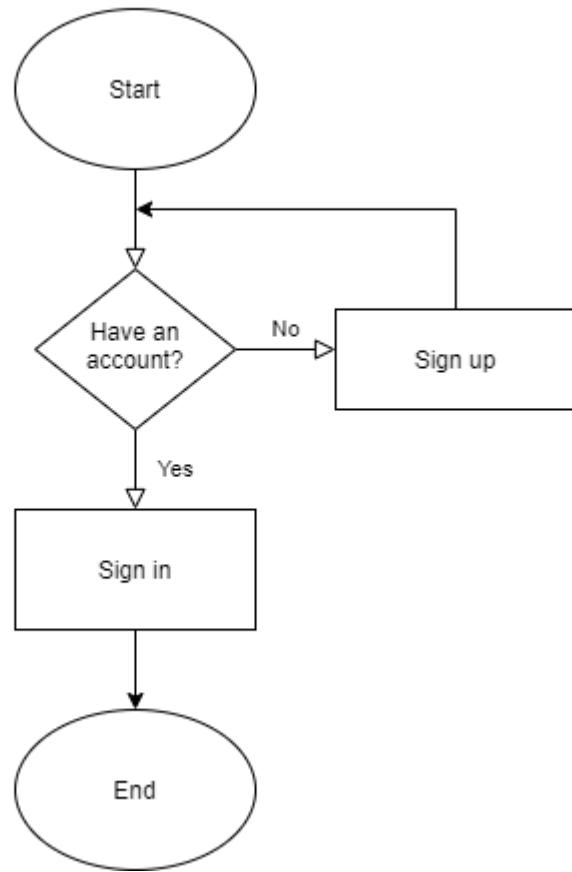
Sign Up – If the user has not used the program before, the first thing they will need to do is create an account and after filling in the username and password textboxes and pressing “sign up” the information entered will be copied into a datatable which the program checks when anyone signs in.

Password – The user has a password which keeps their account secure so that nobody else accesses their account

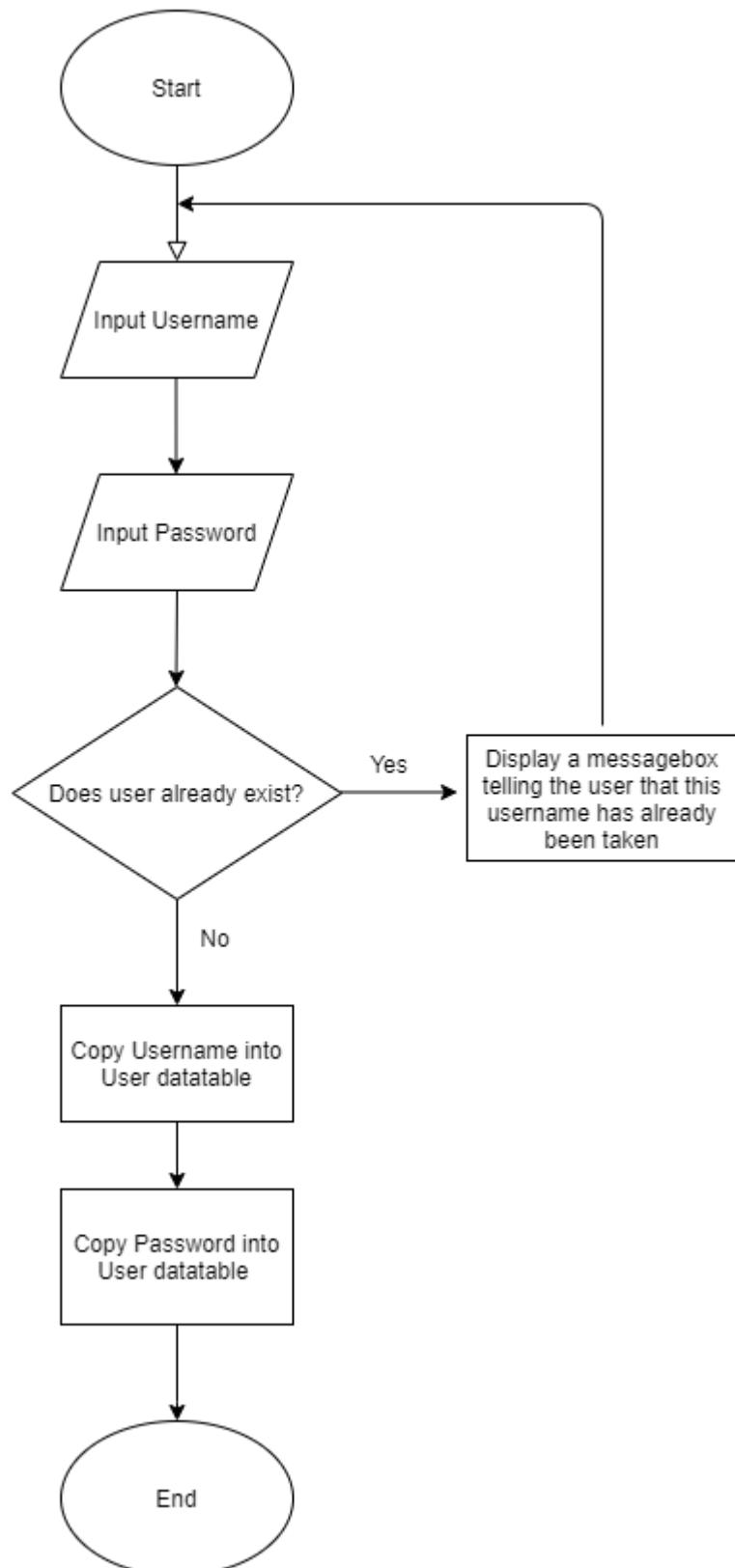
Username – Textbox where the user can enter a name that allows the program to differentiate between the different people that may use the quiz

The form contains the username and password textboxes on the screen as well as both the sign in/up buttons. They can enter a username and password combination and choose whether to sign in or sign up depending on what they need to do. Once they have created an account with the sign-up button, there will likely not be a need to use it again and they shall only be using the sign in button. Once the students have signed in, they shall be taken to the main menu, from which they have the choice of "Quiz", "Topic quiz", "Study" and "Stats".

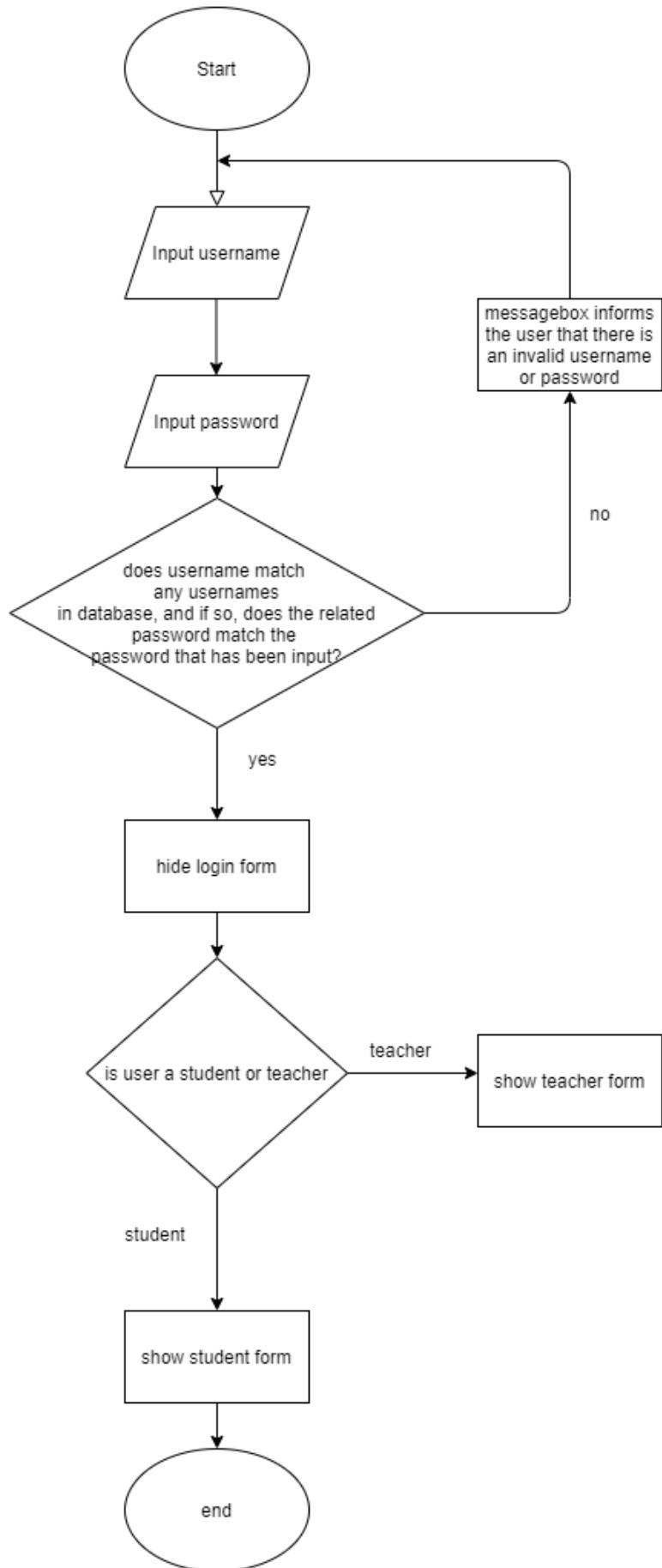
Form1



Sign Up



Sign In

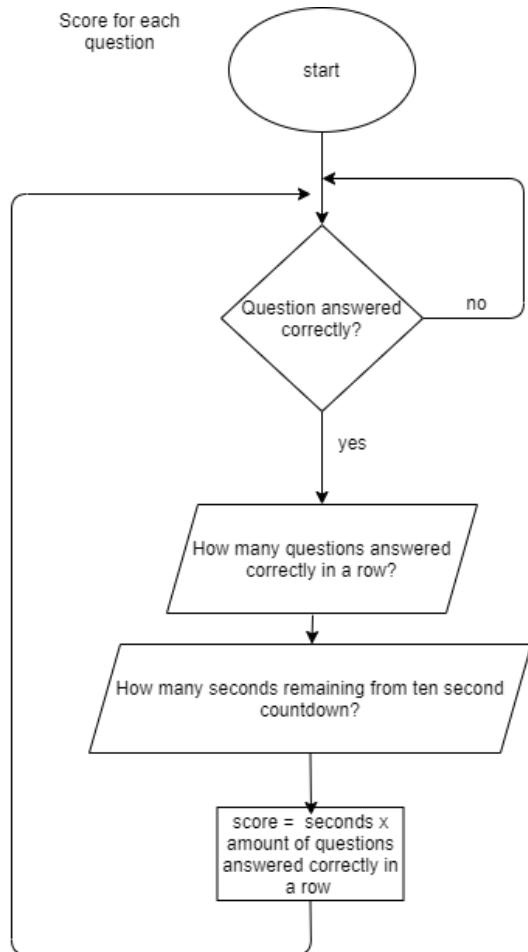


STUDENT

QUIZ

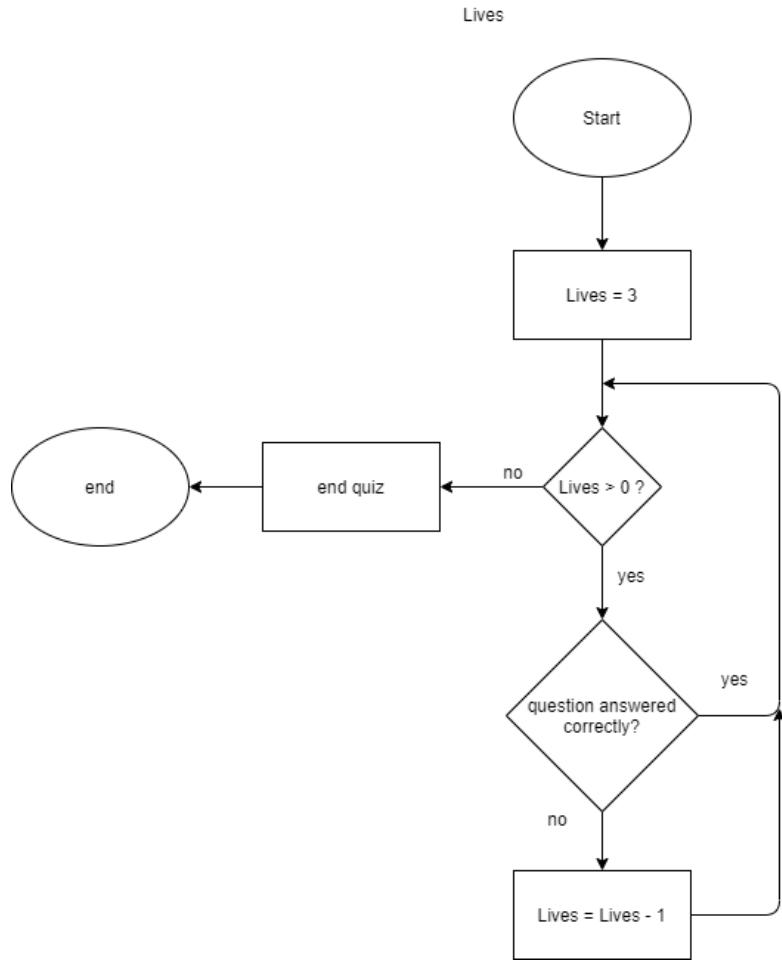
Questions – The quiz will contain an array of random questions to test the knowledge of the students.

Score – A score will be given to the student which will give an idea of how well they understand the topic



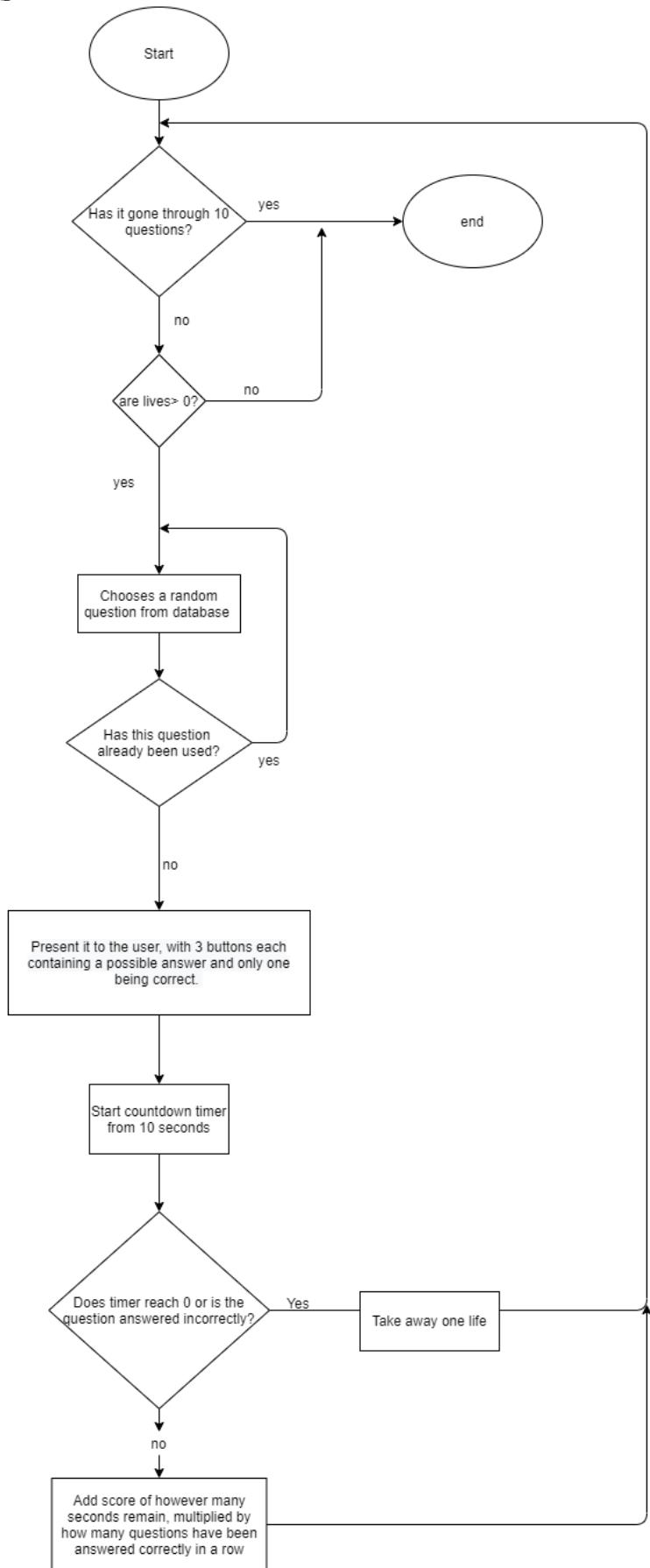
Timer – There will be a timer throughout the quiz which will skip the question after a certain amount of time to prevent the student from getting too many points from questions where they are just guessing

Lives – The student will have 3 lives in the quiz which ends the quiz if the value of the integer lives is equal to 0.



Answers – Answers to the questions will be displayed after the quiz has been completed so the student can see where they went wrong.

Quiz

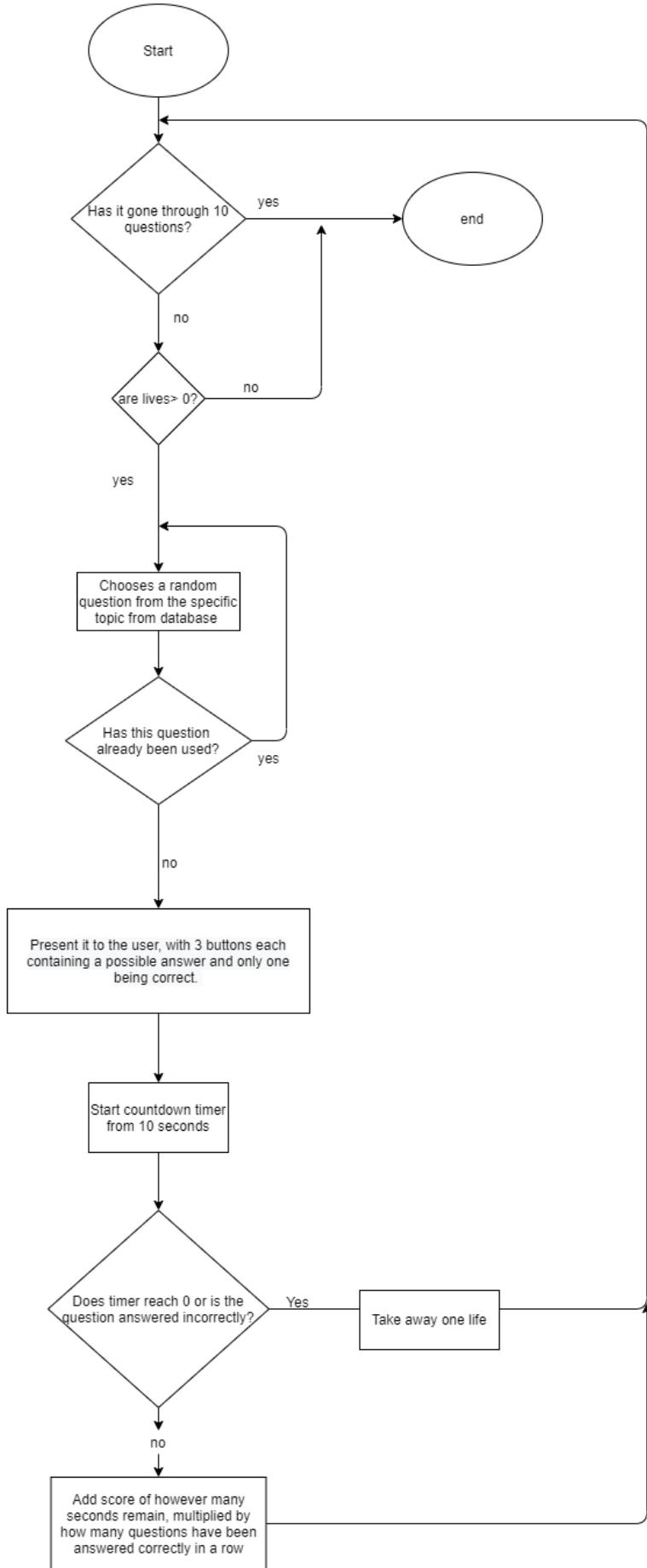


The quiz section will have a selection of random questions presented after one another. It will be multiple choice so there will be 3 options presented to the user who will have to choose the one that they believe to be correct. All 3 options will be linked to each question individually so that the answer is not extremely obvious to the user; if 2 of the options are from something completely unrelated, it will make the quiz too easy, however I could take this into consideration in regard to the difficulty, using this idea to make questions more/less difficult. A timer will start once the quiz starts to keep track of how long the student spends on it. Another timer will start as soon as each question is presented and the student will be given around 15 seconds to answer each question (which I may change after getting feedback and I determine whether it is practical or not) and it will skip to the next question if it has not been answered in the required time if I am capable of implementing this. I think it may also be a good idea to have the score for each question vary depending on how long they took to answer. For each question the student is unable to answer correctly, they will receive 0 additional points and their lives will decrement by one and so if they get a certain amount of questions wrong, the quiz ends, preventing them from achieving a higher score.

TOPIC QUIZ

The topic quiz will be almost the same as the regular quiz, however the difference is that it gives the choice of topic for the student to choose, so the questions shall only be from the selected topic. This will allow the students to work on topics they feel they need more practice with, rather than questions from all topics which could get annoying for them if it composed of a lot of questions from the other topics that they perhaps feel they already have a good understanding of.

Topic Quiz



STUDY

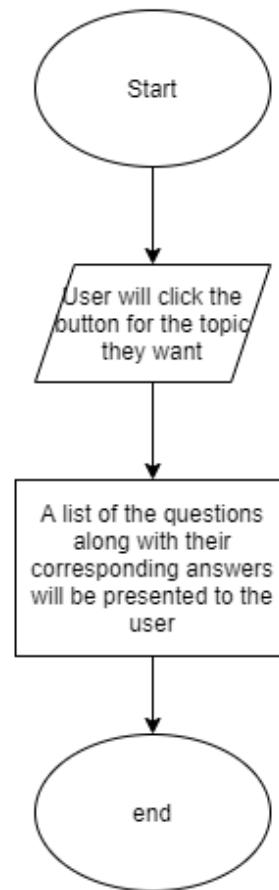
Topic – There will be a list of all the topics

Questions – There will be a list of the questions asked in the quiz

Answers – For each question, the answer will be accessible

In the study section, students will be able to choose whichever topic they want and see all questions with the answers that they will be required to know to get a higher score in the quiz. This will allow them to be

Study



prepared for any questions they are asked.

STATS

High score – Will show the highest score the student has been able to achieve at the time they check

Amount of quizzes – Will give an idea to both the student and teacher how often the student uses the program

Time spent – Along with amt of quizzes, gives idea of how much the student uses the program

Average Score in past 10 games – gives idea of student's current knowledge

The high score is kept track of so that the student has a goal in mind that they would like to reach, in this case beating their previous high score, and allows them to see their improvement as they progressively score higher which may keep them motivated. The amount of quizzes along with time spent on the quizzes and their average score is useful information to the students and their teachers as it will reflect their dedication to trying to improve their knowledge.

TEACHER

STUDENTS

Stats – Students stats

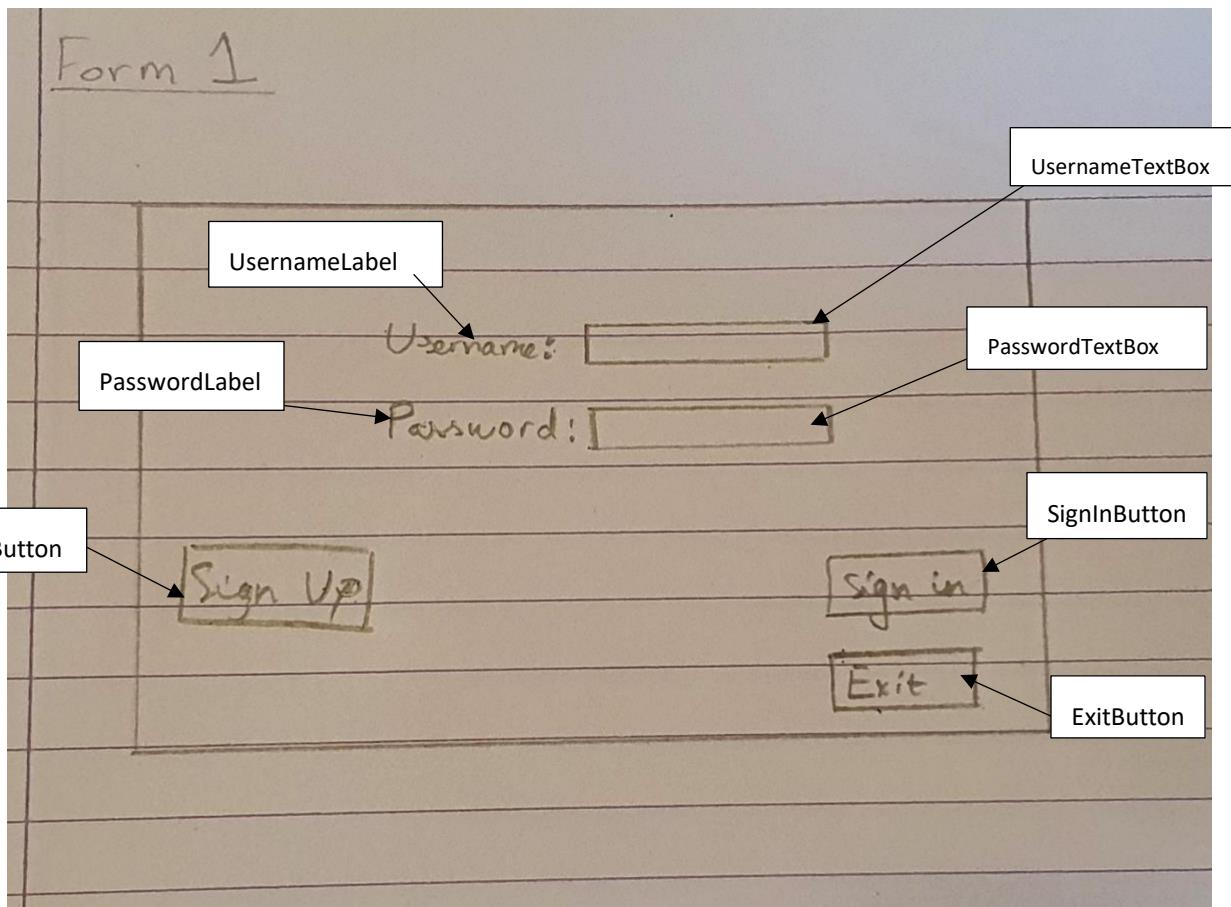
The teacher will have access to all the students' stats as this information can be useful to them. If I am able to make it give a level to the ability of the students for each topic, this will also be shown.

FORM DESIGN

Different fonts could be used to add style to each form. I will use Microsoft Sans Serif as the main font, a regular font style and a font size of 8 throughout as it matches the tone of the content while not affecting readability.

The back colour of the forms will be ActiveCaption, which is a light blue, and blue represents wisdom, confidence & intelligence and is considered beneficial to the mind and body. Blue is strongly associated with tranquility and calmness and is said to produce a calming effect. This fits the purpose of the program as I would not want the students using this revision tool to be under a lot of stress, and it retains a professional feeling to the program, unlike if I were to use something like red.

FORM1



Form1 is the login form. Once the user has entered their details, depending on what kind of user they are, it will display either the student or teacher form. I have decided to design and make the interfaces of the two different types of users on separate forms as it will be easier to manage. If I designed everything onto a single form, it would be more difficult to design and probably a lot longer to program. This method will hopefully make the development process more manageable and organisable.

USERNAME LABEL & PASSWORD LABEL

The purpose of these labels is to indicate to the user where the username and password should be entered, following established norms to allow for effectiveness of the design

USERNAME & PASSWORD TEXTBOXES

I will be using textboxes for this, which permits the client to enter their username and password. This will be easier for both the user to utilize and for myself to manipulate than any alternatives, such as an onscreen keyboard for the user to click each letter. I intend to make it so when a user inputs their password in the textbox PasswordTextbox, whatever is inside of it on the screen will be displayed as asterisks, regardless of what the user types as this feature would be beneficial for security because this will prevent others from being able to see anything on the screen, which is a **usability feature**.

SIGN-IN & SIGN-UP BUTTON

The sign-in button enables the user to click the button, labelled "sign in", to access their account, given they have already created one, after entering a correct username and password. Both buttons make use of UsernameTextbox & PasswordTextbox, with the sign-in button using the string input to check with the database, & the sign-up button inserting the values into the database.

For the sign-in button, as there will not be a limit to the amount of users & the ability to create new users will be available, it isn't necessary to include a radio button which would only be used if there were a limited amount of options which could all be displayed to the user. If I were to use this, it would take away from the **usability** of the program, making it visually unclear and unpleasing as well as being confusing to use, which takes away from the efficiency and likely the engagement, especially if there were 30+ account that needed to be displayed at once. For this reason, if the system does not require the user to make an informed decision, then a regular button will be used, however even in cases where it would be more appropriate, a regular button could still be used in its place in majority of situations without much of a noticeable difference to ease of use of the program.

Once clicked, it will open a connection with the database, and search, in the table containing the accounts, for the username entered into UsernameTextbox.

If it cannot be found, a messagebox will be displayed, saying "invalid login".

If it is found, but the corresponding password doesn't match, a messagebox will be displayed, saying "invalid login".

If it is found & the username and password both match, it will take the user to the student form, if they are a student or the teacher form if they are a teacher.

With the sign-up button, it opens a connection with the database &, again, searches in the table containing the accounts, for the username entered into UsernameTextbox.

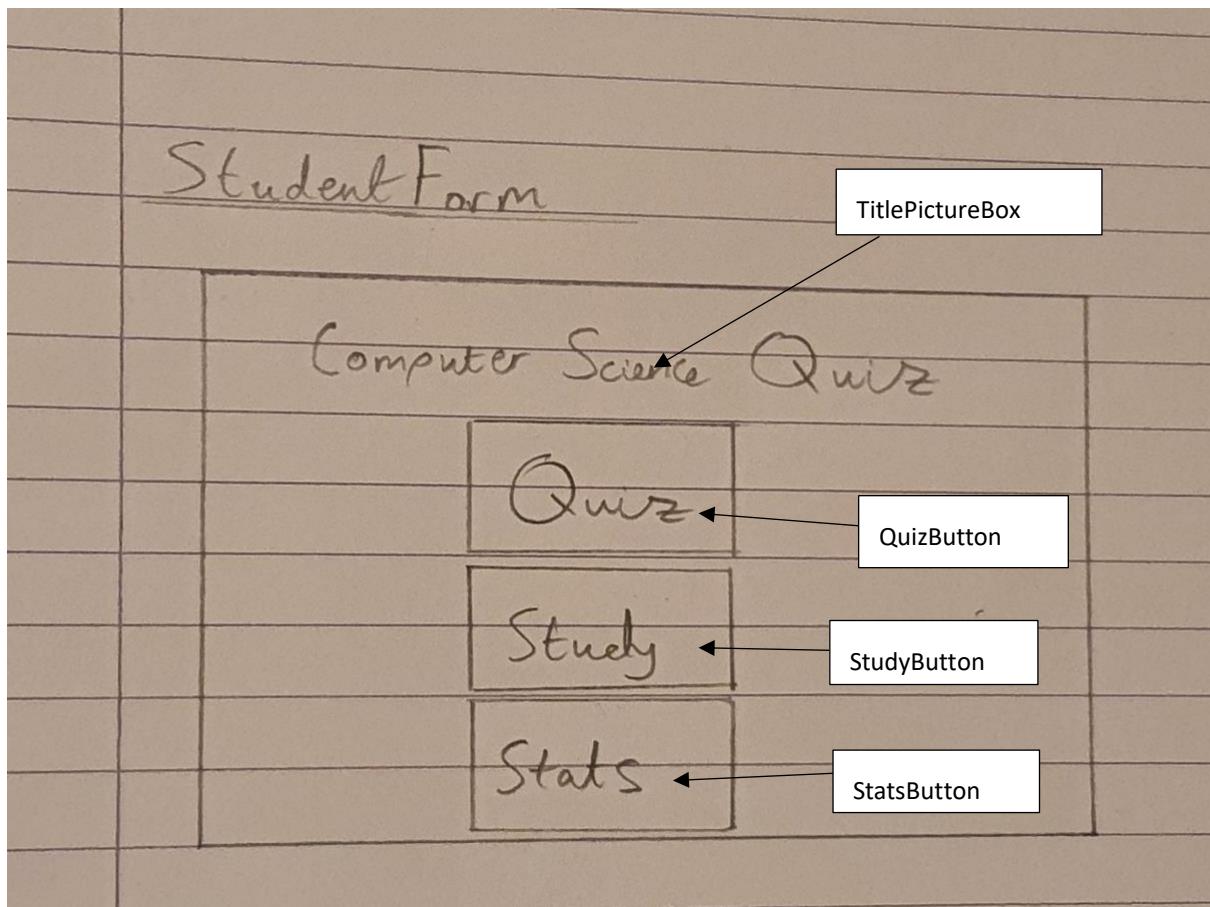
If it is found, a messagebox will be displayed, saying "user already exists".

If it cannot be found, it then allows the user to create the account with their desired username and password, inserting the values input into the database and then will display a messagebox, saying "account created", to notify the user that the creation of their account was successful & they should now use it to sign in.

EXIT BUTTON

This is simply a button that will be used to exit the program to make **usability** slightly better and will more so benefit those who are not as adept at using technology and but would still like to try learn how to use this revision tool.

STUDENTFORM



TITLEPICTUREBOX

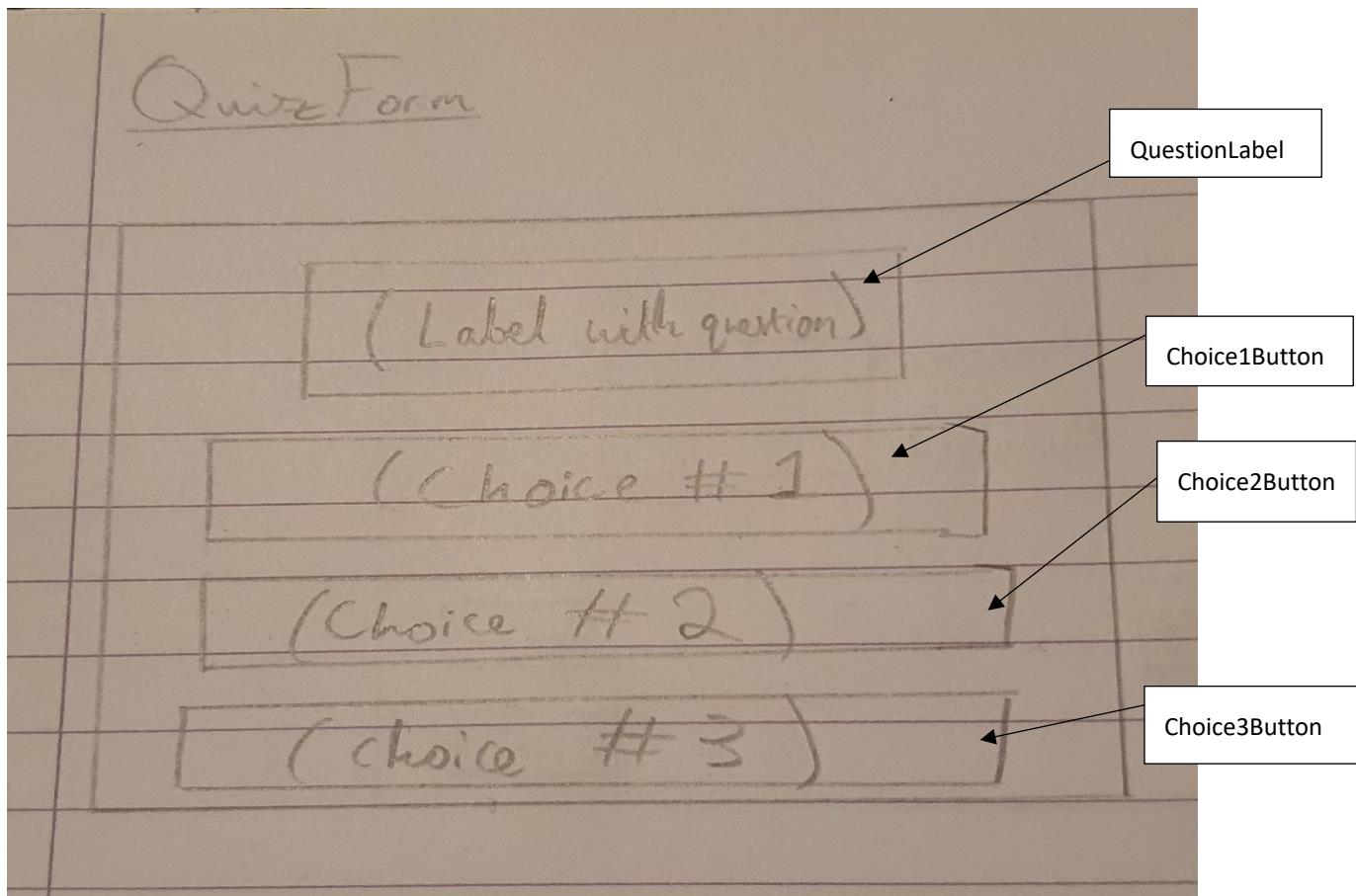
This will be a picture box containing the words “Computer Science Quiz” that I will make with a logo design generator online. I have used this instead of a label as this allows me to use any design of my choice for the title and I think it would look nicer with the logo I have created online.

QUIZ, STUDY & STATS BUTTON

These buttons will just be used to navigate around the program, hiding the current form and taking the user to the respective form associated with the name of the button. I chose to use this instead of a label link because the design looks better in my opinion and is easier to realise the use of, with large buttons rather than some text to be clicked on. Also, it is better to use than a menu bar because it is more flexible, and allows me to use a logo design for each button as well – *this relates to reasoning for all buttons throughout the program.*

I have not yet included the topic quiz button because it is something I feel is not as important as the rest of the main features & will be included if possible, later on.

QUIZFORM

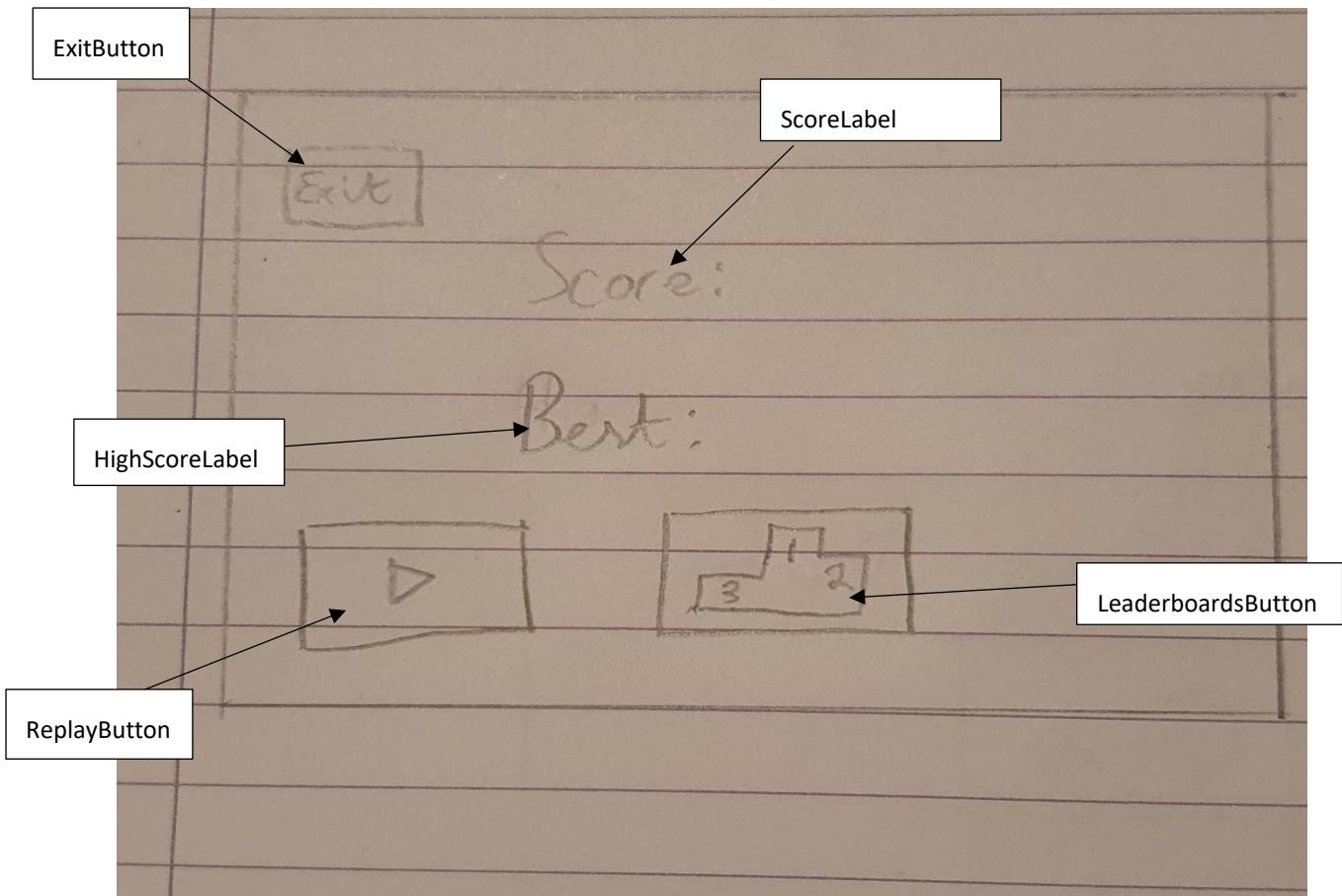


QUESTIONLABEL

This will be a label, at the top of the screen, containing a random question taken from the database. I have chosen a label for this, rather than a picturebox that could possibly display the question in a font that is more impressive or visually(for example TitlePictureBox in StudentForm) pleasing due to the fact that the text will need to be taken from a record from the questions table in the database and so this would not be possible. I could potentially approach how the quiz works in a different way to allow for this, with a form for each question and a picturebox containing the respective question, however this would be very time consuming for a change that in my opinion is not necessary, thus it will depend on the importance of this to the stakeholders.

CHOICEBUTTONS

Each of these is a button that contains one of the associated possible answers for the question chosen, displayed in its text. Only the correct one will give points to the user and go to next question. The others will take away a life and skip to next question. I have used these instead of a check box, despite a checkbox perhaps looking more professional, because in my opinion it looks more user friendly with 3 big buttons. The simplistic design will likely be more appealing to the average user.



Once the quiz is over, the questions will be taken away & this screen will be displayed.

EXITBUTTON

Same reason for [ExitButton](#) in form1. Will lead to AnswersForm

SCORELABEL & HIGHSCORELABEL

These will be labels that will be used to let the user know the score they have just achieved after completing the quiz as well as the highest score they have ever achieved. The score will be different every time the user finishes the quiz & the highscore will update every time a new one is achieved, thus it is much easier and convenient for me to use a label where I can put the variable, containing the the score, in it, rather than using a picturebox with a stylised font similar to [TitlePictureBox](#) in StudentForm & the justification for this relates to the justification for [QuestionLabel](#).

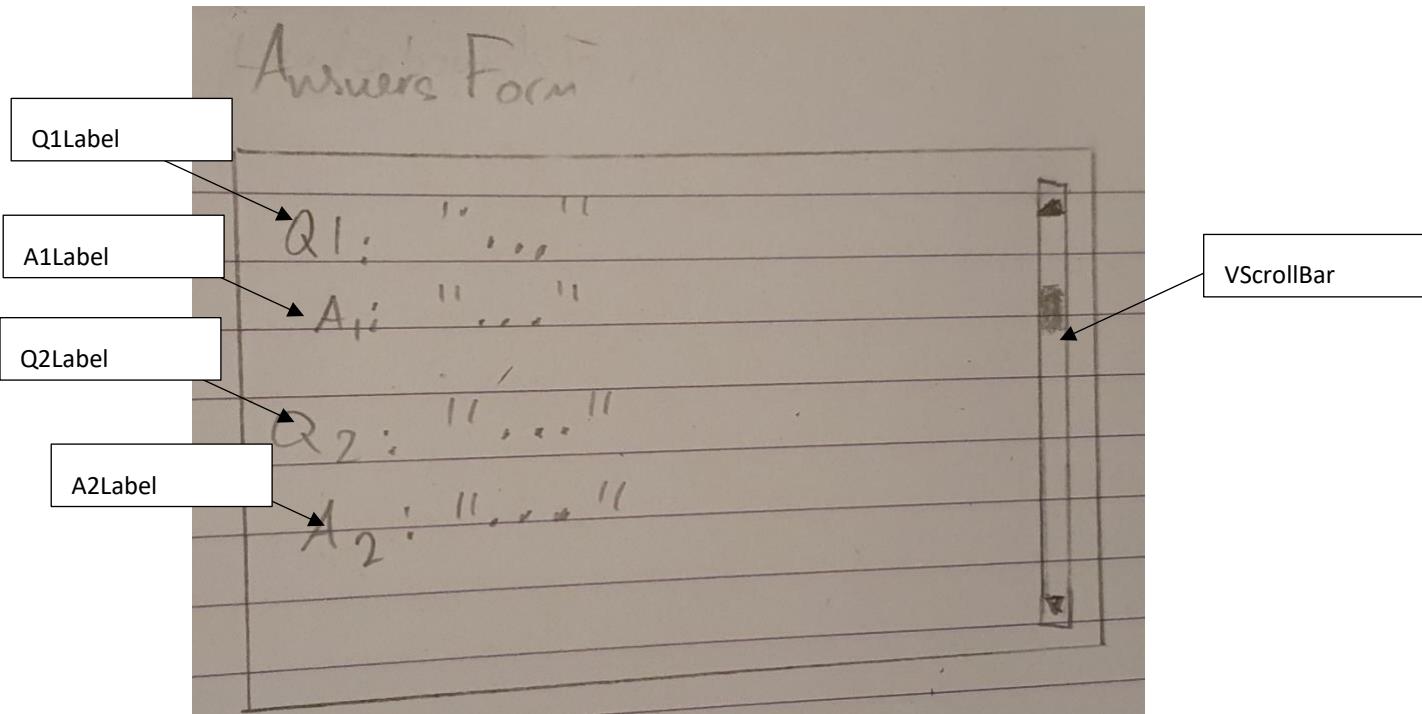
REPLAYBUTTON

Allows the user to play again instantly after completing the quiz, a **usability** feature, saving them time if they intended on playing again. – *this relates to the reasoning for all buttons throughout the program as stated in [Quiz, Study & Stats Button](#) & [ChoiceButtons](#).*

LEADERBOARDSBUTTON

Makes a messagebox appear, containing highscores of all of the users from their class. This relates to how Stakeholder [Craig Bridgens](#) said he wanted a way to see how well the students were performing & if I am unable to fully meet his request, this will hopefully be sufficient, due to time restraints as well as my lack of coding experience. This will also hopefully motivate students to work harder to gain the highest score, relating to the competitive aspect I liked about Kahoot!.

ANSWERSFORM



LABELS

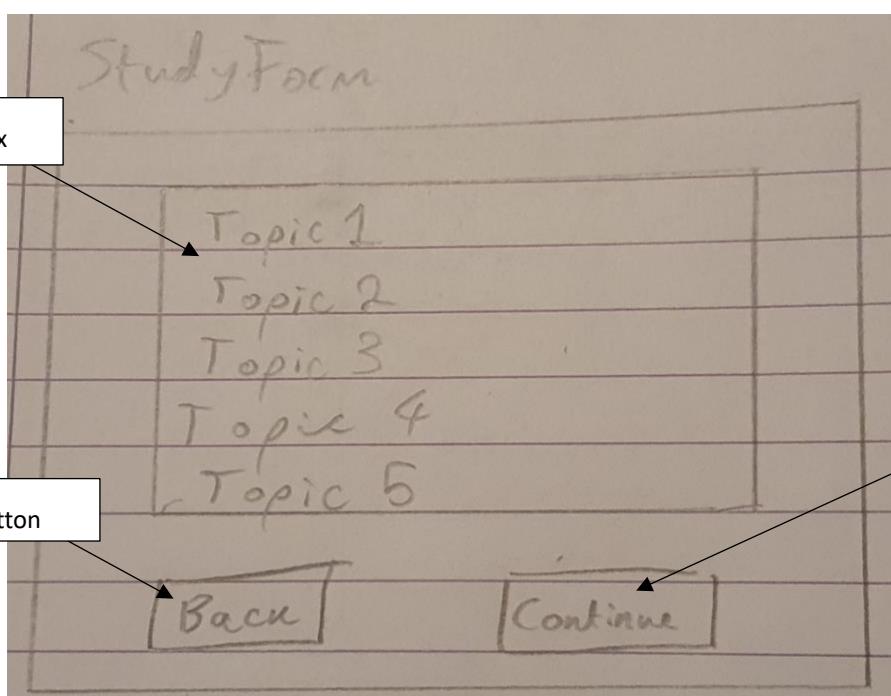
There will be the same number of questions for each quiz, therefore it would be possible for me to make 10 Labels for each question and each corresponding answer. The purpose of these will be so the user can see where they went wrong in the quiz and what the correct answers were. I have chosen this instead of a list because I feel as though it will be easier to make.

VSCROLLBAR

This is so that the user will be able to see all questions & answers if it doesn't fit on the screen.

STUDYFORM

TopicListBox



ContinueButton

BackButton

TOPICLISTBOX & CONTINUEBUTTON

A listbox that contains each Computer Science topic that is tested apart of the quiz. I have used a listbox as I felt like it was more appropriate here, considering the options could all be grouped together under the word "topics" and so they relate to each other. This, in my opinion, makes a listbox more appropriate than several buttons, like whereas with the Quiz, Study & Stats Buttons in StudentForm, it uses buttons because they each lead to a completely different sections of the program that all have different things to do within them. Here it simply takes you to the questions and answers from the selected topic that can be presented in the quiz, when ContinueButton is clicked.

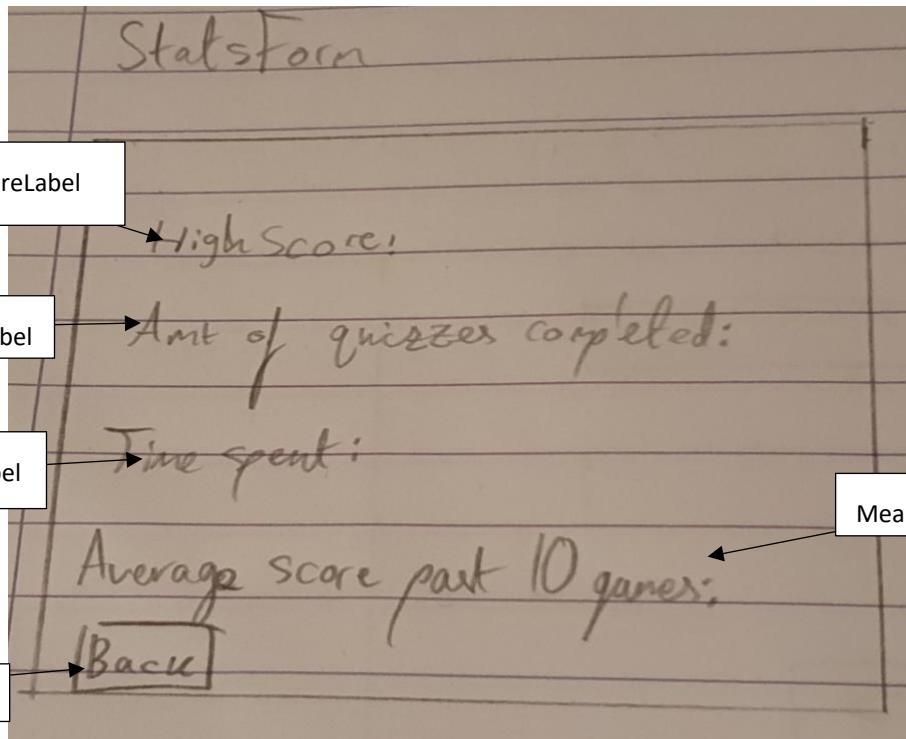
BACKBUTTON

Button that takes the user back to StudentForm as a usability feature if they clicked the wrong option or have finished studying & want to go back. Was used instead of link label for clarity and nicer look.

TOPICFORMS

Each topic form will be similar to the way AnswersForm is presented, however with a different fixed set of questions and answers.

STATSFORM



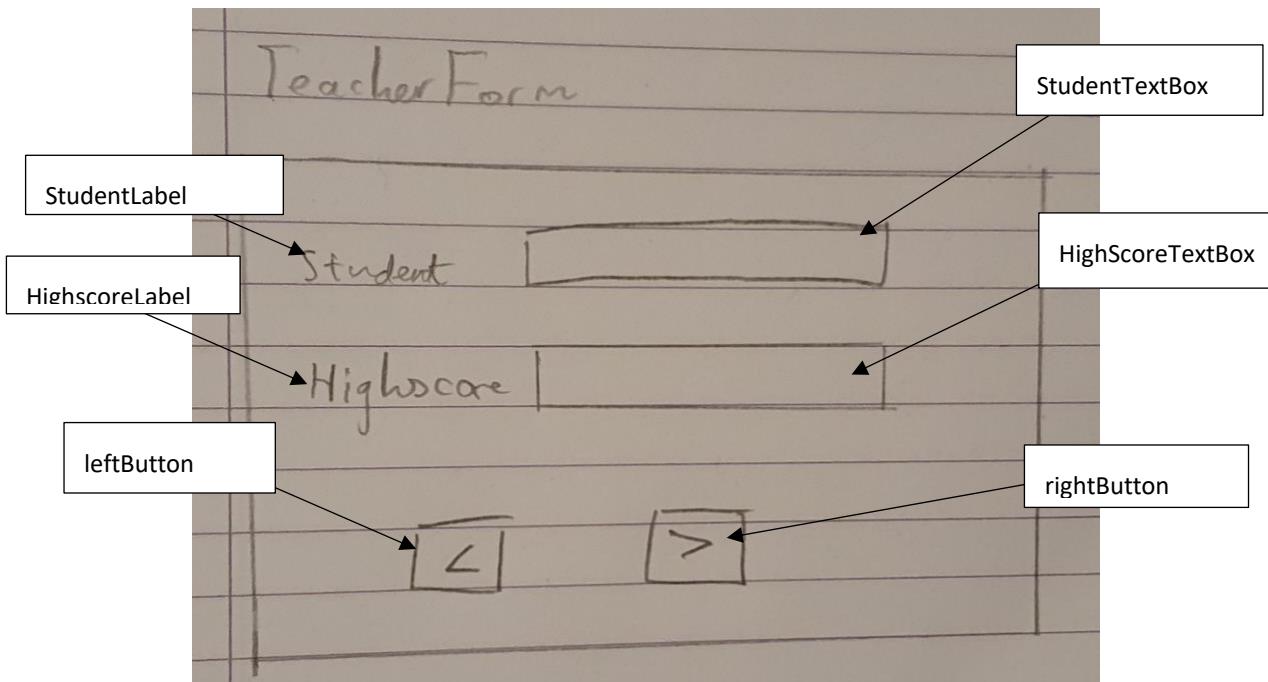
LABELS

Each label will be as shown along with the value associated with it & the explanation for each is the same as stated in the systems diagram. Label used as they contain variables, so cannot use PictureBox & is not too important to need a special design.

BACKBUTTON

Same as StudyForm BackButton

TEACHERFORM



I would like to add a graphical representation of how well each student is doing in each topic however, after consideration I do not believe this will be possible for me to make, given time constraints as well as my knowledge on the capabilities of vb.net, however I will add more than just the highscore information if possible & if the stakeholders request it.

LABELS

Simple way of letting the user know what each textbox represents. Used instead of a picturebox due to the fact the information it contains is not of great importance, therefore a small label is sufficient.

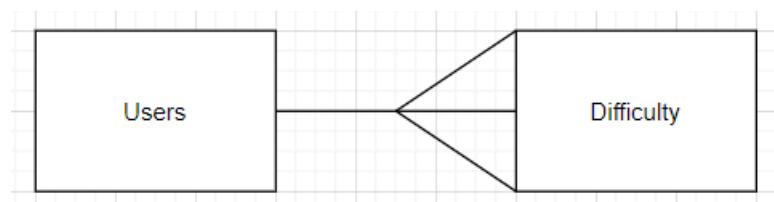
STUDENTTEXTBOX & HIGHSCORETEXTBOX

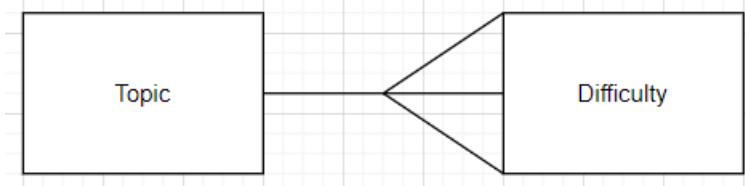
Displays a students name as well as their highscore. I have used a textbox as I have coded a program with a similar function to this form & making changes for it to be anything else would be unnecessary and may take extra time.

LEFT & RIGHT BUTTONS

Navigates through records in the database. Right button will take the user to the next student and the left will take them to the previous student. Buttons were used as they are a simple & fit for purpose.

ERD

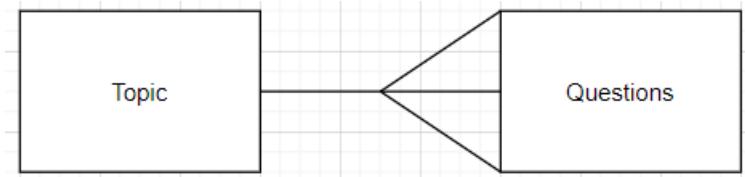




A one-to-many relationship between Users & Difficulty as each user will have multiple different difficulty levels, depending on the topic. One-to-many between topic & difficulty as there will be many difficulty levels for each topic so that the user can have the specific difficulty level for each individual topic.

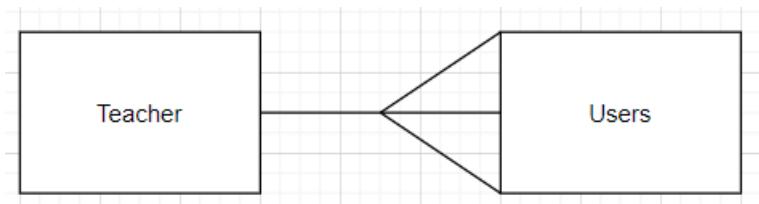
In order to ensure referential integrity, I will make a composite key with UserID & TopicID in the difficulty table.

One-to-many between Topic & Difficulty as there will be many



Each topic will have many different questions. All questions will come under a single topic, this allows for a clear view of where the student is doing well in and where they aren't.

Added during development:



Each teacher will have multiple students. User table will be converted into "Student" table as it will solely include students now.

DATA DICTIONARY

For many of the fields of data dictionary, variables and data structures, the user cannot affect it and so their validation is not really required but I put it for a few anyway.

Datatable Users

Field	Type	Purpose	Validation
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UserID	AutoNumber	To uniquely identify each user	Presence Check
Username	Short Text	To store the username of the user so they can log into their account will be unique to each user.	Subject to presence check
Password	Short Text	To store the password of the user so only they can log into their account	Presence & Minimum length check & combination of capitals and lowercase letters
Teacher?	Yes/No	To determine whether the user is a teacher or not. This column will allow the program to display the correct interface.	No validation needed. If it has a value of True, they will be seen as a teacher, & if it is unchecked, they are a student.

Username is subject to presence check as it will be confusing for the teachers if there is an associated student without a username.

Password has a presence check, minimum length check & has to have both capitals and lowercase to increase security so that others are much less likely to be able to access their accounts.

Datatable Topics

Field	Type	Purpose	Validation
TopicID	Number	To uniquely identify each topic & be a short value to refer to each row in database when used in program. For example, in an sql statement I can say “WHERE TopicID = 1”, rather than “WHERE Topic Name = The characteristics of contemporary processors, input, output and storage devices”	Presence Check

Topic Name	Short Text	To store the names of each topic, will also be unique.	Subject to presence check
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TopicID has a presence check as this is a value that is not optional, needs to have a value to uniquely identify the topics.

Topic Name has a presence check so that it can clarify what topic each topicID is associated with, a numeric value does not provide enough information to be able to understand it.

Datatable Difficulty

Field	Type	Purpose	Validation
UserID	Number	To identify which user will be affected by the other 2 fields.	Presence Check
TopicID	Number	To store the topicID, will be a composite key with UserID to create a unique value. There will be a different value in the other field for each combination of UserID & TopicID.	Subject to presence check
Difficulty	Number	A numeric value that will determine the difficulty for each topic for each user. The difficulty can change depending on how good a user gets at a particular topic, so that the program knows to present more difficult questions to Users who are better at a certain topic. Difficulty from 1-3.	Presence Check Cannot be less than 1 or more than 3

Difficulty cannot be less than 1 or more than 3 as the difficulty should only be inclusively between these values. As there are only 3 possible difficulties.

Datatable Questions

Field	Type	Purpose	Validation
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QuestionID	Autonumber	To uniquely identify each question in a short way. Will be used when randomly selecting a question in the main part of the quiz.	Presence Check
Question	Long Text	To store the questions, it is Long Text as some questions may be too long to store if it was set to short text as a lot of the questions will be a description & the potential answers will be the name of whatever the question is describing.	Subject to presence check
Correct Answer	Short Text	Will store the correct answer related to the question. The text of a button will be set to this & if that button is selected, it will acknowledge the correct answer has been clicked & the program will respond accordingly, perhaps by awarding points.	Presence Check
Incorrect Answer 1	Short Text	Will store a potential answer to the question, will be incorrect however needed so that there are multiple choices for the user. Text of a button will be set to this & if that button is clicked, the program will respond accordingly, for example by taking away a life.	Presence Check
Incorrect Answer 2	Short Text	Same as incorrect answer 1	Presence Check

Incorrect Answer 3	Short Text	Same as incorrect answer 1	Presence Check
TopicID	Number	Will store the value of the topic that the question is associated with.	Has to exist in Topic datatable Presence Check
Difficulty	Number	Will store the value of difficulty that the question is so that the harder & easier questions can be differentiated between & when students reach level 3 difficulty in a topic, they are presented with level 3 difficulty questions.	Presence Check Values from 1-3

QuestionID has a presence check as it is needed to uniquely identify each question.

Question, Correct Answer & all incorrect answers has a presence check as there must be a question stored in that field, otherwise there will not be a question presented to the users in the quiz & the potential answers are needed so that the quiz functions properly, as blank buttons would not be helpful to the main purpose of the quiz, which would ruin the program.

VARIABLE TABLE

Login Form

Name	DataType	Scope	Purpose	Validation
Variablename	String	Global	To store the username that the user has chosen to sign in with, so that the program will know which user is signed in, in other forms.	Presence Check

Presence check as it is needed in other forms. If there is no value in this variable, the program cannot complete SQL commands for adding & changing things in the datatable in relation to the user who is signed in.

Quiz Form

Name	DataType	Scope	Purpose	Validation
Score	Integer	Local to QuizForm	To store the score that the user is accumulating through the quiz as the answer questions correctly.	Has to be an integer value that is 0 or bigger.
lives	Integer	Local to quizform	<p>To store number of chances that the user has in terms of answering questions incorrect. Every time they answer a question incorrectly, or do not answer in the given time frame.</p> <p>$\text{lives} = \text{lives} - 1$</p> <p>When value reaches 0, quiz ends & however many lives remain at the end of the quiz will multiply their score achieved to give a higher score.</p>	Must not be smaller than 0 or bigger than 3.
QuestionsCompleted	Integer	Local to QuizForm	<p>Stores the number of questions that have been completed as the quiz goes on.</p> <p>Once its value reaches 10, the quiz will end, but if its value is less than 10, the program will present another question as long as there are lives remaining.</p>	Cannot be less than 0 or more than 10
second	Integer	Local to QuizForm	Stores the number of seconds that have passed. Will reset every time a question	

			is answered or if its value reaches 10 as there are 10 seconds to complete each question & if its value reaches 10 then a new question will automatically be presented and the user will lose a life.	
w	Integer	Local to QuizForm	<p>Will be used in conjunction with an array that has randomly generated integer values between the column position of CorrectAnswer & IncorrectAnswer3.</p> <p>Therefore the ordering of the same numbers will be random each time.</p> <p>This will allow me to make it so that the button containing the correct answer is not in the same position each time & the value of the variables can be checked to see if it correlates with the position of the CorrectAnswer column.</p>	<p>To implement this, it will require me to have all potential answer field next to each other.</p> <p>Cannot be outside the range of the first potential answer column position & the last potential answer column position.</p>
x	Integer	Local to QuizForm	Same as w	Same as w
y	Integer	Local to QuizForm	Same as w	Same as w

z	Integer	Local to QuizForm	Same as w	Same as w
v	Integer	Local to QuizForm	Will be a randomly generated value between 1 & the number of questions in datatable questions. To select a question randomly with QuestionID.	Cannot be outside the range of questions.
finalscore	Integer	Global	Will take the score integer at the end of the quiz and multiply it by the number of lives as long as lives is greater than 0 & will be what is put into the highscore field if it is greater than the current highscore. & is global so that it can be displayed in the next form that will display the score just achieved.	Cannot be less than 0
Highscore	Integer	Global	Will read the highscore value from the database and set the value of this variale to that the highscore value in database. Will be used to compare to the score just achieved so that it knows whether it needs to update the highscore or not. & is global as it will be displayed in the next form.	Cannot be less than 0
SqlString	String	Local to QuizForm	Will store any sql commands needed when reading or	SQL query is automatic

			updating the database	
Count	Integer	Local to QuizForm	<p>Will be used for a while loop that gives unique values to integers w,x,y,z & increments each time the loop has completed so that it loops 4 times.</p> <p>While loop is needed as W,x,y,z will need to represent a certain potential answer column, therefore they cannot have the same value.</p>	Will not be less than 0 or bigger than 4
rand	Integer	Local to QuizForm	<p>Will be the randomly generated integer within the while loop.</p> <p>Within the while loop,</p> <p>“usednumbers(count) = rand”</p> <p>will run 4 times when rand is not already contained in the array usednumbers to make sure each element contains a unique value.</p> <pre>w = usednumbers(0) x = usednumbers(1) y = usednumbers(2) z = usednumbers(3)</pre> <p>so each of these integers is set to a unique value from</p>	<p>Like w, as the value of w is taken from rand:</p> <p>Cannot be outside the range of the first potential answer column position & the last potential answer column position</p>

			each element in array usednumbers	
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Stats Form

Name	DataType	Scope	Purpose	Validation
NumQuizzes	Integer	Local to StatsForm	To store the number of Quizzes that have been completed. Will likely take a value from the database. Then will be used to display this information in a label.	Has to be an integer value that is 0 or bigger.
TotalTime	Integer	Local to StatsForm	To store the number of seconds that have passed during Quizzes. Will likely take a value from the database. Then will be used to display this information in a label. & Will likely be divided by 60 and rounded to 2 dp when shown in label to display in minutes to be more useful. Does not need to be a data type Real as the value inside the variable itself is not being divided, however the label text will take the variable and display its value divided by 60.	Cannot be less than 0
MeanScore	Real	Local to StatsForm	To store the average score in the past 10 quizzes attempted. Will likely be the	Cannot be less than 0

			result of a calculation that takes in values from the database. Value will then be used in a label to display the information. Real data type as it involves division so could likely give a decimal value.	
Highscore	Integer	Local to StatsForm	To store the highscore to display in a label. Value will be taken from database.	Cannot be less than 0

DATA STRUCTURES

Form1

Name	DataType	Scope	Purpose	Validation
Connection	New OleDb.OleDbConnection	Local to Form1	To define the connection to the database	Does not need a validation as there is nothing the user can do to affect it
dt	New DataTable	Local to Form1	Defines a new datatable, will store the values that are taken from the database	Doesn't need validation
DataAdapter	New OleDb.OleDbDataAdapter	Local to Form1	Defines DataAdapter as a DataAdapter, will be used to run SQLstatement in the database	Doesn't need validation
RoughCode1DB	Access Database	Global	Will store multiple different tables. For example, Users datatable that stores their login information & highscores as well as Questions datatable which	Presence check to make sure that all textboxes are filled with data before SQL query is run.

			stores all potential quiz questions.	Will have to ensure referential integrity.
--	--	--	--------------------------------------	--

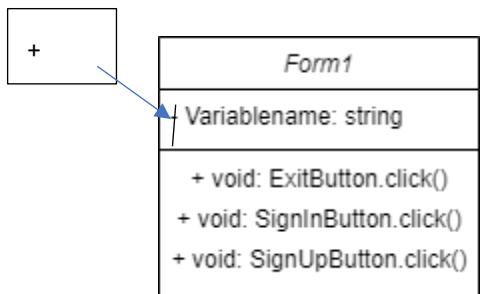
In this circumstance, I have planned to use these data structures in form 1 for the login system, however these will likely be used in many of the forms wherever database information is needed. & will be used with the scope local to whichever form requires it.

QuizForm

Name	DataType	Scope	Purpose	Validation
usedquestions(10)	Integer Array	Local to QuizForm	To contain all the values of integer variable "v" that have been used so that this array can be checked before a new question is displayed & so questions do not repeat	Does not need a validation as there is nothing the user can do to affect it, however cannot have another value added to it after there are 11 values in it.
usednumbers(4)	Integer Array	Local to QuizForm	To contain all unique values of "rand" that have been generated. Rand can only be a random number between a range of 4 so the purpose is to get a random ordering of each number in this array so the w,x,y,z variables can be set to the number randomly.	User cannot affect it however cannot have another value added to it after there are 5 values in it.

CLASS DIAGRAM

Form1



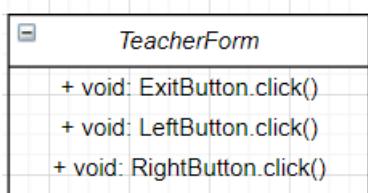
I have made variablename public as it will be needed in other forms such as quizform which needs to know which user has just achieved a particular score.

All the methods are called upon when a button is clicked & will run a set of code that will allow the program to be used as intended.

The sign in button will be clicked after the user has input their information in username and password textboxes & if the information is valid, it will allow access to the next form.

The sign up button will create a new record in the database using the information that has been input, if it is valid.

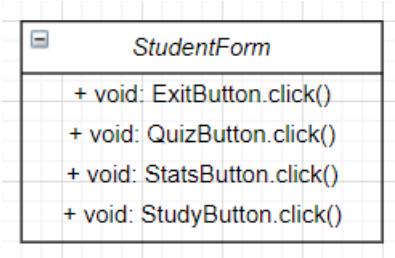
The exit button will end the program eexecution.



Teacherform attributes exit button will close the form and go back to the previous form.

Left button will navigate the database and go up the datatable users & right button will go down 7 it will show the student username and their highscores.

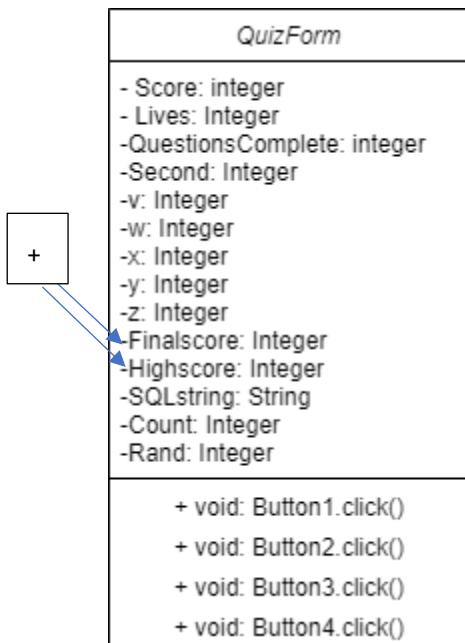
I may also add a search button to allow the teachers to search for a specific student



The exit button functions as usual.

The rest of the buttons lead to the form that correlates with their names.

I may also add a textbox and button to this form to enable the user to add a teachercode that will associate a teacher with them.



QuizForm has a lot of attributes that have their purpose explained in the variable table. Finalscore and highscoore are public as they will be used in another form that will display the score just achieved and the highscoore of the student.

The 4 methods are for when buttons with the text containing potential answers to a question that will be displayed in a label.

<i>StatsForm</i>
- NumQuizzes: Integer
- TotalTime: Integer
- MeanScore: Real
- Highscore: Integer
+ void: ExitButton.click()

TEST DATA FOR DEVELOPMENT

My test data has been chosen due to the fact that these are all things that the user has control of entering into the program. For the username and password I will be able to ensure that they have a value entered into them & the password is more secure. For the teachercode, I can ensure it is entered correctly and the students are able to successfully connect their account to their teachers & in teacherform, the teachers searching for the students doesn't cause any issues.

LOGIN FORM

Username when signing in

Test Data	Type
Adam (if no other student has used it)	Valid
(any username that already exists)	Invalid
adam (as it doesn't have any capital letters)	Valid extreme
(any username over 255 characters)	Invalid extreme
(blank)	Erroneous

Password

Test Data	Type
AdAm1234 (secure password)	Valid
adam1234 (no capitals)	Invalid
Adami (1 capital and barely meets minimum length of 5)	Valid extreme
a (no capitals and doesn't meet minimum length)	Invalid extreme
(blank)	Erroneous

STUDENTFORM

Teachercode

Test Data	Type
A3X5G (if it exists as a teacherID)	Valid
(any 5 character combination that doesn't exist as a teacherID)	Invalid
(Doesn't apply)	Valid extreme
(any combination of characters that is not 5 characters)	Invalid extreme
(blank)	Erroneous

TEACHERFORM

SearchButton

Test Data	Type
(any student that exists)	Valid
(any student that exists but has been searched with incorrect capital letters)	Invalid
(doesn't apply)	Valid extreme
(any combination of characters that is more than 255 characters or any student that doesn't exist)	Invalid extreme
(blank)	Erroneous

TEST DATA FOR FINAL TESTING

Some of the test data for final testing may be tested during development to find errors. All of the testing will be used to determine whether the features are fully functional.

Form1

Test number	What is being tested	Test Data	Expected Result
1	When signing up, the user cannot enter a password with less than 5 characters	Adam	Msgbox displayed telling them the problem with the password, & will not allow them to sign up
2	When signing up, the user cannot enter a password that doesn't contain any capital letters	adam1	Msgbox displayed telling them the problem with the password & will not allow them to sign up
3	User cannot sign up with a Username that already exists in the student datatable	Will make a record with Username "Adam" and try and sign up again with the same username	Msgbox displayed telling them the problem with the username & will not allow them to sign up
4	User cannot sign up with a Username that a	I will make a teacher account with Username	Msgbox displayed telling them the problem with

	teacher already possesses.	"Craig" & try to sign up as a student with that account.	the username & will not allow them to sign up
5	User cannot sign in with a username that doesn't exist in that database	I will try and sign in with an account that doesn't exist	Msgbox displayed telling them the problem with the username & will not allow them to sign in
6	User cannot sign in when they input a username that exists in the database, but a password that is not associated with it	I will input an incorrect password for an account that exists.	Msgbox displayed telling them there is a problem with the login details & will not allow them to sign in
7	Student can sign in when there is a valid username and associated password	I will sign in with a student account that exists in the database	StudentForm displayed and login form hidden
8	Teacher can sign in when there is a valid username and associated password input.	I will sign in with an account that exists in the teacher datatable	TeacherForm displayed and login form hidden
9	Sign In button with incorrect student username & correct password for another user entered	I will attempt to sign in with a username in the database & a password for a different student account.	Msgbox displayed telling them there is a problem with the login details & will not allow them to sign in

These will be tested to make sure that the login system is secure, and only the owners of their own accounts are able to sign into them & that students will be sent to student form & teachers will be sent to teacherform.

StudentForm

Test number	What is being tested	Test Data	Expected Result
10	QuizButton	Clicking it	Will close StudentForm & open Quizform
11	StudyButton	Clicking it	Will close StudentForm & open StudyForm
12	StatsButton	Clicking it	Will close StudentForm & open StatsForm
13	ExitButton	Clicking it	Will close StudentForm & open Form1 again

This will be tested so that the user is able to get to navigate the program to be able to use the features of the program.

QuizForm

Test number	What is being tested	Test Data	Expected Result
14	QuestionLabel & Buttons	Loading the form	Will present a random question in QuestionLabel & text in buttons will be the associated potential answers. & Correct Answer will be a random button
15	Correct Answer Button	Clicking it	Will add a particular number to Score variable, that depends on how many seconds remaining. Will then present new question.
16	Incorrect Answer Buttons	Clicking it	Will take 1 away from Lives variable. Will present a new question.
17	Timer	Not clicking anything	Will take 1 away from lives after 10 seconds and presents a new question.
18	Lives variable	Lose all lives	Will end quiz
19	Highscore	Achieve a highscore greater than current highscore	When achieving a score greater than current highscore, it will update highscore to new highscore

These will be tested to see if the quiz itself works which is the main purpose of the quiz and therefore an essential feature.

QuizForm2

Test number	What is being tested	Test Data	Expected Result
20	ScoreLabel HighscoreLabel	Loading the form	ScoreLabel will show the score just achieved in the quiz & HighscoreLabel will show the highscore before the quiz was just attempted
21	ExitButton	Clicking it	Will close the form & open student form again

22	Replay Button	Clicking it	Will restart Quiz by closing current form & open QuizForm again
23	LeaderboardsButton	Clicking it	Will display a messagebox containing highscores.

These will be tested so that there is more usability features & the quiz is easier to navigate & the users know what score they just achieved and their overall highscore.

TeacherForm

Test number	What is being tested	Test Data	Expected Result
24	LeftButton	Clicking it	Value in textboxes will change to the record previous to the one that is currently displayed. But upon loading, it should already be the first record value so in that case, the button should not change anything.
25	RightButton	Clicking it	Value in textboxes will change to the record after to the one that is currently displayed & when it gets to the last one, the button should not change anything.
26	ExitButton	Clicking it	Will close the form and open previous form

StudyForm

Test number	What is being tested	Test Data	Expected Result
27	TopicListBox & ContinueButton	Choosing a value from the ListBox and clicking continue	Will open a form related to the topic clicked.
28	ExitButton	Clicking it	Will close current form and open StudentForm again

Topic Forms

Test number	What is being tested	Test Data	Expected Result

29	Lables & Scroll bar	Choosing a value from the ListBox and clicking continue in StudyForm	The labels will contain all the questions and associated correct answers from the particular topic, next to each other & if scroll bar works
----	---------------------	--	--

DEVELOPMENT

As said in my design section, I will be developing my system in a series of prototypes. For each prototype I will describe the process of the development, test the prototype and talk with my client regarding the progress to that point. The prototypes for my system are planned to be as follows:

The 1st prototype will have a log in system completed connected to a database.

The 2nd will have a Study section.

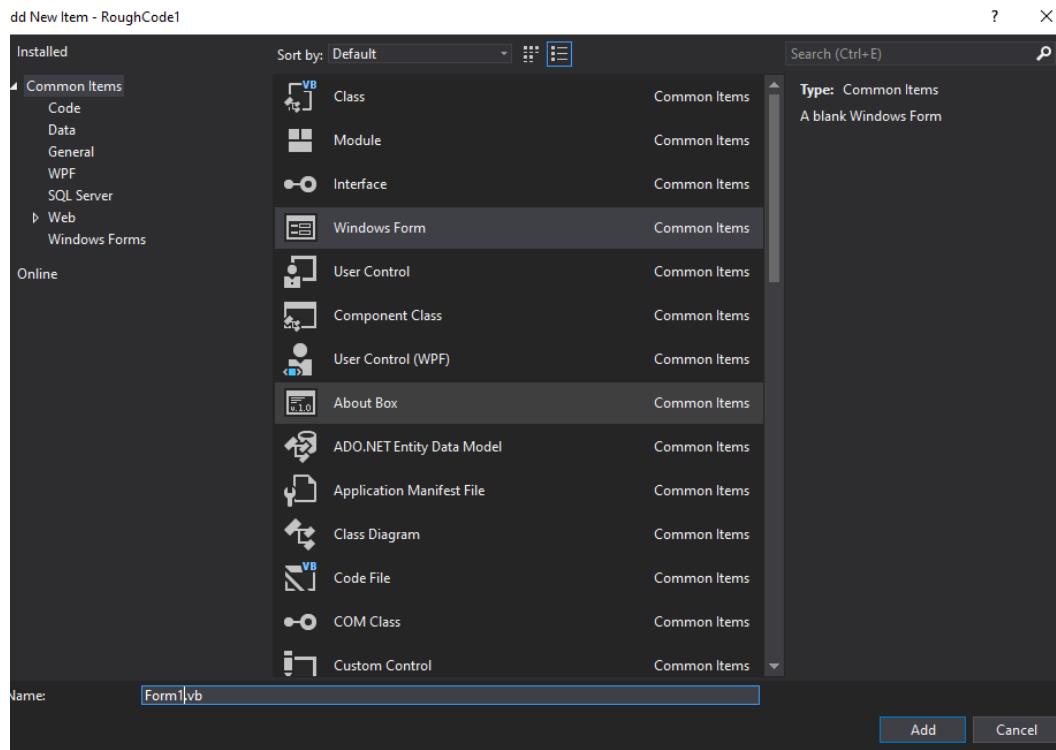
The 3rd will have a working quiz a functioning link between the students and something to save their scores.

The 4th will have working topic quizzes & a stats form.

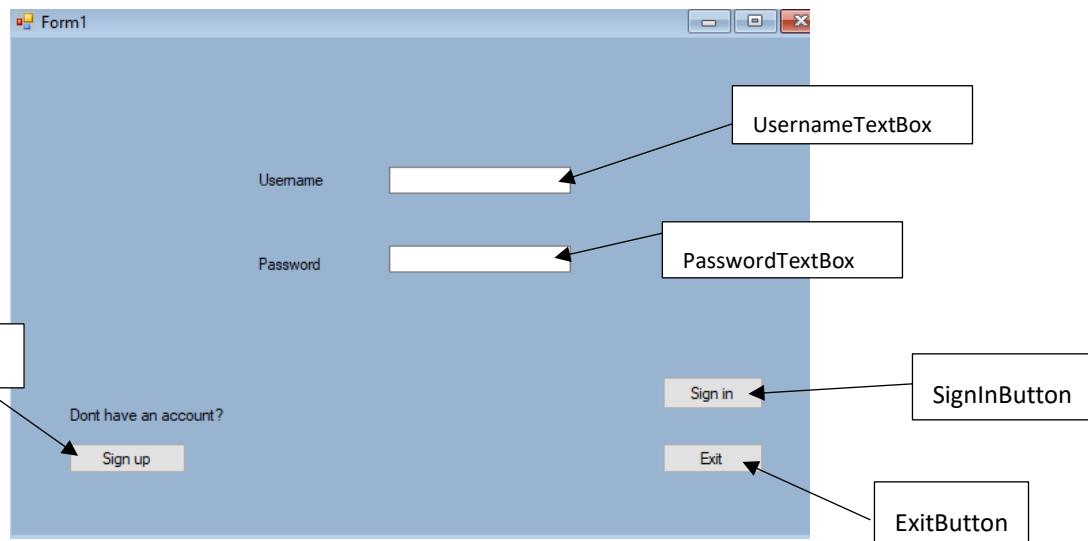
I have broken the problem up in this way because I have considered the difficulty to achieve each prototype stage and have chosen this order accordingly, so that I do the easier things first and the more I break it up, the more the problem becomes more manageable and I will be able to focus on a specific aspect at a single time which will hopefully result in a better quality final product.

PROTOTYPE 1

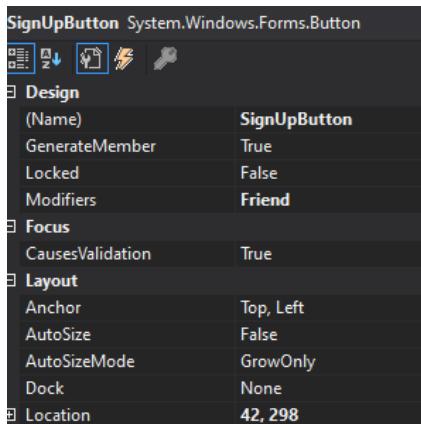
I started by opening Visual Studio 2017, creating a Visual Basic Windows Forms App and creating a page to allow for the users to log in. I left the name of the first Windows Forms App as 'Form1.vb'. This will be the first thing the user will see upon loading the program and so it will be easy for me to remember the purpose of this form. This is where they will sign into their account for the Computer Science Quiz. I then created 2 other forms: StudentForm & TeacherForm as they will be needed to help me test if Form1 works correctly.



The login page will allow the user to access their accounts with 2 text boxes to enter a username and password and a button to sign in. I chose to use textboxes, rather than an having an onscreen keyboard to input letters as this will likely be the most efficient method, considering most users will have access to a keyboard, and so I have also listed a keyboard as a hardware requirement. They can also enter a potential username and password into these textboxes and sign up for an account through pressing the "Sign Up" button. Finally, there is a button to close the program as a usability feature. Everything has been labelled to make it clear what each button or text box is used for.



Buttons were used as they are the easiest way to input data and navigate throughout the program, for this form, if I allowed the "enter" key to be used as a way of confirmation, the program wouldn't know whether the user would like to sign in or sign up. All the buttons were given standard names that explain the purpose of the button as seen as the example in the screenshot below.



I have used Microsoft Sans Serif as the font throughout as it clear and easy to read.

I will be using a connection to a Microsoft Access database for the login as it is an efficient method of storing usernames and passwords and will be required for the connections between accounts and their respective data later on in the program. Firstly, I created an access file and placed it into the folder of the code: bin -> debug, which makes it apart of the program.

Within this, I created columns: UserID, Username, Password, Teacher?

Field Name	Data Type
UserID	AutoNumber
Username	Short Text
Password	Short Text
Teacher?	Yes/No

"UserID" is set as the Data Type AutoNumber as this allows for each to have a simple unique value, which is needed because it is a primary key which needs to be a unique identifier for each row. "Username" & "Password" are both set to data type short text because it will require to input a string that may contain letters, numbers and symbols. "Teacher?" is set as the data type Yes/No as it only requires a boolean value of true or false for the program to determine whether the user is a teacher or not.

I then entered some values so that I have data ready for when I test the functioning of the login page, which will be the first section of prototype 1 that I will develop.

Users					
	UserID	Username	Password	Teacher?	Click to Add
[+]	1	Adam	Adam1234	<input type="checkbox"/>	
[+]	2	Craig	Bridgens	<input checked="" type="checkbox"/>	
[+]	20	fortnite	isepic	<input type="checkbox"/>	
[+]	21	q	q	<input type="checkbox"/>	
[+]	24	ss	s	<input type="checkbox"/>	
[+]	25	JOSHUSH	JOSHUSH	<input type="checkbox"/>	

```

Public Class Form1
    Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCodeIDB.accdb") 'defines connection as a new instance of the OleDb.OleDbConnection class with the specified string
    'that says its Provider and source, linking my database to the program
    Dim dt As New DataTable 'defines dt as a new instance of the DataTable class
    Dim DataAdapter As New OleDb.OleDbDataAdapter 'defines DataAdapter as a new instance of the OleDb.OleDbDataAdapter class

```

To code it, firstly, I defined main variables that need to be used within more than one subroutine within the form. Whenever data needs to be retrieved from the database, I will store it in a data table because it allows for easier processing of data than if it were not.

```

Private Sub SignInButton_Click(sender As Object, e As EventArgs) Handles SignInButton.Click
    Dim SQLString As String = "select * from Users where Username = '" & UsernameTextBox.Text & "'" 'Defines variable sqlstring As data type String, which contains the command To read from data table Users where Username is
    'equal to the text entered into UsernameTextBox
    'pay attention to speech mark & apostrophe when coding
    connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
    DataAdapter = New OleDb.OleDbDataAdapter(SQLString, connection)
    dt.Clear()
    DataAdapter.Fill(dt)
    connection.Close() 'Lines 22-26 puts the data from database into the data table & closes connection with the database
    If dt.Rows.Count = 0 Then 'If the Username entered into UsernameTextBox is not found in the Username column,
        MsgBox("invalid login") 'a messagebox will be displayed and say the login is invalid
        Exit Sub ' and then exit the subroutine as it should do nothing further
    End If
    If dt.Rows(0)(2) = PasswordTextBox.Text Then 'This If statement will only be run if the username was found in the database, & checks if the associated password matches the password entered into PasswordTextBox
        Me.Hide() 'if so, will then hide the login form as it can now proceed to the next form
    Else
        MsgBox("invalid login") 'if it doesnt match, a messagebox will be displayed saying invalid login
        Exit Sub
    End If
    If dt.Rows(0)(3) = True Then 'if there is an account that exists & the password matches & attribute 'Teacher?' is True then it will show the teacher form
        TeacherForm.Show()
    Else
        StudentForm.Show() 'if 'Teacher?' isnt True then it will show the student form as it will know the user isnt a teacher
    End If
End Sub

```

There is now a connection between the access database, I could begin creating some code for SignInButton_Click() which is run when the “Sign in” button is clicked to allow access to the rest of the program, when clicked, by checking if the username and password combination entered into the textboxes matched any username and password combination that were stored in the database & if so, the login form was hidden & a student form or teacher form was shown, depending on whether the attribute “Teacher?” was set to true or false.

The purpose of each line has been commented.

I declared a variable called SQLstring which will store the SQL statement, the SQL statement will instruct the DataAdapter to retrieve all records from the Users table where the username field matches what was typed in UsernameTextBox.

I created an IF statement as a **validation** check that means if nothing was found, a messagebox will be displayed saying “invalid login” & exits the subroutine to allow them to try again. This IF statement will not be run if the username entered into UsernameTextBox was found & instead, it will run an IF statement that checks if the password entered matches the related password in the database & then proceeds to hide the login form. However if the password is incorrect, the messagebox saying “invalid login” will be displayed & it will exit the sub. This is **validation** to maintain security, not allowing people other than the users themselves to access their respective accounts.

If the username & password is correct for a user, an IF statement will be run checking if the user is a teacher by checking the “Teacher” attribute in the database is true or false. This is at the end as this will only need to be checked if this is a user that should have access to the program.

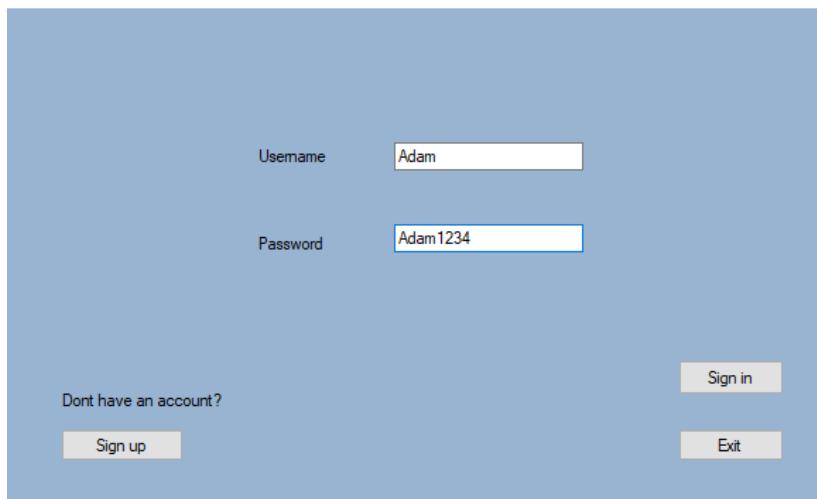
I then started on typing code to make SignUpButton_Click() work as intended.

```
45 Dim SQLstring1 As String = "select * from Users where Username = '" & UsernameTextBox.Text & "'" 'lines 46-51 recycled from lines 19-26 with the same purpose
46 connection.Open()
47 DataAdapter = New OleDb.OleDbDataAdapter(SQLstring1, connection)
48 dt.Clear()
49 DataAdapter.Fill(dt)
50 connection.Close()
51 If dt.Rows.Count = 0 Then 'this if statement runs only if username entered into UsernameTextBox isn't found to not allow for duplicate accounts as a validation check
52     Dim sqlString As String = "select * from Users" 'defines sqlString as datatype string
53     sqlString = "Insert into Users ([Username], [Password])"
54     sqlString &= " values ('"
55     sqlString &= UsernameTextBox.Text & "', ''"
56     sqlString &= PasswordTextBox.Text & "')" 'these lines have been separated to make each part of the sql command clearer for me,
57     'this command inserts the username and password that the user has entered into the database
58     connection.Open()
59     DataAdapter = New OleDb.OleDbDataAdapter(sqlString, connection)
60     dt.Clear()
61     DataAdapter.Fill(dt)
62     connection.Close()
63 Else
64     MsgBox("user already exists") ' if the username entered into UsernameTextBox is found, this messagebox is displayed
65     Exit Sub 'exits the subroutine as there is nothing further to be done because it cannot create an account for them if there is already someone with that username
66 End If
67 End Sub
```

I declared SQLstring1 as a string that stores an SQL statement that tells the dataadapter to retrieve all records from Users where the username entered into UsernameTextBox is in the username column. This is similar to what the sign up button does, however the difference is that in this case the program wants the Username to not exist so that it can create the new account, whereas with the sign in button, if the username didn't exist in the column, its main purpose would not work.

I have made an IF statement so that if the username wasn't found, it defined the variable sqlString as a string containing a different SQL statement that held a command to insert the UsernameTextBox text & the PasswordTextBox text into the Username & Password columns respectively. If the username was found, it would notify the user & exit subroutine.

Test no.	What is being tested	Expected outcome	Actual outcome
1	Sign In button with correct student username & pass entered	Form1 will be hidden and it will display StudentForm	An error comes up saying 'The 'Microsoft.ACE.OLEDB.12.0' provider is not registered on the local machine.'



```

Private Sub SignInButton_Click(sender As Object, e As EventArgs) Handles SignInButton.Click
    Dim SQLString As String = "select * from Users where Username = '" & UsernameTextBox.Text & "'" 'Defines variable sqlstring As data type String, which contains the query to select all rows from the Users table where the Username column matches the value entered into the UsernameTextBox
    'pay attention to speech mark & apostrophe when coding
    connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
    DataAdapter = New OleDb.OleDbDataAdapter(SQLString, connection)
    dt.Clear()
    DataAdapter.Fill(dt)
    connection.Close() 'Lines 22-26 puts the data from database into the data table
    If dt.Rows.Count = 0 Then 'If the Username entered into UsernameText
        MsgBox("invalid login") 'a messagebox will be displayed and say the
        Exit Sub ' and then exit the subroutine as it should do nothing further
    End If
    If dt.Rows(0)(2) = PasswordTextBox.Text Then 'This If statement will
        Me.Hide() 'if so, will then hide the login form as it can now proceed to the next form
    Else

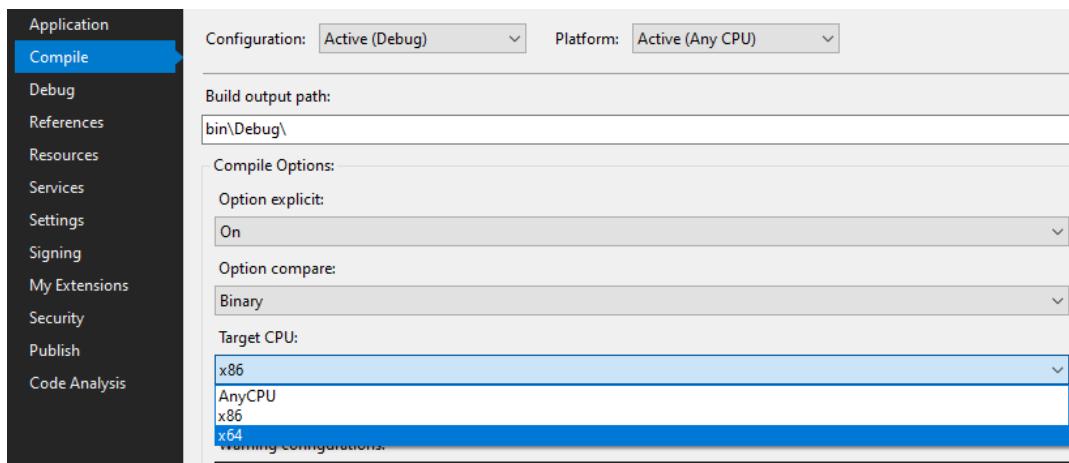
```

The code is a VBA script for a Windows application. It connects to a database using an OleDb connection. It performs a SELECT query on the 'Users' table where the 'Username' matches the value in the 'UsernameTextBox'. If no rows are found, it displays an error message and exits. If a row is found and the password matches, it hides the current form ('Me') and proceeds to the next form.

Exception Unhandled

System.InvalidOperationException: 'The 'Microsoft.ACE.OLEDB.12.0' provider is not registered on the local machine.'

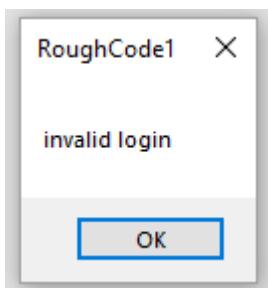
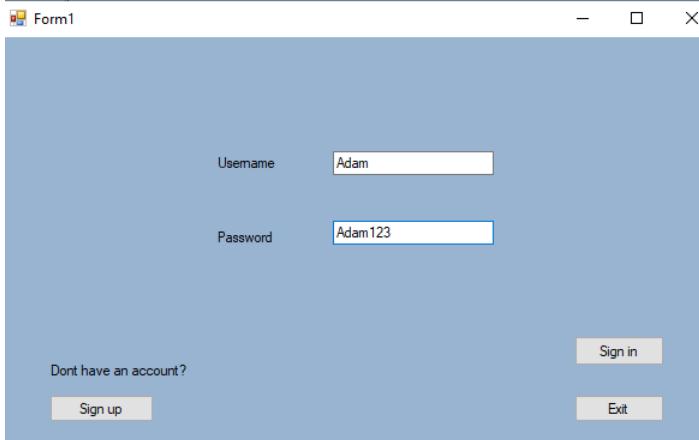
The likely cause of this error is that the target CPU is incorrect when compiling so I will change this and try again.



Test no.	What is being tested	Expected outcome	Actual outcome
1a	Sign In button with correct student username & pass entered	Form1 will be hidden and it will display StudentForm	Form1 is hidden & it displays StudentForm



Test no.	What is being tested	Expected outcome	Actual outcome
2	Sign In button with correct student username & incorrect pass entered	Messagebox will say "invalid login" and it will not allow access to any further form	Messagebox will say "invalid login" and it will not allow access to any further form

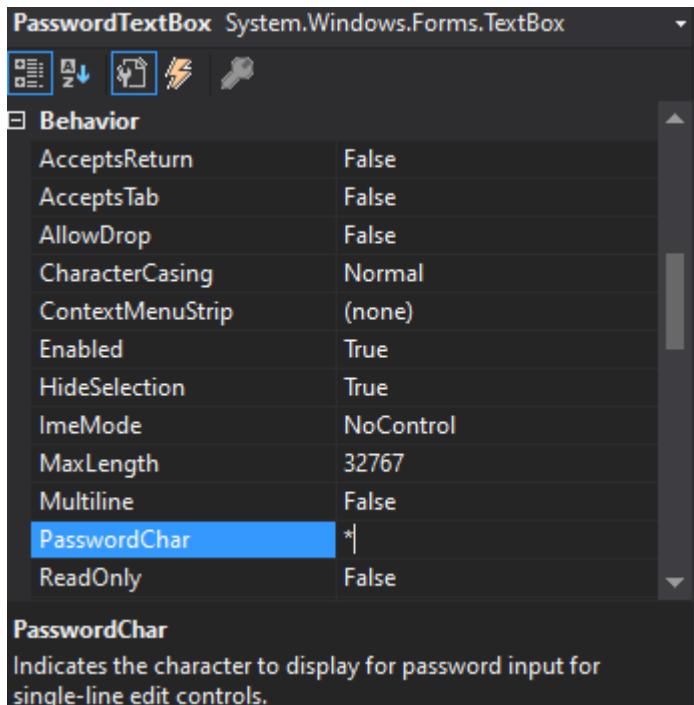


So, this test has been successful.

However, I have just realised a couple **usability** features that I should probably include.

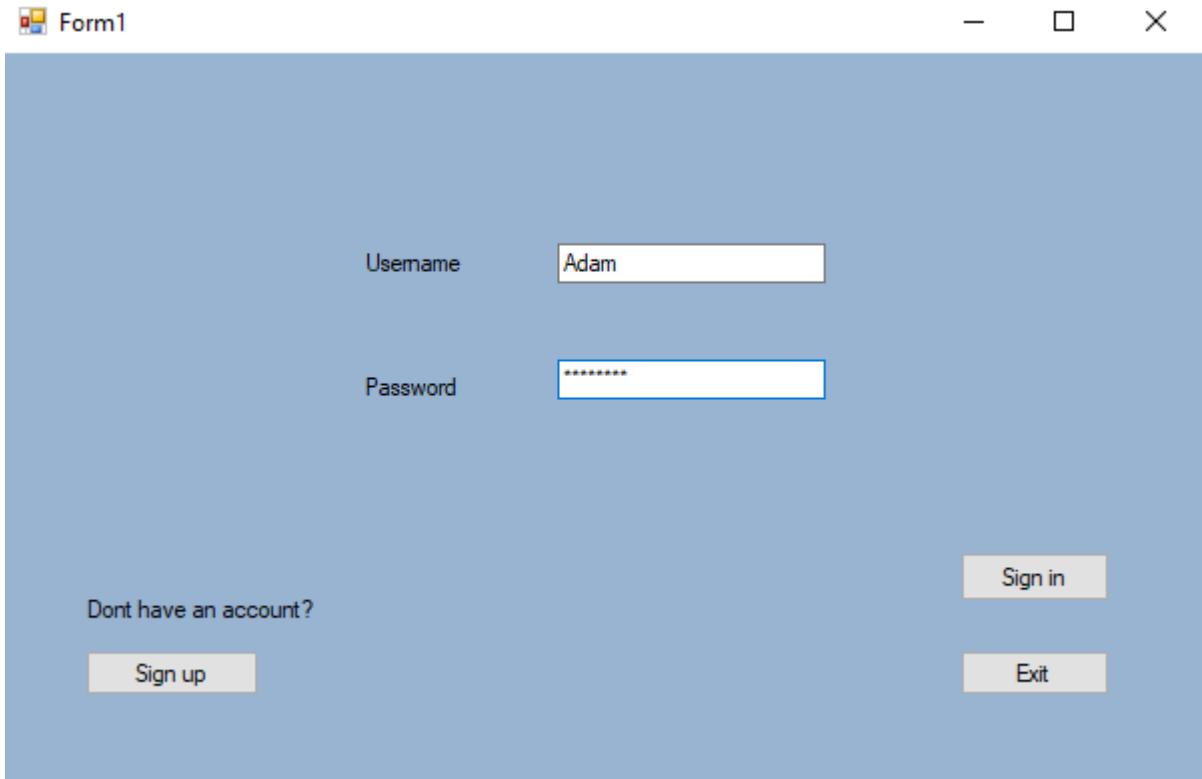
The password should be hidden so that others cannot see what is being input.

Also, when the login is invalid, the textboxes should be cleared so that the user can type in a new password without having to delete it. In this case where I have only missed one character from the correct password, it may be more of a drawback than something that would benefit the user; however, it increases security by making it slightly more difficult to sign in.



Putting an asterisk as the PasswordChar value in PasswordTextBox's behaviour, should make the characters appear as * as they are being typed in.

Test no.	What is being tested	Expected outcome	Actual outcome
3	If there is an asterisk in place of where the characters would be displayed in the textbox	There will only be *'s in place of each character	There was only *'s in place of each character



The test was successful.

I will now try to make it so that the textboxes are cleared after an incorrect username or password was input.

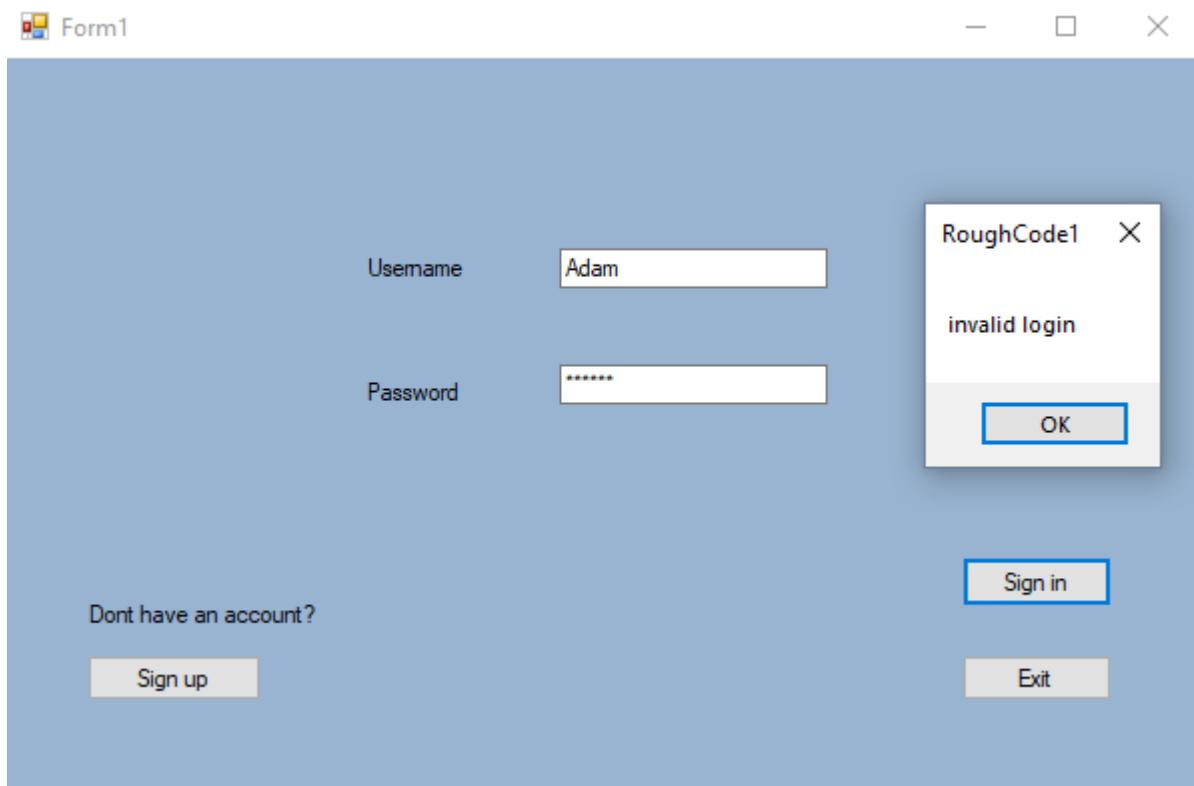
```
28 |    MsgBox("invalid login") 'a messagebox will be displayed and say the login is invalid
29 |    PasswordTextBox.Text = "" 'clears PasswordTextBox
30 |    UsernameTextBox.Text = "" 'clears UsernameTextBox
```

I have added lines 29 & 30 to wherever there was a messagebox saying "invalid login".

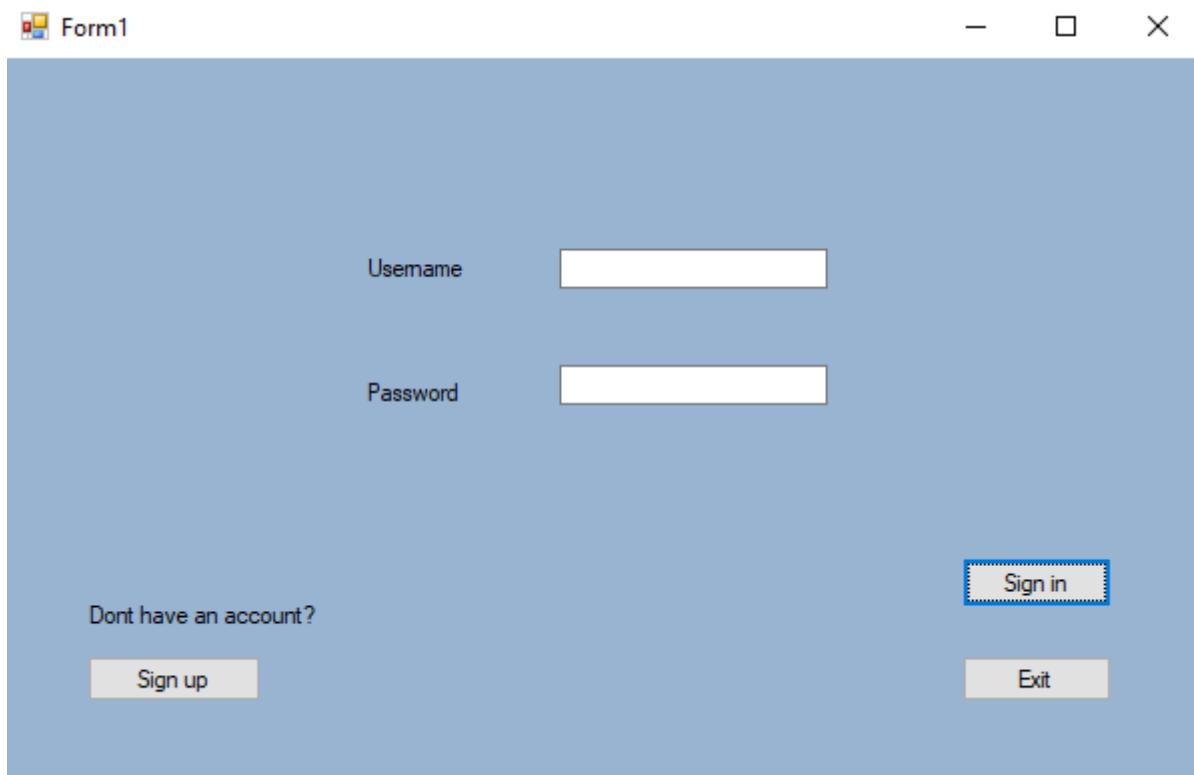
```
68 |    MsgBox("user already exists")
69 |    PasswordTextBox.Text = "" 'clears PasswordTextBox
70 |    UsernameTextBox.Text = "" 'clears UsernameTextBox
```

I then also added it to the sign up button, when there is already a user that exists with the username they are trying to sign up with.

Test no.	What is being tested	Expected outcome	Actual outcome
4	If the textboxes are cleared when there is an invalid login	The textboxes will be cleared	The textboxes were cleared

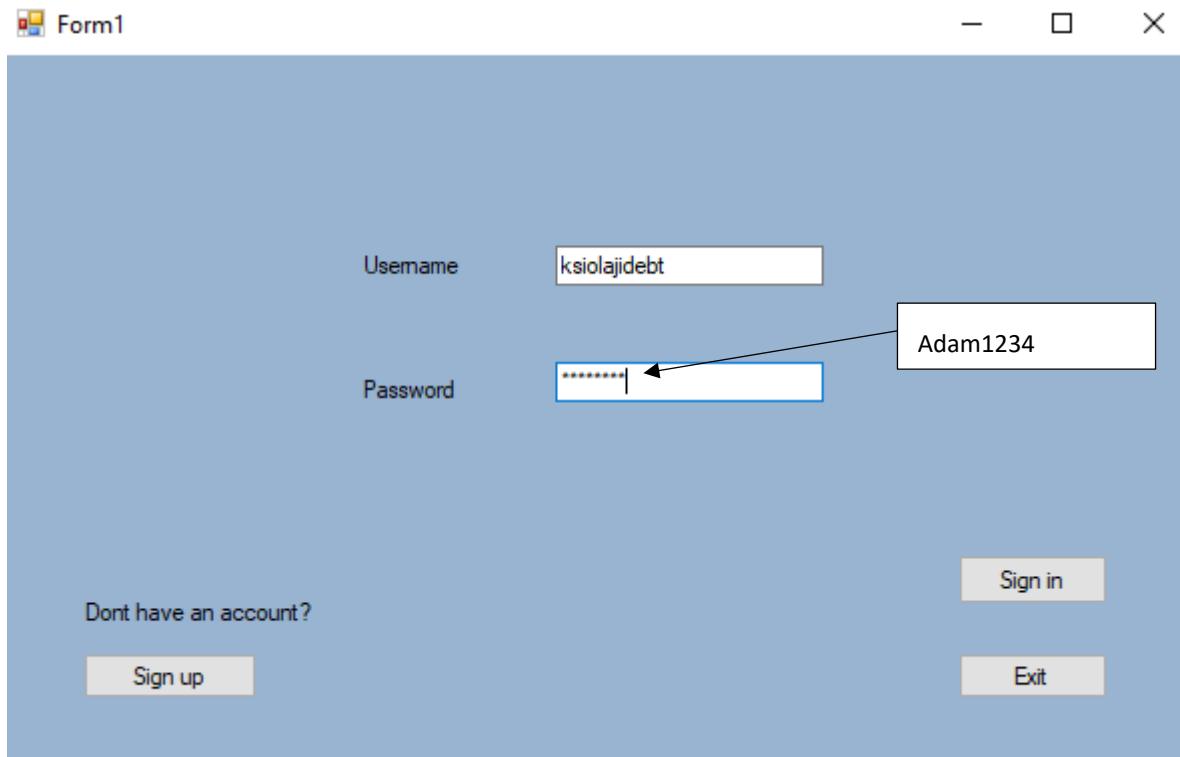


After pressing okay, the textboxes were cleared, and the test was successful.



Test no.	What is being tested	Expected outcome	Actual outcome
5	Sign In button with incorrect student	Messagebox will say "invalid login" and it	Messagebox said "invalid login" and it

	username & correct password for another user entered	will not allow access to any further form	didn't allow further access.
--	--	---	------------------------------



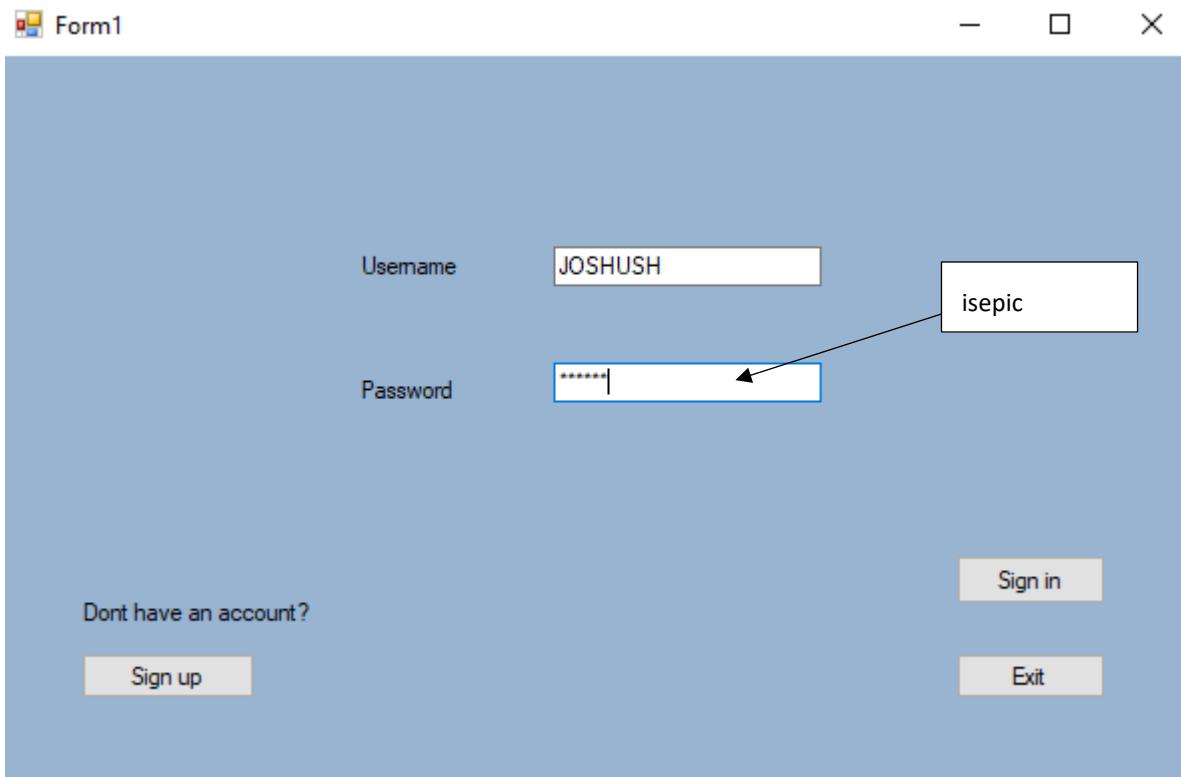
RoughCode1 X

invalid login

OK

Test successful

Test no.	What is being tested	Expected outcome	Actual outcome
6	Sign In button with correct student username & correct password for another user entered but incorrect for the associated user	Messagebox will say "invalid login" and it will not allow access to any further form	Messagebox said "invalid login" and it didn't allow further access.



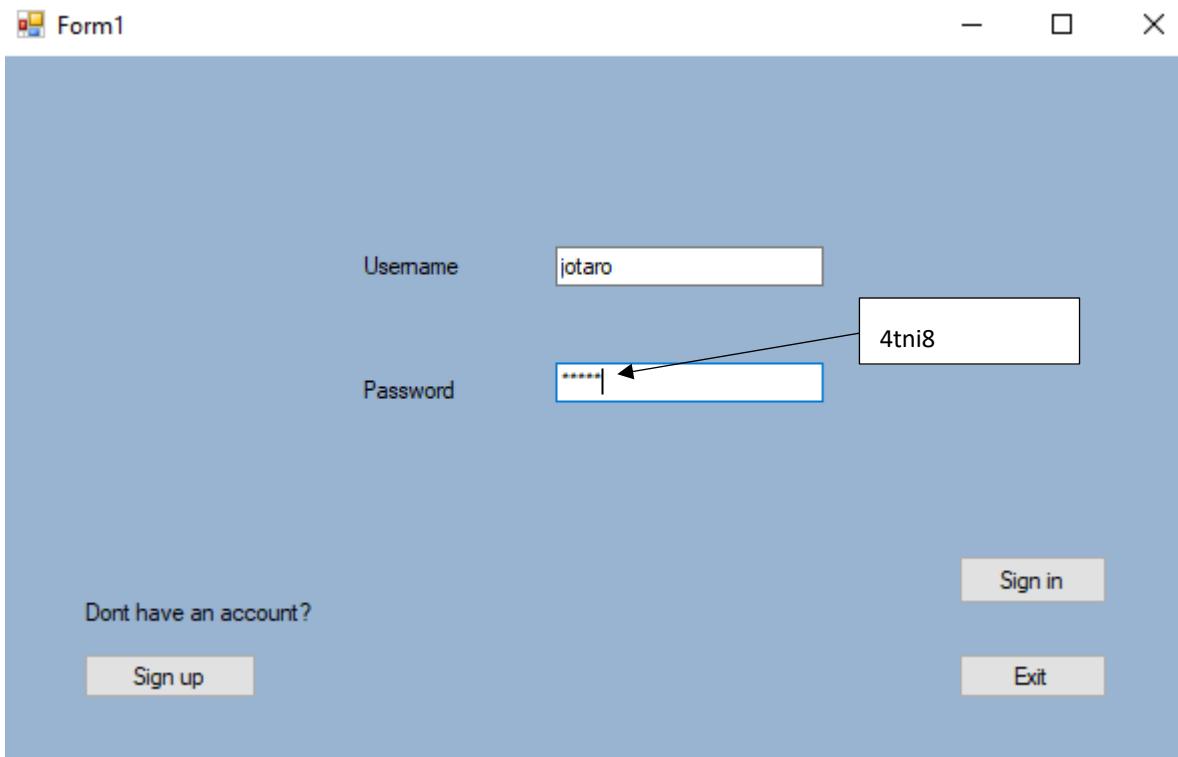
RoughCode1 X

invalid login

OK

As required

Test no.	What is being tested	Expected outcome	Actual outcome
7	Sign In button with incorrect student username & password	Messagebox will say “invalid login” and it will not allow access to any further form	Messagebox said “invalid login” and it didn’t allow further access.



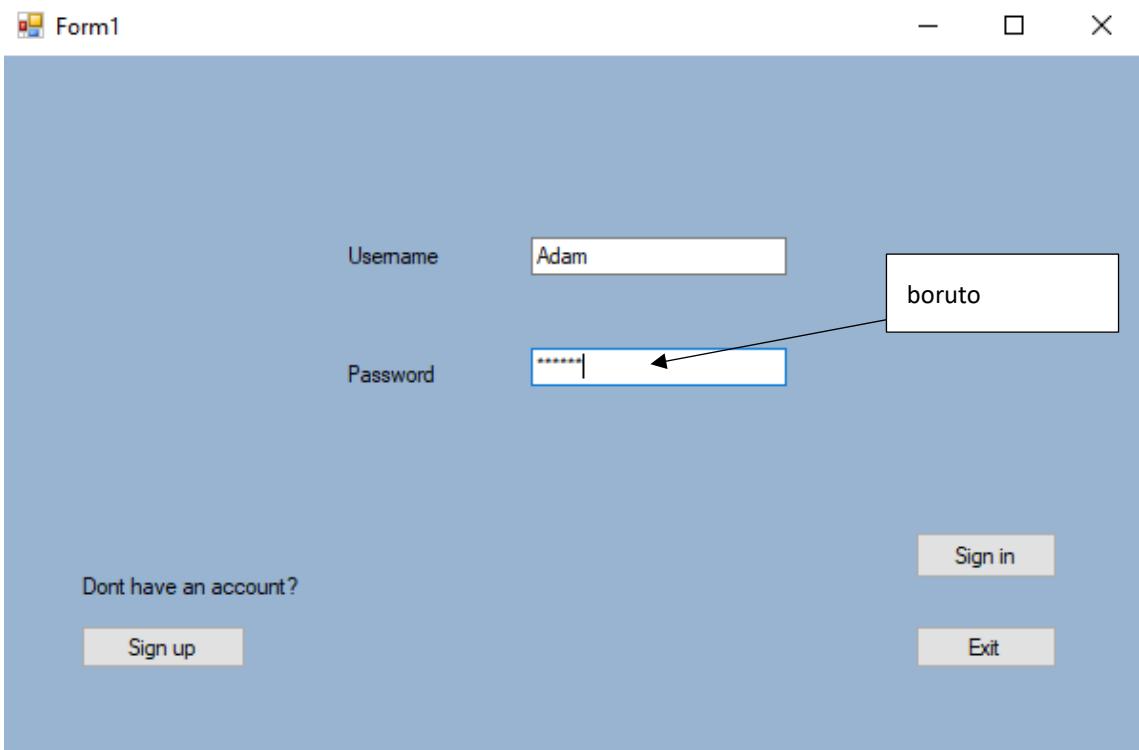
RoughCode1 X

invalid login

OK

As required

Test no.	What is being tested	Expected outcome	Actual outcome
8	Sign up button with username that already exists	Messagebox will say “user already exists” will not create a new user	Messagebox said “user already exists” and it didn’t create new user



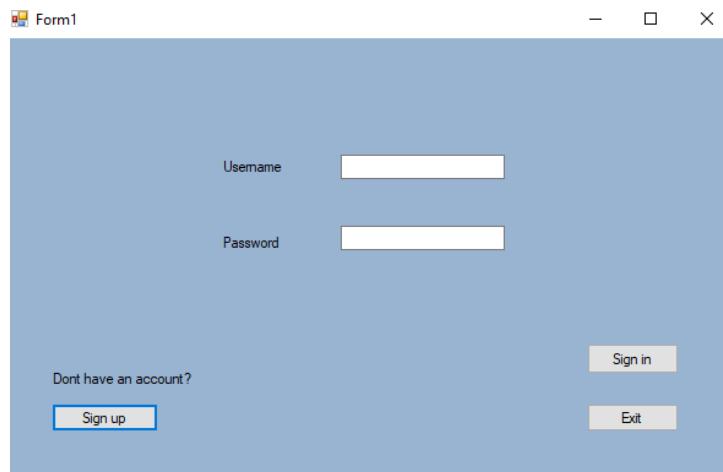
Displays messagebox

RoughCode1 X

user already exists



Clears username & password textboxes

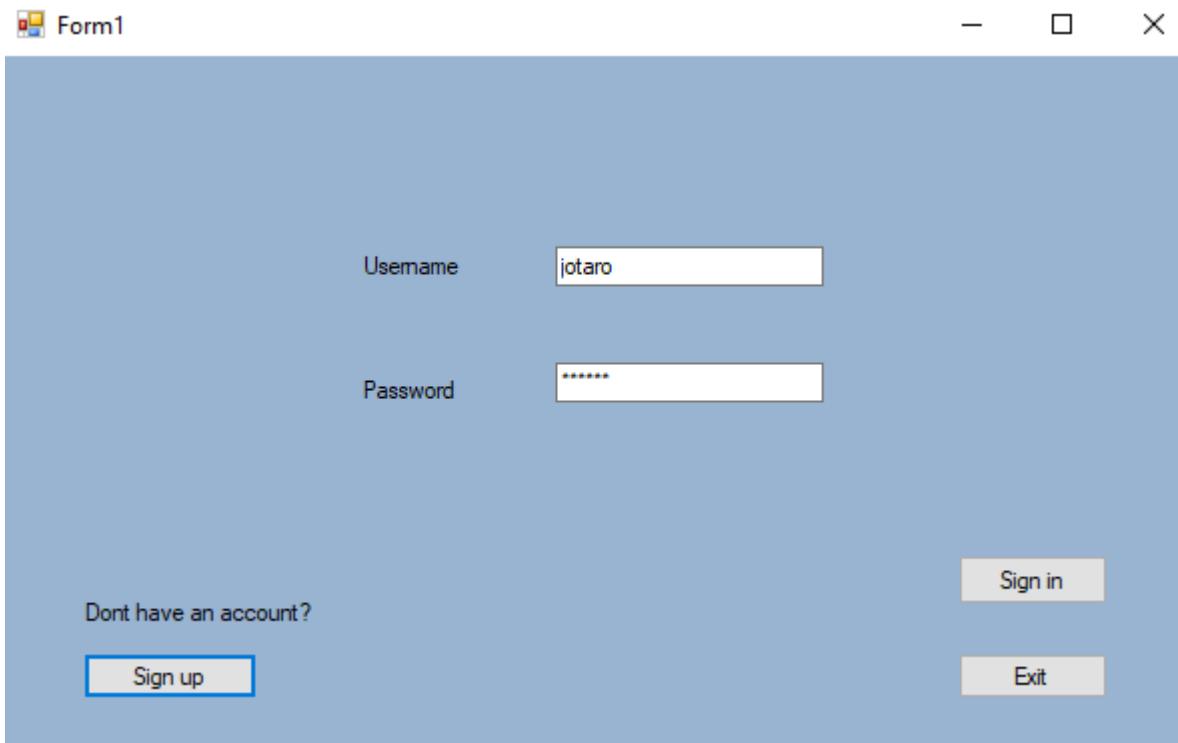


Doesn't create a new record in the database

Users					
	UserID	Username	Password	Teacher?	Click to Add
[+]	1	Adam	Adam1234	<input type="checkbox"/>	
[+]	2	Craig	Bridgens	<input checked="" type="checkbox"/>	
[+]	20	fortnite	isepic	<input type="checkbox"/>	
[+]	21	q	q	<input type="checkbox"/>	
[+]	24	ss	s	<input type="checkbox"/>	
[+]	25	JOSHUSH	JOSHUSH	<input type="checkbox"/>	
*	(New)			<input type="checkbox"/>	

As required

Test no.	What is being tested	Expected outcome	Actual outcome
9	Sign up button with username that doesn't already exist	Will display a messagebox saying "user created" & create a new user	Created new user but no messagebox and username & password textboxes did not clear



Users					
	UserID	Username	Password	Teacher?	Click to Add
*	1	Adam	Adam1234	<input type="checkbox"/>	
	2	Craig	Bridgens	<input checked="" type="checkbox"/>	
	20	fortnite	isepic	<input type="checkbox"/>	
	21	q	q	<input type="checkbox"/>	
	24	ss	s	<input type="checkbox"/>	
	25	JOSHUSH	JOSHUSH	<input type="checkbox"/>	
	27	jotaro	Armaan	<input type="checkbox"/>	
*	(New)			<input type="checkbox"/>	

After pressing "Sign up", it created the account, but stayed like this. I will now add code that I forgot to add earlier.

```

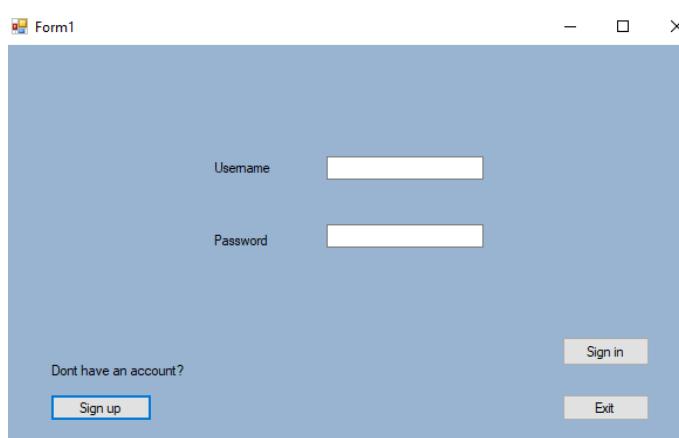
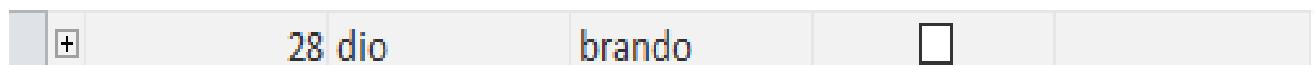
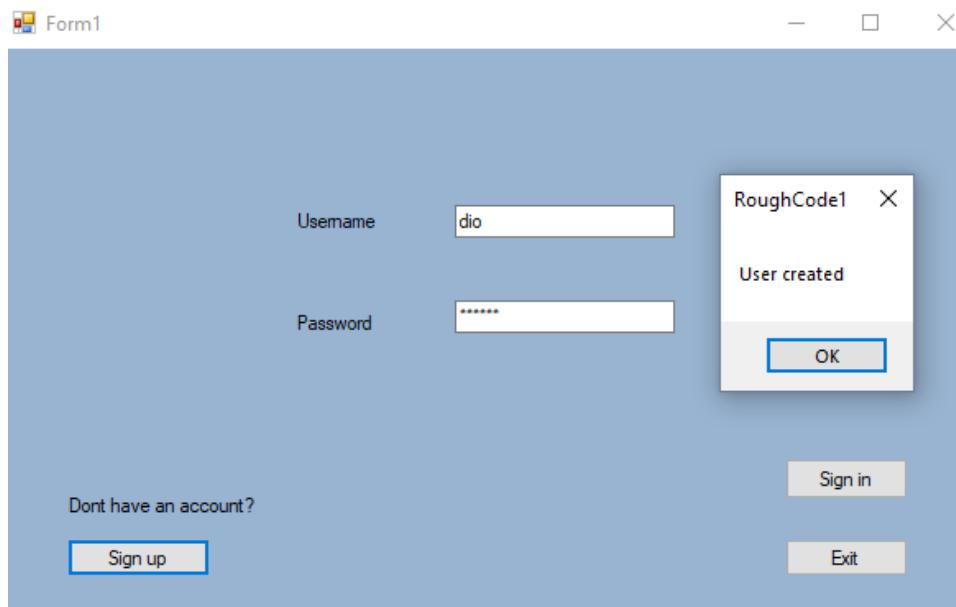
56 If dt.Rows.Count = 0 Then 'this if statement runs only if username entered into UsernameTextBox isn't found, so that it does not allow for duplicate accounts as a validation check
57 Dim sqlString As String = "select * from Users"
58 sqlString = "Insert into Users ([Username], [Password])"
59 sqlString &= " values ('"
60 sqlString &= UsernameTextBox.Text & "', ''"
61 sqlString &= PasswordTextBox.Text & "')"
62 connection.Open()
63 DataAdapter = New OleDb.OleDbDataAdapter(sqlString, connection)
64 dt.Clear()
65 DataAdapter.Fill(dt)
66 connection.Close()
67 MsgBox("User created") 'displays a messagebox to the user telling them their account has been created
68 PasswordTextBox.Text = "" 'clears PasswordTextBox
69 UsernameTextBox.Text = "" 'clears UsernameTextBox

```

Lines 67-69 were added

Test no.	What is being tested	Expected outcome	Actual outcome
----------	----------------------	------------------	----------------

9a	Sign up button with username that doesn't already exists	Will display a messagebox saying "user created" & create a new user & clear textboxes	Works as expected
----	--	---	-------------------



As required

10	Sign in with teacher account	Will take user to teacherform	Took user to teacherform
----	------------------------------	-------------------------------	--------------------------

Form1

Username

Password

[Dont have an account?](#)

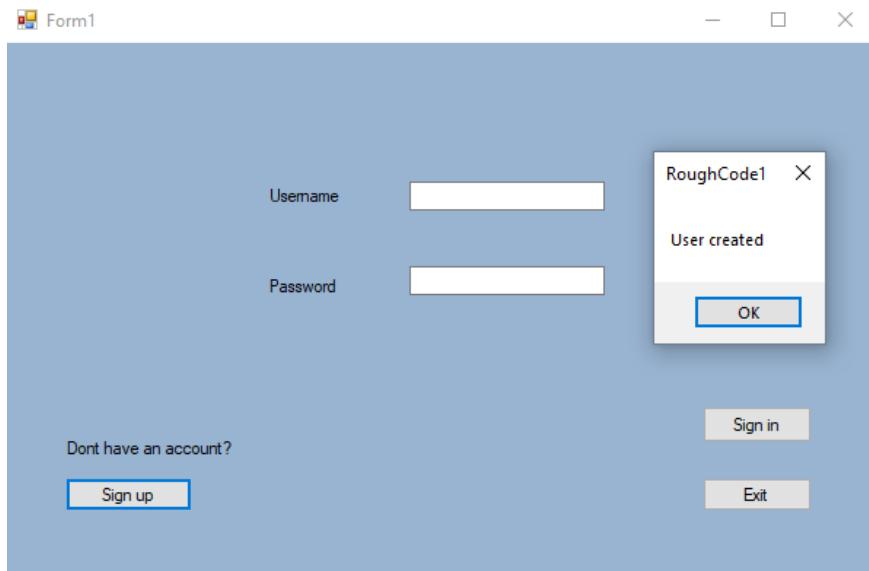
TeacherForm

COMPUTER SCIENCE

Button1

As req

11	Sign up button with nothing entered	Will not create a new user	Created a user
----	-------------------------------------	----------------------------	----------------



28	dio	brando	<input type="checkbox"/>
29			<input type="checkbox"/>

I will now delete this new record & add code to prevent this.

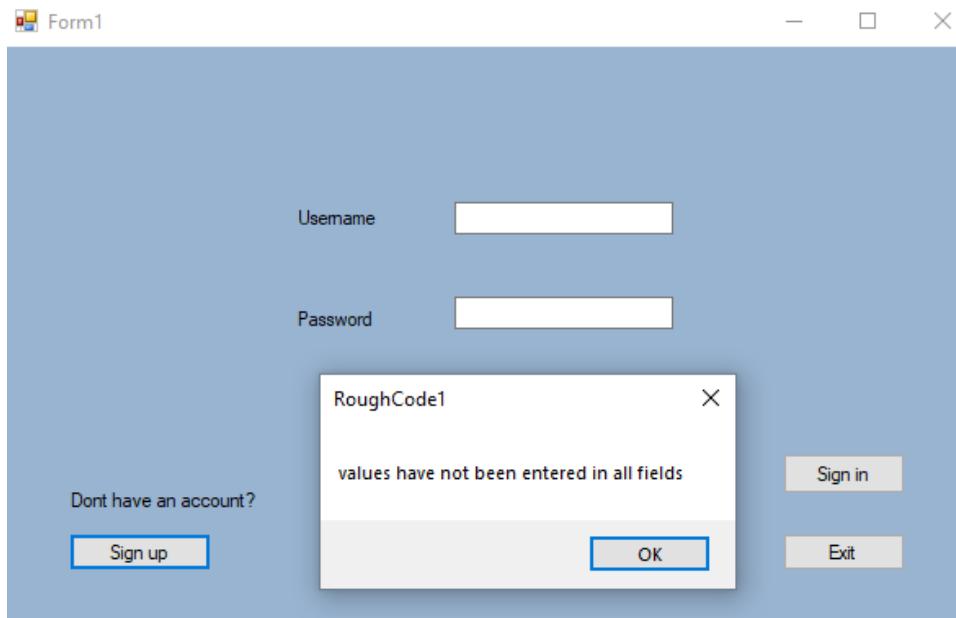
```

56 If PasswordTextBox.Text = "" Or UsernameTextBox.Text = "" Then 'if there is no text entered in the box, then
57   MsgBox("values have not been entered in all fields") 'a messagebox will be displayed, telling the user they havent entered something in all of the boxes that they need to
58   Exit Sub 'will exit the subroutine to allow the user to now enter something
59 End If

```

This IF statement makes it so that if there is nothing entered in PasswordTextBox then the messagebox will be displayed and it will not create the user & if there is nothing entered in UsernameTextBox it will not create the user & if there is nothing entered in either, it will not create the user. It will exit the subroutine and allow the user to actually type something in.

10a	Sign up button with nothing entered in username or password boxes	Will not create a new user & will display messagebox	Did not create a new user as required
-----	---	--	---------------------------------------



	+	28	dio	brando	<input type="checkbox"/>
*		(New)			<input type="checkbox"/>

Through testing I have realised that I have not yet created any validation to make the accounts more secure through a minimum amount of characters for the password, so I will add code for this now.

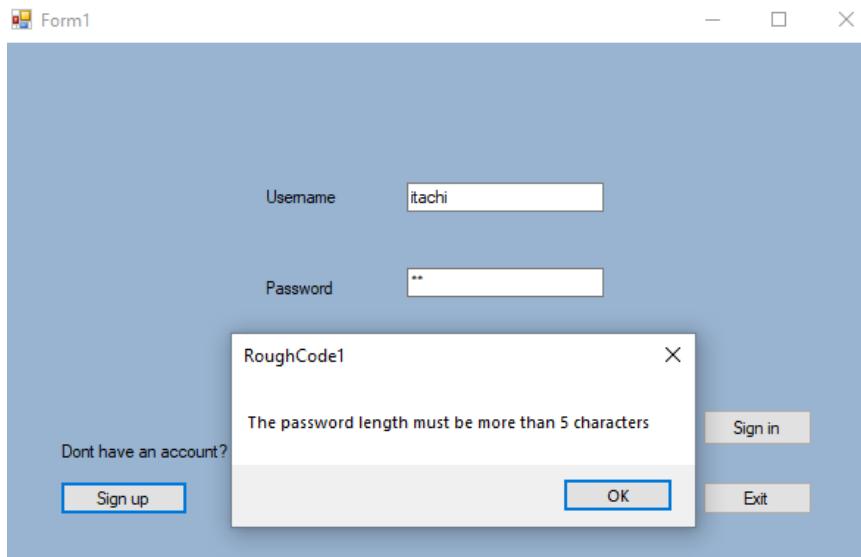
```

60 | If PasswordTextBox.Text.Length < 5 Then 'If the number of characters in the text in PasswordTextBox is less than 5
61 |   MsgBox("The password length must be more than 5 characters") 'msgbox displayed
62 |   PasswordTextBox.Text = "" 'clears PasswordTextBox
63 |   Exit Sub ' exits sub to not allow account to be created
64 End If

```

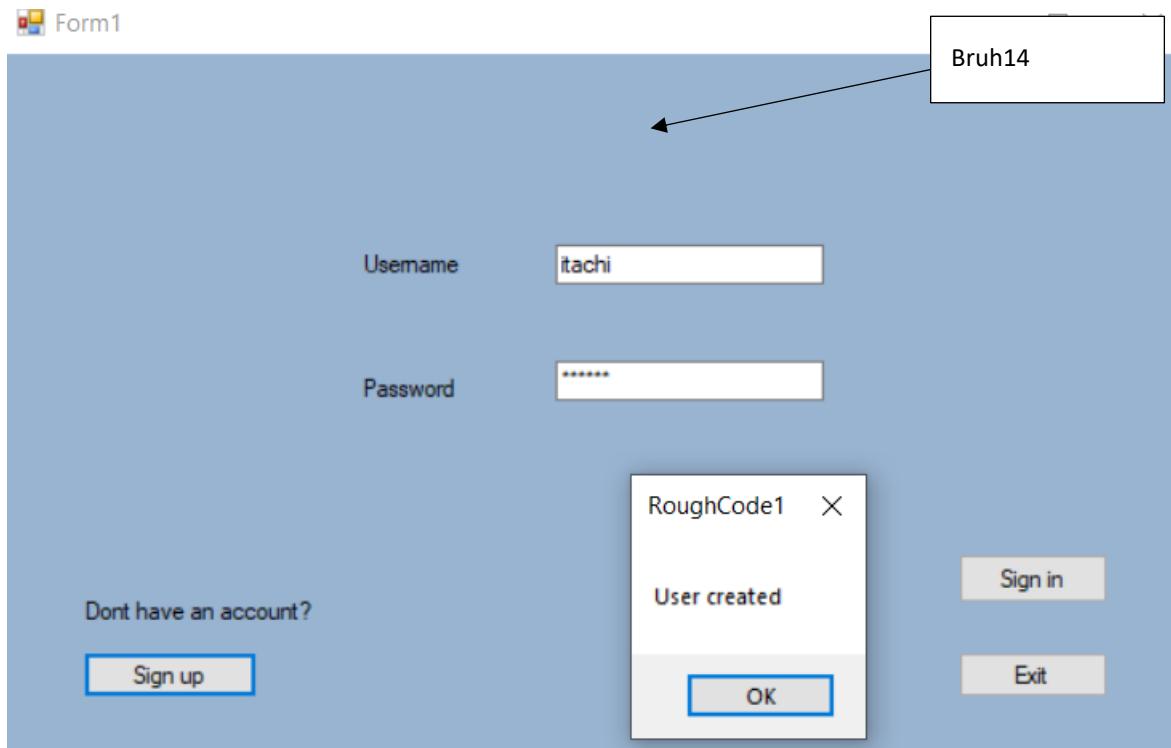
FINAL TESTING LINK 1

11	Sign up button with a password with less than 5 characters	Will not create a new user & will display messagebox	Did not create a new user & displayed messagebox as required
----	--	--	--



And no new records were added to the database.

12	Sign up button with a password with more than 5 characters	Will create a new user & will display messagebox	Created a new user & displayed msgbox as required
----	--	--	---



I will now try to further increase security by making it so that there must be a capital letter in the password, otherwise it will not create a new record in the database.

```
65 | If Not PasswordTextBox.Text <> LCase$(PasswordTextBox.Text) Then  
66 |     'if the text in passwordtextbox is not different a complete lowercase conversion of the text  
67 |     MsgBox("password must contain caps") 'msgbox displayed  
68 |     Exit Sub 'exit subroutine to not allow record to be created  
69 | End If
```

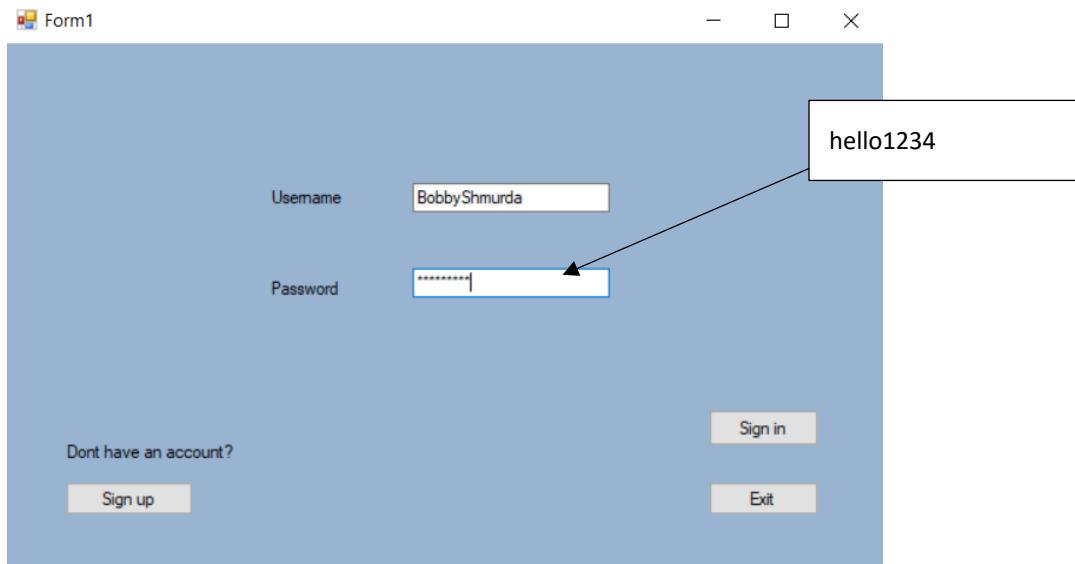
I have added this IF statement into the sign up button subroutine.

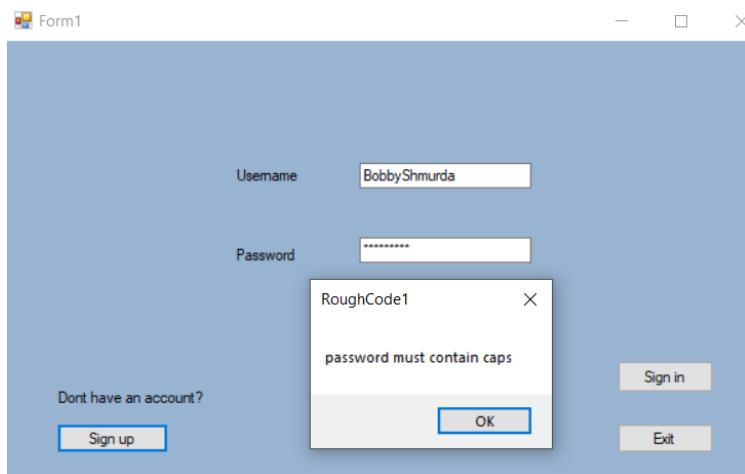
Line 65 compares the text in PasswordTextBox with the text in a complete lowercase conversion of the text in PasswordTextBox. The operator <> will compare both values and return a value TRUE, if they are different. If they are not different then the password contains no capitals, therefore I have made it say "If Not" so that the lines following will run if they are the same value.

If they are not different and so the same value, a msgbox will be displayed, telling them to include capitals in the password. It will then exit the subroutine so the record is not added to the database.

FINAL TESTING LINK 2

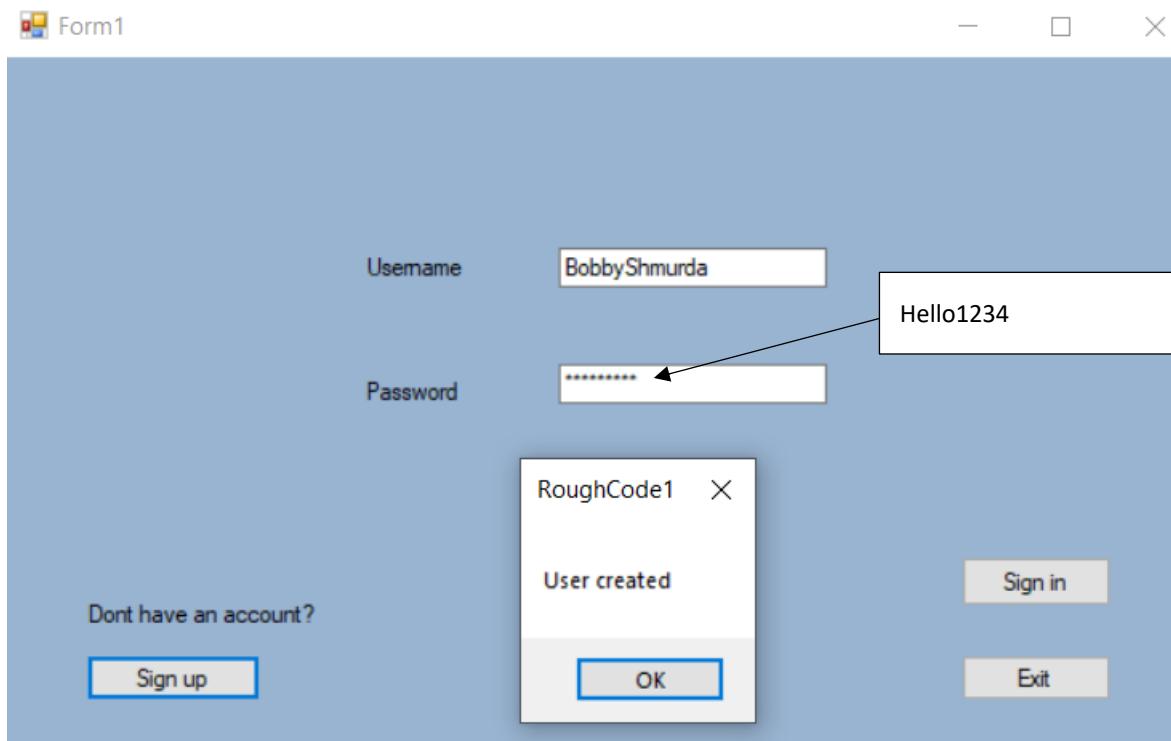
13	Sign up button with a password without capital letters included	Will not create a new user & will display messagebox	Did not create a new user & displayed msgbox as required
----	---	--	--





And no records added to database as required

14	Sign up button with a password containing at least 1 capital letter	Will create a new user & will display messagebox	Created a new user & displayed msgbox
----	---	--	---------------------------------------



[+]	30	BobbyShmurda	Hello1234	[]
		(New)		

As required

15	Exit Button	Will close program	Nothing as I hadn't added code
----	-------------	--------------------	--------------------------------

I then added

```

92  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
93      End 'ends program execution
94  End Sub

```

which stops program execution immediately. I used "end" rather than "me.close()" as it was shorter & both would lead to the same result

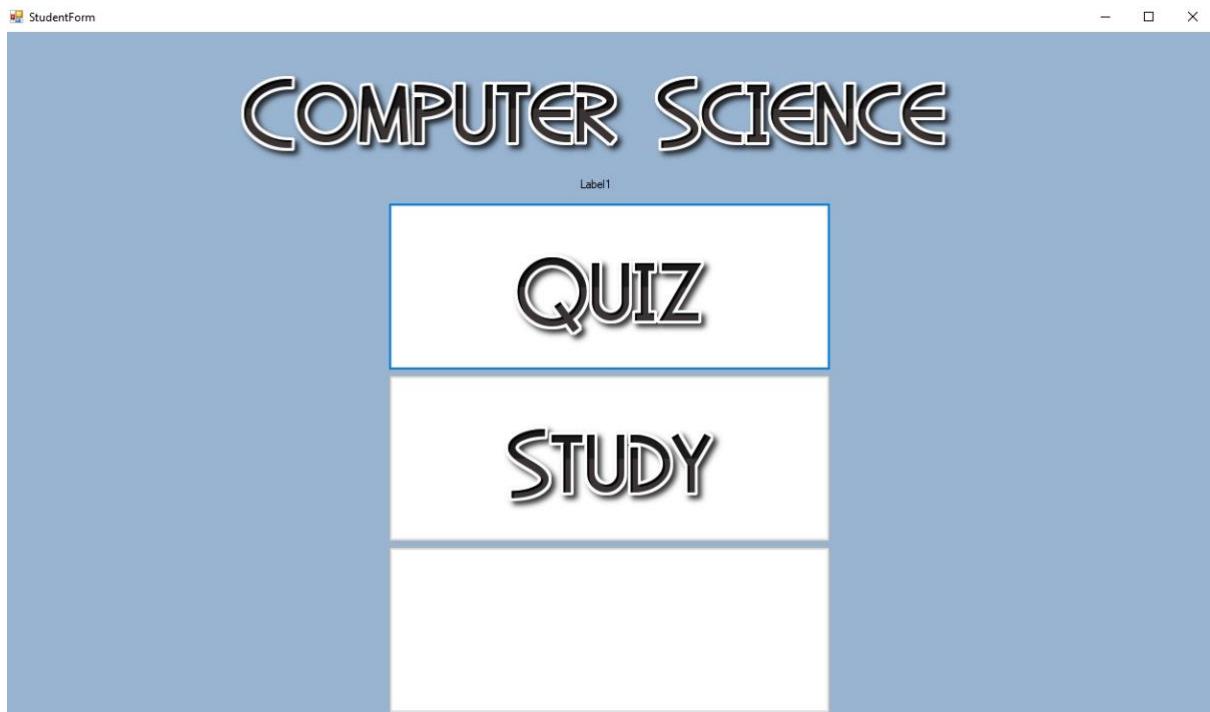
15a	Exit Button	Will close program	Closed program
-----	-------------	--------------------	----------------

After creating the exit button, I believed I was done with the development of prototype 1, however I then realised that these logins simply gained the user access to the next form & I had nothing in place for the program to keep track of which user was using the program in the forms after the login form. I will now create a public variable that contains the username entered in UsernameTextBox.

6 Public variablename As String 'defines variablename as public string, allowing me to use it in other forms defined in the class, outside any subroutines

42 variablename = UsernameTextBox.Text 'variablename is equal to the username that was used when login was accepted
this is done inside the SignInButton_Click() subroutine, and is only run when the username and password are correct for a user in the database..

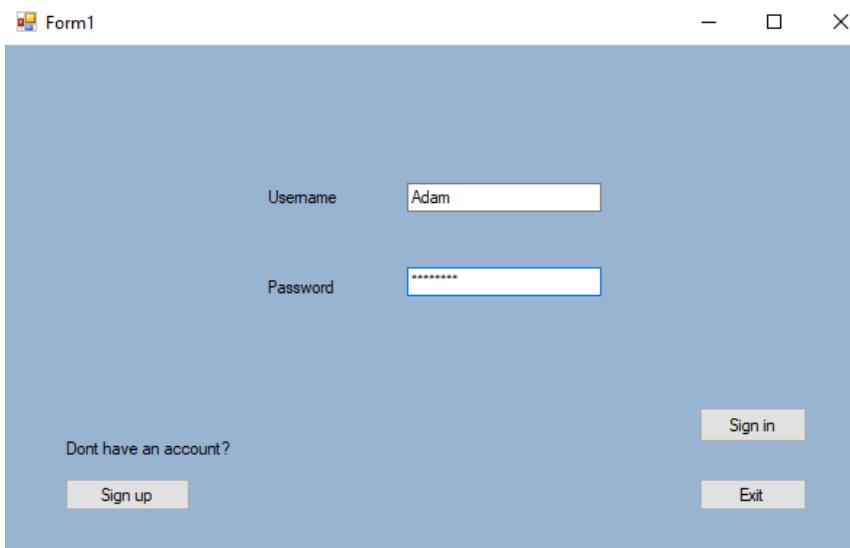
I will test to see if this works with a label in a different form



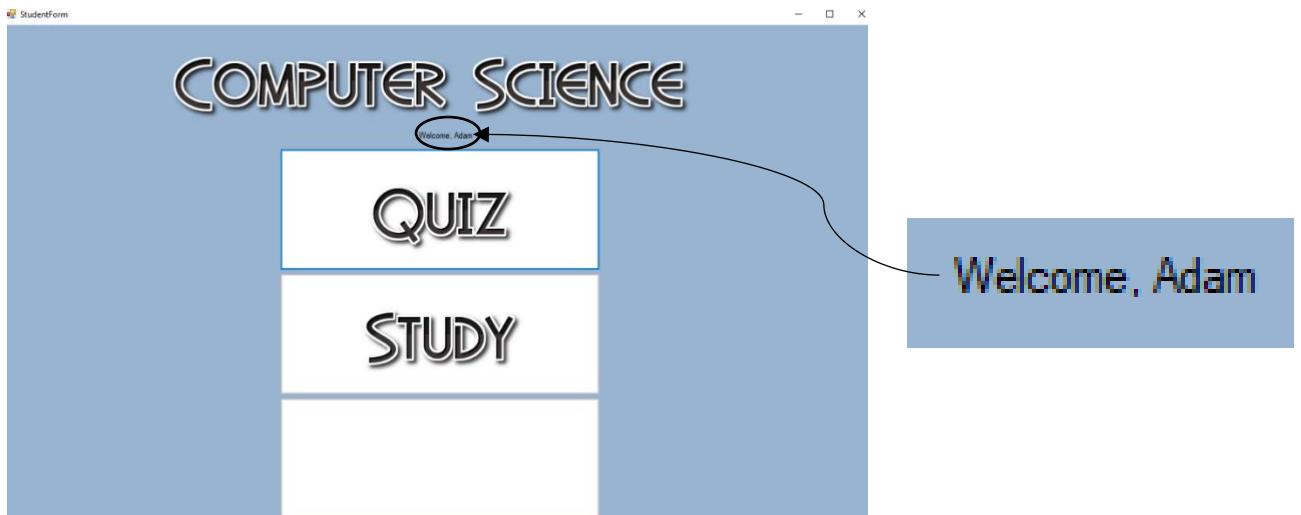
In studentform, I added a picturebox containing the words “Computer Science” in a stylised font as well as 3 buttons, 2 of which I have added pictures to so far. I then have a label which will be used to test if this form can call the variable from Form1.

```
15 Private Sub StudentForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
16     Label1.Text = "Welcome, " & Form1.variablename 'Upon loading the form, the text in the label will be made what is stated
17 End Sub
```

16	If label1 in StudentForm can use variablename	x = username used to sign in Label1 will say “Welcome, x”	Label1 said “Welcome, x”
----	---	--	--------------------------



I also realised that there isn't anything to link the students to a teacher. Currently the program will work fine,



once completed, assuming there is a single teacher. However, if there is more than one teacher using the same system, there will need to be links in the database between teachers and students by connecting them through an additional datatable. Doing this would require the log in & sign up form to be amended so that it will check the teacher datatable when performing both tasks.

Also, even if there is only a single teacher, there is no way for them to sign up through the program. They will have to manually add it through the database and this is a lack of a usability feature. However I do not want students to sign up as teachers.

I will be the person setting it up, therefore I believe a potential solution to this could be making myself a teacher account & making the program so that all users can only sign up as students, but teachers have a permission to make other users into teachers. All users assigned as teacher will be responsible enough to not make students teachers.

Firstly I will make a teacher datatable and make an account for myself to use.

Teachers		
ID	Username	Password
A3X5G	Boris	Johnson
*		

I made all attribute data types short text

The ID is just a random combination of 5 characters. I believe this will be a good way of linking the students to a teacher.

I turned the previous code that checked the 4th column to see if the user was a teacher into comments so that it did not affect the program when running but it was still there if I ever needed it again, in the instance I cannot get this method to work properly.

```
'If dt.Rows(0)(3) = True Then 'if there is an account that exists & the password matches & attribute 'Teacher?' is True then it will show the teacher form
'TeacherForm.Show()
'Else
'StudentForm.Show() 'if 'Teacher?' isn't True then it will show the student form as it will know the user isn't a teacher
'End If
```

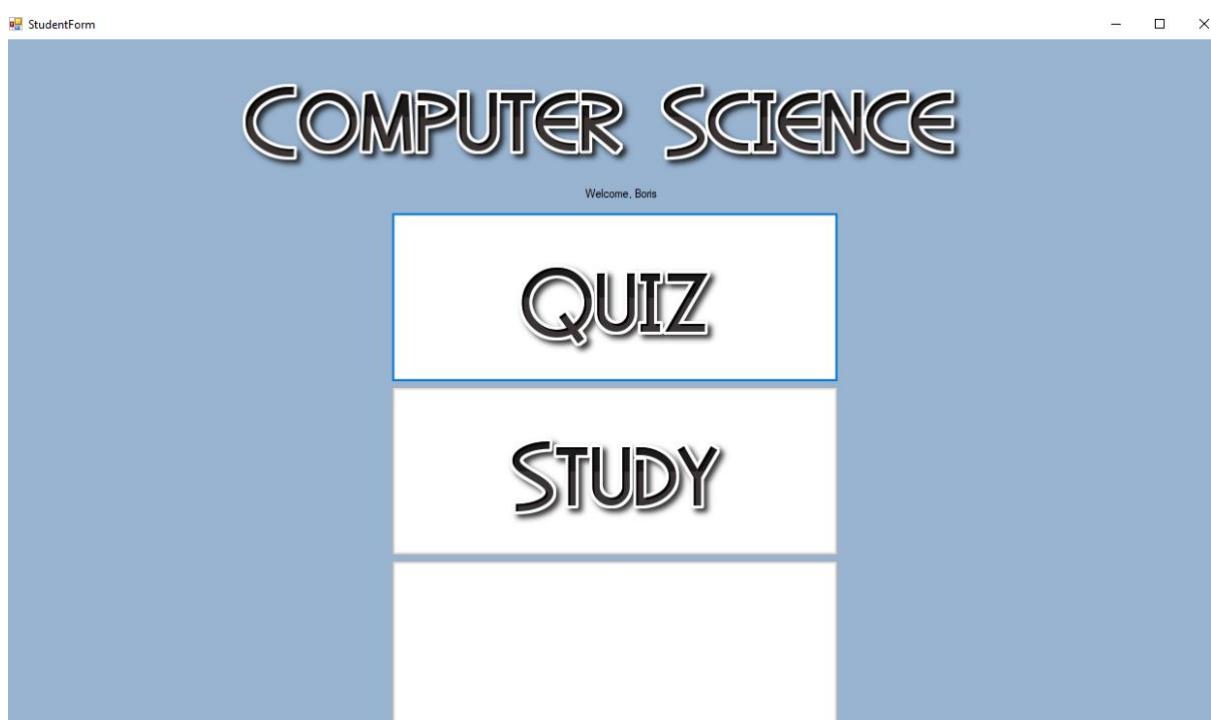
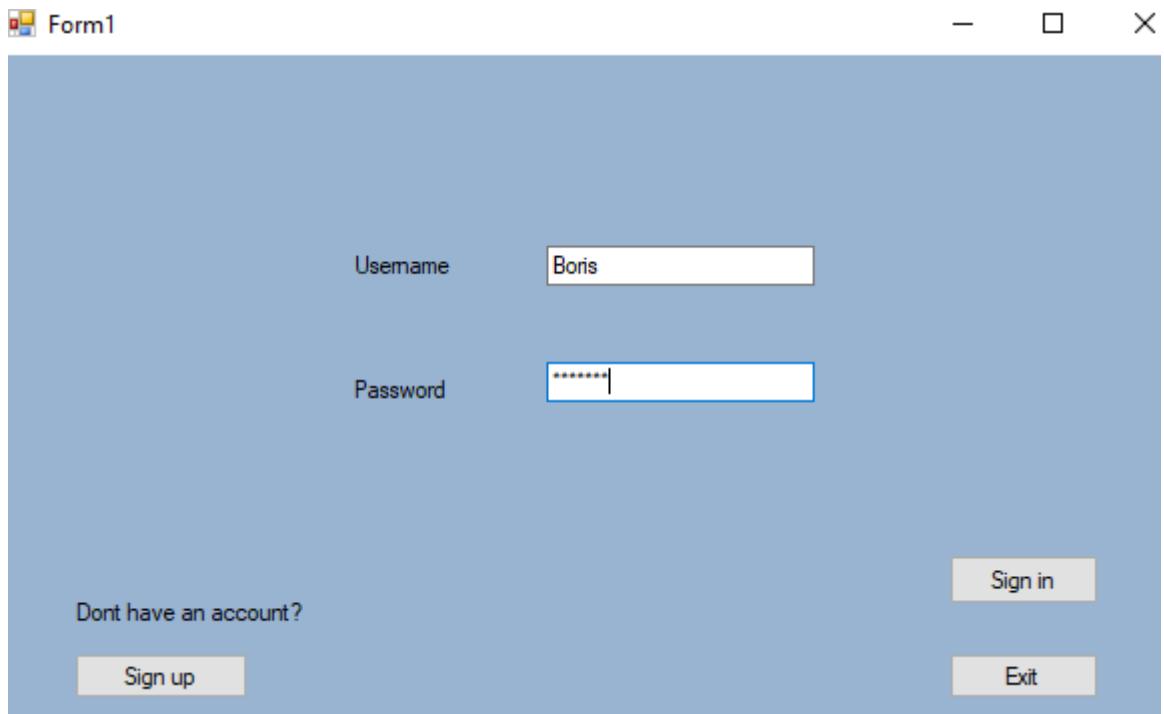
Then, I started adding to the sign in button so that it checked this datatable if it did not find the username entered in the Users table.

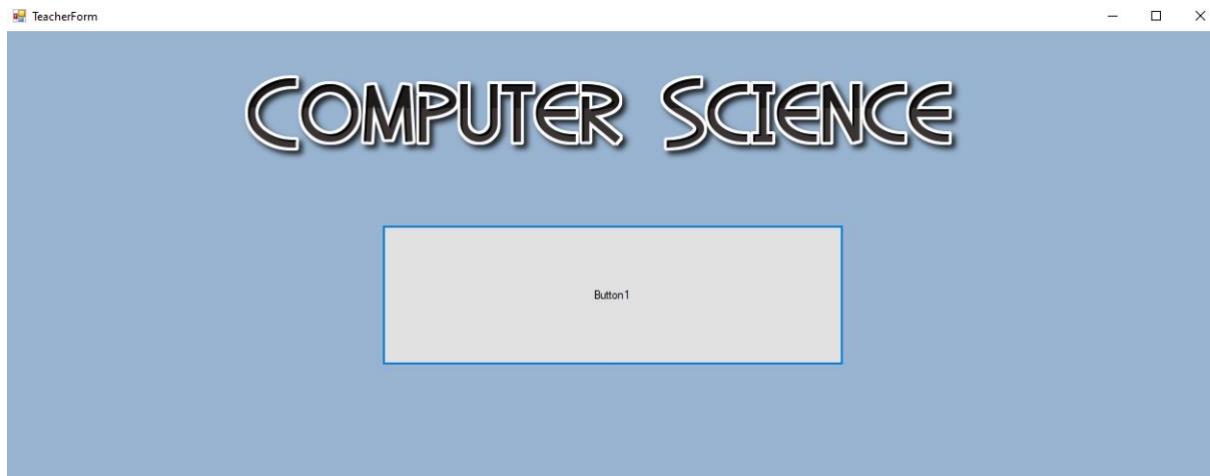
```
If dt.Rows.Count = 0 Then 'If the Username entered into UsernameTextBox is not found in the Username column,
    Dim SQLstring2 As String = "select * from Teachers where Username = '" & UsernameTextBox.Text & "'" 'Defines variable sqlstring As data type String, which contains the command To run
    'from data table Teachers where Username is equal to what has been input in UsernameTextBox
    connection.Open()
    DataAdapter = New OleDb.OleDbDataAdapter(SQLstring2, connection)
    dt.Clear()
    DataAdapter.Fill(dt)
    connection.Close()
    If dt.Rows.Count = 0 Then
        : MsgBox("invalid login") 'a messagebox will be displayed and say the login is invalid
        PasswordTextBox.Text = "" 'clears PasswordTextBox
        UsernameTextBox.Text = "" 'clears UsernameTextBox
        Exit Sub ' and then exit the subroutine as it should do nothing further
    End If
    If dt.Rows(0)(2) = PasswordTextBox.Text Then 'This If statement will only be run if the username was found in the database, & checks if the associated password matches the
        'password entered into PasswordTextBox
        Me.Hide()
    Else
        MsgBox("invalid login") 'if it doesn't match, a messagebox will be displayed saying invalid login
        PasswordTextBox.Text = "" 'clears PasswordTextBox
        UsernameTextBox.Text = "" 'clears UsernameTextBox
        Exit Sub
    End If
End If
```

I now needed a way for it to know whether the user was a teacher or a student. I could add in a Yes/No datatype attribute for if the user was a teacher or not and have it set to True for all teachers and False for all students, as was used before, but I think it would be easier to rearrange the code and have the “variablename = usernametextbox.text”, “hide current form” & “show teacher/student form” commands within the IF statements that check whether the username and passwords matched.

```
42 |     If dt.Rows(0)(2) = PasswordTextBox.Text Then 'This If statement will only be run if the username was found in the database, & checks if the associated password matches the
43 |         'password entered into PasswordTextBox
44 |         Me.Hide()
45 |         variablename = UsernameTextBox.Text 'variablename is equal to the username that was used when login was accepted
46 |         TeacherForm.Show()
47 |
48 |     If dt.Rows(0)(2) = PasswordTextBox.Text Then 'This If statement will only be run if the username was found in the database, & checks if the associated password matches the password entered
49 |         'into PasswordTextBox
50 |         Me.Hide() 'if so, will then hide the login form as it can now proceed to the next form
51 |         variablename = UsernameTextBox.Text 'variablename is equal to the username that was used when login was accepted
52 |         StudentForm.Show()
```

17	If the new teacher table is able to sign in properly	Will hide login for & display teacherform	Opened both forms
----	--	---	-------------------





```
If dt.Rows(0)(2) = PasswordTextBox.Text Then 'This If statement will only be run if the username was found in the database, & checks if the associated password matches the
    'password entered into PasswordTextBox
    Me.Hide()
    variablename = UsernameTextBox.Text 'variablename is equal to the username that was used when login was accepted
    TeacherForm.Show()
    Exit Sub
```

I have added an “exit sub” in the IF statement that allows access to the teacherform so that if they are a teacher and have been granted access,

```
If dt.Rows(0)(2) = PasswordTextBox.Text Then '
    Me.Hide() 'if so, will then hide the login form as i
    variablename = UsernameTextBox.Text 'variabler
    StudentForm.Show()

Else
    MsgBox("invalid login") 'if it doesnt match, a mes
    PasswordTextBox.Text = "" 'clears PasswordTex
    UsernameTextBox.Text = "" 'clears UsernameTex
    Exit Sub
End If
```

this code will not be run.

I also added a label in teacherform to check “variablename” with the same code I used in test 16

17a	If the new teacher table is able to sign in properly & if label displays the username in teacherform	Will hide login for & display teacherform & label will display the username	Only opened teacherform & label displayed username as required
-----	--	---	--

I will now need the program to check if the username has been used in both student tables & teacher tables.

There is already code that checks if it matches a Username in Users table.

```

If dt.Rows.Count = 0 Then 'this if statement runs only if username entered into UsernameTextBox isn't found, so that it does not allow for duplicate accounts as a validation check
    Dim SQLString2 As String = "select * from Teachers where Username = '" & UsernameTextBox.Text & "'"
    connection.Open()
    DataAdapter = New OleDb.OleDbDataAdapter(SQLString2, connection)
    dt.Clear()
    DataAdapter.Fill(dt)
    connection.Close() 'copies values from teachers data table
    If dt.Rows.Count = 0 Then 'if there are no teachers with that username then it will allow them to sign up with that username

```

This checks if there are no Username value that is the same as the username they are trying to sign up with, in the teachers datatable, once it has already verified there are no users in the User table with the same username. If there are not, then it runs the code inserting the values into User table as usual & if there is a student or teacher with that username,

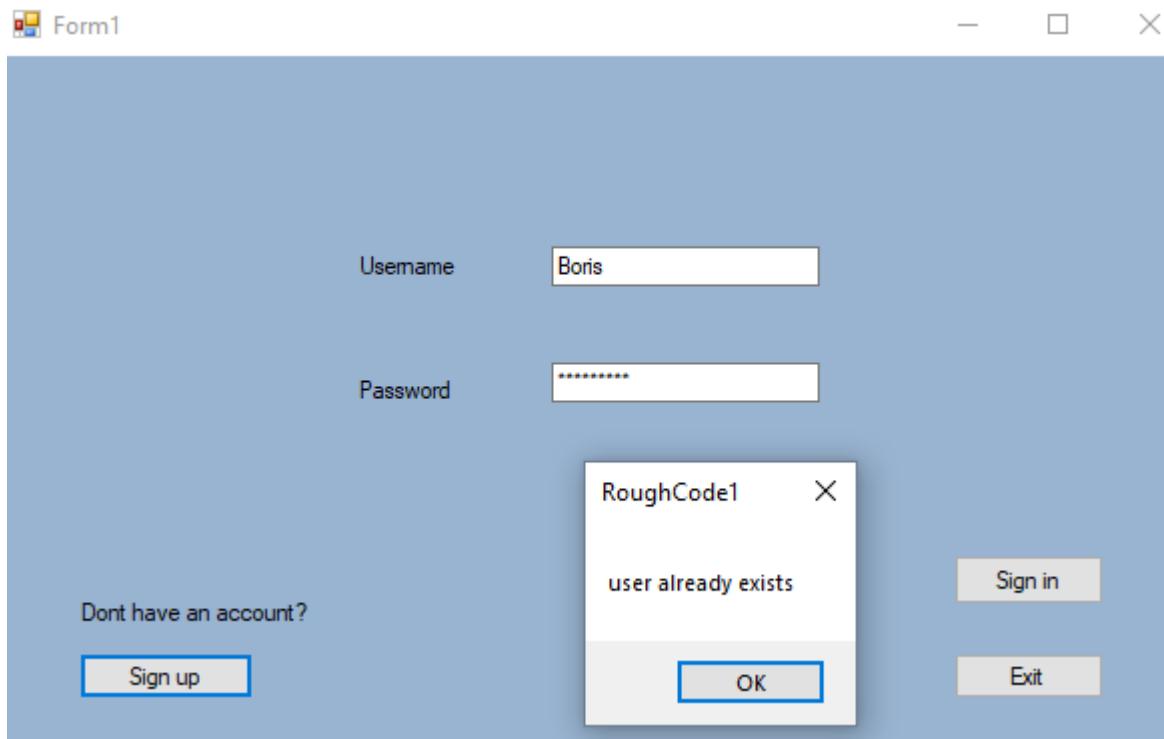
```

    Else
        MsgBox("user already exists")
        PasswordTextBox.Text = "" 'clears PasswordTextBox
        UsernameTextBox.Text = "" 'clears UsernameTextBox
        Exit Sub
    End If
Else
    MsgBox("user already exists")
    PasswordTextBox.Text = "" 'clears PasswordTextBox
    UsernameTextBox.Text = "" 'clears UsernameTextBox
    Exit Sub
End If

```

This code applies so whether it is a student or teacher with the suername, it displays the msgbox, clears the textboxes & exits sub

18	If a student is able to sign up with a username that a teacher already has	Will not allow: displays the msgbox, clears the textboxes & exits sub	Did as expected
----	--	--	-----------------



For the connection between the student & teacher, I initially thought that the student should sign up with the primary key of the teacher. But for this, when a teacher signs up, they would then also have to sign up with a teacher code, which could be confusing. Also it would always be there even after they have signed up, making it feel unnecessary & I could make it more secure by having students enter their teacher code every time they sign in, but this may be difficult for them to remember.

I believe a better approach could be to have the connection to a teacher be optional. This would allow for me to have a textbox & button on StudentForm, asking the user to input it & once it has been done, the program will have code so that the textbox & button is hidden if there is a value in their record for the attribute of TeacherID. This will make it easier for to use the program and make it look nicer.

TeacherID	Username	Password
A3X5G	Boris	Johnson

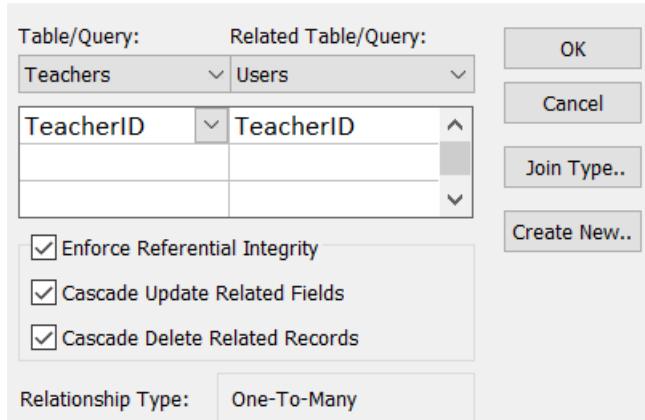
I renamed the first column in the datatable Teacher to TeacherID from ID to make things less confusing.

I then added a field in the Users table called TeacherID with data type ShortText so that I can now create a One-to-Many relationship between the Teachers & Users tables which is because there will be many students under one teacher & I don't think it would be necessary to cater to students with more than one computer science teacher as this isn't what majority of students will have & a possible solution to teachers in this situation is to just have a shared account.

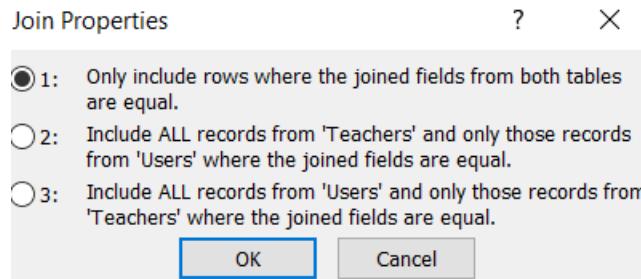
Field Name	Data Type
UserID	AutoNumber
Username	Short Text
Password	Short Text
Teacher?	Yes/No
TeacherID	Short Text

I have left the field "Teacher?" in for now, just in case I find a problem later on which will require me to make use of it, however I do intend to eventually delete it.

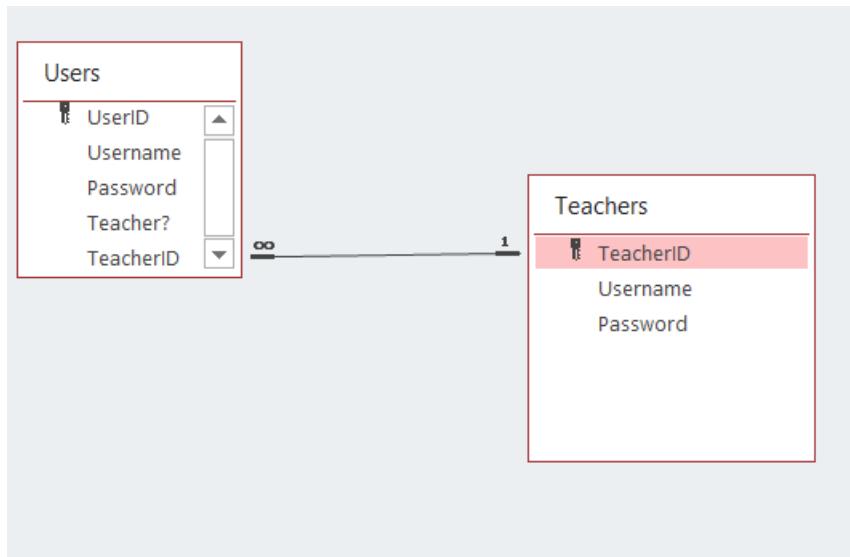
I then created the relationship.



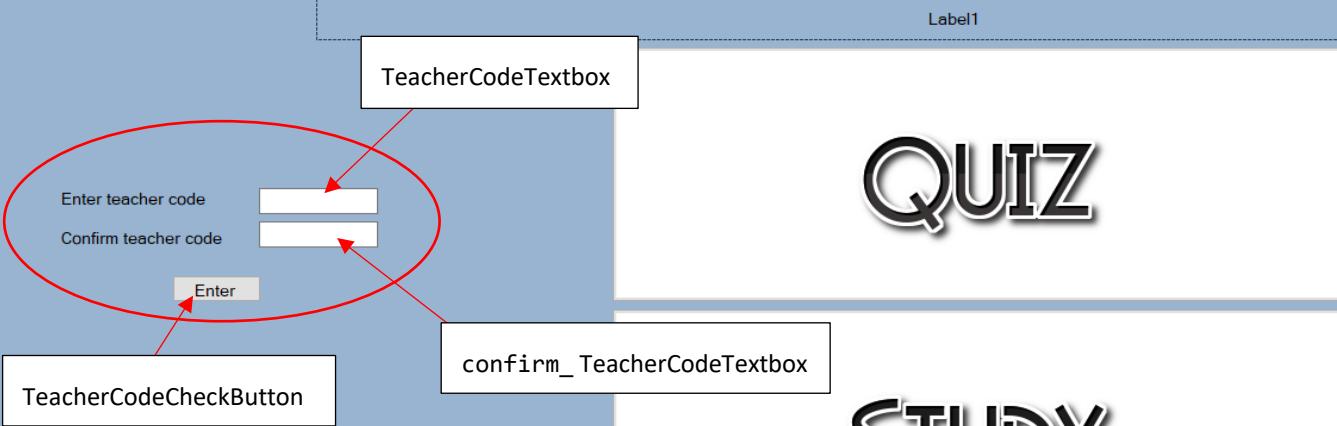
I have enforced referential integrity as it ensures the relationships between tables in a database remain accurate by applying constraints to prevent users or applications from entering inaccurate data or pointing to data that doesn't exist.



I have chosen option 1 as this will prevent it from including rows that aren't supposed to be linked.



COMPUTER SCIENCE QUIZ



I then added 2 textboxes & 2 labels to indicate what each textbox was for as well as a button for when they have finished entering the teacher code twice.

I have added a confirm textbox as this will force the student to concentrate as they are entering it, lowering the chances of them entering the wrong code, helping with **validation**.

```

1  Public Class StudentForm
2    Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb") 'defines connection as a new instance
3    'of the OleDb.OleDbConnection class with the specified string that says its Provider and source, linking my database to the program
4    Dim dt As New DataTable 'defines dt as a new instance of the DataTable class
5    Dim DataAdapter
  
```

Defines variables that will be needed for database connection.

TeacherCodeCheckButton

```

35  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles TeacherCodeButton.Click
36    If Not TeacherCodeTextbox.Text = confirm_TeacherCodeTextbox.Text Then 'This if statement makes sure that the TeacherCode and confirm TeacherCode text boxes
37    'are the same
38    MsgBox("TeacherCodes do not match")
39    Exit Sub
40  End If
  
```

If both text in textboxes dont match, it displays a msgbox notifying the user & exits sub to not allow any following code to run. "Exit sub" will have the same purpose throughout.

```

41  If TeacherCodeTextbox.Text = "" Or confirm_TeacherCodeTextbox.Text = "" Then 'This if statement makes sure that there is text entered into the textboxes before
42  'they press the button
43  MsgBox("enter something into both textboxes")
44  Exit Sub
45  End If
  
```

If there is nothing entered in either of the textboxes, there is a msgbox displayed, telling the user they need to enter something into both textboxes, & then it exits sub.

Defines first SQL statement to be used so that it reads the TeacherID column in datatable Users where the attribute Username is equal to the username the student signed into the program with on Form1.

```
46 Dim SQLstring1 As String = "select TeacherID from Users where Username = '" & Form1.variablename & "'"
47 'Defines variable sqlstring1 As data type String, which contains the Command To read TeacherID from data table Users where Username is equal to the text
48 'entered into UsernameTextBox
49 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
50 DataAdapter = New OleDb.OleDbDataAdapter(SQLstring1, connection)
51 dt.Clear()
52 DataAdapter.Fill(dt)
53 connection.Close()
```

Then opens connection with the database in the same way as it has previously.

```
54 If dt.Rows.Count = 0 Then 'if there is nothing in TeacherID
55 Dim sqlString2 As String = "select * from Teachers where TeacherID = '" & TeacherCodeTextbox.Text & "'" 'defines sql string to select all values from Teachers table
56 'where teacherID is equal to what has been entered into the textboxes
57 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
58 DataAdapter = New OleDb.OleDbDataAdapter(sqlString2, connection)
59 dt.Clear()
60 DataAdapter.Fill(dt)
61 connection.Close()
62 If dt.Rows.Count = 0 Then 'if the teachercodetextbox text doesnt appear in the database then there is no associated teacher with the code they have entered
63 'therefore the folling msgbox is displayed
64 MsgBox("Teacher doesn't exist")
65 Exit Sub 'will not insert anything into the TeacherID attribute of the Users table
66 Else
67 Dim sqlString3 As String = "select * from Users" 'defines sql statemnt to insert the teacher code into the datatable
68 sqlString3 = "Insert into Users ([TeacherID])"
69 sqlString3 &= " values ('"
70 sqlString3 &= TeacherCodeTextbox.Text & "')"
71 connection.Open()
72 DataAdapter = New OleDb.OleDbDataAdapter(sqlString3, connection)
73 dt.Clear()
74 DataAdapter.Fill(dt)
75 connection.Close()
76 End If
```

If there is nothing found in TeacherID column,

Defines sqlstring2 as string containing sql statement

Opens connection with the database.

If nothing is found in Teachers table in TeacherID that is equal to what they have entered in the textboxes, this means that there is no teacher with that TeacherCode & so a msgbox will say “teacher doesn’t exist” which will tell the student that they have likely entered the code wrong.

This is also a **validation** that prevents the student from entering a random teacher code and their account not being associated with any teacher after entering it.

If something is found, this means the teacher exists & it can insert the teacher code in the TeacherID column of their row.

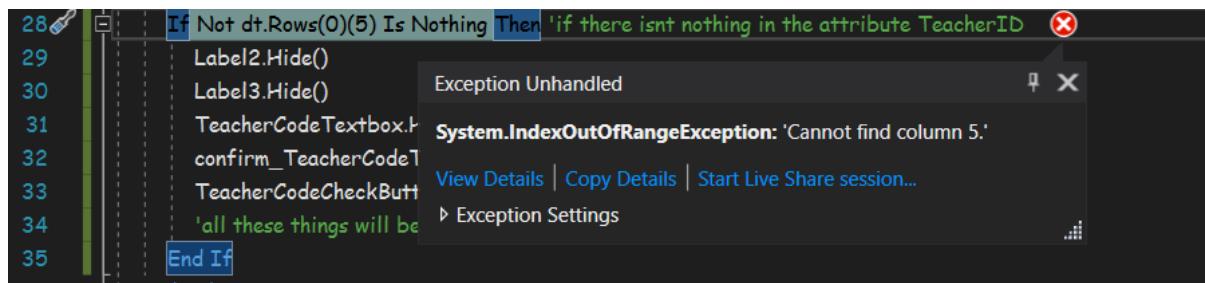
```
77 | Else
78 |     MsgBox("bruh how can you see this") 'this is displayed if there is already a value in the TeacherID attribute of Users table
79 |     'they shouldnt be able to enter anything as there will be an if statement that checks if there is anything in that column and if so, the labels, textboxes & button
80 |     'related to entering a teachercode will be hidden
81 | End If
```

Has been explained in the comments.

```
Private Sub StudentForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
    Label1.Text = "Welcome," & Form1.variablename 'Upon loading the form, the text in the label will be made what is stated
    Dim SQLstring1 As String = "select * from Users where Username = '" & Form1.variablename & "'"
    'Defines variable sqlstring1 As data type String, which contains the Command To read TeacherID from data table Users where Username is equal to the one
    'entered into UsernameTextBox
    connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
    DataAdapter = New OleDb.OleDbDataAdapter(SQLstring1, connection)
    dt.Clear()
    DataAdapter.Fill(dt)
    connection.Close()
    If Not dt.Rows(0)(5) = Nothing Then 'if there isn't nothing in the attribute TeacherID
        Label2.Hide()
        Label3.Hide()
        TeacherCodeTextbox.Hide()
        confirm_TeacherCodeTextbox.Hide()
        TeacherCodeCheckButton.Hide()
        'all these things will be hidden as they don't need to associate a teacher with their account
    End If
End Sub
```

All but the first line in this sub make it so that, upon loading, if the students account is associated with a teacher then the labels, textboxes & button related to associating a teacher with their accounts are hidden.

19	If a student is able to associate a teachercode when nothing is entered in either textboxes	Will not allow: displays the msgbox, clears the textboxes & exits sub	There was an error before StudentForm was shown
----	---	--	---



The screenshot shows a portion of a Visual Studio code editor. The code is written in VB.NET. A tooltip is displayed over the line of code 'If Not dt.Rows(0)(5) Is Nothing Then'. The tooltip contains the following information:

- Exception Unhandled
- System.IndexOutOfRangeException: 'Cannot find column 5.'
- View Details | Copy Details | Start Live Share session...
- Exception Settings

```

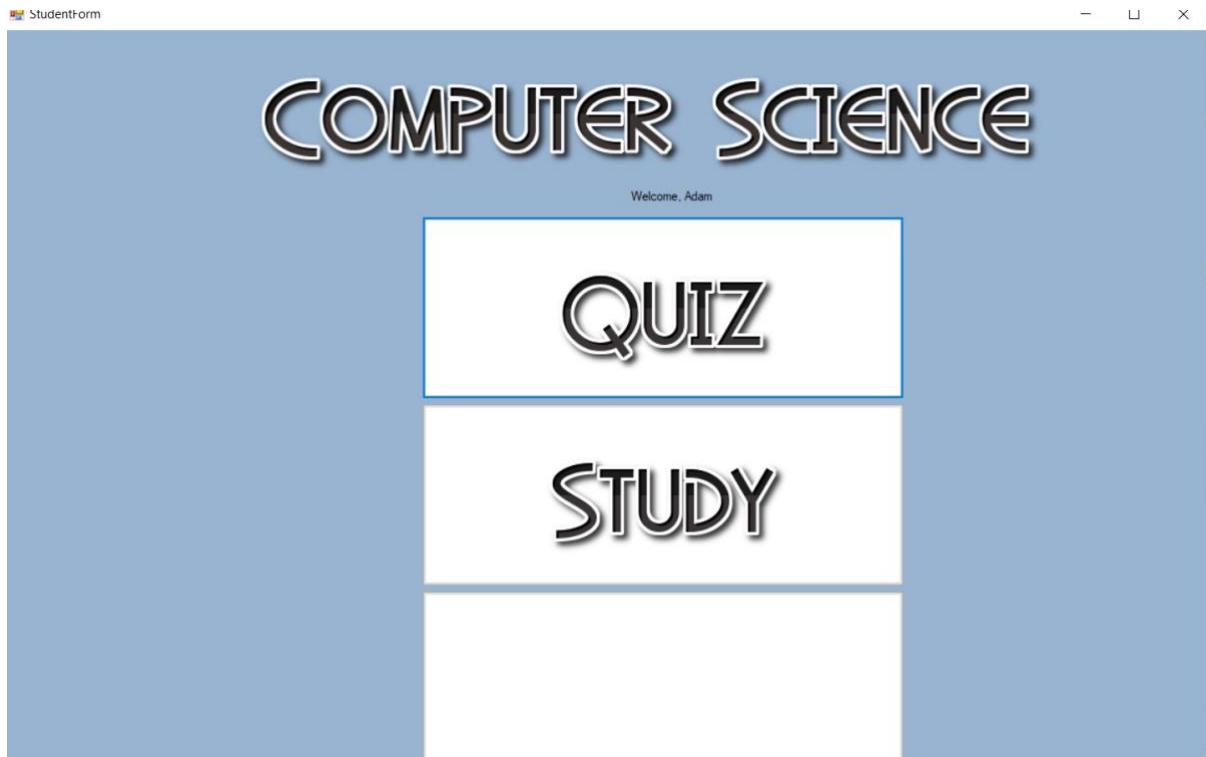
28 If Not dt.Rows(0)(5) Is Nothing Then 'if there isn't nothing in the attribute TeacherID
29     Label2.Hide()
30     Label3.Hide()
31     TeacherCodeTextbox.t
32     confirm_TeacherCode1
33     TeacherCodeCheckButt
34     'all these things will be
35 End If

```

	UserID	Username	Password	Teacher?	TeacherID
[+]	1	Adam	Adam1234	<input type="checkbox"/>	
[+]	2	Craig	Bridgens	<input checked="" type="checkbox"/>	
[+]	20	fortnite	isepic	<input type="checkbox"/>	
[+]	21	q	q	<input type="checkbox"/>	
[+]	24	ss	s	<input type="checkbox"/>	
[+]	25	JOSHUSH	JOSHUSH	<input type="checkbox"/>	
[+]	27	jotaro	Armaan	<input type="checkbox"/>	
[+]	28	dio	brando	<input type="checkbox"/>	
[+]	30	BobbyShmurda	Hello1234	<input type="checkbox"/>	
[+]	31	itachi	Bruh14	<input type="checkbox"/>	
*		(New)			

The error I made was that I called column 5 which does not exist – in the database the first column is column 0 therefore TeacherID would be column 4.

20	StudentForm	Textboxes, labels & button appear when there is nothing in the “TeacherID” attribute.	The textboxes, labels & button were all hidden
----	-------------	---	--



```

28 If (dt.Rows(0)(4) IsNot "") = True Then 'if there isn't nothing in the attribute TeacherID
29     Label2.Hide()
30     Label3.Hide()
31     TeacherCodeTextbox.Hide()
32     confirm_TeacherCodeTextbox.Hide()
33     TeacherCodeCheckButton.Hide()
34     'all these things will be hidden as they don tneed to associate a teacher with their account
35 End If
36 End Sub

```

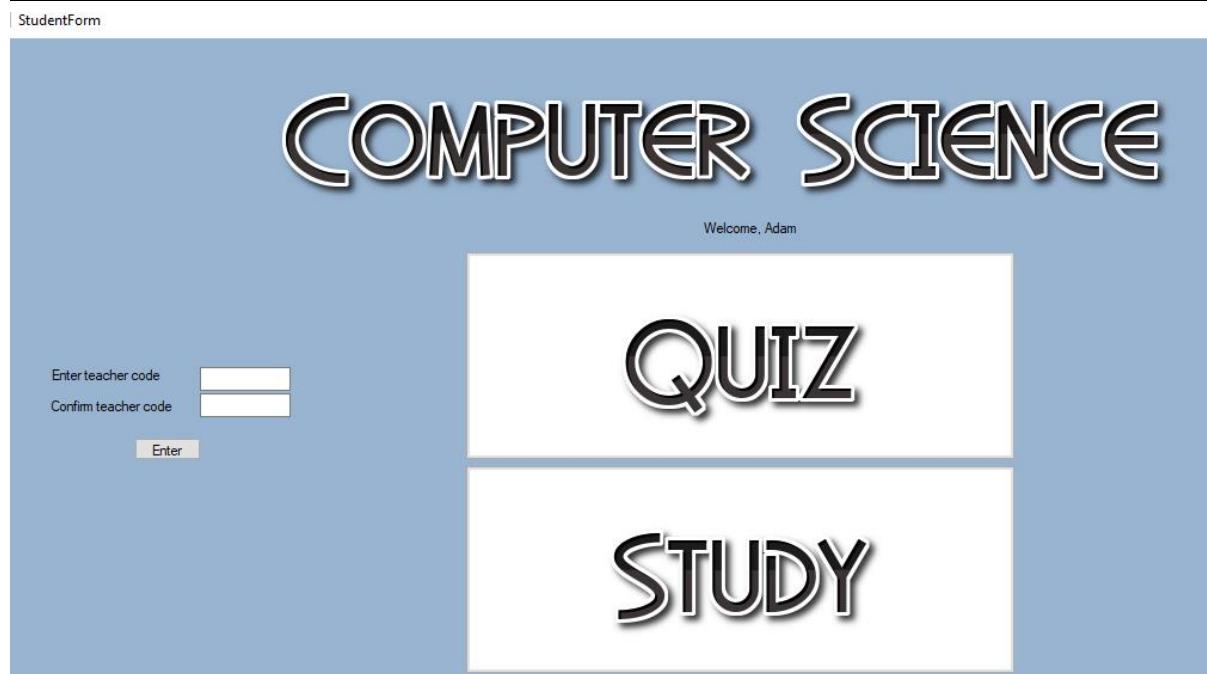
Above did not fix, then tried:

```

If IsDBNull(dt.Rows(0)(4)) = False Then 'if there isn't nothing in the attribute TeacherID
    Label2.Hide()
    Label3.Hide()
    TeacherCodeTextbox.Hide()
    confirm_TeacherCodeTextbox.Hide()
    TeacherCodeCheckButton.Hide()
    'all these things will be hidden as they don't need to associate a teacher with their account
End If

```

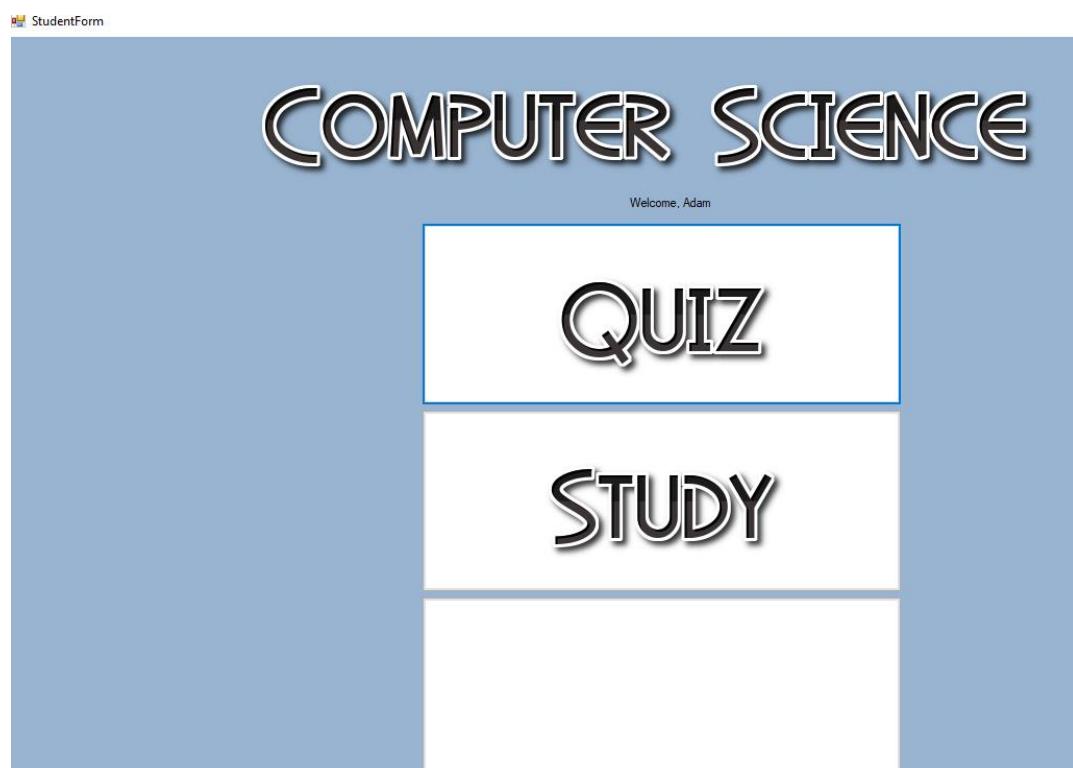
20a	StudentForm	Textboxes, labels & button appear when there is nothing in the "TeacherID" attribute.	The textboxes, labels & button were all displayed as req
-----	-------------	---	--



20b	StudentForm	textboxes, labels & button appear when there is something in the "TeacherID" attribute.	The textboxes, labels & button were all hidden as req
-----	-------------	---	---

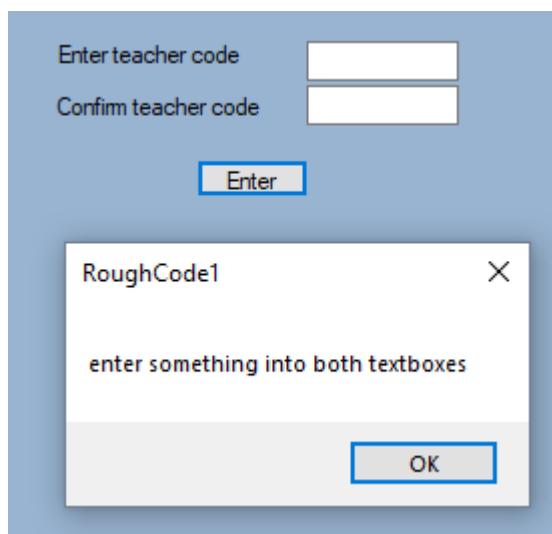
UserID	Username	Password	Teacher?	TeacherID
1	Adam	Adam1234	<input type="checkbox"/>	A3X5G
2	Craig	Bridgens	<input checked="" type="checkbox"/>	
20	fortnite	isepic	<input type="checkbox"/>	
21	q	q	<input type="checkbox"/>	
24	ss	s	<input type="checkbox"/>	
25	JOSHUSH	JOSHUSH	<input type="checkbox"/>	
27	jotaro	Armaan	<input type="checkbox"/>	
28	dio	brando	<input type="checkbox"/>	
30	BobbyShmurd	Hello1234	<input type="checkbox"/>	
31	itachi	Bruh14	<input type="checkbox"/>	

Signing in with “Adam”,



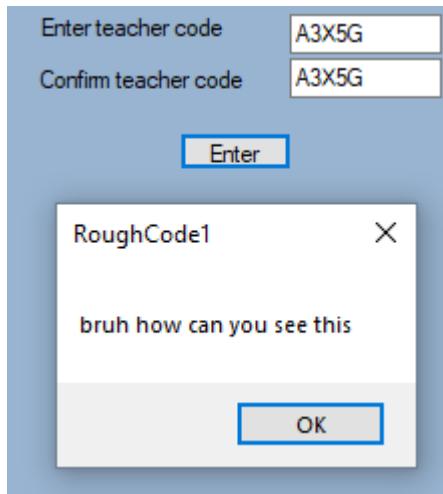
I then deleted the TeacherID value from the “Adam” account for further testing.

19a	TeacherCodeCheckButton	<p>Will not associate a teachercode when nothing is entered in either textboxes.</p> <p>Then displays the msgbox, clears the textboxes & exits sub</p>	As expected
-----	------------------------	--	-------------



21	TeacherCodeCheckButton	If will insert a valid teachercode into users table attribute TeacherID	Did not insert any values & msgbox appeared that should only be shown if there is already a value
----	------------------------	---	---

UserID	Username	Password	Teacher?	TeacherID
1	Adam	Adam1234	<input type="checkbox"/>	



After reviewing my code, I made a couple changes

```
61 | Dim SQLstring1 As String = "select TeacherID from Users where Username = '" & Form1.variablename & "'"
```

to

```
61 [SQL] | Dim SQLstring1 As String = "select * from Users where Username = '" & Form1.variablename & "'"  
&
```

```
69 | If dt.Rows.Count = 0 Then 'if there is nothing in TeacherID
```

To

```
69 | If IsDBNull(dt.Rows(0)(4)) = False Then 'if there is nothing in TeacherID
```

21a	TeacherCodeCheckButton	It will insert the teachercode into users table attribute TeacherID	Same result
-----	------------------------	---	-------------

```
69 | If IsDBNull(dt.Rows(0)(4)) = True Then 'if there is nothing in TeacherID
```

21b	TeacherCodeCheckButton	If it inserts the teachercode into users table attribute TeacherID	Inserted the value in a different row than the user who is signed in & no msgbox that notifies the user it has been done, which resulted in me pressing it multiple times
-----	------------------------	--	---

UserID	Username	Password	Teacher?	TeacherID
1	Adam	Adam1234	<input type="checkbox"/>	
2	Craig	Bridgens	<input checked="" type="checkbox"/>	
20	fortnite	isepic	<input type="checkbox"/>	
21	q	q	<input type="checkbox"/>	
24	ss	s	<input type="checkbox"/>	
25	JOSHUSH	JOSHUSH	<input type="checkbox"/>	
27	jotaro	Armaan	<input type="checkbox"/>	
28	dio	brando	<input type="checkbox"/>	
30	BobbyShmurd	Hello1234	<input type="checkbox"/>	
31	itachi	Bruh14	<input type="checkbox"/>	
32			<input type="checkbox"/>	A3X5G
33			<input type="checkbox"/>	A3X5G
34			<input type="checkbox"/>	A3X5G

I then deleted the new rows & changed the following line

```
82 | | | Dim sqlString3 As String = "select * from Users" 'defines sql statemnt to insert the teacher code into the datatable
```

To

```
82 | | | Dim sqlString3 As String = "select * from Users where Username = '" & Form1.variablename & "'" 'defines sql statemnt to insert the teacher code into the datatable
```

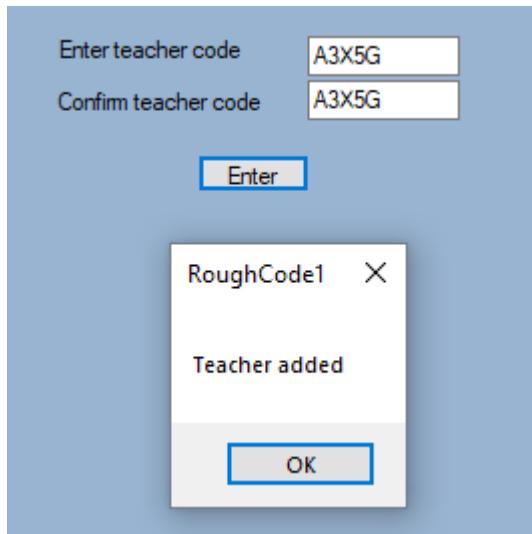
So that the entire sql statement is

```
Dim sqlString3 As String = "select * from Users where Username = '" & Form1.variablename & "'" 'defines sql statemnt to insert the teacher code into the datatable
sqlString3 = "Insert into Users ([TeacherID])"
sqlString3 &= " values ('"
sqlString3 &= TeacherCodeTextbox.Text & "')"
```

& this should make it change the value of the user who is signed in.

```
91 | | | MsgBox("Teacher added")
```

21c	TeacherCodeCheckButton	If it inserts the teachercode into users table attribute TeacherID	Displays msgbox saying “teacher added” but same problem with adding to wrong row
-----	------------------------	--	--



UserID	Username	Password	Teacher?	TeacherID
1	Adam	Adam1234	<input type="checkbox"/>	
2	Craig	Bridgens	<input checked="" type="checkbox"/>	
20	fortnite	isepic	<input type="checkbox"/>	
21	q	q	<input type="checkbox"/>	
24	ss	s	<input type="checkbox"/>	
25	JOSHUSH	JOSHUSH	<input type="checkbox"/>	
27	jotaro	Armaan	<input type="checkbox"/>	
28	dio	brando	<input type="checkbox"/>	
30	BobbyShmurd	Hello1234	<input type="checkbox"/>	
31	itachi	Bruh14	<input type="checkbox"/>	
35			<input type="checkbox"/>	A3X5G

I then checked the code again & after some research, I found out that the insert statement could not be used to edit an already existing row.

```
Dim sqlString3 As String = "select * from Users where Username = '" & Form1.VariableName & "'" 'defines sql statement to insert the teacher code into the datatable
sqlString3 = "UPDATE Users set TeacherID = '" & TeacherCodeTextbox.Text
connection.Open()
DataAdapter = New OleDb.OleDbDataAdapter(sqlString3, connection)
dt.Clear()
DataAdapter.Fill(dt)
connection.Close()
MsgBox("Teacher added")
```

21d	TeacherCodeCheckButton	If it inserts the teachercode into users table attribute TeacherID	There was a syntax error that stopped it from running
Exception Unhandled			
System.Data.OleDb.OleDbException: 'Syntax error in string in query expression "A3X5G".'			
View Details Copy Details Exception Settings			

I then tried to add to the SQL statement by saying where it should update TeacherID.

Also added square brackets and changed a couple words to capitals just in case it helps

```
82      Dim sqlString3 As String = "select * from Users where Username = '" & Form1.variablename & "'"
83      sqlString3 = "UPDATE Users set [TeacherID] = '" & TeacherCodeTextbox.Text
84      sqlString3 &= " WHERE [Username] = '" & Form1.variablename & "'"
85      connection.Open()
86      DataAdapter = New OleDb.OleDbDataAdapter(sqlString3, connection)
87      dt.Clear()
88      DataAdapter.Fill(dt)
89      connection.Close()
90      MsgBox("Teacher added")
91  End If
```

defines sql statement to insert the teacher code into the datatable

22e	TeacherCodeCheckButton	If it inserts the teachercode into users table attribute TeacherID	There was a different syntax error that stopped it from running. (missing operator)
-----	------------------------	--	---

```
82      Dim sqlString3 As String = "select * from Users where Username = '" & Form1.variablename & "'"
83      sqlString3 = "UPDATE Users set [TeacherID] = '" & TeacherCodeTextbox.Text
84      sqlString3 &= " WHERE [Username] = '" & Form1.variablename & "'"
85      connection.Open()
86      DataAdapter = New OleDb.OleDbDataAdapter(sqlString3, connection)
87      dt.Clear()
88      DataAdapter.Fill(dt) X
89      connection.Close()
90      MsgBox("Teacher added")
91  End If
```

defines sql statement to insert the teacher code into the datatable

Exception Unhandled ✖

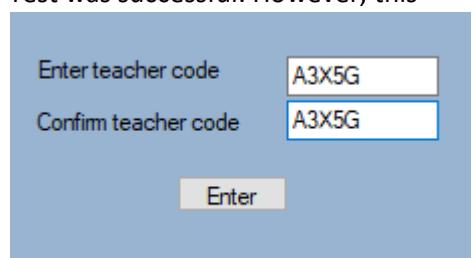
System.Data.OleDb.OleDbException: 'Syntax error (missing operator) in query expression "A3X5G WHERE [Username] = 'Adam'.'

[View Details](#) | [Copy Details](#)

► [Exception Settings](#)

I believe the missing operator was just an apostrophe missing from line 84

```
84      sqlString3 &= " WHERE [Username] = '" & Form1.variablename & "'"
```

22f	TeacherCodeCheckButton	If it inserts the teachercode into users table attribute TeacherID	Test was successful. However, this was left afterwards, which I will now fix. 
-----	------------------------	--	---

I then deleted the teacherid from that account for further testing purposes

To fix that, I considered clearing the textboxes, but there will be no need as it will not make a difference to the user if it is hidden after clicking the button.

```

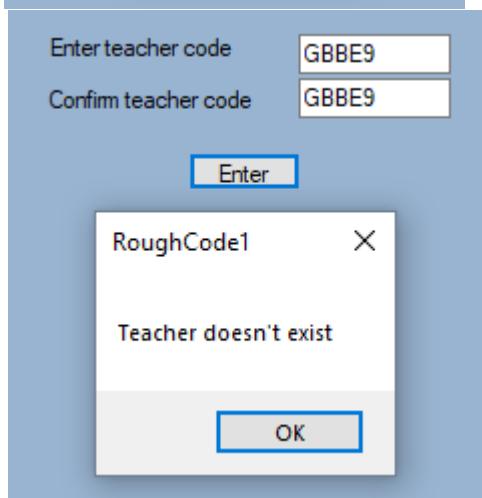
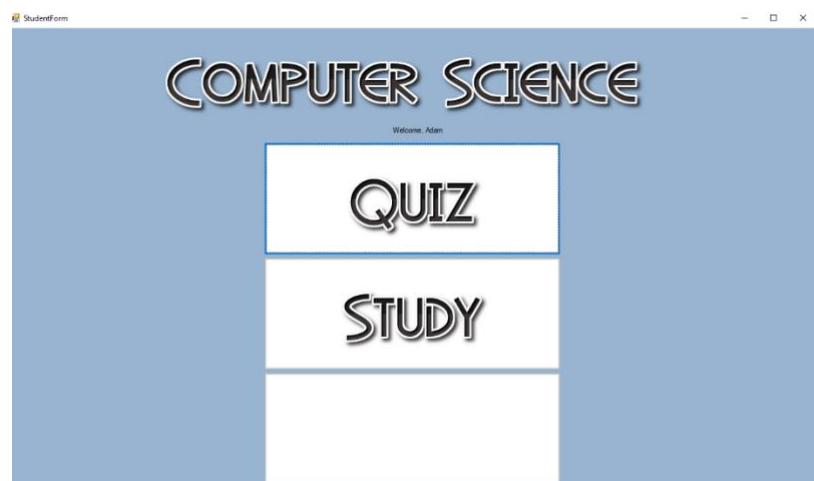
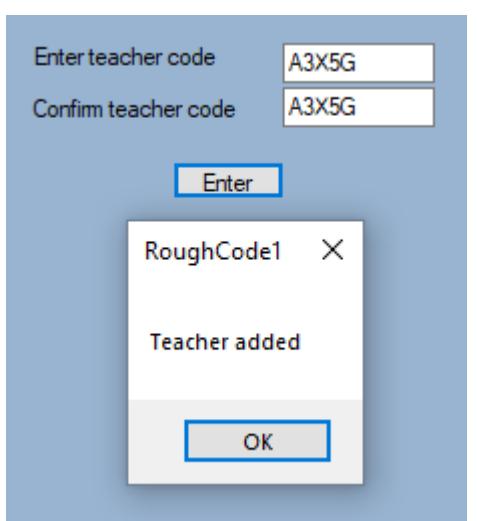
82     Dim sqlString3 As String = "select * from Users where Username = '" & Form1.VariableName & "'" 'defines sql statement to insert the teacher code into the datatable
83     sqlString3 += "UPDATE Users set [TeacherID] = '" & TeacherCodeTextbox.Text 'updates teacher id in users table
84     sqlString3 += " WHERE [Username] = '" & Form1.VariableName & "'" 'where username is equal to that of the user who is signed in
85     connection.Open()
86     DataAdapter = New OleDb.OleDbDataAdapter(sqlString3, connection)
87     dt.Clear()
88     DataAdapter.Fill(dt)
89     connection.Close()
90     MsgBox("Teacher added") 'notifies user
91
92     'hide
93     Label2.Hide()
94     Label3.Hide()
95     TeacherCodeTextbox.Hide()
96     confirm_TeacherCodeTextbox.Hide()
97     TeacherCodeCheckButton.Hide()
98     'all these things will be hidden as they no longer need to associate a teacher with their account

```

23	TeacherCodeCheckButton	If it hides the following after a teacher has been added 	Test was successful.
----	------------------------	--	----------------------

After pressing OK, it disappeared as required

24	TeacherCodeCheckButton	If it allows a student to associate a teachercode that doesn't exist in the teacher table	Test was successful – didn't allow user to add it.
----	------------------------	---	--



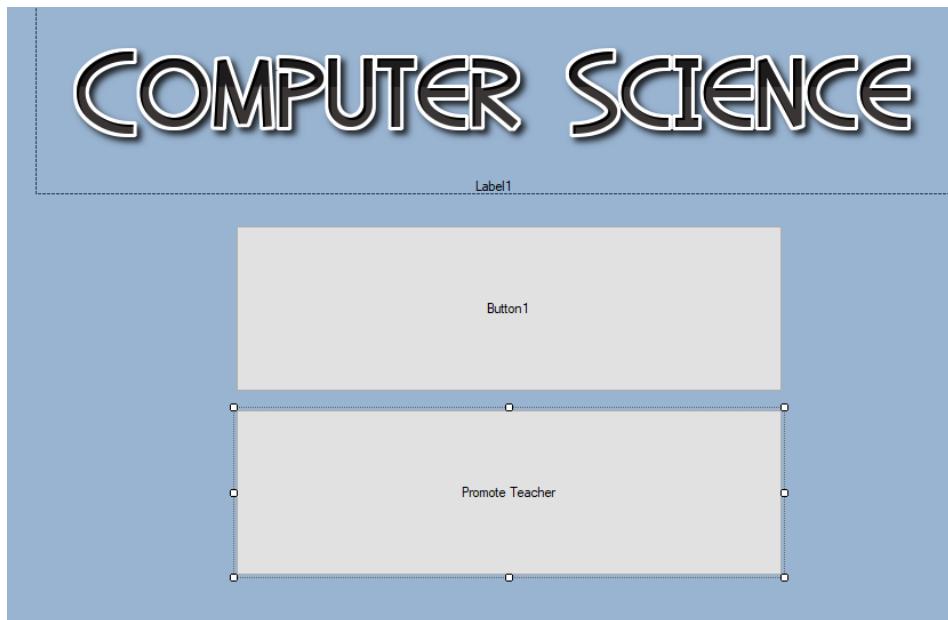
The textboxes didn't clear after pressing OK so I added code to fix in lines 82 & 82

```

77   If dt.Rows.Count = 0 Then 'if the teachercodetextbox text doesn't appear in the database then there is no associated teacher with the code they have entered
78   'therefore the following msgbox is displayed
79   MsgBox("Teacher doesn't exist")
80   'following 2 lines clear textboxes
81   TeacherCodeTextbox.Text = ""
82   confirm_TeacherCodeTextbox.Text = ""
83   Exit Sub 'will not insert anything into the TeacherID attribute of the Users table

```

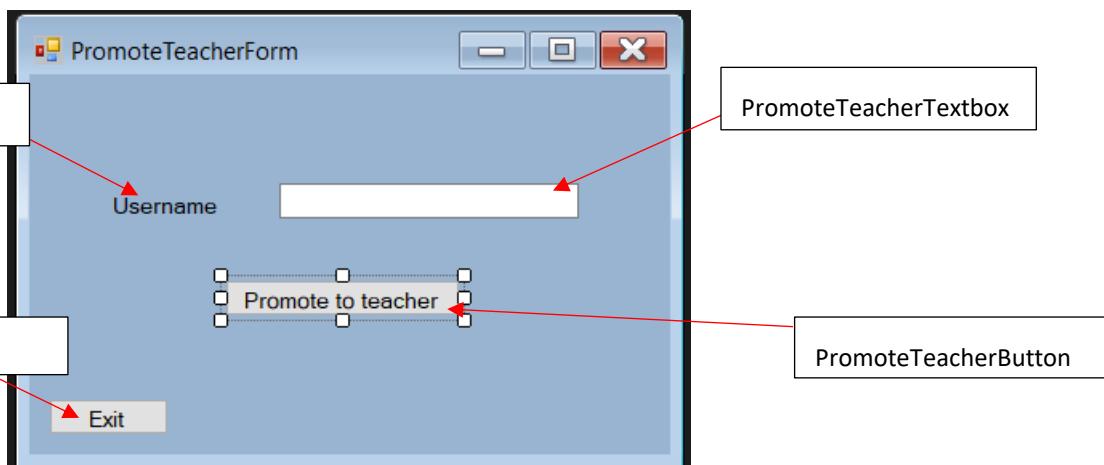
I now need to add the feature of teachers promoting users to teacher accounts.



First I created a button called PromoteTeacherButton in the teacher form with the text "Promote Teacher"

I then created a new form called PromoteTeacherForm and added code to the button to open this form.

```
10  Private Sub PromoteTeacherButton_Click(sender As Object, e As EventArgs) Handles PromoteTeacherButton.Click  
11      PromoteTeacherForm.Show()  
12  End Sub
```



I've kept active caption as the background colour for consistency.

A label with the text "Username" to indicate the username of the user to be promoted should be typed into the textbox next to it.

The Exit button closes the form.

A button called PromoteTeacherButton which will run the main code that promotes the user to a teacher.

I then began coding it.

```
1 Imports System.Text 'statement enables types that are contained in a given namespace to be referenced directly.
```

I am importing system.text as this will allow me to use the class StringBuilder as a way of making a random character generator that I am familiar with, which I will need later on.

Public Class PromoteTeacherForm

```
2  Public Class PromoteTeacherForm
3      Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb") 'defines connection as a new instance
4          'of the OleDb.OleDbConnection class with the specified string that says its Provider and source, linking my database to the program
5      Dim dt As New DataTable 'defines dt as a new instance of the DataTable class
6      Dim DataAdapter As New OleDb.OleDbDataAdapter 'defines DataAdapter as a new instance of the OleDb.OleDbDataAdapter class
```

I reused this code I made in Form1.

```
Dim validchars As String = "abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890" 'valid characters for the teachercode to be used later
```

Defined this variable as a string and put all characters that can possibly be randomly selected later on in the code for the TeacherID.

PromoteTeacherButton Click sub

```
11  If PromoteTeacherTextBox.Text = "" Then 'This if statement makes sure that there is text entered into the textboxes before
12      'they press the button
13      MsgBox("enter something into the textbox")
14      Exit Sub
15  End If
```

If nothing has been entered in the textbox and the user has pressed the button, then they will see a msgbox telling them to enter something into the textbox. It will then exit the subroutine as there is nothing further to be done if nothing has been entered in the textbox.

```
16  Dim SQLstring1 As String = "select * from Users where Username = '" & PromoteTeacherTextBox.Text & "' " ' selects all data from users where username
17      ' is equal to what was input into PromoteTeacherTextBox
18  connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
19  DataAdapter = New OleDb.OleDbDataAdapter(SQLstring1, connection)
20  dt.Clear()
21  DataAdapter.Fill(dt)
22  connection.Close()
```

Defines sqlstring1 as string equal to the sql statement that I want to run. In this case, it reads all data from datatable Users where Username column is equal to the text within PromoteTeacherTextBox.

The lines after is a good way connecting to the database as explained when I first used them in early Form1 development.

```
23  If dt.Rows.Count = 0 Then 'if the username doesnt exist in users table
24      Dim SQLstring2 As String = "select * from Teachers where Username = '" & PromoteTeacherTextBox.Text & "' " 'selects all data from teachers table where username
25          'is equal to what was input into PromoteTeacherTextBox
26  connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
27  DataAdapter = New OleDb.OleDbDataAdapter(SQLstring2, connection)
28  dt.Clear()
29  DataAdapter.Fill(dt)
30  connection.Close()
```

Dt.rows.count will be equal to 0 if there is not a username found that is equal to what was entered in the textbox.

If this is true, then it defines a new sql statement to be run. It will read all data from datatable Teachers where the Username is equal to what has been entered into the textbox. This will be run if there was no such username found in the Users table so this checks if the User the teacher is trying to promote is already a teacher.

```
31 If dt.Rows.Count = 0 Then 'if username doesnt exist in teachers data table
32     MsgBox("no users with that username found")
33     PromoteTeacherTextBox.Text = "" 'clears textbox
34     Exit Sub
35 Else
36     MsgBox("user is already a teacher") 'if username was found in teachers table msgbox displayed
37     PromoteTeacherTextBox.Text = "" 'clears textbox
38     Exit Sub
39 End If
```

If the username isn't found in the teachers datatable, the msgbox will let them know that there is no individual within the database with that username. It will then clear the textbox to allow them to type in a different username & exits the subroutine as there is nothing further it can do until a valid username has been entered into the textbox.

If the Username is actually found in the Teachers datatable then a msgbox will be displayed notifying the individual that the user they are attempting to promote, is in fact already a teacher so there is no need to continue trying & this is a **usability feature**. It will then clear the textbox & exit the subroutine.

```
40 Else 'if username does exist in users table
41     Dim newteachercode As String 'defines variable newteachercode as string
42     Dim newteacherusername As String = PromoteTeacherTextBox.Text 'defines variable newteacherusername as string equal to the text entered into the textbox
43     Dim newteacherpassword As String = dt.Rows(0)(2) 'defines variable newteacherpassword as string equal to the password of whichever user was entered into
44     'the textbox
45     Dim sb As New StringBuilder() 'defines sb as a new instance of StringBuilder class
46     Dim rand As New Random() 'defines rand as new instance of Random class
```

If the username entered into the textbox was valid & they actually exist within the Users datatable,

It defines 5 new variables.

Newteachercode will contain the TeacherID for the user once they become a teacher

Newteacherusername contains their current username which will be needed to be stored in this variable as it will be deleted out of the users datatable and this will be used to insert it into the teachers datatable.

Newteacherpassword contains their current password and its explanation is the same as newteacherusername

Sb becomes an instance of StringBuilder class and this is what I needed to Import System.Text for in the first line.

Rand becomes a new instance of Random & this will be used to get random characters from ValidChars which was defined in the public class.

```

48     For i As Integer = 1 To 5 'so that it does adds a new random character 5 times
49         Dim idx As Integer = rand.Next(0, validchars.Length) 'returns a random integer value between 0 and the final position number of ValidChars
50             'that will be the position of the random character chosen from ValidChars
51             Dim randomChar As Char = validchars(idx) 'Defines randomChar as datatype Char equal to the letter in validchars that has the position randomly chosen by
52                 'the previous lines
53                 sb.Append(randomChar) 'adds the random character to sb
54             Next i 'continues the for loop until 5

```

This code is what generates the random TeacherID and each lines purpose has been commented on.

newteachercode = sb.ToString 'converts sb to datatype string and makes variable newteachercode equal to it'

Puts variable defined earlier, newteachercode, equal to sb when sb is converted to datatype string as newteachercode needs to be datatype string

```

58     Dim SQLstring3 As String = "select * from Teachers where TeacherID = '" & newteachercode & "' 'defines sqlstring3 as string containing sql statement that selects all
59             'columns where TeacherID is equal to the new teacher code in Teachers table
60
61             connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
62             DataAdapter = New OleDb.OleDbDataAdapter(SQLstring3, connection)
63             dt.Clear()
64             DataAdapter.Fill(dt)
65             connection.Close()

```

Defined a new string to contain a new sqlstatement to recall all data from datatable Teachers where TeacherID is equal to newteachercode, which had its value randomly generated.

```

67             While dt.Rows.Count > 0 'while the newteachercode generated is one that has already been used
68                 For i As Integer = 1 To 5 'runs the for loop again, making a different new teacher code
69                     Dim idx As Integer = rand.Next(0, validchars.Length)
70                     Dim randomChar As Char = validchars(idx)
71                     sb.Append(randomChar)
72                 Next i
73                 newteachercode = sb.ToString
74                 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
75                 DataAdapter = New OleDb.OleDbDataAdapter(SQLstring3, connection)
76                 dt.Clear()
77                 DataAdapter.Fill(dt)
78                 connection.Close()
79             End While 'will end once the teachercode is one that hasn't been used

```

Dt.Rows.Count > 0 means that a TeacherID exists that is equal to newteachercode.

If this happens, it will continue to create new random TeacherIDs for newteachercode to be equal to until it is unique to the database. This is unlikely to happen as there are over 900 million possible 5 character combinations using the characters contained in the ValidChars string, however if it somehow did, this is a validation feature.

```

81             Dim sqlstring4 As String = "Delete * from Users where Username = '" & PromoteTeacherTextBox.Text & "' 'defines sqlstring 4 as a string containing sql command to
82                 'delete all records from users where the username is equal to what has been entered into the promoteteachertextbox
83                 connection.Open()
84                 DataAdapter = New OleDb.OleDbDataAdapter(sqlstring4, connection)
85                 dt.Clear()
86                 DataAdapter.Fill(dt)
87                 connection.Close()

```

Once it has a unique value for the TeacherID within the variable newteachercode, the above sql statement has been defined and will run deletes the row of the user, who's name was entered into the textbox, from the Users table.

```

89 Dim sqlstring5 As String = "Insert into Teachers ([Username], [Password], [TeacherID])" ' sql statement that will create a new row in teachers ta
90 'with the username and password from the user who has been promoted as well as the randomly generated teachercode
91 sqlstring5 &= " values (""
92     sqlstring5 &= newteacherusername & "", ""
93     sqlstring5 &= newteacherusername & "", ""
94     sqlstring5 &= newteachercode & "")"
95 connection.Open()
96 DataAdapter = New OleDb.OleDbDataAdapter(sqlstring5, connection)
97 dt.Clear()
98 DataAdapter.Fill(dt)
99 connection.Close()

100 MsgBox("user promoted to teacher") 'msgbox to let the individual know the task has been completed
101 
```

A new sql statement is then defined and run where it inserts values into the Username, Password & TeacherID columns of the database.

The variables I defined earlier are being utilised now for this purpose.

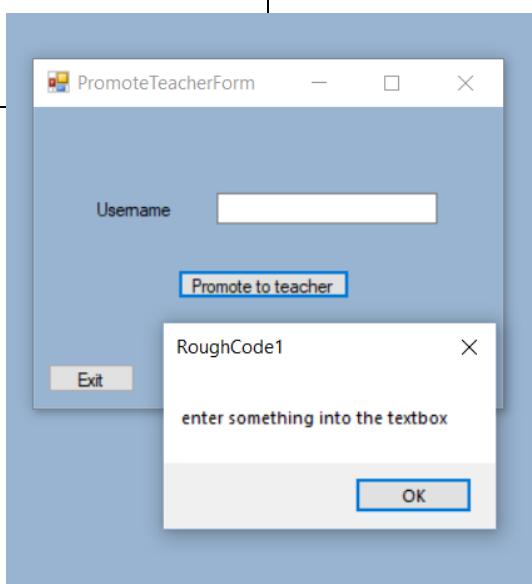
A msgbox is then displayed which tells the person know it has been successful.

```

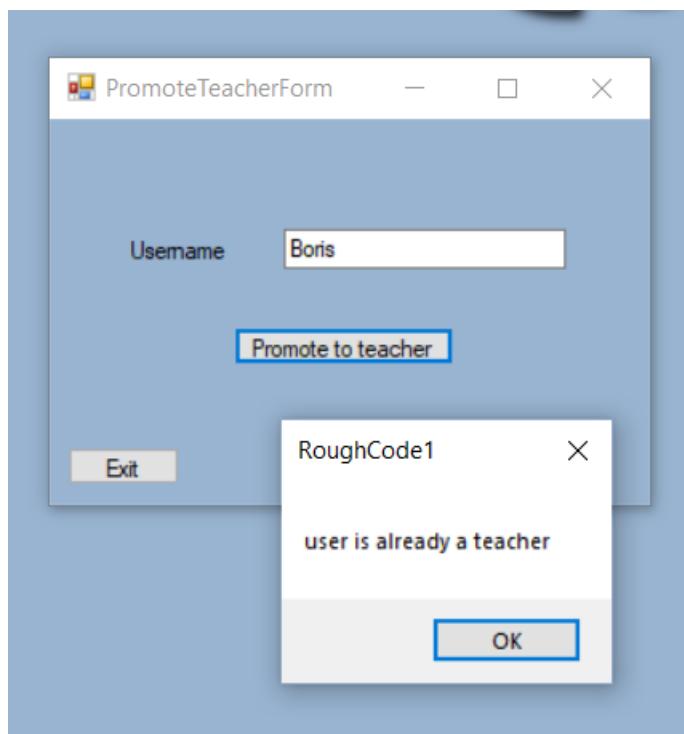
103     Exit Sub
104     End If
105     Exit Sub
106 End Sub

```

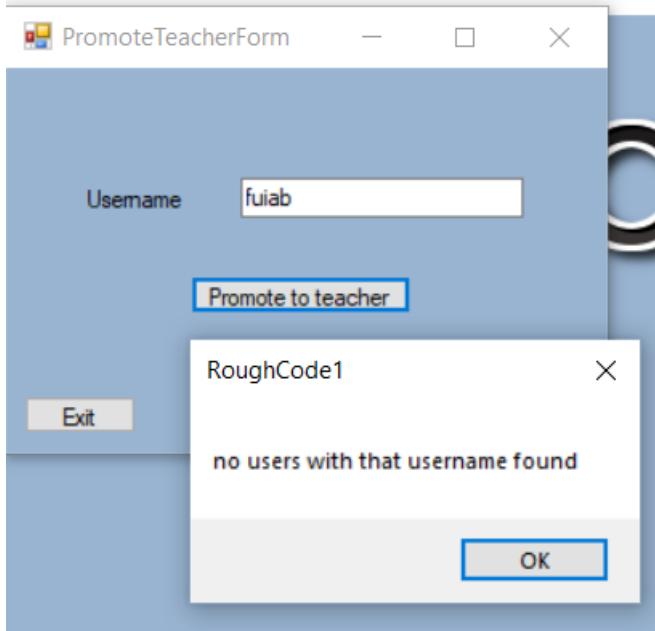
Test No	What is being tested	Expected Outcome	Actual Outcome
25	PromoteTeacherButton	Will not work when nothing is entered into the textbox	Test was successful – didn't affect database & displayed messagebox



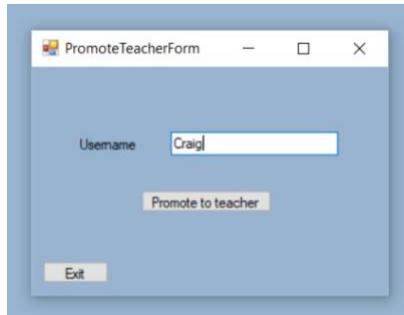
Test No	What is being tested	Expected Outcome	Actual Outcome
26	PromoteTeacherButton	Will not work when Teacher username is entered	Test was successful – didn't affect database & displayed messagebox



Test No	What is being tested	Expected Outcome	Actual Outcome
27	PromoteTeacherButton	Will not work when a username that does not exist within the database is entered	Test was successful – didn't affect database & displayed messagebox



Test No	What is being tested	Expected Outcome	Actual Outcome
28	PromoteTeacherButton	Will work properly when a valid username from datatable users is entered	Test was almost successful. A messagebox was displayed. The row of the user who's Username was entered was deleted from datatable users. A random TeacherID was inserted & their username was inserted successfully, however their password was changed to their username



UserID	Username	Password	Teacher?	TeacherID
1 Adam	Adam1234			A3X5G
#Deleted	#Deleted	#Deleted	<input checked="" type="checkbox"/>	#Deleted
20 fortnite	isepic			
21 q	q			
24 ss	s			
25 JOSHUSH	JOSHUSH			
27 jotaro	Armaan			
28 dio	brando			
30 BobbyShmurda	Hello1234			
31 itachi	Bruh14			

TeacherID	Username	Password
A3X5G	Boris	Johnson
cyQgi	Craig	Craig

Their previous Password was “Bridgens”.

After reviewing the code, I have found there was a minor mistake where I had written it should insert the variable containing their username into both the Username & Password columns.

```

89
90 Dim sqlstring5 As String = "Insert into Teachers ([Username], [Password], [TeacherID])" ' sql statement that will create a new row in teachers table
91 'with the username and password from the user who has been promoted as well as the randomly generated teachercode
92 sqlstring5 &= " values (""
93     sqlstring5 &= newteacherusername & ", "
94     sqlstring5 &= newteacherpassword & ", "
95     sqlstring5 &= newteachercode & ")"
96     connection.Open()
97 DataAdapter = New OleDb.OleDbDataAdapter(sqlstring5, connection)
98 dt.Clear()
99 DataAdapter.Fill(dt)
connection.Close()
```

I have changed line 93 to say “newteacherpassword” where it previously said “newteacherusername”

Test No	What is being tested	Expected Outcome	Actual Outcome
28a	PromoteTeacherButton	Will work properly when a valid username from datatable users is entered	Test was successful, however it didn't clear the textbox so I will add a line of code to do that.

The screenshot shows a Windows application window titled "PromoteTeacherForm". Inside, there's a text box labeled "Username" containing "fortnite". Below it is a button labeled "Promote to teacher". A modal dialog box titled "RoughCode1" is displayed, showing the message "user promoted to teacher" and an "OK" button. In the bottom left corner of the main window, there's an "Exit" button.

User ID	Username	Password	Teacher?	Teacher ID
Adam	Adam1234		<input type="checkbox"/>	A3X5G
#Deleted	#Deleted	#Deleted	<input checked="" type="checkbox"/>	#Deleted

Teacher ID	Username	Password
A3X5G	Boris	Johnson
cyQgi	Craig	Craig
saaGt	fortnite	isepic

& where the records say "#Deleted" for the deleted user, it completely disappears after refreshing the database.

102 | PromoteTeacherTextBox.Text = "" 'clears textbox

This will clear the textbox.

Test No	What is being tested	Expected Outcome	Actual Outcome
28b	PromoteTeacherButton	Textbox will be cleared after main function is completed	Test was successful

I will now add validation in the database where I said in design. For presence checks:

Required Yes
Allow Zero Length No

And so prototype 1 has been fully completed, with a working log in system.

CLIENT INTERVIEW & ANALYSIS

CRAIG BRIDGENS

Said he is happy with the consistent background colour & design.

Therefore I will not make any major changes to the design of the overall project.

Said he likes the idea of promoting users to teachers for security and to stop students from signing up with teacher accounts.

Therefore I will not make changes to this part of the sign up system.

Said he is happy with the log in system, however believes it would be better if the user sign up feature was on a separate form to make it easier for users to understand.

I will take this into consideration as I can see how some users may expect to be taken to a new form to sign up for their accounts. This will also allow me to add a “confirm password” textbox for the sign up which stops the user from making a mistake during sign up and then not being able to access their account. If I were to add one now, while having the same form for the sign up & sign in, I believe would be annoying to the user if they need to type their password twice every time they access their accounts.

JOSH FRASER

Agreed with Craig Bridgens about the idea of the sign up feature being on a separate form, once the button has been pressed as it confused him at first.

I will definitely try to meet this request seeing as both clients have suggested this.

Suggested I create a way to recover a students account through giving teachers permission to look at their passwords & add a change password form.

I will eventually try to add this feature as it shouldn't be too difficult, with allowing teachers to look at a listview containing usernames & passwords, & changing the password will be quite a similar process to how users add teachers, with the UPDATE SQL statement. This then stops students from having to create a new account if they forgot their passwords which may have also demotivated them from use of the program.

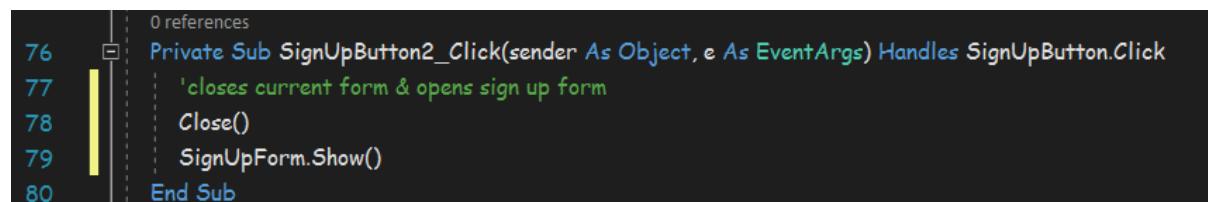
Suggested I add the main logo to the login form & I make the forms fixed so that it looks more professional.

This is something that I believe is a good idea & I will make sure to do.

CHANGES

Signupform

First I made a signupform form, then removed all the code from signupbutton

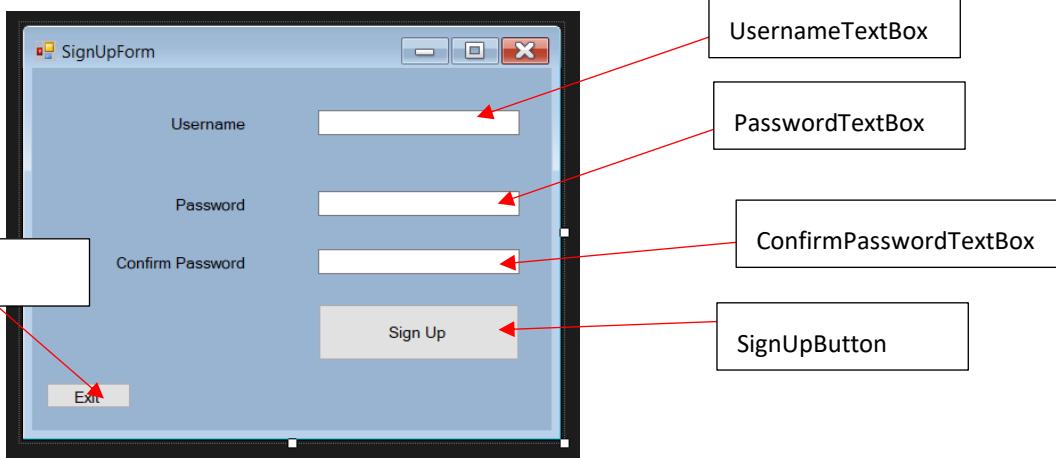


The screenshot shows a code editor with a dark theme. A yellow vertical bar highlights line 76. The code is as follows:

```
    76  | 0 references
    77  | Private Sub SignUpButton2_Click(sender As Object, e As EventArgs) Handles SignUpButton.Click
    78  |     'closes current form & opens sign up form
    79  |     Close()
    80  |     SignUpForm.Show()
```

& added these 2 lines.

I then added labels & textboxes to SignUpForm & made the background colour activecaption.



I defined the database variables

```
Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb") 'defines  
'that says its Provider and source, linking my database to the program  
Dim dt As New DataTable 'defines dt as a new instance of the DataTable class  
Dim DataAdapter As New OleDb.OleDbDataAdapter 'defines DataAdapter as a new instance of the OleDb.OleDbDataAdapter class
```

& added the sign up button code into the sign up button, but changed parts of it to include the confirm password textbox.

```
connection.Close()
```

```
If PasswordTextBox.Text = "" Or UsernameTextBox.Text = "" Or ConfirmPasswordTextBox.Text = "" Then 'if there is no text entered in the box, then  
MsgBox("values have not been entered in all fields") 'a messagebox will be displayed, telling the user they havent entered something in all of the boxes that they m
```

```
Exit Sub 'will exit the subroutine to allow the user to now enter something
```

```
End If
```

```
17 | If Not PasswordTextBox.Text = ConfirmPasswordTextBox.Text Then 'This if statement makes sure that the password and confirm password text boxes  
18 | 'are the same  
19 | MsgBox("passwords do not match")  
20 | Exit Sub  
21 | End If
```

This will help with **usability** so that the user doesn't enter the wrong password and not know his password when signing in.

& I then added

```
57 | Close() ' closes signupform  
58 | Form1.Show() 'shows login form again
```

Which runs if the user has successfully been created.

Test No	What is being tested	Expected Outcome	Actual Outcome
!1	SignUpForm	Sign up form will open & sign up button will work properly as it did previously & will only work if the confirm password textbox text value is equal to the value of password text box text, otherwise a messagebox will appear.	The program ended as soon as I pressed sign up button in form1

I believe this means I can't close form1 which is probably what ended program execution with the close() command in signupbutton_click().

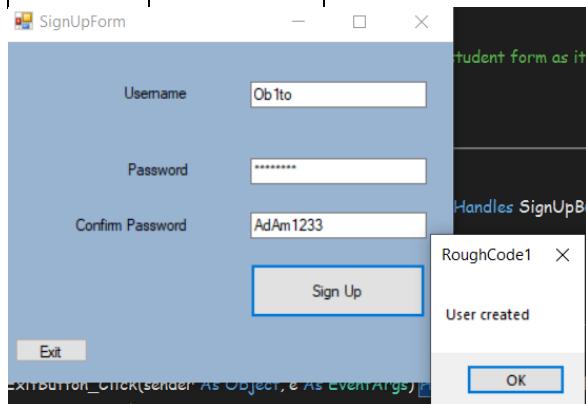
I will now make it a hide command.

```

76  Private Sub SignUpButton2_Click(sender As Object, e As EventArgs) Handles SignUpButton.Click
77      'closes current form & opens sign up form
78      Me.Hide()
79      SignUpForm.Show()
80  End Sub

```

Test No	What is being tested	Expected Outcome	Actual Outcome
!1a	SignUpForm	Sign up form will open & sign up button will work properly as it did previously & will only work if the confirm password textbox text value is equal to the value of password text box text, otherwise a messagebox will appear.	Was successful, however I need to hide the confirmPasswordtextbox text.

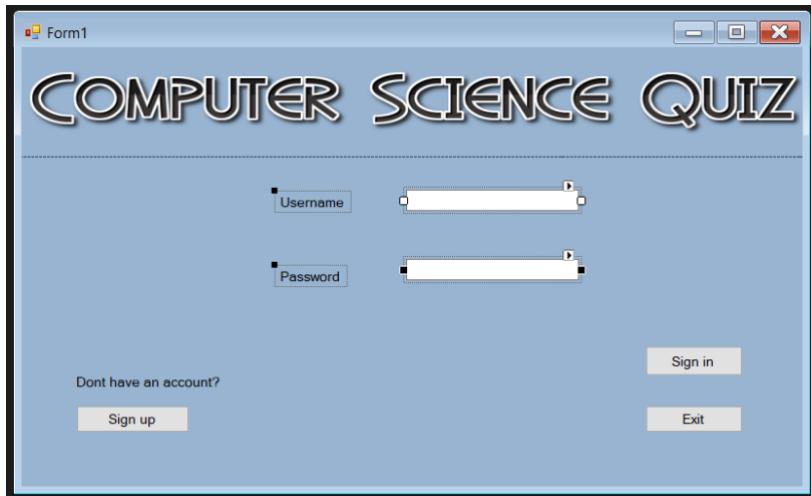


to fix it, I added

>PasswordChar *

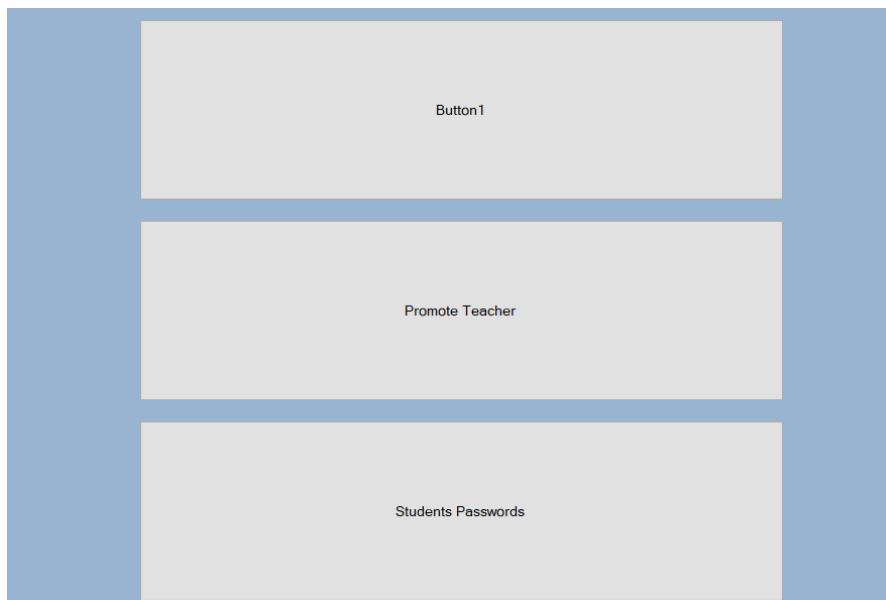
to the confirmpasswordtextbox.

Logo



Recover Password

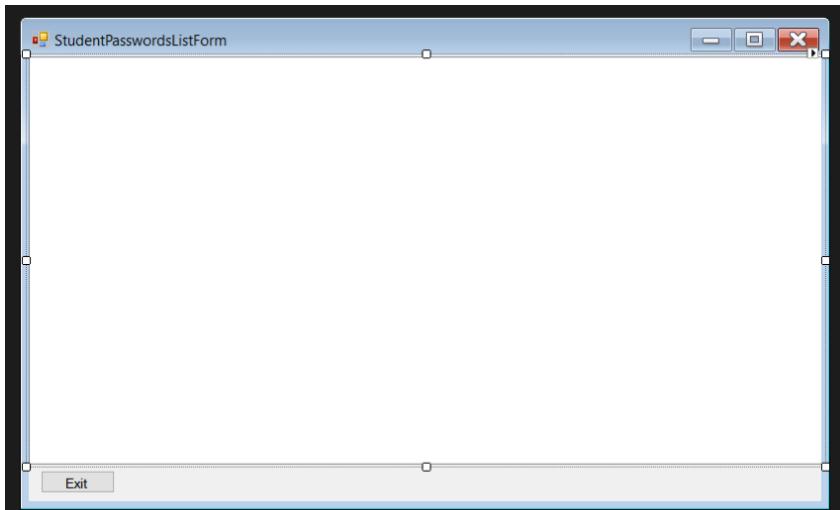
First I added a button "RecoverStudentPassButton" to TeacherForm



I then created a form "StudentPasswordsListForm"

I added code to the button so it opens the new form.

```
14  Private Sub RecoverStudentPassButton_Click(sender As Object, e As EventArgs) Handles RecoverStudentPassButton.Click
15      'closes form & opens studentpasswordlistform
16      Close()
17      StudentPasswordsListForm.Show()
18  End Sub
```



I added an exit button "ExitButton" (as used before) & a ListView "ListView1".

exitbutton:

```

2  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
3      'closes current form, opens teacher form again
4      Close()
5      TeacherForm.Show()
6  End Sub

```

I am adding this after prototype 3, therefore I am able to copy & paste most of the lines for LeaderboardsForm & make minor changes.

```

1  Imports System.Data.OleDb
2  'Enables data types & classes to be referenced without namespace qualification.

```

Imports system.data.oledb to allow me to use new commands that make setting this list view up much easier.

```

9
10     'defines variables
11     Dim connection As OleDbConnection = New OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb")
12     Dim command As OleDbCommand
13     Dim data_reader As OleDbDataReader

```

Variables defined which are only possible due to imports statement.

```

13     Sub ListViewSetup()
14         'add columns to the listview
15         ListView1.Columns.Add("Users", 500, HorizontalAlignment.Left)
16         ListView1.Columns.Add("Password", 500, HorizontalAlignment.Left)
17         'Display listview in details view
18         ListView1.View = View.Details
19         'display grid lines
20         ListView1.GridLines = True
21         'allow full row selection
22         ListView1.FullRowSelect = True
23     End Sub

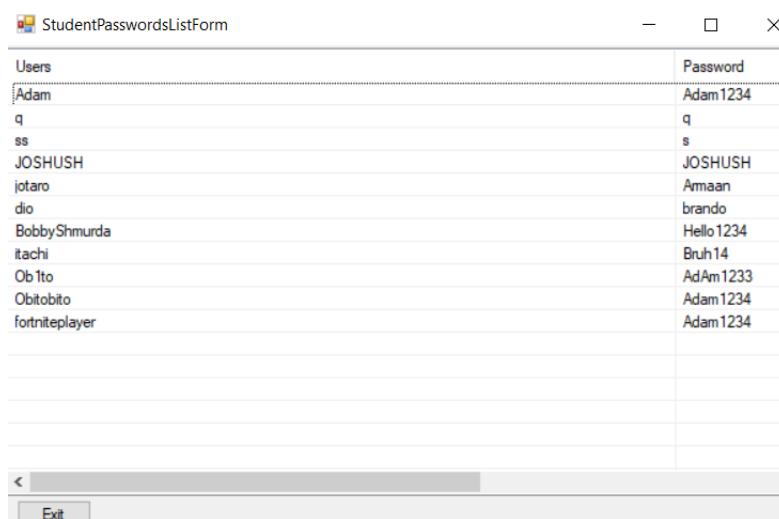
```

Subroutine to be called to set the listview up.

```
0 references
25  Private Sub StudentPasswordsListsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
26      'setup listview
27      ListViewSetup()
28      'connect to ms.access database
29      connection.Open()
30      'reading data from Questions table
31      command = New OleDbCommand("SELECT * FROM Users", connection)
32      data_reader = command.ExecuteReader
33
34      'adds data to listview
35      If data_reader.HasRows Then
36          While data_reader.Read
37              Dim newitem As New ListViewItem()
38              newitem.Text = data_reader.GetValue(1) 'first column
39              newitem.SubItems.Add(data_reader.GetValue(2)) 'second column
40              ListView1.Items.Add(newitem)
41          End While
42      End If
43  End Sub
44 End Class
```

When form loads, ListViewSetup() subroutine is called & run, connection to database is established & then it inserts the chosen columns into the columns of the listview, in this case I have chosen the Username & Password columns.

Test No	What is being tested	Expected Outcome	Actual Outcome
I2	StudentPasswordsForm	When opened, will display student usernames & passwords	Was successful, however I have decided it would be better if the teacher can only view the passwords of their own students.



In Form1,

Public Teachercode As String 'defines Teachercode as public string, allowing me to use in other forms

When a student successfully signs in,

```
63     'if teachercode isnt empty for the student, teachercode variable will be equal to their assigned teachercode
64     If Not IsDBNull(dt.Rows(0)(4)) Then
65         Teachercode = dt.Rows(0)(4)
66     End If
```

When a teacher successfully signs in,

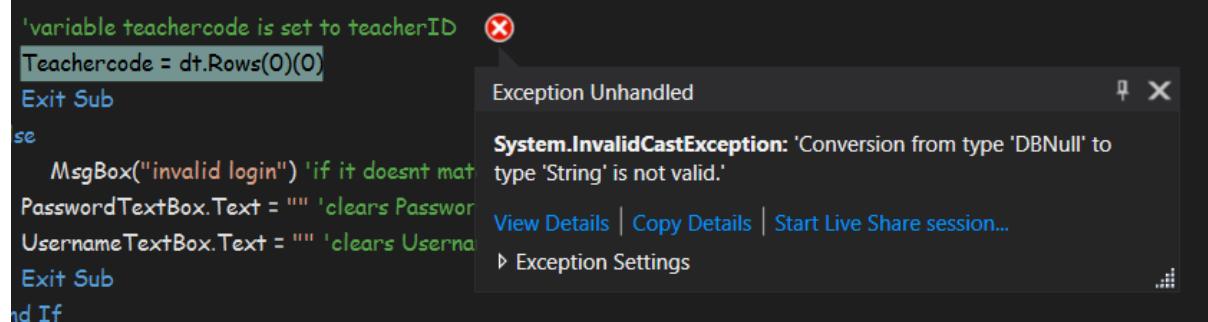
```
50     'variable teachercode is set to teacherID
51     Teachercode = dt.Rows(0)(0)
```

Do not need to check if it is null as all teachers will have a unique teacherID.

In StudentPasswordsListForm,

```
31     command = New OleDbCommand("SELECT * FROM Users where TeacherID = '" & Form1.Teachercode & "'", connection)
```

Test No	What is being tested	Expected Outcome	Actual Outcome
I2a	StudentPasswordsForm	When opened, will display student usernames & passwords from only associated students	Was an error.



To fix this, I will define a new datatable. This will somehow fix it, as I discovered in Prototype 3.

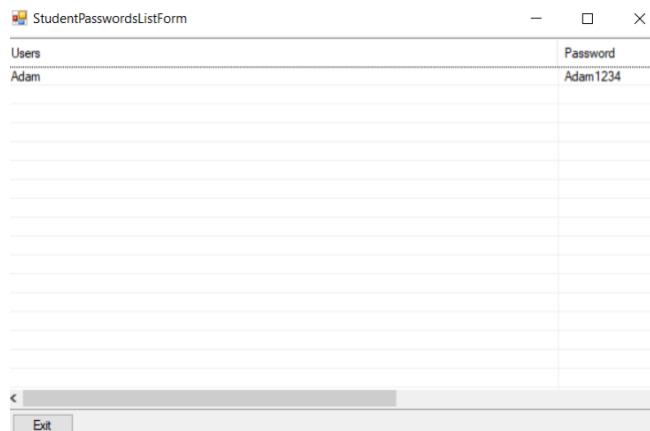
```

31 Dim newdt As New DataTable
32 Dim SQLstring2 As String = "select * from Teachers where Username = '" & UsernameTextBox.Text & "'" 'Defines variable sqlstring As data type String, which contains the command
33 'from data table Teachers where Username is equal to what has been input in UsernameTextBox
34 connection.Open()
35 DataAdapter = New OleDb.OleDbDataAdapter(SQLstring2, connection)
36 newdt.Clear()
37 DataAdapter.Fill(newdt)
38 connection.Close()
39 If newdt.Rows.Count = 0 Then
40     MsgBox("invalid login") 'a messagebox will be displayed and say the login is invalid
41     PasswordTextBox.Text = "" 'clears PasswordTextBox
42     UsernameTextBox.Text = "" 'clears UsernameTextBox
43     Exit Sub ' and then exit the subroutine as it should do nothing further
44 End If
45 If newdt.Rows(0)(2) = PasswordTextBox.Text Then 'This If statement will only be run if the username was found in the database, & checks if the associated password matches the
46 'password entered into PasswordTextBox
47 Me.Hide()
48 variablename = UsernameTextBox.Text 'variablename is equal to the username that was used when login was accepted
49 TeacherForm.Show()
50
51 'variable teachercode is set to teacherID
52 Teachercode = newdt.Rows(0)(0)
53 Exit Sub

```

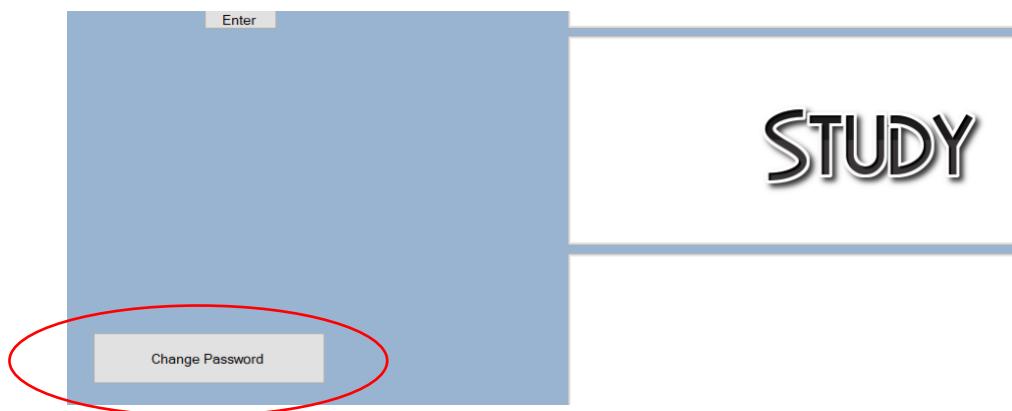
I defined newdt as New DataTable & used this for the Teachers Datatable instead of “dt” which was defined publicly & used elsewhere.

Test No	What is being tested	Expected Outcome	Actual Outcome
I2b	StudentPasswordsForm	When opened, will display student usernames & passwords from only associated students	Works as expected.



Adam is the only currently associated student with the teacher I signed in with.

[Change Password](#)



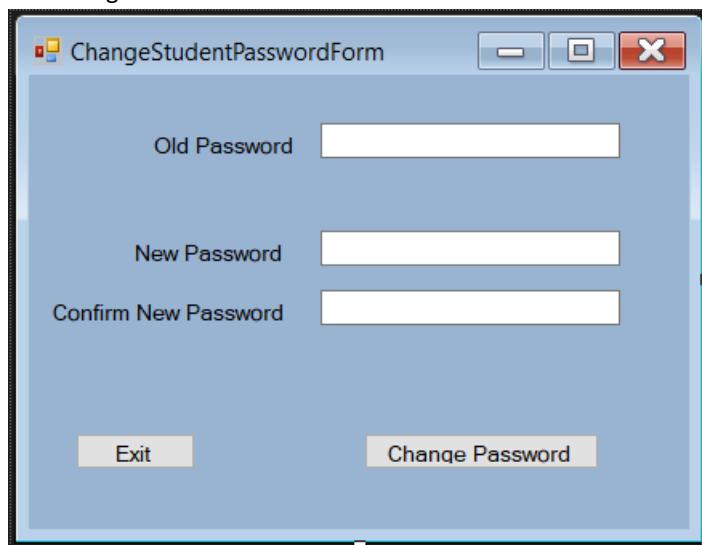
Added "ChangePasswordButton" to StudentForm with code to close studentform & open ChangeStudentPasswordForm, which I will now create.

```

116  Private Sub ChangePasswordButton_Click(sender As Object, e As EventArgs) Handles ChangePasswordButton.Click
117      'closes current form & opens changestudentpasswordform form
118      Close()
119      ChangeStudentPasswordForm.Show()
120  End Sub

```

3 Labels, 3 Textboxes "OldPassTB", "NewPassTB", "ConfirmNewPassTB", 2 Buttons "ExitButton" & "ChangePassButton"



Defines variables for database connection

```

1  Public Class ChangeStudentPasswordForm
2      Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb") 'defines connection as a new instance
3      'of the OleDb.OleDbConnection class with the specified string that says its Provider and source, linking my database to the program
4      Dim dt As New DataTable 'defines dt as a new instance of the DataTable class
5      Dim DataAdapter As New OleDb.OleDbDataAdapter 'defines DataAdapter as a new instance of the OleDb.OleDbDataAdapter class

```

When ChangePassButton is clicked

```

7  Private Sub ChangePassButton_Click(sender As Object, e As EventArgs) Handles ChangePassButton.Click

```

If New Password is not equal to Confirm New Pass

```
8 | If Not NewPassTB.Text = ConfirmNewPassTB.Text Then 'This if statement makes sure that the New Pass TB and confirm & ConfirmNewPassTB text boxes  
9 |   'are the same  
10 |   'msgbox to notify user  
11 |   MsgBox("New passwords do not match")  
12 |   'exit subroutine  
13 |   Exit Sub  
14 | End If
```

Displays a msgbox & exits subroutine & I now realise I need to clear textboxes before the exit sub

```
13 |   'clears textboxes  
14 |   OldPassTB.Text = ""  
15 |   NewPassTB.Text = ""  
16 |   ConfirmNewPassTB.Text = ""  
17 |   Exit Sub  
18 | End If
```

If new password length < 5, displays a msgbox, clears textboxes & exits sub

```
27 | If NewPassTB.Text.Length < 5 Then 'If the number of characters in the text in newpasstb is less than 5  
28 |   MsgBox("The new password length must be more than 5 characters") 'msgbox displayed  
29 |   'clears all textboxes  
30 |   OldPassTB.Text = ""  
31 |   NewPassTB.Text = ""  
32 |   ConfirmNewPassTB.Text = ""  
33 |   Exit Sub ' exits sub to not allow account to be created
```

If any of the textboxes are empty, msgbox displayed, textboxes cleared & exits sub

```
19 | If OldPassTB.Text = "" Or NewPassTB.Text = "" Or ConfirmNewPassTB.Text = "" Then 'if there is no text entered in the textboxes, then  
20 |   MsgBox("values have not been entered in all fields") 'a messagebox will be displayed, telling the user they havent entered something in all of the boxes that they need to  
21 |   'clears all textboxes  
22 |   OldPassTB.Text = ""  
23 |   NewPassTB.Text = ""  
24 |   ConfirmNewPassTB.Text = ""  
25 |   Exit Sub 'will exit the subroutine to allow the user to now enter something  
26 | End If
```

If there is not any capital letters in new password textbox, msgbox displayed, textboxes cleared & exits sub

```
35 | If Not NewPassTB.Text <> LCase$(NewPassTB.Text) Then  
36 |   'if the text in NewPassTB is not different a complete lowercase conversion of the text  
37 |   MsgBox("new password must contain caps") 'msgbox displayed  
38 |   'clears all textboxes  
39 |   OldPassTB.Text = ""  
40 |   NewPassTB.Text = ""  
41 |   ConfirmNewPassTB.Text = ""  
42 |   Exit Sub 'exit subroutine to not allow record to be created  
43 | End If
```

Defines sql statement, connects to database, and runs sql statement on the database, reading Users table record for user currently signed in

```
44 Dim sqlString3 As String = "select * from Users where Username = '" & Form1.variablename & "'"
45 connection.Open()
46 DataAdapter = New OleDb.OleDbDataAdapter(sqlString3, connection)
47 dt.Clear()
48 DataAdapter.Fill(dt)
```

If OldPassTB text is equal to the actual password, then it will update the password to the new password entered, other IF statements have already been run to prevent the New Password from not being valid.

```
50 If OldPassTB.Text = dt.Rows(0)(2) Then 'If old password is set to the current password, then
51 Dim sqlString4 As String = "select * from Users where Username = '" & Form1.variablename & "'"
52 sqlString4 = "UPDATE Users set [Password] = '" & NewPassTB.Text 'updates password in users table to new password
53 sqlString4 &= " WHERE [Username] = '" & Form1.variablename & "'"
54 'where username is equal to that of the user who is signed in
55 'establishes connection with database
56 connection.Open()
57 DataAdapter = New OleDb.OleDbDataAdapter(sqlString4, connection)
58 dt.Clear()
59 DataAdapter.Fill(dt)
60 connection.Close()
61 'message box to notify user
62 MsgBox("Password changed")
63 'clears textboxes
64 OldPassTB.Text = ""
65 NewPassTB.Text = ""
66 ConfirmNewPassTB.Text = ""
67 'shows studentform again & closes current form
68 StudentForm.Show()
69 Close()
70 Exit Sub
71 Else
72 'messagebox to notify user
73 MsgBox("Old password incorrect")
74 OldPassTB.Text = ""
75 NewPassTB.Text = ""
76 ConfirmNewPassTB.Text = ""
77 Exit Sub
78 End If
d Sub
```

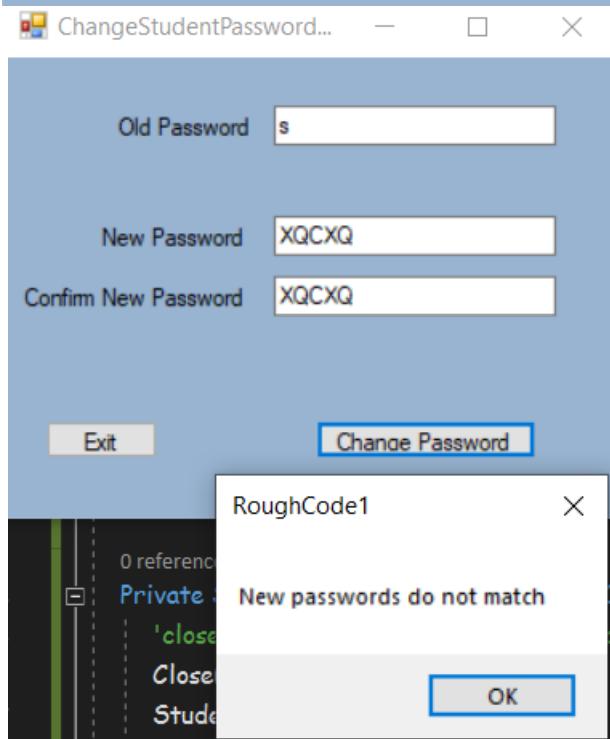
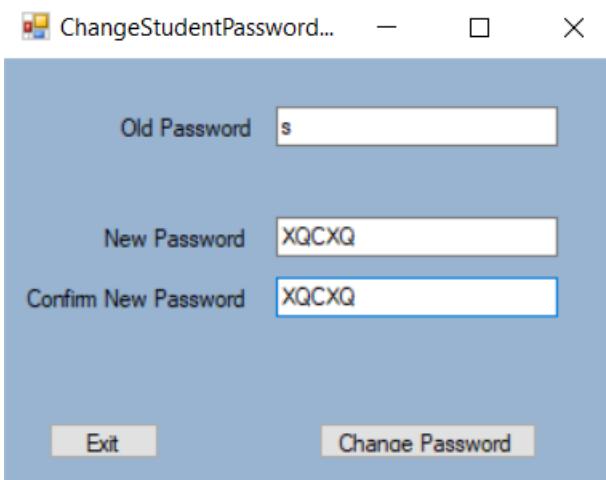
Textboxes are cleared, studentform is shown again & current form is closed. If OldPassTB text is not equal to their actual password, a messagebox is displayed, textboxes are cleared & it exits the sub.

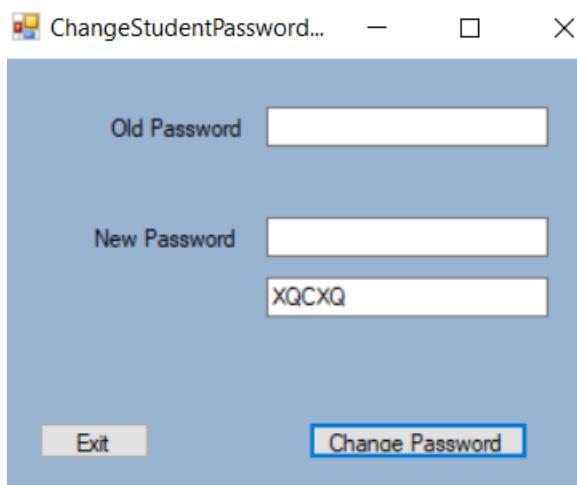
```
84 Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
85     'closes current form & shows student form
86     Close()
87     StudentForm.Show()
88 End Sub
```

Exit button does what it always does, closes current form & opens previous form

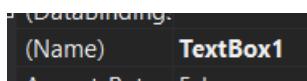
Test No	What is being tested	Expected Outcome	Actual Outcome
I3	ChangeStudentPasswordForm	Old password must be valid, new password must be valid & then it will allow user to change password.	Said new passwords didn't match when they did. Didn't update password. Not all textboxes were cleared. Label disappeared.

User ID	Username	Password
1	Adam	Adam1234
21	q	q
24	ss	s

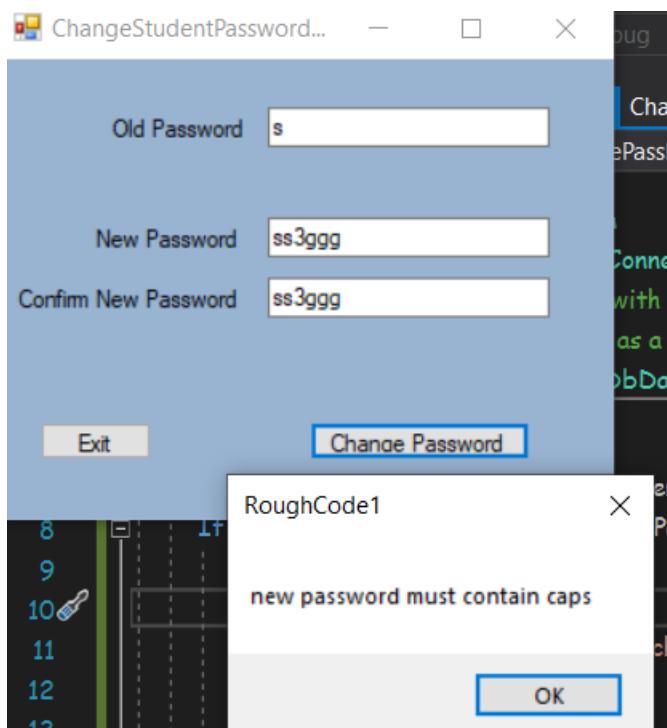




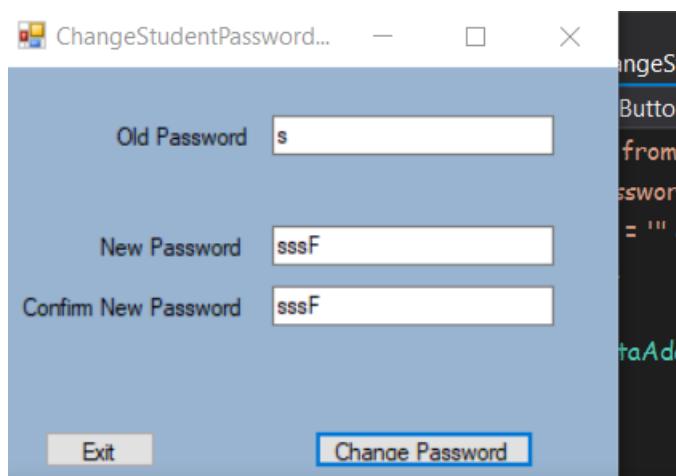
The problem was that I accidentally named the Label ConfirmNewPassTB & the textbox was called



Test No	What is being tested	Expected Outcome	Actual Outcome
I3a	ChangeStudentPasswordForm	Old password must be valid, new password must be valid & then it will allow user to change password.	Worked as expected



& database didn't update & textboxes cleared

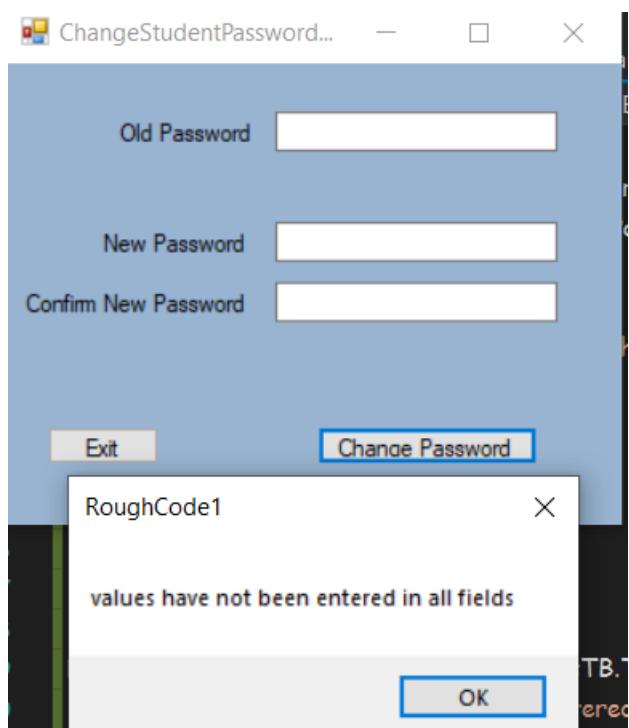


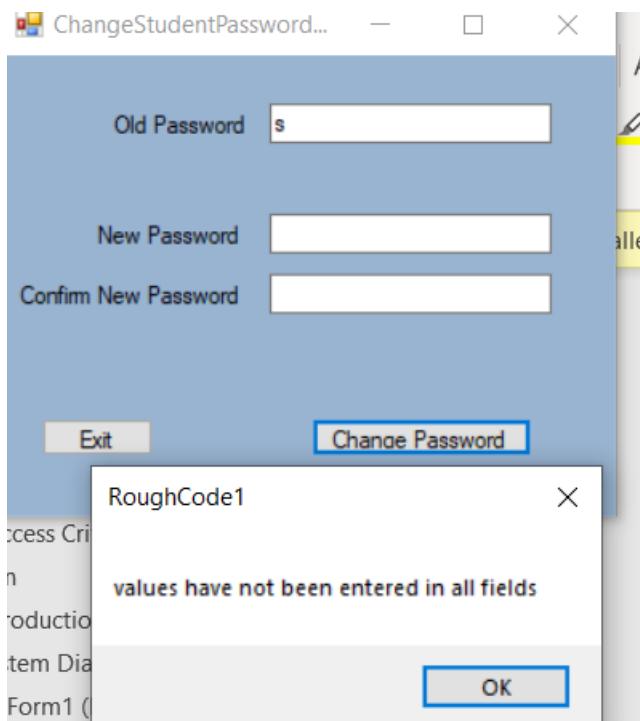
RoughCode1 X

The new password length must be more than 5 characters

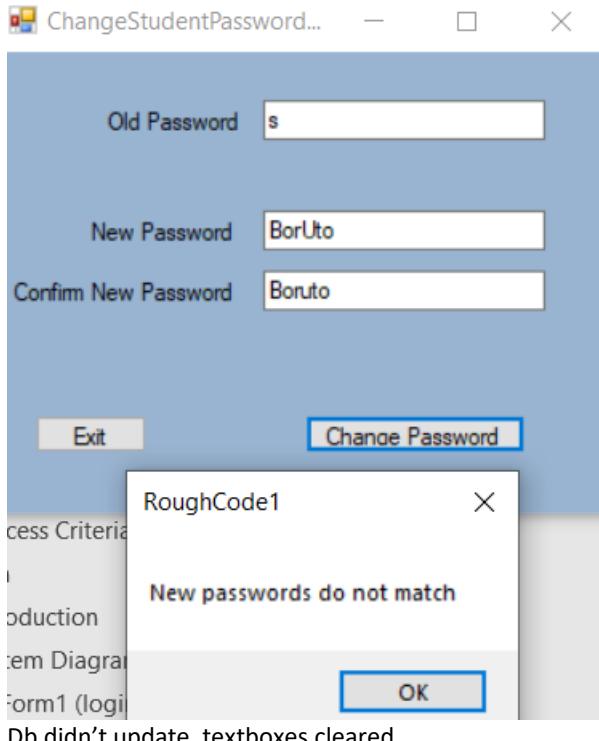
OK

& database didn't update & textboxes cleared

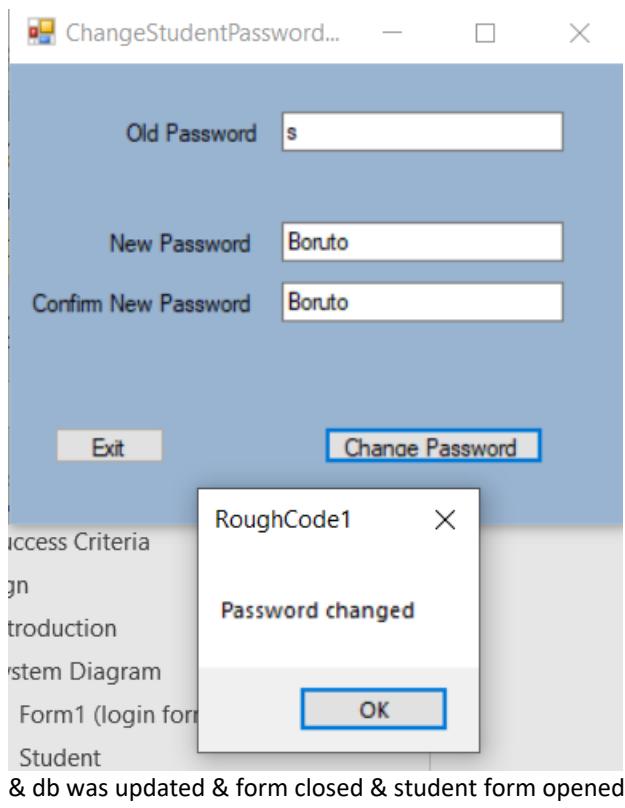




& database wasn't updated & textboxes cleared.



Db didn't update, textboxes cleared



& db was updated & form closed & student form opened.

	24	ss	Boruto
--	----	----	--------

PROTOTYPE 2

In this section I will have a completed Study section. This should not require a very large amount of code, in comparison to Prototype 1 & most of the work will be centred around me gathering questions & answers & creating the database relations to contain them.

First, I created a Topics datatable

TopicID	TopicName
1	The characteristics of contemporary processors, input, output and storage devices
2	Software and software development
3	Exchanging data
4	Data types, data structures and algorithms
5	Legal, moral, cultural and ethical issues
6	Elements of computational thinking
7	Problem solving and programming
8	Algorithms

Field Name	Data Type
TopicID	AutoNumber
TopicName	Short Text

Then a Difficulty table

This allows me to provide the right conditions to give higher difficulty questions to students who are better at certain topics & links to their teacher being able to see how well they are doing. This will only be implemented if I have time to do this though.

UserID	TopicID	Difficulty
1	1	2
1	2	1
24	1	3
0	0	0

Field Name	Data Type
UserID	Number
TopicID	Number
Difficulty	Number

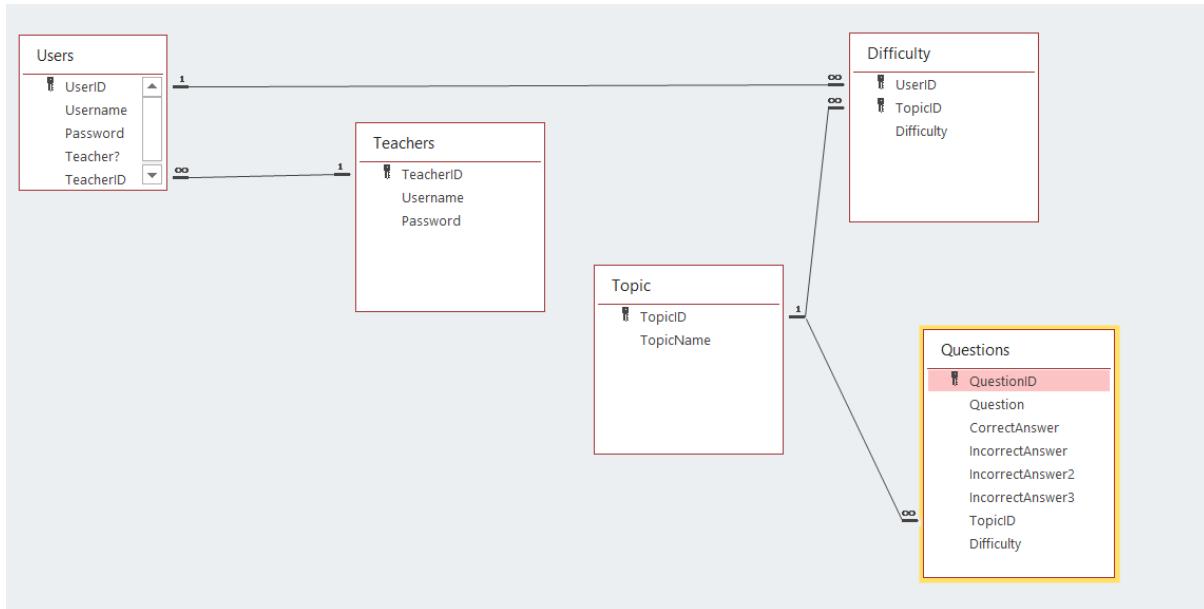
Then a Questions table

QuestionID	Question	CorrectAnswer	IncorrectAnswer	IncorrectAnswer2	IncorrectAnswer3	TopicID	Difficulty
1	What is the purpose of an ALU?	to perform arithmetic and logic operations	To send control signals around the computer	fetch, decode and execute instructions	to store data	1	0

Where all the questions will actually be stored.

There is an associated correct answer & 2 associated incorrect answers. The reason for associating possible incorrect answers is so that the incorrect answers will be somewhat related to the topic to make it less obvious. On questions I give a higher difficulty, the incorrect answers will be closer to what the true answer is.

I then made the following relationships between the tables:



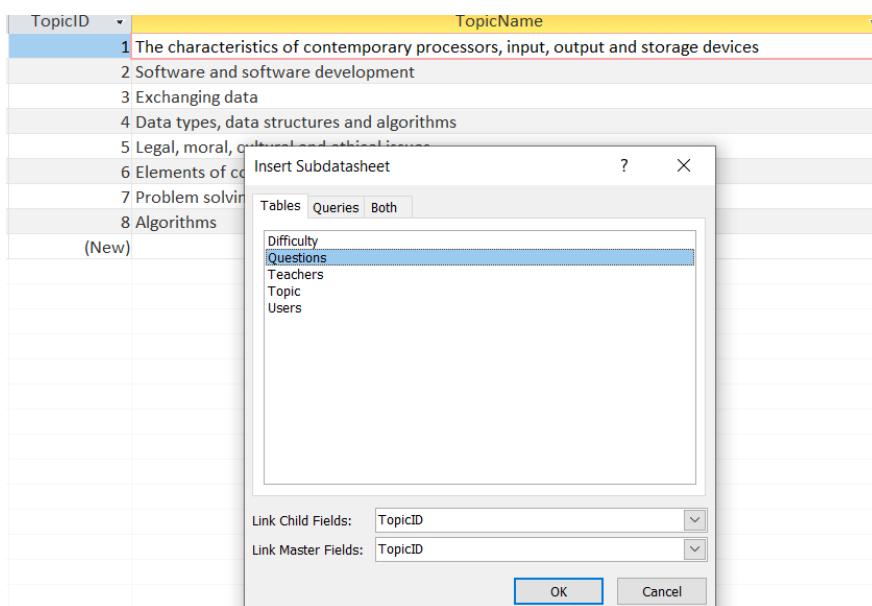
Two of my tables have fields in common, so I have embedded the datasheet from Questions in Topic. The subdatasheet is useful as it allows me to view and edit joined data easier.

The values in the Link Child Fields and Link Master Fields boxes create a one-to-many join between Topic and Questions with TopicID as the foreign in Questions.

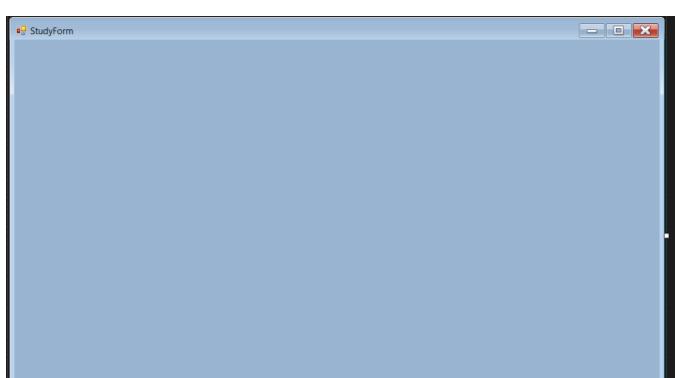
I went onto different quizzes for inspiration and used questions I thought would be helpful as well as questions I thought of myself and added around 100 questions. I have not yet added any questions to topicID 7 & topicID 8 as the questions were similar to that of ones in other topics or were something that didn't feel to appropriate to the quiz setting, but I may add some later.

It carries on like that for about 100 questions but I haven't decided on the difficulty for most of them just yet, but that is not required for this prototype.

Difficulty 1 will refer to an easy difficulty & difficulty 3 will refer to a harder question.

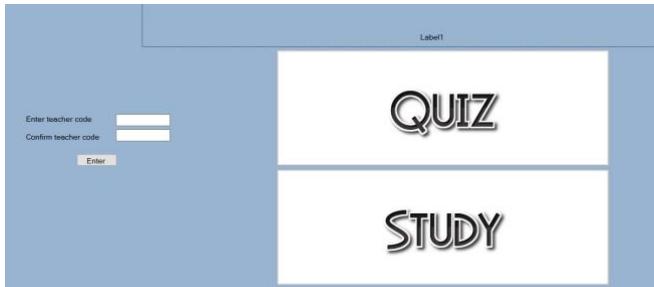


I then created a new form called StudyForm with the same background colour as the other forms

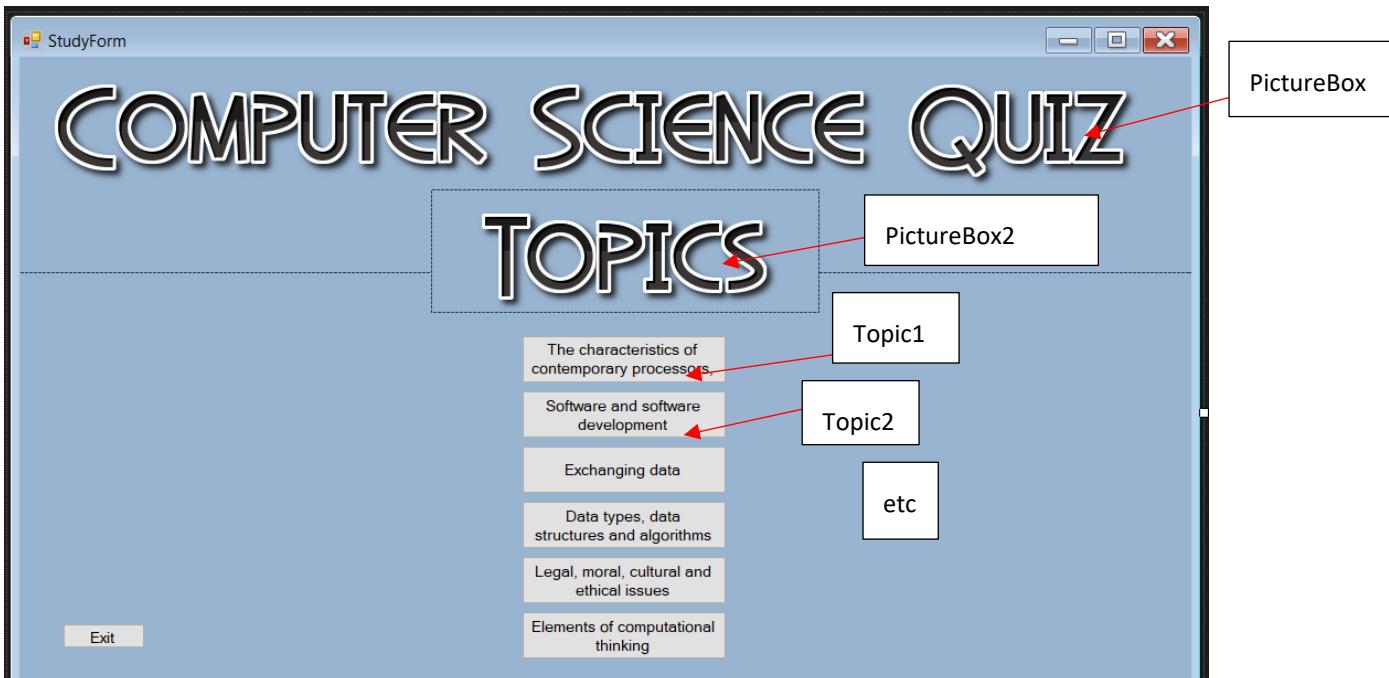


& added the following code to the study button

```
6 Private Sub StudyButton_Click(sender As Object, e As EventArgs) Handles StudyButton.Click
7     Me.Hide()
8     StudyForm.Show()
9 End Sub
```



I then added 2 picture boxes, the same "Computer Science Quiz" one from student form & one that says



"Topics". Then 7 buttons, 6 for the topics I have questions for from the database thus far & an exit button.

After that, I made a form called "Topic1Form" & made it so that the button "Topic1" hid the current form and opened Topic1Form.

```
10 Private Sub Topic1_Click(sender As Object, e As EventArgs) Handles Topic1.Click
11     Me.Hide()
12     Topic1Form.Show()
13 End Sub
```

I then added a ListView into the new form and made it fill the form and began making the code for the connection

```
1 Imports System.Data.OleDb
```

First I used imports as it gives me access to commands I am familiar with for displaying a database in a listview

```
4 Sub ListViewSetup()
5     'add columns to the listview
6     ListView1.Columns.Add("Questions", 500, HorizontalAlignment.Left)
7     ListView1.Columns.Add("Correct Answer", 500, HorizontalAlignment.Left)
8     'Display listview in details view
9     ListView1.View = View.Details
10    'display grid lines
11    ListView1.GridLines = True
12
13 End Sub
```

Then I created a subroutine that I will call later on. This will add the columns “Questions & Correct Answer” to the ListView, with the other parameters changing the width and its horizontal alignment, which I’ve made 500 and left respectively.

The line after sets the way the ListView is seen into the Details View which helps it to achieve its purpose of displaying the questions next to their answers.

GridLines is set to true so the user can clearly see where everything is separated.

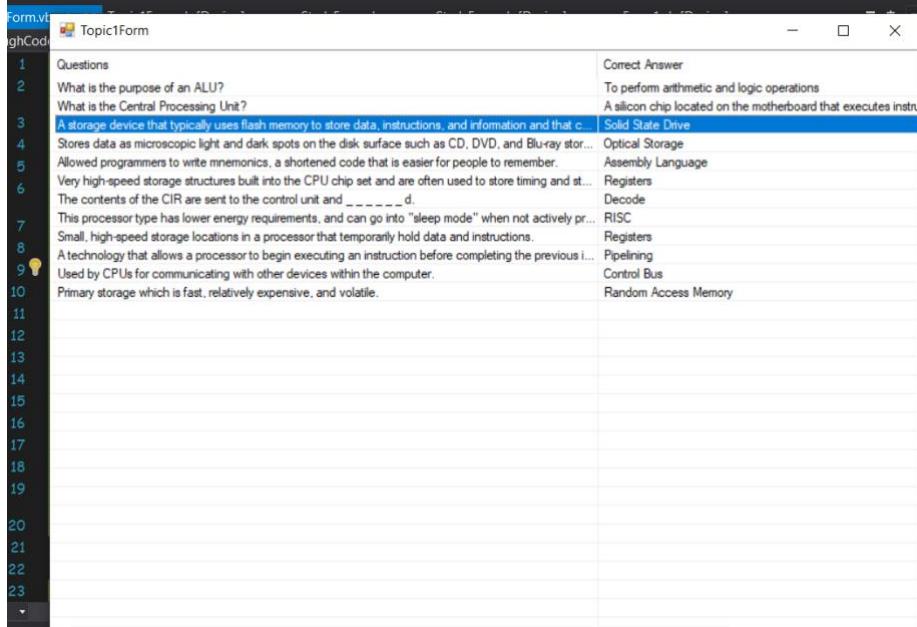
```
4 Dim connection As OleDbConnection
5 Dim command As OleDbCommand
6 Dim data_reader As OleDbDataReader
```

I then defined variables that I will be using.

```
22 Private Sub Topic1Form_Load(sender As Object, e As EventArgs) Handles MyBase.Load
23     'setup listview
24     ListViewSetup()
25     'connect to ms.access database
26     connection = New OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb")
27     connection.Open()
28     'reading data from Questions table
29     Command = New OleDbCommand("SELECT * FROM Questions WHERE TopicID = 1", connection)
30     data_reader = Command.ExecuteReader
31
32     'adds data to listview
33     If data_reader.HasRows Then
34         While data_reader.Read
35             Dim newitem As New ListViewItem()
36             newitem.Text = data_reader.GetValue(1) 'first column
37             newitem.SubItems.Add(data_reader.GetValue(2)) 'second column
38             ListView1.Items.Add(newitem)
39         End While
40     End If
41 End Sub
```

When the form loads up, it will call the subroutine made earlier which sets up the listview. It then creates a connection with the database and runs the sql command to read all data from Questions from Topic 1. Once the connection has been established, it adds the data to listview of the columns I have specified from the database to each of the columns apart of the list view.

Test No	What is being tested	Expected Outcome	Actual Outcome
29	Button – Study Button – Topic1 ListView - ListView1	Study button in studentform will take me to studyform. Topic1 button in studyform will take me to Topic1Form. Listview will display the data from the database in a format that is readable	Test was successful however I will adjust the sizing of the form and listview & I will increase the width of the columns As you cannot see the entire questions for some.



I then manually resized the form and listview & changed the code for the width of the columns

```
9     ListView1.Columns.Add("Questions", 800, HorizontalAlignment.Left)  
10    ListView1.Columns.Add("Correct Answer", 900, HorizontalAlignment.Left)
```

Test No	What is being tested	Expected Outcome	Actual Outcome
29a	ListView1	It will display the data from the database in a format that is readable	Test was successful

The correct answers can be seen simply by using the horizontal scrollbar.

I realise there isn't an exit button which I will now add.



```

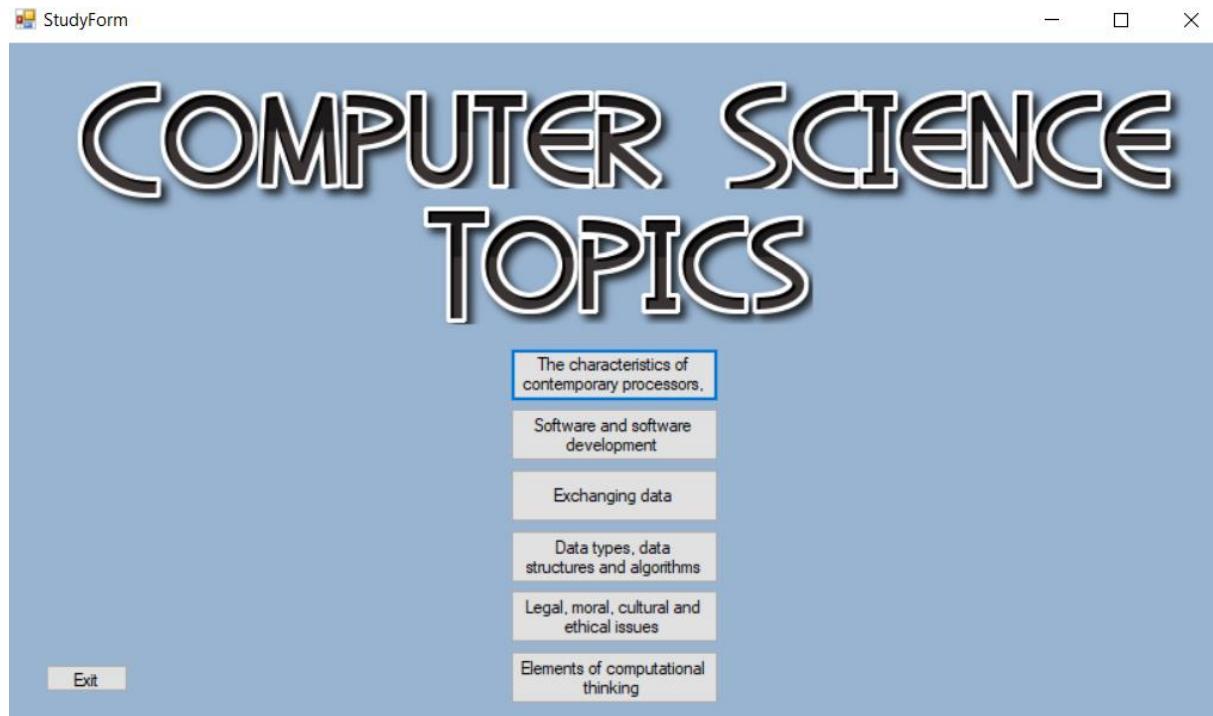
41  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
42      Me.Hide() 'hides current form
43      StudyForm.Show() 'shows studyform again
44  End Sub

```

Test No	What is being tested	Expected Outcome	Actual Outcome
29b	ListView1	It will display the data from the database in a format that is readable as well as an exit button that works	Test was successful.

< Exit >

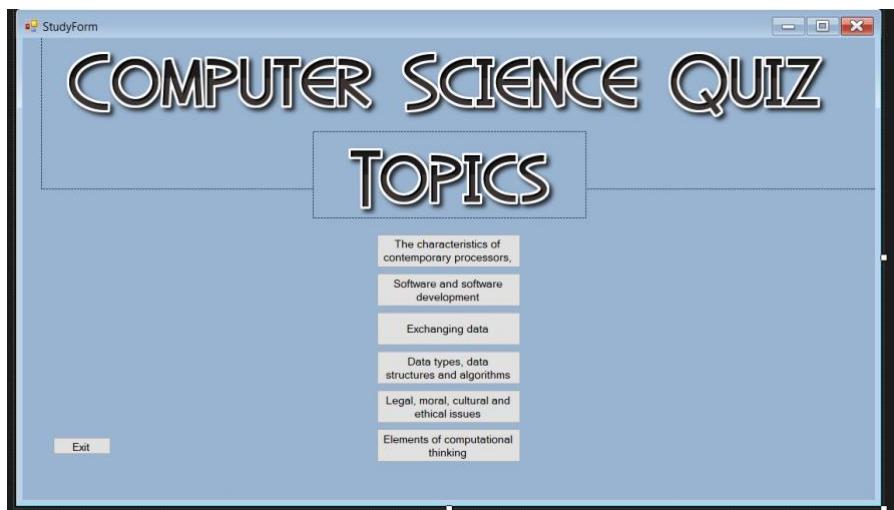
After pressing the exit button, returns to studyform as required & is a **usability feature**.



Topic1Form is now complete.

I will now repeat this entire process for the other topics which I will not bother documenting in as much detail step by step as it will be almost the exact same thing around 6 times.

In StudyForm,



I finally added the code for the exit button

```
40 |  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
41 |  Me.Hide() 'hides the current form
42 |  StudentForm.Show() 'shows studentform again
43 | End Sub
```

& then added the following code to the buttons

```

14      0 references
15  □ Private Sub Topic2_Click(sender As Object, e As EventArgs) Handles Topic2.Click
16      Me.Hide()
17      Topic2Form.Show()
18  End Sub
19
20      0 references
21  □ Private Sub Topic3_Click(sender As Object, e As EventArgs) Handles Topic3.Click
22      Me.Hide()
23      Topic3Form.Show()
24  End Sub
25
26      0 references
27  □ Private Sub Topic4_Click(sender As Object, e As EventArgs) Handles Topic4.Click
28      Me.Hide()
29      Topic4Form.Show()
30  End Sub
31
32      0 references
33  □ Private Sub Topic5_Click(sender As Object, e As EventArgs) Handles Topic5.Click
34      Me.Hide()
35      Topic5Form.Show()
36  End Sub
37
38      0 references
39  □ Private Sub Topic6_Click(sender As Object, e As EventArgs) Handles Topic6.Click
40      Me.Hide()
41      Topic6Form.Show()
42  End Sub

```

I then created the forms to be shown and repeated the code for Topic1Form, just replacing the number “1” with whatever associated topic number it is.

Test No	What is being tested	Expected Outcome	Actual Outcome
30	In all topic forms, ListView1 & Button1 (exit button)	It will display the data from the database in a format that is readable as well as an exit button that works	Test was successful.

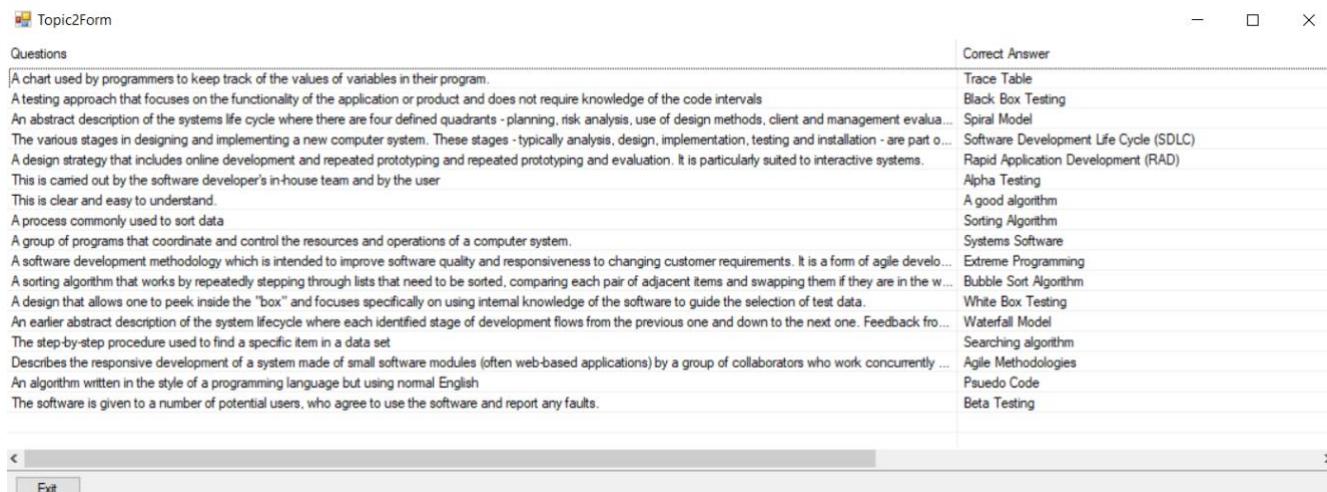
Topic2Form

Questions

A chart used by programmers to keep track of the values of variables in their program.
A testing approach that focuses on the functionality of the application or product and does not require knowledge of the code intervals
An abstract description of the systems life cycle where there are four defined quadrants -planning, risk analysis, use of design methods, client and management evalua...
The various stages in designing and implementing a new computer system. These stages - typically analysis, design, implementation, testing and installation - are part o...
A design strategy that includes online development and repeated prototyping and repeated prototyping and evaluation. It is particularly suited to interactive systems.
This is carried out by the software developer's in-house team and by the user
This is clear and easy to understand.
A process commonly used to sort data
A group of programs that coordinate and control the resources and operations of a computer system.
A software development methodology which is intended to improve software quality and responsiveness to changing customer requirements. It is a form of agile develo...
A sorting algorithm that works by repeatedly stepping through lists that need to be sorted, comparing each pair of adjacent items and swapping them if they are in the w...
A design that allows one to peek inside the "box" and focuses specifically on using internal knowledge of the software to guide the selection of test data.
An earlier abstract description of the system lifecycle where each identified stage of development flows from the previous one and down to the next one. Feedback fro...
The step-by-step procedure used to find a specific item in a data set
Describes the responsive development of a system made of small software modules (often web-based applications) by a group of collaborators who work concurrently ...
An algorithm written in the style of a programming language but using normal English
The software is given to a number of potential users, who agree to use the software and report any faults.

Correct Answer

Trace Table
Black Box Testing
Spiral Model
Software Development Life Cycle (SDLC)
Rapid Application Development (RAD)
Alpha Testing
A good algorithm
Sorting Algorithm
Systems Software
Extreme Programming
Bubble Sort Algorithm
White Box Testing
Waterfall Model
Searching algorithm
Agile Methodologies
Pseudo Code
Beta Testing



Questions	Correct Answer
Easier to maintain and change a normalised database	Advantages of normalisation
No duplication	File Transfer Protocol
Data integrity is maintained	Check sum detection
Saves storage	Internet registrar
Used to transfer files across a network	SQL
A calculation is done before data is sent and when data is received this is compared to see if an error has occurred or not	Proxy Server
Organisation that manages all of the internet domain names; it stores all of the domain names which have been created	Run length encoding
Declarative language used for querying and updating tables in a relational database	Search Engines
Makes a request on behalf of your computer so the true IP address is hidden	Reducing data
Summarises consecutive patterns of the same data; wherever there is repetition	Atomicty
Provides a number of ways to find information quickly and efficiently from anywhere in the web	Trojans
Data can be sent quicker	Public Addresses
Less bandwidth is used as transfer limits can apply	Transmission control/ internet protocol
Buffering is less likely	Class B addresses
Less storage is required	Packet switching
Transaction is processed in its entirety (whole thing) or not at all	Lossless compression
Malicious software disguised as genuine programs	2nd normal form
Addresses anyone can use it	
Used to carry data packets across the internet	
Uses the first two octet as the network address and the other two as the node address. Begins with a 10	
Where large data files are broken down into a series of smaller packets and are transmitted over different routes	
Patterns in the data are spotted and summarised to reduce the size of the file	
Contains no partial dependencies - no attributes are dependent on part of a composite key	
If the primary key is a composite key	

< Exit

Questions	Correct Answer
The output is true when either inputs are true, but not both. Otherwise, the output is false.	XOR
0+0=1, 1+0=1, 0+1=1, 1+1=0 (carry 1) and 1+1+1=1 (carry 1). Apply this logic from right to left on a binary number. If carrying is required on the eighth bit, it is causes a...	Binary addition
Write out column values based on the powers of 2, starting from 2^0 , from right to left, and the binary number underneath it. Add together the column values which con...	Converting Binary to denary
Allows for 65,536 different combinations and can represent alphabets from dozens of languages such as Latin and Arabic. A further version was also developed to incl...	Unicode
Data types are provided by a programming language. They include integers, real/floating point numbers, boolean variables, characters and strings.	Primitive data types
A kilobyte (KB) represents 1024 bytes, while a kilobyte (KB) represents 1000 bytes. The same pattern goes for megabytes (10^6 B, MB) and mebibytes (2^{20} B, MiB), gi...	Unit Nomenclature
Where all the bits move either right or left, causing the least significant bit to be shifted into the carry bit, and a 0 moves into the most significant bit to occupy the vacat...	Logical Shift
Divide the denary number by 2 and record its remainder (either 1 or 0) until there is 0 remaining. The remainders, written in order, is the converted binary number.	Denary to binary
Names = ['Sam', 'Lucy', 'James', 'Jack', 'Jane']	Array
First-in-first-out data structure	Queue
Cannot be edited once assigned and can contain values of different types	Tuples
Used to find empty spaces in a static array	Searching array
Empty in Python	NULL
Easily implemented using an array or linked list to hold the data and a variable to point to the top of the structure	Stacks
Last-in-first-out data structure	Stacks
Factor effecting runtime of program	Type of data structure
Stored in private section of the Node class	Information (pointer & data)
Adjust item before node to point to item after node	Remove node
Easily implemented in Python using an array and two variables, one pointing to first item in the other pointing to next free space	Queue

< Exit

Questions	Correct Answer
Controls the way data about living people is stored and processed	Data protection act 1998
Hacking, storing or processing personal data, trading hacking tools, making digital copies, intercepting messages	What is illegal?
Act prevents the threat of violence through stalking or trolling or any sort of communication material that can harm an individual	Communications act 2003
Intelligence that has been built into a computer program; enabling it to perform tasks normally done by humans	Artificial Intelligence
o Unable to make ethical decisions	Disadvantages of AI
Computers are not responsible for their actions. They are only as good as their algorithms	Advantages of AI
Regulates surveillance and investigation and covers the interception of communications	Regulation of investigatory powers act 2000
Laws which can be national or international	Legislation
o Fair and lawful	8 sections of data protection act
Relevant and not excessive	Equality Act 2010
Accurate and up to date	Environmental effects
o Only kept as long as needed	Disadvantages of a computer in a workplace
o Only be used for the stated purpose	Data Mining
o Be kept securely	Computer Misuse Act 1990
o Hacked	Internet Censorship
Certain protected characteristics which makes it illegal to discriminate anyone e.g. blind people	Advantages of computers in a workplace
o Computers are made from toxic materials (PCBs, airborne dioxins, cadmium, chromium, isotopes) that needs to be disposed of correctly	Copyright, designs & patents act 1988
Computers are hazardous w...	
o Some jobs have disappeared completely	
People are not educated in the new systems	
New computer systems can be expensive/to install	
Automated process that searches for patterns in large sets of data to predict and find links between events	
Makes it an offence to access/modify a computer without permission	
The deliberate suppression of what can be accessed or published on the internet	
o New job has been created	
Computer speed up the repetitive, boring parts of jobs, leaving people free to do the creative/interesting parts	
o Computers are cheaper t...	
Covers the copying or use of other peoples work e.g. books, music and software	

< Exit

Questions	Correct Answer
The act of representing essential features or details without including the background details or explanations.	
A problem solving approach (also known as stepwise design) in which you breakdown a system to gain insight into the sub-systems that make it up.	
The thought processes involved in formulating problems and their solutions. It involves algorithmic thinking and logical thinking.	
Refers to when a computer uses information	
A list of steps that allow you to complete a task	
Refers to when a computer takes in information	
A piece of code that you can easily call over and over again.	
The action of doing something over and over again.	
A programming language that captures only the most primitive operations available to a machine. Anything that a computer can do can be represented with combinations of these operations.	
A graphical representation of a computer program in relation to its sequence of functions.	
Putting commands in correct order so computers can read the commands.	
A generic term for a type of programming statement (usually an if-statement) that uses a Boolean condition to determine, or select, whether or not to run a certain block of code.	
A base-16 number system that uses sixteen distinct symbols 0-9 and A-F to represent numbers from 0 to 15	
A text based informal language that helps programmers develop algorithms.	
To repeat in order to achieve, or get closer to, a desired goal	
Refers to when a computer sends out information.	
A collection of commands made available to a programmer	
A particular kind of looping construct provided in many languages. Defines a counting variable that is checked and incremented on each iteration in order to loop a specific number of times.	
	For loop

Exit

Prototype 2 is now complete

CLIENT INTERVIEW & ANALYSIS

CRAIG BRIDGENS

Said he thought it was fine & liked the usage of a database to store the questions, however thought I should add the extra topics & more difficult questions.

I didn't add the last couple topics as there appeared to be a decent amount of crossover between the topics where there were questions that it was appropriate for the format of my quiz, therefore I have not bothered adding the last couple topics. Adding the current questions within the database took a significant amount of time. I doubt I will have enough time to find more questions to use for this, especially when having to filter out any that might be considered easy. This will be something I will add towards the end, if I have time after adding all the main features as it may be required for Topic Quizzes.

JOSH FRASER

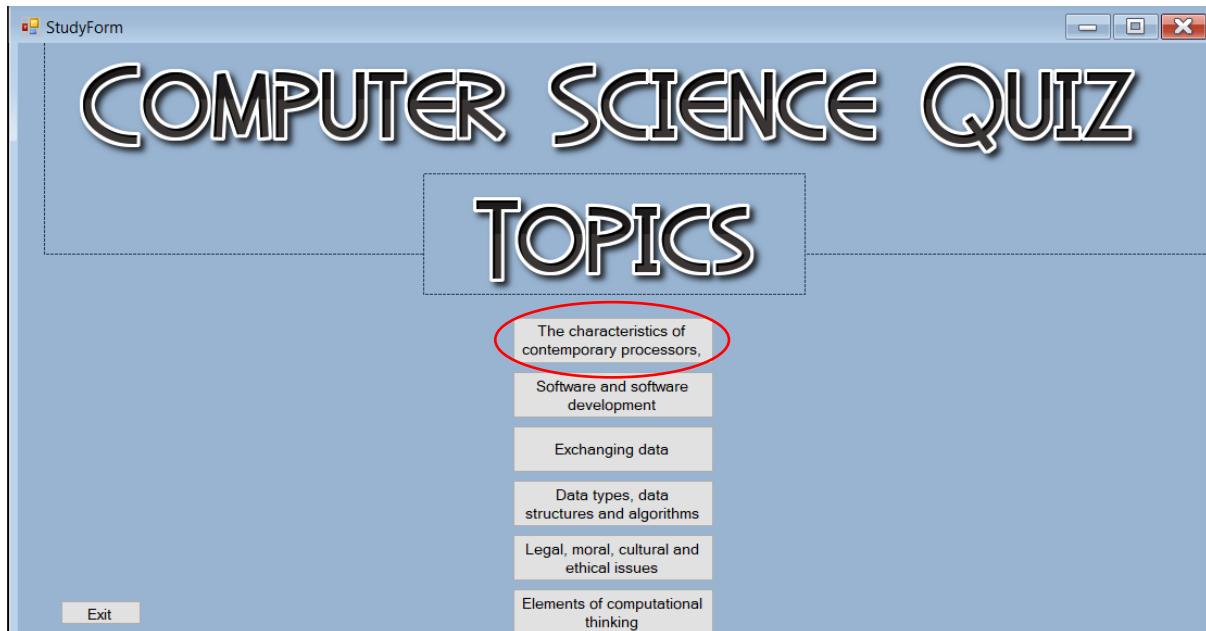
Said he liked the separation between topics & suggested adding exam questions for the students to use for revision

I believe this would be quite useful to the students using this program so I will try to add this after the main features of the quiz

CHANGES

Exam Questions

I created a new form called Topic1LinkForm & changed the code for this button in StudyForm:



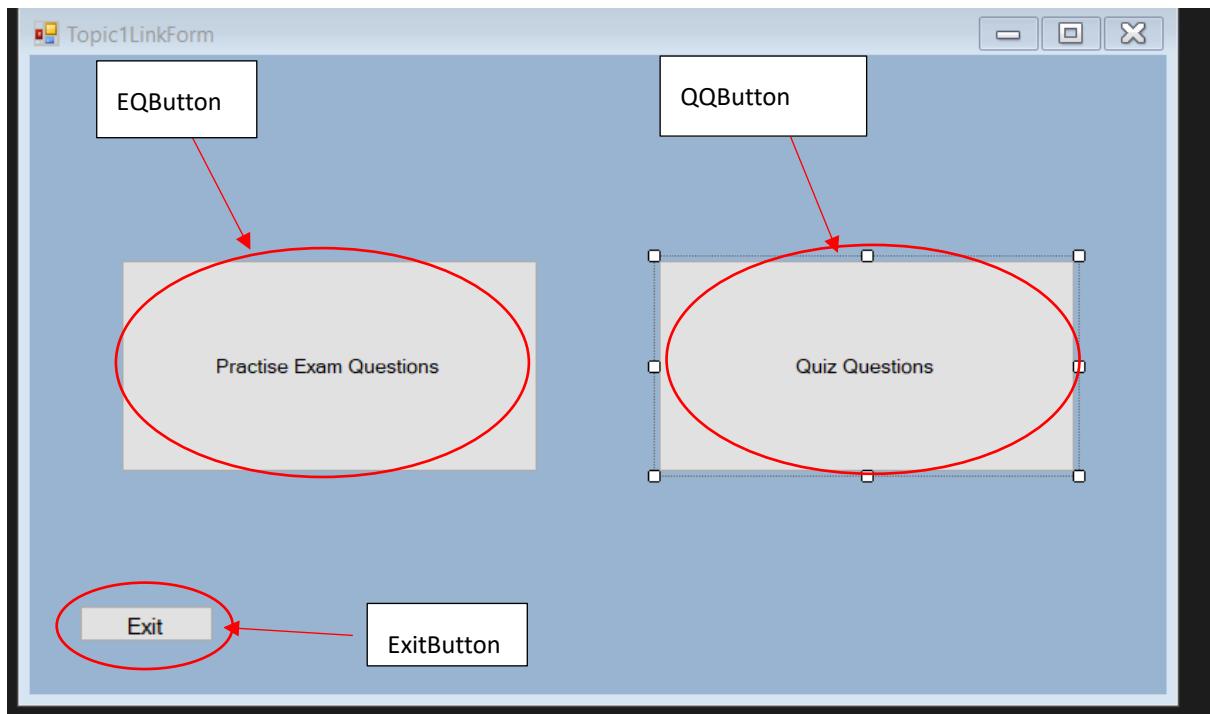
```
10  Private Sub Topic1_Click(sender As Object, e As EventArgs) Handles Topic1.Click
11      'hides current form and shows topic1form
12      Me.Hide()
13      Topic1Form.Show()
14  End Sub
```

So that it now shows Topic1LinkForm

```
10  Private Sub Topic1_Click(sender As Object, e As EventArgs) Handles Topic1.Click
11      'hides current form and shows topic1Linkform
12      Me.Hide()
13      Topic1LinkForm.Show()
14  End Sub
```

I then created a form called Topic1EQForm.

The design of topic1linkform:



EQButton:

```

6  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles EQButton.Click
7      'hides current form & shows topic1eqform
8      Hide()
9      Topic1EQForm.Show()
10     End Sub

```

Hides current form and opens form where the user will be able to see the practise questions.

QQButton:

```

12     References
13  Private Sub QQButton_Click(sender As Object, e As EventArgs) Handles QQButton.Click
14      'hides current form and shows topic1form
15      Hide()
16      Topic1Form.Show()
17  End Sub

```

Hides current form and shows the form that the button in studyform originally linked to, that has the list of questions and answers related to topic1

ExitButton:

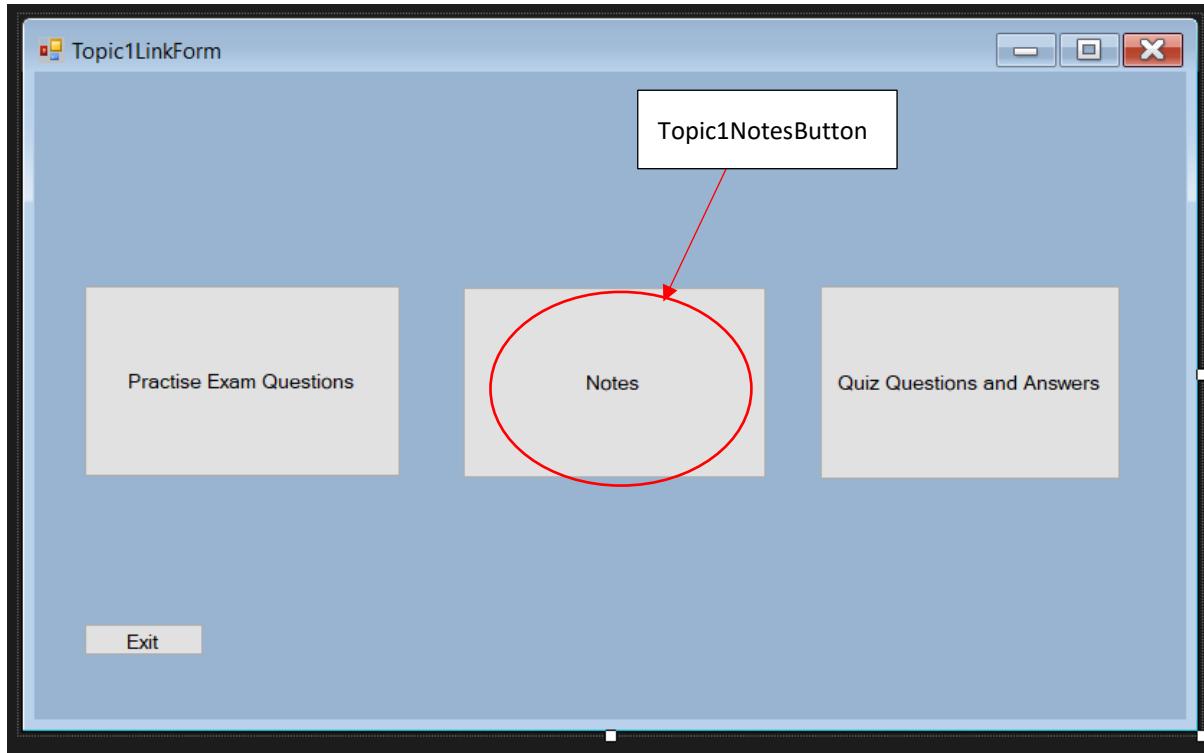
```

18  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
19      'hides current form and shows previous form - studyform
20      Hide()
21      StudyForm.Show()
22  End Sub

```

Hides current form and shows studyform

I then decided to add notes for the topics as this will aid their revision so I created a form called "Topic1NotesForm" & a button in the Topic1LinkForm that opens the new form.



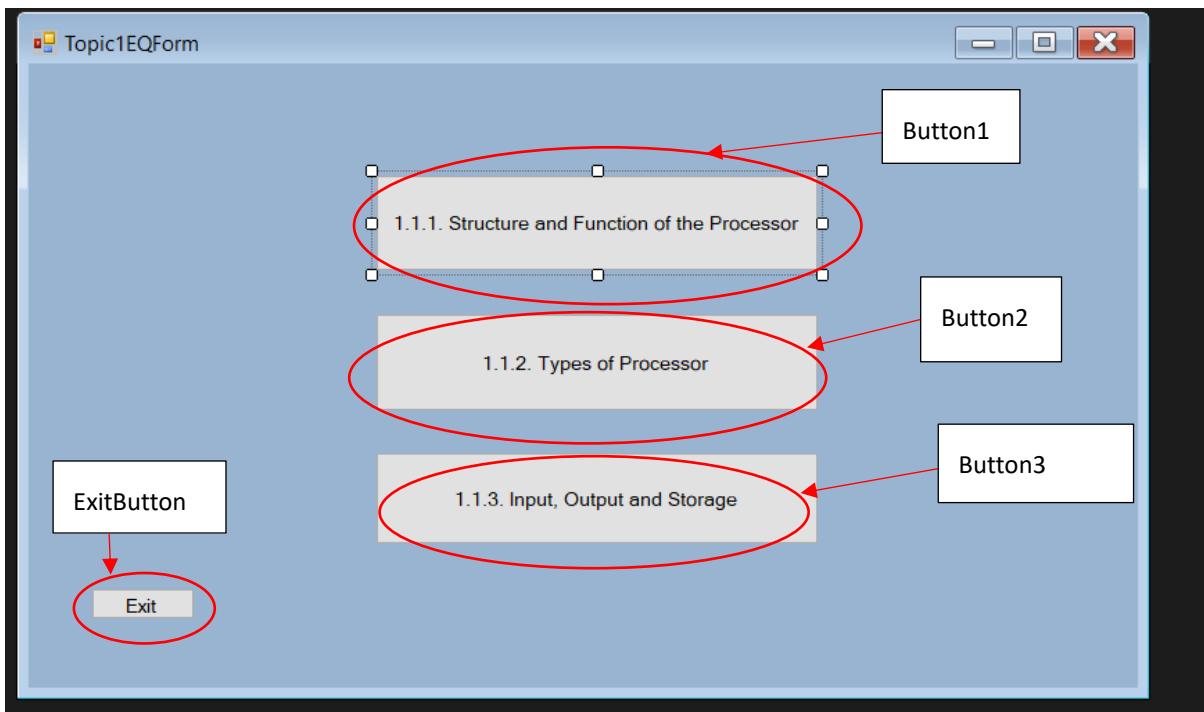
I will get the notes & exam questions from physicsandmathstutor.com and have the program open the pdfs in either their default pdf viewing application or any application of their choice.

Topic1NotesButton:

```
24  Private Sub Topic1NotesButton_Click(sender As Object, e As EventArgs) Handles Topic1NotesButton.Click
25      'hides current form and shows topic1notesform
26      Hide()
27      Topic1NotesForm.Show()
28  End Sub
```

Hides topic1linkform and opens topic1notesform where there will be notes on topic1.

Topic1EQForm:



Button1:

```

2  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
3      'opens pdf with exam questions
4      Process.Start("D:/College/Computer Science/Coursework/pmt/topic1/eq/1.1.1 Structure and function of the processor (A Level only).pdf")
5  End Sub

```

Button2 & 3:

```

7  References
8  Private Sub Button2_Click(sender As Object, e As EventArgs) Handles Button2.Click
9      'opens pdf with exam questions
10     Process.Start("D:/College/Computer Science/Coursework/pmt/topic1/eq/1.1.2 Types of Processor (A Level only).pdf")
11 End Sub
12 References
13 Private Sub Button3_Click(sender As Object, e As EventArgs) Handles Button3.Click
14     'opens pdf with exam questions
15     Process.Start("D:/College/Computer Science/Coursework/pmt/topic1/eq/1.1.3 Input, Output and Storage.pdf")

```

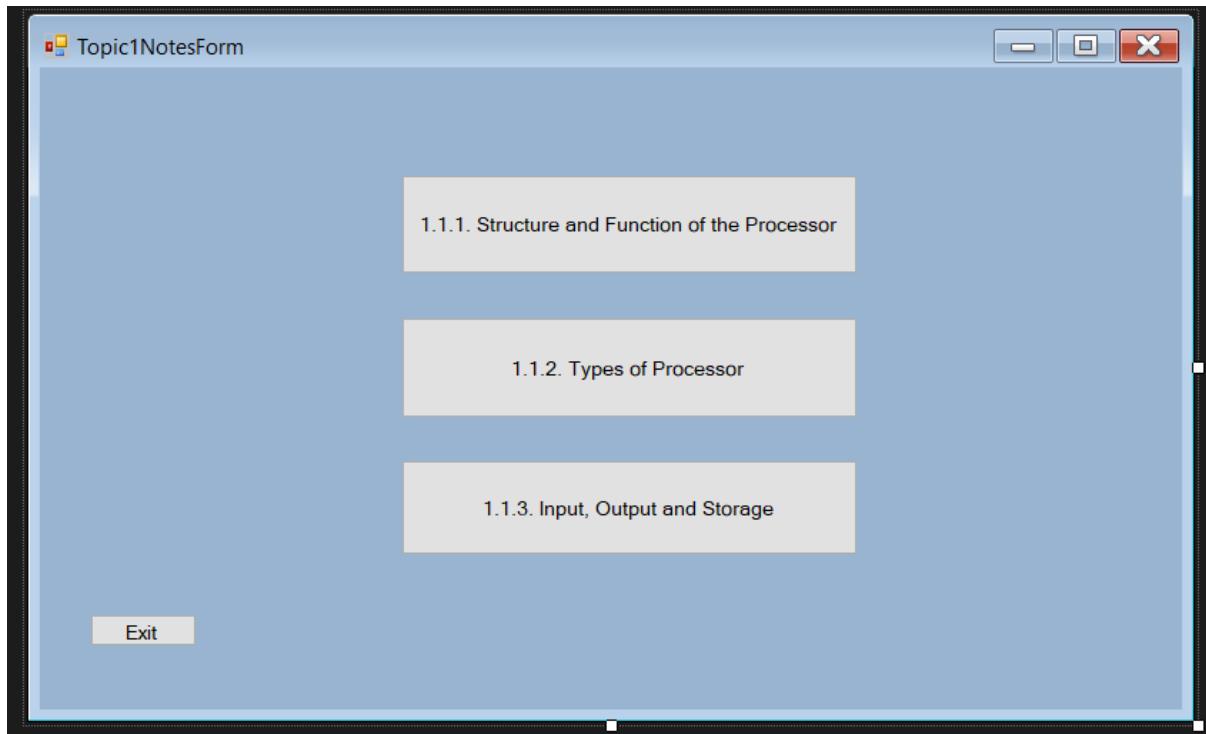
ExitButton:

```

17  References
18  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
19      'hides current form and shows topic1linkform
20      Hide()
21      Topic1LinkForm.Show()

```

Topic1NotesForm:



Which has its design the same as topic1eqform, however the difference is the code for each button and the pdf file that opens.

The exit button code is the same.

Button1,2 & 3:

```

2  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
3      'opens pdf with notes
4      Process.Start("D:/College/Computer Science/Coursework/pmt/topic1/notes/1.1. Structure and Function of the Processor notes.pdf")
5  End Sub
6
7  Private Sub Button2_Click(sender As Object, e As EventArgs) Handles Button2.Click
8      'opens pdf with notes
9      Process.Start("D:/College/Computer Science/Coursework/pmt/topic1/notes/1.1.2. Types of Processor notes.pdf")
10 End Sub
11
12 Private Sub Button3_Click(sender As Object, e As EventArgs) Handles Button3.Click
13     'opens pdf with notes
14     Process.Start("D:/College/Computer Science/Coursework/pmt/topic1/notes/1.1.3. Input, Output and Storage notes.pdf")
15 End Sub

```

I changed the exit button in topic1form to topic1linkform rather than studyform now so the program is easier to navigate as topic1linkform is now the form that is used to access topic1form.

Previous code:

```

41  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
42      Me.Hide() 'hides current form
43      StudyForm.Show() 'shows studyform again
44  End Sub

```

New:

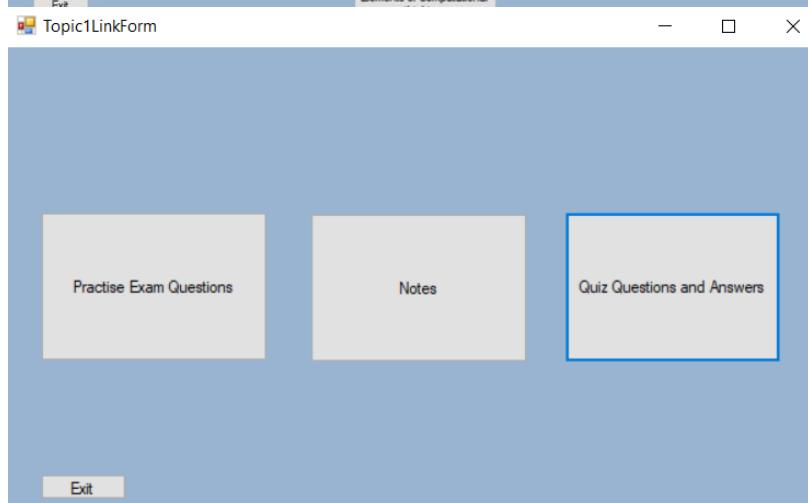
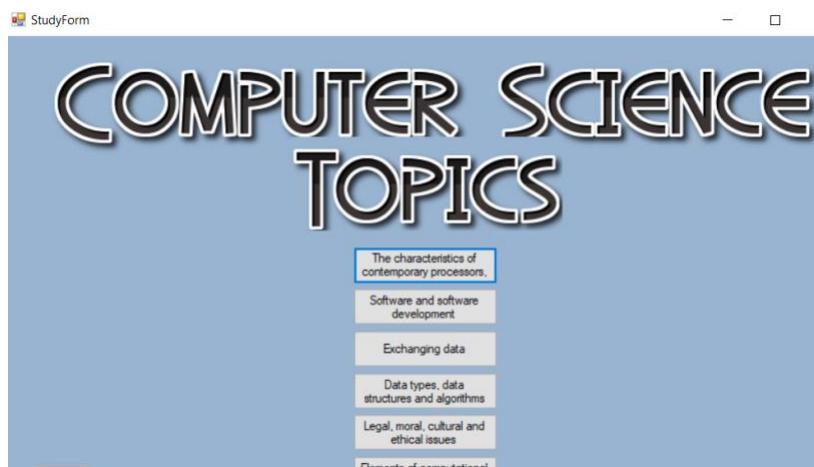
```

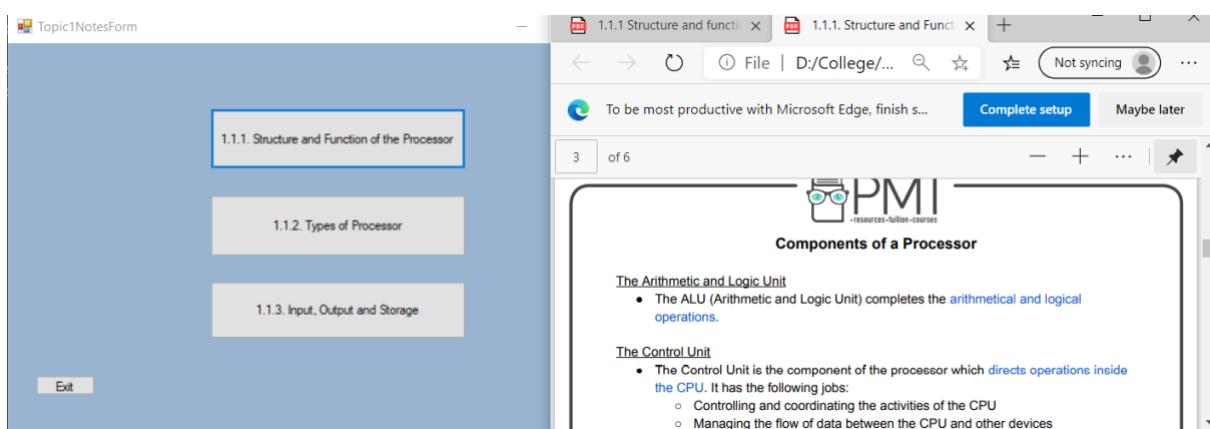
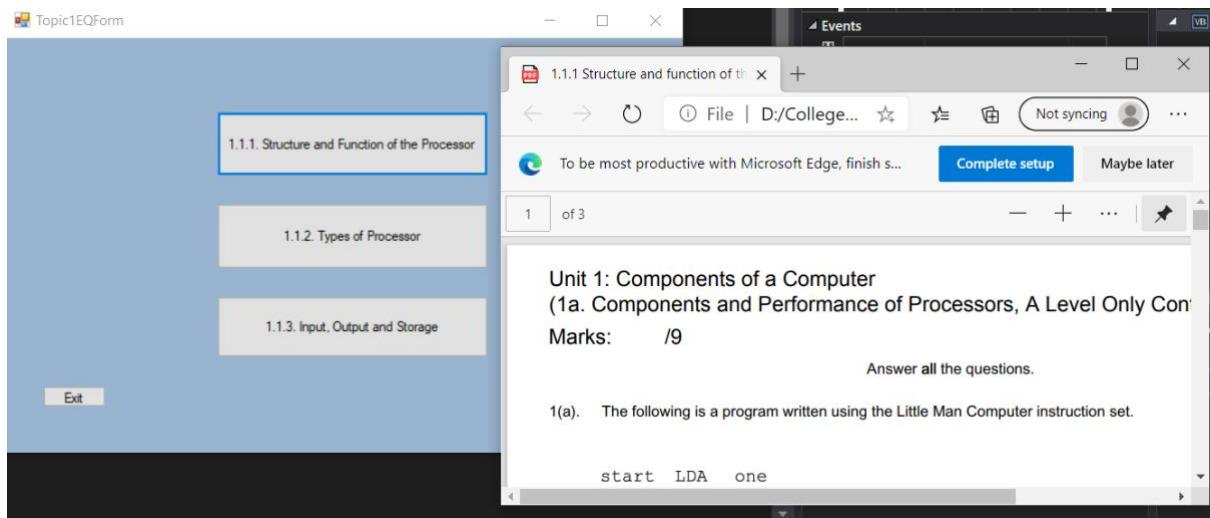
41  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
42      Me.Hide() 'hides current form
43      Topic1LinkForm.Show() 'shows topic1linkform again
44  End Sub

```

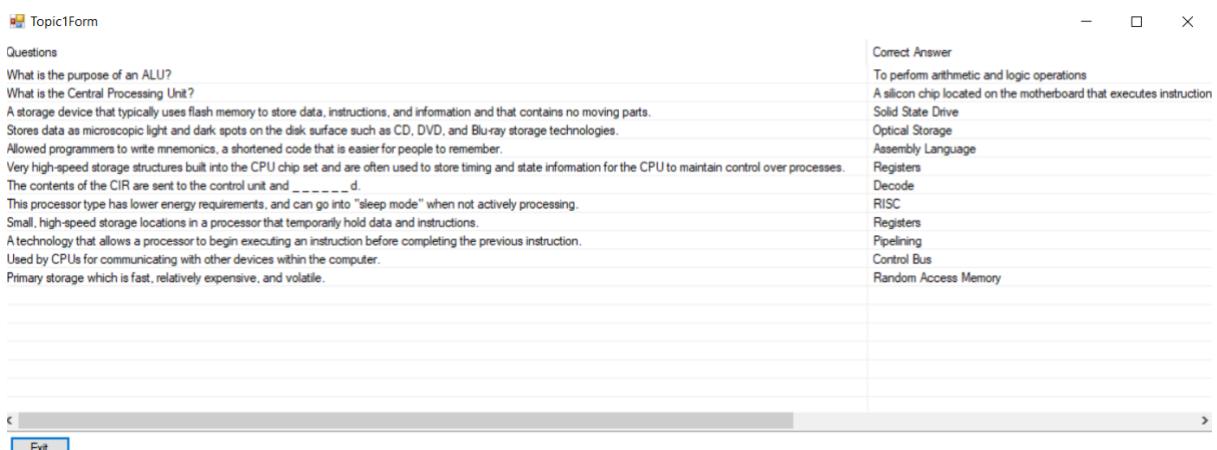
I was then going to repeat the steps for each topic with the minor changes to the code that applies it to each topic and added extra buttons in forms when there are extra subtopics, however whilst doing it, I realised I do not have time.

Test No	What is being tested	Expected Outcome	Actual Outcome
!1	New Study Section features	Buttons that are required to show a new form will work, exit buttons will close current form and open previous forms, buttons that should open pdfs will open pdfs and they will be the correct pdfs.	All worked as required





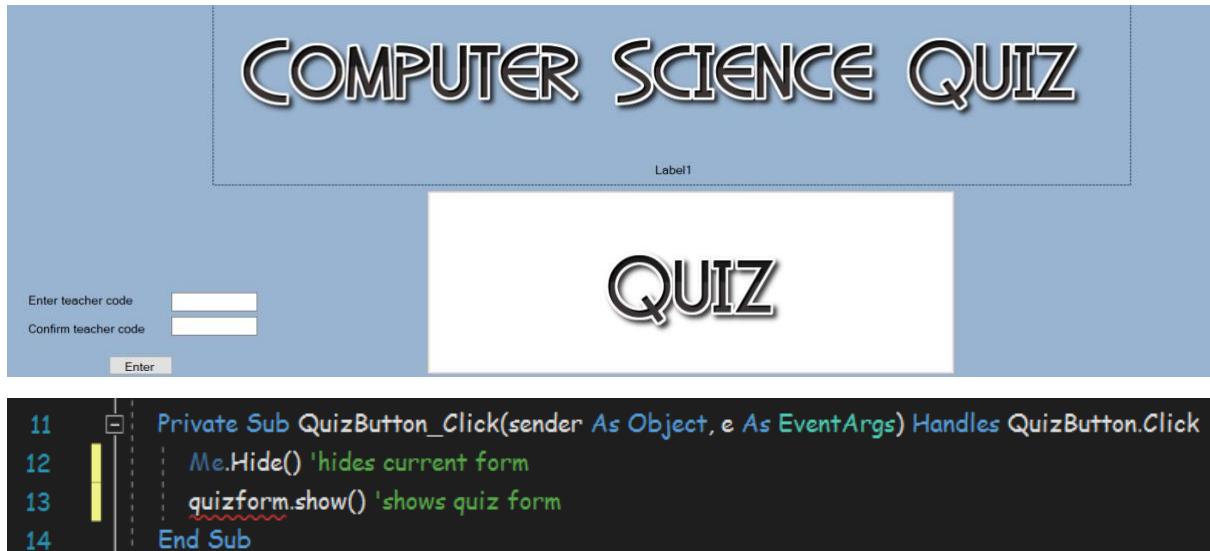
And the “Quiz Questions & Answers” button opens Topic1Form when navigating the first topic section which was created before.



All were tested and work, but I have not bothered to screenshot every single button working as they all work in the same way

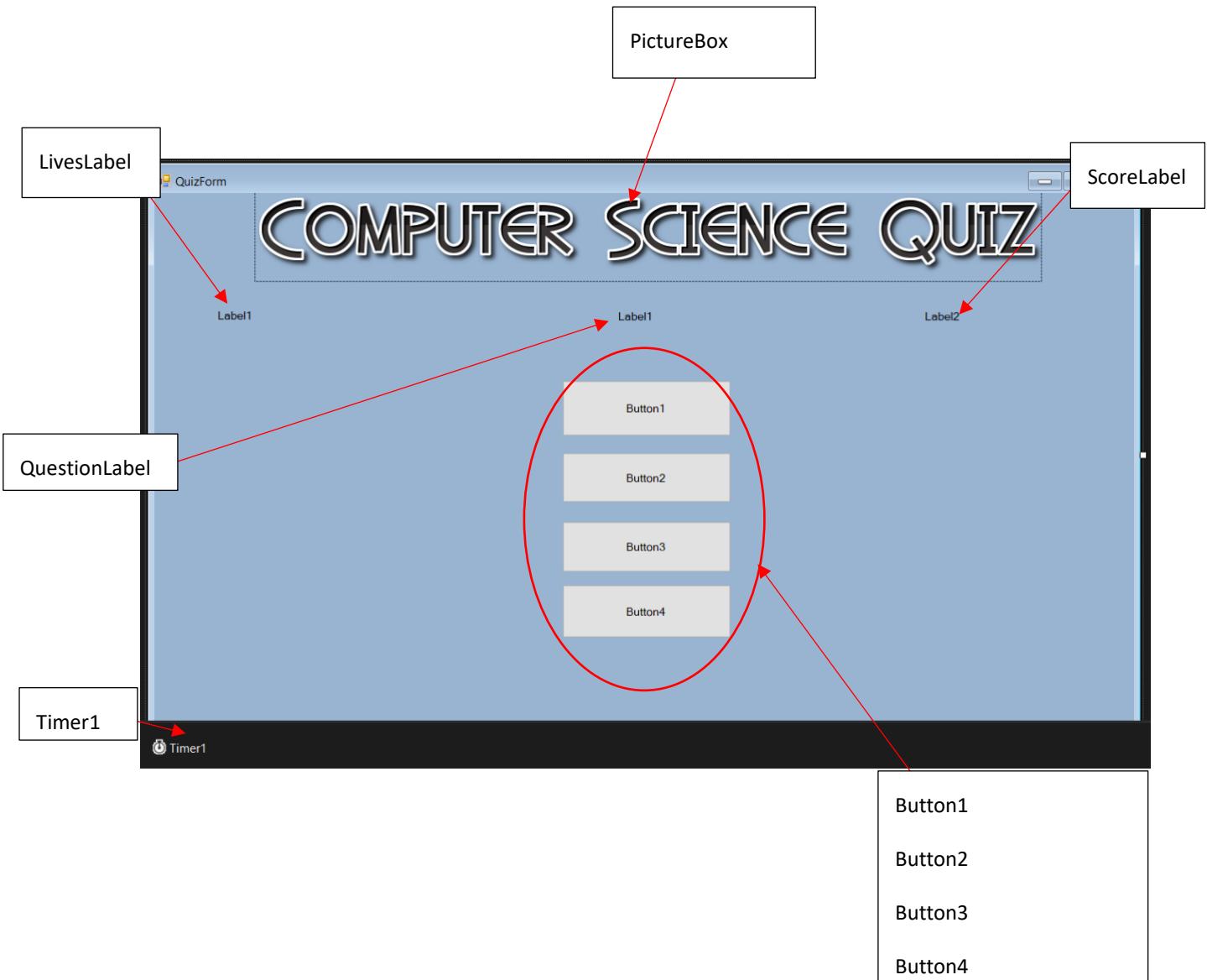
PROTOTYPE 3

On studentform,



So that it hides the current form & opens the quiz.

I then created a form called "QuizForm"



```

1  Public Class QuizForm
2      Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb") 'defines connection as a new instance
3      'of the OleDb.OleDbConnection class with the specified string that says its Provider and source, linking my database to the program
4      Dim dt As New DataTable 'defines dt as a new instance of the DataTable class
5      Dim DataAdapter As New OleDb.OleDbDataAdapter 'defines DataAdapter as a new instance of the OleDb.OleDbDataAdapter class
6
7      Dim score As Integer = 0 'defines variable score as integer with its initial value set to 0
8      Dim lives As Integer = 3 'defines variable lives as integer with its initial value set to 3
9      Dim questionscompleted As Integer = 0 'defines questionscompleted as integer with its initial value set to 0
10     Dim second As Integer 'defines second as integer to define each tick of 1000 miliseconds as a second
11
12     'the following integer variables will be used to randomly decide the column associated with each button
13     Dim w As Integer
14     Dim x As Integer
15     Dim y As Integer
16     Dim z As Integer

```

Defined variables in the public class before I need them, outside of subroutines in case I need them in multiple subs.

First 3 variables have the same purpose as when they were used in Form1, for the connection to the database.

Score is a variable integer as it will be a number that increases as the user gets more questions correct, doesn't need to have decimal values as that would unnecessarily complicate things for the user.

Lives is a variable integer as it will change each time a question is answered incorrectly, decrementing by one each time & there is no purpose to get rid of a fraction of a life.

Questions completed is an integer variable as a fraction of the question cannot be completed & it will increment by one each time a question is completed to keep track of the amount of questions so that the quiz ends after a certain number has been completed.

Second is an integer value as I don't need to be too accurate for anything, I just need to keep track of the amount of seconds that have passed. This will be used in conjunction with the timer so that each tick will represent a second.

W, x, y & z are integer variables as I need them to be randomly assigned a unique value between 2 & 5 inclusive each time a new question is presented. This is needed as a **usability feature**:

These numbers will refer to the column in the Questions datatable. As can be seen, column 2 represents the correct answers column & 3,4,5 represent each of the incorrect answer columns.

QuestionID	Question	CorrectAnswer	IncorrectAnswer	IncorrectAnswer2	IncorrectAnswer3	TopicID	Difficulty
1	What is the purpose of an ALU?	To perform arithmetic and logic operations	To send control signals around the computer	fetch, decode and execute instructions	to store data	1	1
2	What is the Central Processing Unit?	A silicon chip located on the motherboard that executes instructions to process data into information	A microprocessor that usually performs the calculations to produce high-quality graphic images on a screen	The rate at which a processor can complete a processing cycle	Stores data	1	3
3	A storage device that typically uses flash memory to store data, instructions, and information and that contains no moving parts.	Solid State Drive	Memory	Parallel Processing System	Proximity Sensor	1	3
4	Stores data as microscopic light and dark spots on the disk surface such as CD, DVD, and Blu-ray storage technologies.	Optical Storage	Registers	Cache	Primary Storage	1	1
5	Allows programmers to write mnemonics, a shortened code that is easier for people to remember.	Assembly Language	Parallel Processing System	Data Bus	Read-Only Memory	1	2

Each button's text will need to be taken from a random column value, thus I have made these variables to be assigned a random value, otherwise if I chose a number, a particular button will always be set to the correct answer which makes it harder for the user to actually learn & use the program as intended when they know exactly which button the correct answer will be.

Timer1_Tick()

```

61  Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
62      second = second + 1 'every time it ticks, variable second increases by 1
63      If second >= 10 Then 'if second reaches 10
64          Timer1.Stop() 'Timer stops functioning
65          second = 0 'seconds value is set to 0
66          Timer1.Start() 'Timer is started again
67      End If
68  End Sub

```

The timer is a **usability feature** as it requires

Every time the timer ticks, the integer variable second increases by one, keeping track of how many seconds are passing. The tick interval will be set to 1000 milliseconds which is one second.

If 10 seconds have passed, the timer stops, the variable second is set to 0 again & the timer is started again. This means the timer resets every time it reaches 10 seconds.

67

questionscompleted += 1

I then added this line so that if 10 seconds have passed, it understands that a question has been completed.

QuizForm_Load()

```
18  Private Sub QuizForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
19      Timer1.Interval = 1000 'sets the interval to 1 second
20      Timer1.Start() 'Timer starts functioning
21      ScoreLabel.Text = "Score = " & score 'label displays the current score
22      LivesLabel.Text = "Lives = " & lives 'label displays the current amount of lives remaining
```

Upon the quiz loading, I have set the interval of the timer to tick every 1000 milliseconds, which is equal to 1 second & it then starts the timer.

ScoreLabel will display the score & LivesLabel will display the lives remaining.

While Loop

23

While second < 10

I started a while loop so that it does this before 10 seconds have passed & I'm hoping that it will restart every time 10 seconds pass.

```
24      ' Initialize the random-number generator & following lines try to make it so that w, x, y, z are all unique values between 2 and 5 inclusive
25      Randomize()
26      w = CInt(Math.Floor((5 - 2 + 1) * Rnd())) + 2
27      Randomize()
28      x = CInt(Math.Floor((5 - 2 + 1) * Rnd())) + 2
29      While x = w
30          Randomize()
31          x = CInt(Math.Floor((5 - 2 + 1) * Rnd())) + 2
32      End While
33      Randomize()
34      y = CInt(Math.Floor((5 - 2 + 1) * Rnd())) + 2
35      While y = w Or y = x
36          Randomize()
37          y = CInt(Math.Floor((5 - 2 + 1) * Rnd())) + 2
38      End While
39      Randomize()
40      z = CInt(Math.Floor((5 - 2 + 1) * Rnd())) + 2
41      While z = w Or z = x Or z = y
42          Randomize()
43          z = CInt(Math.Floor((5 - 2 + 1) * Rnd())) + 2
44      End While
```

This is all inside the while loop which hasn't yet ended.

Here I'm trying to get unique values between 2 & 5 inclusive, using a method of a random number generator for the integer variables.

```
45  Dim SQLString1 As String = "SELECT TOP 1 * FROM Questions ORDER BY RND(QuestionID)"
46  'Defines variable sqlstring1 As data type String, which contains the Command To read all from the 1st row from data table Questions which has been randomly ordered by QuestionID
47  connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
48  DataAdapter = New OleDb.OleDbDataAdapter(SQLString1, connection)
49  dt.Clear()
50  DataAdapter.Fill(dt)
51  connection.Close()
52  QuestionLabel.Text = dt.Rows(0)(1) 'sets question label to the randomly selected question
53  'Set the text of the following buttons to a record from random row with the column a random value between 2 and 5 inclusive
54  Button1.Text = dt.Rows(0)(w)
55  Button2.Text = dt.Rows(0)(x)
56  Button3.Text = dt.Rows(0)(y)
57  Button4.Text = dt.Rows(0)(z)
58  End While
59  End Sub
```

I then define sqlstring1 as a variable string which contains the SQL command to read the 1st row from Questions after it has been randomly ordered by QuestionID.

It then connects to the database and runs the sql command which allows me to use dt.rows

QuestionLabel text is set to the column 1 which contains the actual question.

Each of the buttons has a rand column value between 2 & 5, and whichever one gets the value of 2 will be the correct answer, therefore I've added the following code to each button.

```
0 references
71 Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
72     'if w gets chosen as 2 & this particular button is clicked then score increments & timer resets
73     If w = 2 Then
74         score += score + 1
75         questionscompleted += 1
76         Timer1.Stop()
77         Timer1.Start()
78     End If
79 End Sub
0 references
80 Private Sub Button2_Click(sender As Object, e As EventArgs) Handles Button2.Click
81     'if x gets chosen as 2 & this particular button is clicked then score increments & timer resets
82     If x = 2 Then
83         score += score + 1
84         questionscompleted += 1
85         Timer1.Stop()
86         second = 0
87         Timer1.Start()
88     End If
89 End Sub
0 references
90 Private Sub Button3_Click(sender As Object, e As EventArgs) Handles Button3.Click
91     'if y gets chosen as 2 & this particular button is clicked then score increments & timer resets
92     If y = 2 Then
93         score += score + 1
94         questionscompleted += 1
95         Timer1.Stop()
96         second = 0
97         Timer1.Start()
```

```

98     End If
99  End Sub
0 references
100 Private Sub Button4_Click(sender As Object, e As EventArgs) Handles Button4.Click
101     'if z gets chosen as 2 & this particular button is clicked then score increments & timer resets
102     If z = 2 Then
103         score += score + 1
104         questionscompleted += 1
105         Timer1.Stop()
106         second = 0
107         Timer1.Start()
108     End If
109 End Sub
110 End Class

```

I then added

```

Else
    lives -= 1 'takes 1 away from lives

```

To all of the if statements in the button click subroutines.

Test No	What is being tested	Expected Outcome	Actual Outcome
31	Labels & button text	<p>Labels will show lives, the question & the score.</p> <p>Button text will be possible answers to the question in a random order</p>	QuizForm did not load.

It is likely that there was an infinite loop with the w,x,y,z variable integers as the form showed up when the code was removed.

I will now get a random value for them through a different method.

```

64      0 references
65  Private Sub QuizForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
66      Timer1.Interval = 1000 'sets the interval to 1 second
67      Timer1.Start() 'Timer starts functioning
68      ScoreLabel.Text = "Score = " & score 'label displays the current score
69      LivesLabel.Text = "Lives = " & lives 'label displays the current amount of lives remaining
70
71      Randomize()
72      Dim Rand As New Random()
73      Dim Index As Integer = Rand.Next(0, wxyzArray.Length - 1)
74      Dim SelectedValue = wxyzArray(Index)
75      w = SelectedValue
76      RemoveArrayElement_Old(wxyzArray, Index)
77
78      Index = Rand.Next(0, wxyzArray.Length - 1)
79      SelectedValue = wxyzArray(Index)
80      x = SelectedValue
81      RemoveArrayElement_Old(wxyzArray, Index)
82
83      Index = Rand.Next(0, wxyzArray.Length - 1)
84      SelectedValue = wxyzArray(Index)
85      y = SelectedValue
86      RemoveArrayElement_Old(wxyzArray, Index)
87
88      Index = Rand.Next(0, wxyzArray.Length - 1)
89      SelectedValue = wxyzArray(Index)
90      z = SelectedValue
91      RemoveArrayElement_Old(wxyzArray, Index)

```

Test No	What is being tested	Expected Outcome	Actual Outcome
31a	Labels & button text	<p>Labels will show lives, the question & the score.</p> <p>Button text will be possible answers to the question in a random order</p>	QuizForm did load this time, however potential answers were repeated.

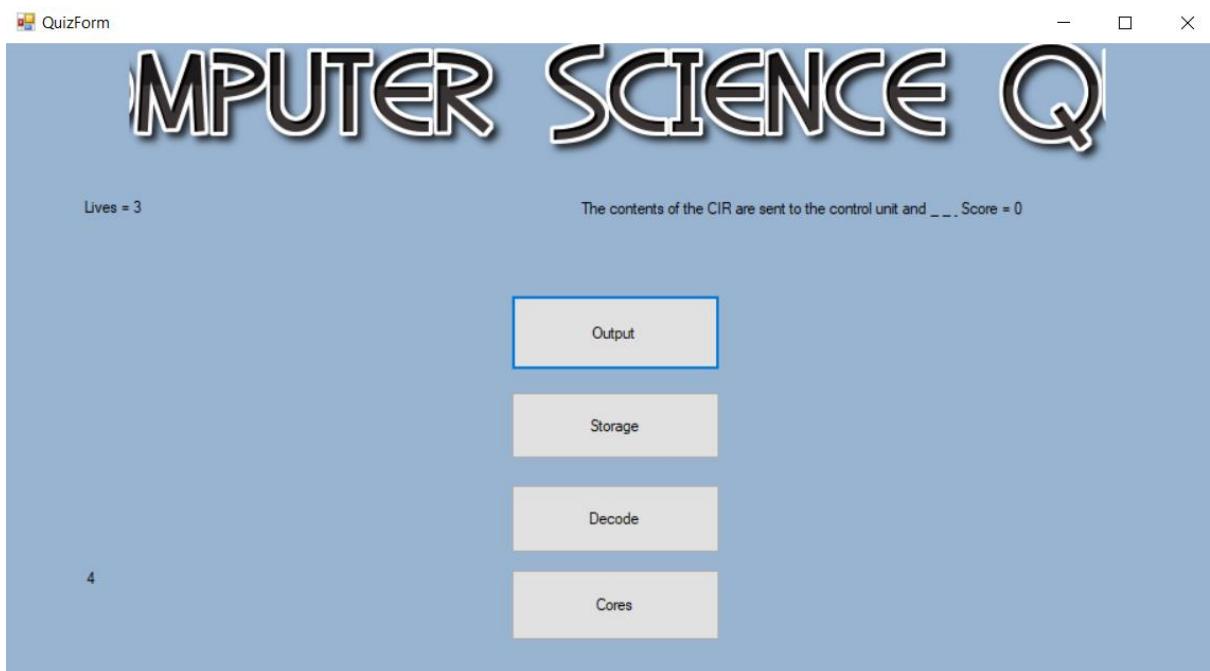
```

28      Dim usednumbers(4) As Integer 'array defined as usednumbers and limit of 4 values
29      Dim count = 0 'dims count as integer set to 0
30      Randomize() ' initializes random number generator
31      Dim rand As Integer = Int(Math.Floor((5 - 2) * Rnd()) + 2) 'defines rand as integer and sets it to a randomly generated number between 2 & 5
32      While count < 4 ' while count is less than 4 so will repeat until there are 4 values in the array
33          If usednumbers.Contains(rand) Then 'if array usednumbers contains the randomly generated number
34              rand = Int(Math.Floor((5 - 2) * Rnd()) + 2) 'gets a new randomly generated number value for rand
35          Else
36              usednumbers(count) = rand 'sets the current count as element where rand is its value
37              count += 1 'count increments by 1
38          End If
39      End While
40      w = usednumbers(0) 'w set to usednumbers array element 0
41      x = usednumbers(1) 'x set to usednumbers array element 1
42      y = usednumbers(2) 'y set to usednumbers array element 2
43      z = usednumbers(3) 'z set to usednumbers array element 3

```

I then attempted the above code to get random unique values for w,x,y,z

Test No	What is being tested	Expected Outcome	Actual Outcome
31b	Labels & button text	Labels will show lives, the question & the score. Button text will be possible answers to the question in a random order	QuizForm did load this time, potential answers were not repeated. After opening more than once, potential answers were in different spots as required. However I noticed the same question was repeated every time.



Therefore

```
Dim SQLstring1 As String = "SELECT TOP 1 * FROM Questions ORDER BY RND(QuestionID)"
```

This sql command is not very useful.

```

51   v = Int(Math.Floor((107 - 1) * Rnd() + 1) 'defines rand as integer and sets it to a randomly generated number between 2 & 5
52
53
54   Dim SQLstring1 As String = "SELECT * FROM Questions"
55   'Defines variable sqlstring1 As data type String, which contains the Command To read all from the data table Questions
56   connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
57   DataAdapter = New OleDb.OleDbDataAdapter(SQLstring1, connection)
58   dt.Clear()
59   DataAdapter.Fill(dt)
60   connection.Close()
61   QuestionLabel.Text = dt.Rows(v)(1) 'sets question label to the randomly selected question
62   'Set the text of the following buttons to a record from random row with the column a random value between 2 and 5 inclusive
63   Button1.Text = dt.Rows(v)(w)
64   Button2.Text = dt.Rows(v)(x)
65   Button3.Text = dt.Rows(v)(y)
66   Button4.Text = dt.Rows(v)(z)
67
68   questionscompleted += 1
69 End While

```

I used the same approach for the row value that I have just done for the column values, defining v as an integer then assigning it the random value between 1 & 107 inside the QuizFormLoad() subroutine. This is because there are 107 rows.

I changed the SQL statement to read all values from datatable Questions. It then connects to allow it to take the records to insert into the buttons and label.

Test No	What is being tested	Expected Outcome	Actual Outcome
31c	Labels & button text	Labels will show lives, the question & the score. Button text will be possible answers to the question in a random order	QuizForm did load this time, potential answers were not repeated. After opening more than once, potential answers were in different spots as required & the same question was not repeated every time as required.

COMPUTER SCIENCE Q

Lives = 3

Malicious software disguised as genuine programs

Score = 0

Trojans

Phishing

Simplex

Hashing

7

Test No	What is being tested	Expected Outcome	Actual Outcome
32	Timer, Buttons, Score, Lives	<p>Every 10 seconds there is a new question, unless the button is pressed in which case there will be a new question instantly. If 10 seconds pass, lives decrements by 1 and the label will update instantly.</p> <p>When the incorrect answer button is pressed, lives decrement by 1 and the label will update instantly.</p> <p>When the correct answer button is pressed, score increases by 1 and the label will update instantly.</p>	<p>There is not a new question after 10 seconds.</p> <p>Buttons do not seem to do anything.</p> <p>Score and lives label do not update when buttons are pressed or after 10 seconds have passed.</p>

I cut the following code & put it inside a new public subroutine called question() as it will need to be repeated

```
24 Dim usednumbers(4) As Integer 'array defined as usednumbers and limit of 5 values
25 Dim count = 0 'dims count as integer set to 0
26 Randomize() ' initializes random number generator
27 Dim rand As Integer = Int(Math.Floor((5 - 2) + 1) * Rnd() + 2) 'defines rand as integer and sets it to a randomly generated number between 2 & 5
28 While count < 4 ' while count is less than 4 so will repeat until there are 4 values in the array
29     If usednumbers.Contains(rand) Then 'if array usednumbers contains the randomly generated number
30         rand = Int(Math.Floor((5 - 2) + 1) * Rnd() + 2) 'gets a new randomly generated number value for rand
31     Else
32         usednumbers(count) = rand 'sets the current count as element where rand is its value
33         count += 1 'count increments by 1
34     End If
35 End While
36 w = usednumbers(0) 'w set to usednumbers array element 0
37 x = usednumbers(1) 'x set to usednumbers array element 1
38 y = usednumbers(2) 'y set to usednumbers array element 2
39 z = usednumbers(3) 'z set to usednumbers array element 3
40 v = Int(Math.Floor((107 - 1) + 1) * Rnd() + 1) 'defines rand as integer and sets it to a randomly generated number between 2 & 5
41 Dim SQLString1 As String = "SELECT * FROM Questions"
42 'Defines variable sqlstring1 As data type String, which contains the Command To read all from the data table Questions
43 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
44 DataAdapter = New OleDb.OleDbDataAdapter(SQLString1, connection)
45 dt.Clear()
46 DataAdapter.Fill(dt)
47 connection.Close()
48 QuestionLabel.Text = dt.Rows(v)(1) 'sets question label to the randomly selected question
49 'Set the text of the following buttons to a record from random row with the column a random value between 2 and 5 inclusive
50 Button1.Text = dt.Rows(v)(w)
51 Button2.Text = dt.Rows(v)(x)
52 Button3.Text = dt.Rows(v)(y)
53 Button4.Text = dt.Rows(v)(z)
54 questionscompleted += 1
```

& the same for

```
57 Public Sub updatelabel()
58     ScoreLabel.Text = "Score = " & score 'label displays the current score
59     LivesLabel.Text = "Lives = " & lives 'label displays the current amount of lives remaining
60
61 End Sub
```

Which I put in the public sub updatelabel()

I then added a label called QuestionsCompletedLabel & added to this sub.

```
57 Public Sub updatelabel()
58     ScoreLabel.Text = "Score = " & score 'label displays the current score
59     LivesLabel.Text = "Lives = " & lives 'label displays the current amount of lives remaining
60     QuestionsCompletedLabel.Text = "QC = " & questionscompleted 'displays questions completed
61
62 End Sub
```

QuizForm_Load() now looks like

```
63 Private Sub QuizForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
64     Timer1.Interval = 1000 'sets the interval to 1 second
65     Timer1.Start() 'Timer starts functioning
66     updatelabel()
67     While questionscompleted < 11
68         question()
69     End While
70 End Sub
```

It sets the timer interval & starts the timer, then updates the labels.

While less than 11 questions have been completed, it keeps running question subroutine.

Timer1_Tick:

```
72  Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
73      second = second + 1 'every time it ticks, variable second increases by 1
74      SecondsLabel.Text = second
75      If second >= 10 Then 'if second reaches 10
76          Timer1.Stop() 'Timer stops functioning
77          second = 0 'seconds value is set to 0
78          Timer1.Start() 'Timer is started again
79          questionscompleted += 1
80          lives -= 1 'If it reaches 10 seconds, they have ran out of time
81          updatelabel() 'updates label
82          question() 'goes to next question
83      End If
84  End Sub
```

Each time the timer ticks, which has its interval set to 1000milliseconds, a second has passed & so variable second increments by 1 every second.

I added the secondslabel to test if the timer works & every second (with each timer tick), it updates.

If 10 seconds pass, the timer is reset, questions completed increments by one as the time has ran out for them to answer a question so this question is recorded as complete.

Lives is minused by 1 as they will lose a life if they take 10 seconds to answer the question.

The labels update & the new question should load.

Button1_Click():

```
85  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
86      'if w gets chosen as 2 & this particular button is clicked then score increments & timer resets
87      If w = 2 Then
88          score = score + 1
89          questionscompleted += 1
90          Timer1.Stop()
91          second = 0
92          updatelabel()
93          Timer1.Start()
94          question()
95      Else
96          lives -= 1 'takes 1 away from lives
97          questionscompleted += 1
98          updatelabel()
99      End If
100 End Sub
```

This will be the same for each button click subroutine, with their associated letter being the only difference.

Button1 = w ; Button2 = x; Button3 = y; Button4 = z

If w = 2, this means the column that was randomly chosen for this button was the one containing the correct answer, therefore 1 is added to the score. Questionscompleted gets 1 added as a question has just been completed. The timer then resets, the labels update, the timer restarts & a new question should be presented.

If w doesn't equal 2 & they pressed this button, that means they chose the wrong answer, therefore lives = lives - 1. Questionscompleted = questionscompleted + 1 as a new question has been completed. The labels are then updated.

Test No	What is being tested	Expected Outcome	Actual Outcome
32b	Timer, Buttons, Score, Lives	<p>Every 10 seconds there is a new question, unless the button is pressed in which case there will be a new question instantly. If 10 seconds pass, lives decrements by 1 and the label will update instantly.</p> <p>When the incorrect answer button is pressed, lives decrement by 1 and the label will update instantly.</p> <p>When the correct answer button is pressed, score increases by 1 and the label will update instantly.</p>	<p>Every 10 seconds there is a new question & if 10 seconds pass, lives -=1 and the label updates instantly.</p> <p>If the correct answer is pressed, there is a new question & score += 1 and updates instantly.</p> <p>However, questions completed increases by more than one when a question is answered correctly.</p> <p>If an incorrect answer is pressed, questions completed only goes up by 1 as required, but a new question is not presented.</p> <p>Lives can go into negative values which is unwanted.</p> <p>After more than 10 questions are completed, it carries on.</p> <p>Eventually, after allowing it to run for a while, program stopped working as the variable for row took a value outside the range of rows available.</p>

COMPUTER SCIENCE QUIZ

Lives = -32

Regulates surveillance and investigation and covers the internet Score = 3 communications

8 sections of data protection act

Regulation of investigatory powers act 2000

Copyright, designs and patents act 1988

Advantages of computers in a workplace

QC = 53

7

```

48 QuestionLabel.Text = dt.Rows(v)(1) 'sets question label to the randomly selected question
49 'Set the text of the following buttons to a record from random row with the column a random value between 2 and 12
50 Button1.Text = dt.Rows(v)(w)
51 Button2.Text = dt.Rows(v)(x)
52 Button3.Text = dt.Rows(v)(y)
53 Button4.Text = dt.Rows(v)(z)
54 questionscompleted += 1
55 End Sub
56
57 10 references
  Public Sub updatelabel()

```

Exception Unhandled

System.IndexOutOfRangeException: There is no row at position 12.

This exception was originally thrown at this call stack:

- [External Code]
- RoughCode1.QuizForm.question() in QuizForm.vb
- RoughCode1.QuizForm.Timer1_Tick(Object, System.EventArgs) in QuizForm.vb
- [External Code]

I firstly got rid of the for loop, which I believe may have been causing the questionscompleted to add 12 to itself after the first question is completed.

```

63 0 references
  Private Sub QuizForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
64   Timer1.Interval = 1000 'sets the interval to 1 second
65   Timer1.Start() 'Timer starts functioning
66   updatelabel() 'updates labels
67   question() 'presents first question
68 End Sub

```

I created a form called QuizForm2.

I then made a new sub called checkqc()

```
56 9 references
57 Public Sub checkqc()
58     If questionscompleted >= 10 Then 'if 10 questions have been completed
59         Me.Hide() 'hides current form
60         QuizForm2.Show() 'shows QuizForm2
61     End If
62 End Sub
```

Its purpose being to check if 10 questions have been completed.

Question()

```
54 questionscompleted += 1
```

I took out this line from the question() sub as I believe this makes questionscompleted increase by 2 each time after it increased by 12 the first time.

ButtonClick_1()

```
90 Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
91     'if w gets chosen as 2 & this particular button is clicked then score increments & timer resets
92     If w = 2 Then
93         score += score + 1 'score increases
94         questionscompleted += 1 'questions completed increases
95         Timer1.Stop() 'timer stops
96         second = 0 'second = 0 so tht timer resets
97         updatelabel() 'labels update
98         checkqc() 'checks if 10 questions have been completed
99         Timer1.Start() 'timer starts again
100        question() 'presents new question
101    Else
102        Timer1.Stop() 'timer stops
103        second = 0 'second is set to 0
104        lives -= 1 'takes 1 away from lives
105        questionscompleted += 1 'questions completed increases
106        updatelabel() 'labels update
107        checkqc() 'checks if 10 questions have been completed
108        question() 'presets new question
109        Timer1.Start() 'starts timer again
110    End If
111 End Sub
```

I've made it so checkqc runs every time a question is answered & the timer ressets no matter whether the question was answered correctly or not.

& this code is the same for each button, with the letter "w" being the only change between the different buttons.

```
76 Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
77     second = second + 1 'every time it ticks, variable second increases by 1
78     SecondsLabel.Text = second
79     If second >= 10 Then 'if second reaches 10
80         Timer1.Stop() 'Timer stops functioning
81         second = 0 'seconds value is set to 0
82         Timer1.Start() 'Timer is started again
83         questionscompleted += 1
84         lives -= 1 'If it reaches 10 seconds, they have ran out of time
85         updatelabel() 'updates label
86         question() 'goes to next question
87         checkqc() 'checks if 10 questions have been completed
88     End If
89 End Sub
```

ive made it check every 10 seconds as well.

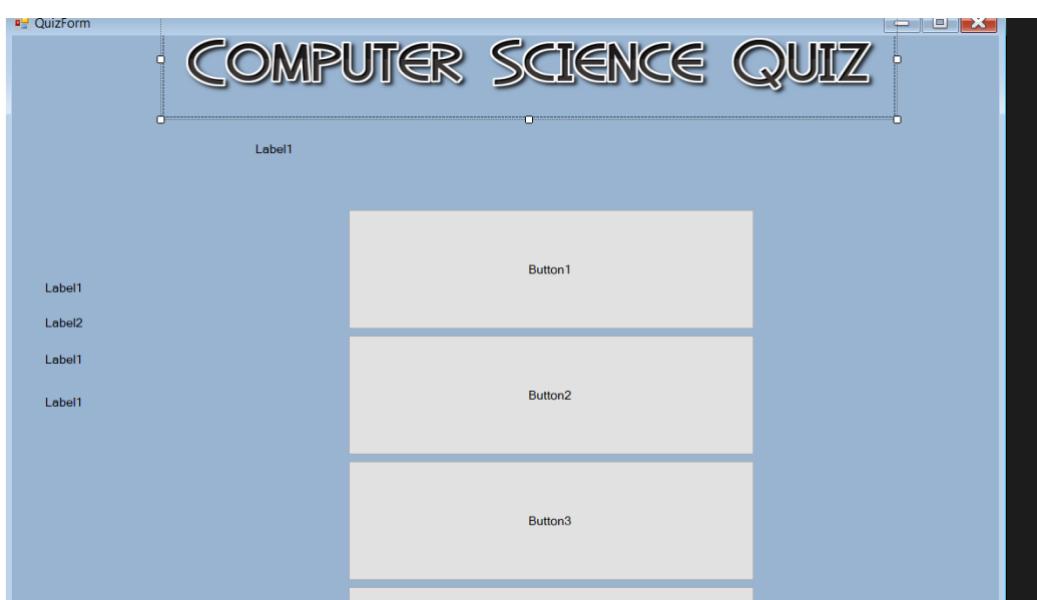
As for the unhandled exception error, the cause was that rows begin at 0, so having the range be between 1 & 107 would take it one higher than the amount of rows there are in the datatable.

46 v = Int(Math.Floor((106 - 1) + 1) * Rnd() + 1) 'defines rand as integer and sets it to a randomly generated number between 1 & 106

I then remembered I needed it to end if lives = 0 so I changed the sub checkac() to be called CheckacAndLives()

```
55 Public Sub CheckqcAndLives()
56     If questionscompleted >= 10 Or lives <= 0 Then 'if 10 questions have been completed or lives = 0
57         Me.Hide() 'hides current form
58         QuizForm2.Show() 'shows QuizForm2
59     End If
60 End Sub
```

And it now checks if lives = 0. This will now replace all uses of Checkqc()



I also rearranged a few things in the form design.

Test No	What is being tested	Expected Outcome	Actual Outcome
32c	Timer, Buttons, Score, Lives	<p>Every 10 seconds there is a new question, unless the button is pressed in which case there will be a new question instantly. If 10 seconds pass, lives decrements by 1 and the label will update instantly.</p> <p>When the incorrect answer button is pressed, lives decrement by 1 and the label will update instantly.</p> <p>When the correct answer button is pressed, score increases by 1 and the label will update instantly.</p> <p>If lives = 0, quiz ends.</p>	<p>Every 10 seconds there is a new question & if 10 seconds pass, lives -=1 and the label updates instantly.</p> <p>If an incorrect answer is pressed, there is a new question and lives -= 1</p> <p>If the correct answer is pressed, there is a new question & score += 1 and updates instantly.</p> <p>Questions completed increases by one when a question is answered correctly or incorrectly.</p> <p>After more than 10 questions are completed, it hides the current form and QuizForm2 is shown however it is still running in the background.</p>

After the quiz is complete, this form showed up, but when I pressed the x, it showed up again each time so the code must have still been running to cause this.

I then changed the code in CheckqcAndLives() again.

```

55  Public Sub CheckqcAndLives()
56      If questionscompleted >= 10 Or lives <= 0 Then 'if 10 questions have been completed or lives = 0
57          Timer1.Stop() 'stops timer
58          Close() 'closes current form
59          QuizForm2.Show() 'shows QuizForm2
60      End If
61  End Sub

```

I stopped the timer as I believe the timer was the thing that kept opening it because there would be different intervals of time after I closed QuizForm2 & when it opened again so I think it was ready to open on a fixed interval of time.

I then replaced the hide form command to close() as the description of ".hide" is that it just conceals the controls of it from the user, whereas the close command should simply close the current form.

I now need to make the score different, depending on how long the user takes to answer the question & how many lives they have remaining at the end of the quiz. I also need it to save the users highscore in the Users datatable.

In the button click subroutines, I changed the score addition to take how many seconds have passed into account, so that the faster they answer the question the more score they will earn per question.

```
92 If w = 2 Then
93     score = score + (1 * (10 - second)) 'score increases
```

Outside the subroutines I defined finalscore and highscore as integers

```
22 'used to calculate final score after quiz is over
23 Dim finalscore As Integer
24 'used to compare to final score
25 Dim highscore As Integer
```

I then created a Highscore column in the Users table

	UserID	Username	Password	Teacher?	TeacherID	HighScore	Comments
[+]	1	Adam	Adam1234	<input type="checkbox"/>	A3X5G	0	
[+]	21	q	q	<input type="checkbox"/>		0	
[+]	24	ss	s	<input type="checkbox"/>		0	
[+]	25	JOSHUSH	JOSHUSH	<input type="checkbox"/>		0	
[+]	27	jotaro	Armaan	<input type="checkbox"/>		0	b
[+]	28	dio	brando	<input type="checkbox"/>		0	
[+]	30	BobbyShmurda	Hello1234	<input type="checkbox"/>		0	
[+]	31	itachi	Bruh14	<input type="checkbox"/>		0	
k	(New)			<input type="checkbox"/>		0	

```
61 Public Sub CheckqcAndLives()
62 If questionscompleted >= 10 Or lives <= 0 Then 'if 10 questions have been completed or lives = 0
63     Dim SQLString3 As String = "SELECT * FROM Users where Username = '" & Form1.variablename & "'"
64     'Defines variable sqlstring1 As data type String, which contains the Command To read all from the data table Users where username is equal to the username they signed in with
65     connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
66     DataAdapter = New OleDb.OleDbDataAdapter(SQLString3, connection)
67     dt.Clear()
68     DataAdapter.Fill(dt)
69     connection.Close()
70     highscore = dt.Rows(0)(5) 'variable highscore is whatever highscore in datatable is
71     Timer1.Stop() 'stops timer
72     finalscore = score * (lives + 1) 'final score = score multiplied by lives remaining plus 1, so if no lives remaining, they do not receive a multiplier
73     If finalscore > highscore Then
74         Dim SQLString2 As String = "UPDATE Users set [HighScore] = '" & finalscore
75         SQLString2 &= "' WHERE [Username] = '" & Form1.variablename & "'"
76         'Defines variable sqlstring2 As data type String, which contains the Command To Update the Column HighScore where Username is equal to that of the User currently signed in
77         connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
78         DataAdapter = New OleDb.OleDbDataAdapter(SQLString2, connection)
79         dt.Clear()
80         DataAdapter.Fill(dt)
81         connection.Close()
82     End If
83     Close() 'closes current form
84     QuizForm2.Show() 'shows QuizForm2
85 End If
86 End Sub
```

Once the quiz is over, it will read all values from the datatable users where the Username is equal to the Username they have signed in with, which has its default value set to 0, so it doesn't matter if they do not currently have a highscore.

Only a single row will be read as Usernames must be unique, it then set highscore variable equal to the 5th column of the row.

The timer then stops like usual.

Finalscore variable is then equal to the score multiplied by: 1 + the number of lives remaining. So the more lives remaining, the higher potential score the user will get.

If finalscore > highscore then they have beaten their previous highscore, so it will update the database, recording the new highscore.

It then closes the currentform & shows QuizForm2 as usual.

33	Highscore	If the user gets a score higher than their highscore, the highscore column will update to the new score.	There was an error
----	-----------	--	--------------------

```

highscore = dt.Rows(0)(5) 'variable highscore is whatever highscore in datatable is
Timer1.Stop() 'stops timer
finalscore = score * (lives + 1) 'final score = score multiplied by lives remaining plus 1, so if no lives
If finalscore > highscore Then Exception Unhandled
    Dim SQLString2 As String
    SQLString2 &= " WHERE "
    'Defines variable sqlstrin
    connection.Open() 'opens

```

I then changed the code where the variable highscore gets its value to

```

70 If IsDBNull(dt.Rows(0)(5)) = True Then
71     highscore = 0 'highscore is non existent therefore 0
72 Else
73     highscore = dt.Rows(0)(5) 'variable highscore is whatever highscore in datatable is
74 End If

```

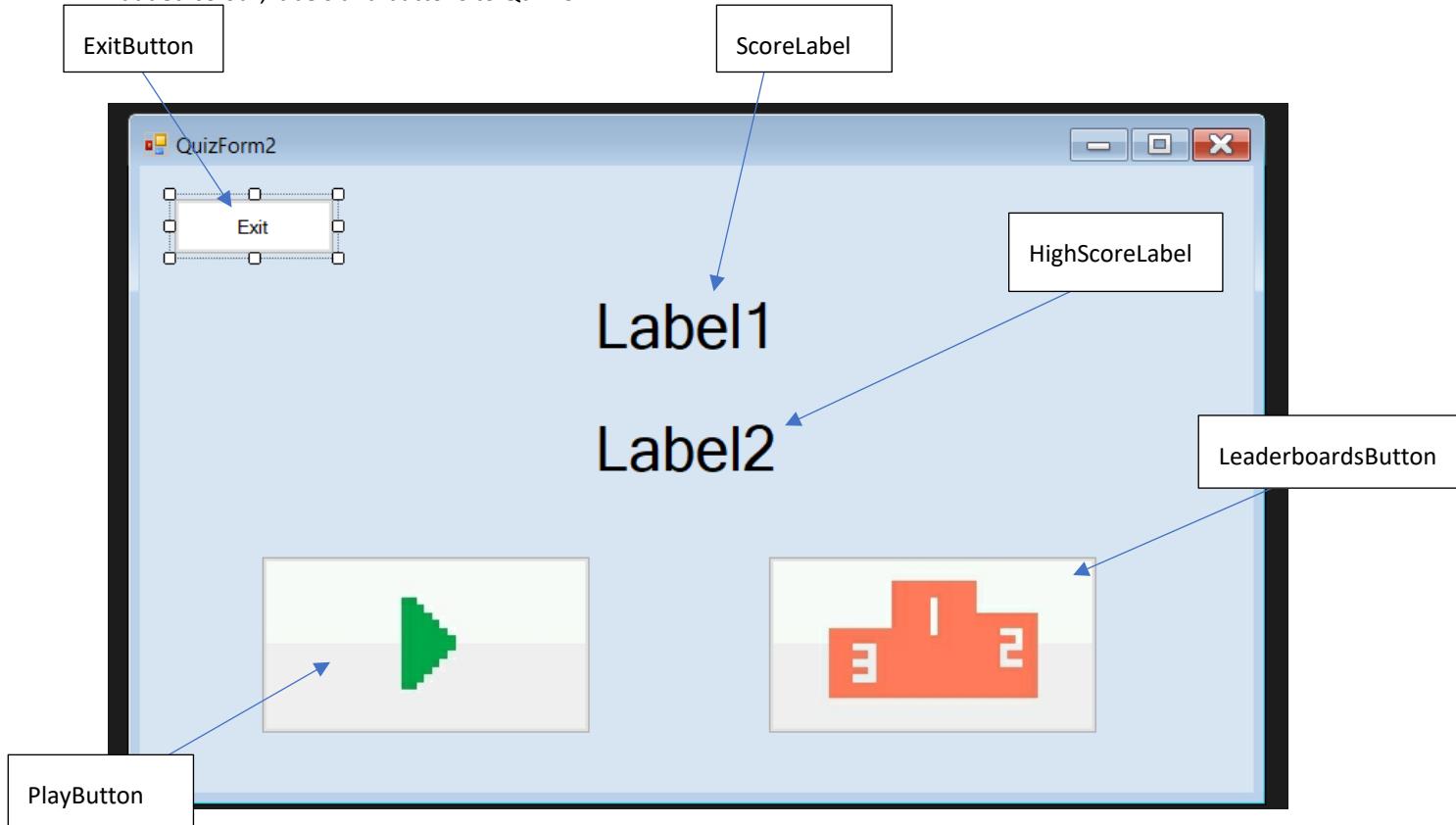
Because if the number was 0, its data type was not integer for some reason. This checks if it is 0, & if it is, it directly sets the variable equal to 0, but if not, then the data type should be integer & it should be able to take the value from the database.

33a	Highscore	If the user gets a score higher than their highscore, the highscore column will update to the new score.	It worked

& then when I beat the highscore again, it updated again without a problem.

[+] 21 q q [] 32

I added colour, labels and buttons to QuizForm2



ExitButton_Click()

```
2 Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click  
3     Me.Hide() 'hides current form  
4     StudentForm.Show() 'shows student form  
5 End Sub
```

Will hide the current form & show studentform again.

ScoreLabel & HighScoreLabel:

QuizForm2_Load()

```
7 Private Sub QuizForm2_Load(sender As Object, e As EventArgs) Handles MyBase.Load  
8     ScoreLabel.Text = "Score: " & QuizForm.finalscore 'scorelabel text will say the text in speech marks and the finalscore variable from QuizForm  
9     Hig 22 'used to calculate final score after quiz is over. ay the text in speech marks and the highscore variable from QuizForm  
10    End Si 23 Public finalscore As Integer  
11    24 'used to compare to final score  
12    25 Public highscore As Integer
```

I then went back to QuizForm & made finalscore & highscore public variables.

PlayButton_Click()

Will close the current form and show QuizForm again.

```
12  Private Sub PlayButton_Click(sender As Object, e As EventArgs) Handles PlayButton.Click
13      Close() 'closes current form
14      QuizForm.Show() 'shows QuizForm
15  End Sub
```

LeaderboardsButton.click()

```
17  Private Sub LeaderboardsButton_Click(sender As Object, e As EventArgs) Handles LeaderboardsButton.Click
18      Close() 'closes current form
19      LeaderboardsForm.Show() 'shows LeaderboardsForm
20  End Sub
```

Will close current form and show LeaderboardsForm form which I will create now.

Test No	What is being tested	Expected Outcome	Actual Outcome
34	QuizForm2	ScoreLabel will display score just achieved. HighscoreLabel will display Highscore. Exitbutton will close current form and show studentform again. PlayButton will close currentform and open QuizForm again. LeaderboardsButton will close current form & open LeaderboardsForm QuizForm2 will not open again for no reason, after being closed by whatever means.	ScoreLabel & HighscoreLabel didn't work, both show 0 as the value from Score & Highscore despite that not being true. ExitButton worked. LeaderboardsButton worked. PlayButton worked. When testing PlayButton, after clicking it, QuizForm2 showed up again for no reason.



In case there is something that resets finalscore & highscore when it goes back to check the value of those

```

22      'used to calculate final score after quiz is over
23      Dim finalscore As Integer
24      'used for displaying score on QuizForm2
25      Public finalscore1 As Integer
26      'used to compare to final score
27      Dim highscore As Integer
28      'used for displaying highscore on QuizForm2
29      Public highscore1 As Integer
  
```

variables, I have created duplicate variables to try to use in QuizForm2.

After finalscore is calculated & highscore is defined,

```

79      finalscore1 = finalscore
80      highscore1 = highscore
  
```

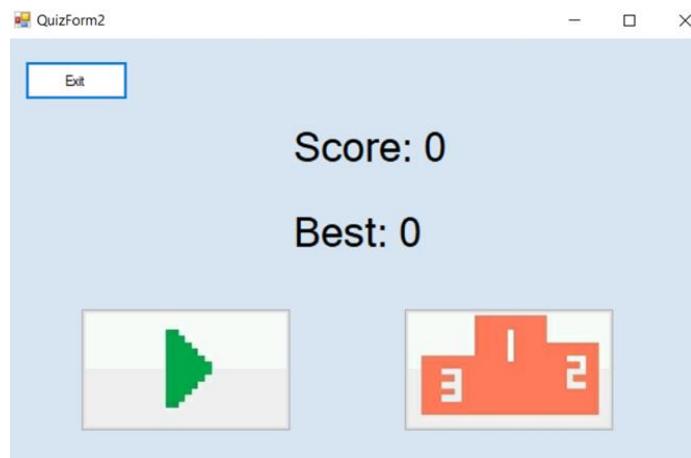
& label code:

```

7      Private Sub QuizForm2_Load(sender As Object, e As EventArgs) Handles MyBase.Load
8          ScoreLabel.Text = "Score: " & QuizForm.finalscore1 'scorelabel text will say the text in speech marks and the finalscore variable from QuizF
9          HighscoreLabel.Text = "Best: " & QuizForm.highscore1 'Highscorelabel text will say the text in speech marks and the highscore variable from C
10         End Sub
  
```

I then rearranged the code when a button is clicked, so that for each button, CheckqcAndLives() was run after the timer with every button. I didn't copy and paste the entirety of Button1_Click() into the other buttons, therefore I made an error whilst retyping the code in a couple of the buttons, in regard to the order of commands where the order was important. This should stop the timer from running which should stop QuizForm2 from showing up without a cause.

Test No	What is being tested	Expected Outcome	Actual Outcome
34	QuizForm2	<p>ScoreLabel will display score just achieved.</p> <p>HighscoreLabel will display Highscore.</p> <p>Exitbutton will close current form and show studentform again.</p> <p>PlayButton will close currentform and open QuizForm again.</p> <p>LeaderboardsButton will close current form & open LeaderboardsForm</p> <p>QuizForm2 will not open again for no reason, after being closed by whatever means.</p>	<p>ScoreLabel & HighscoreLabel didn't work, both show 0 as the value from Score & Highscore despite that not being true.</p> <p>ExitButton worked.</p> <p>LeaderboardsButton worked.</p> <p>PlayButton worked.</p> <p>When testing PlayButton, after clicking it, QuizForm2 did not show up again until the quiz finished.</p>



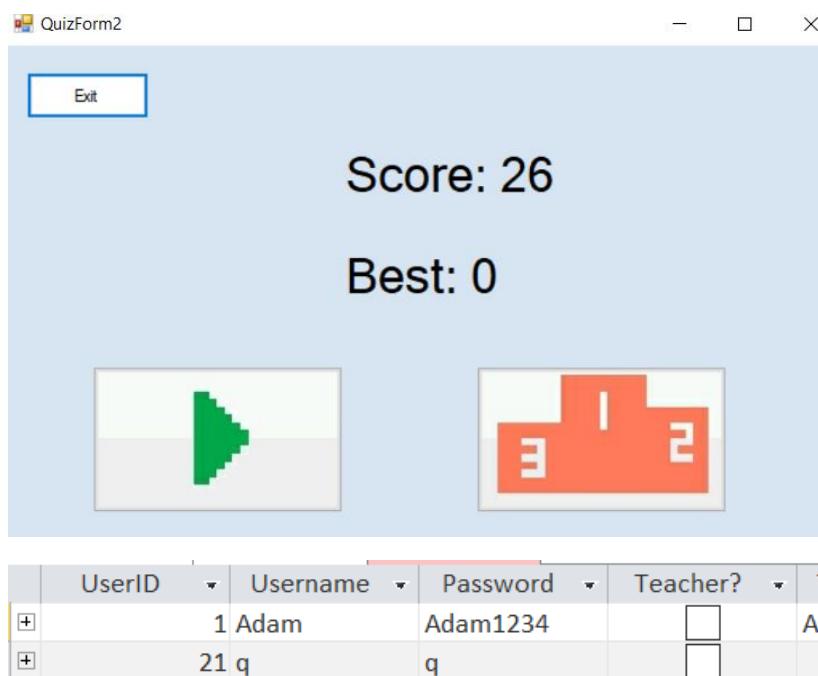
I think a way I can resolve this could be through having the last 3 games' scores apart of the Users datatable.

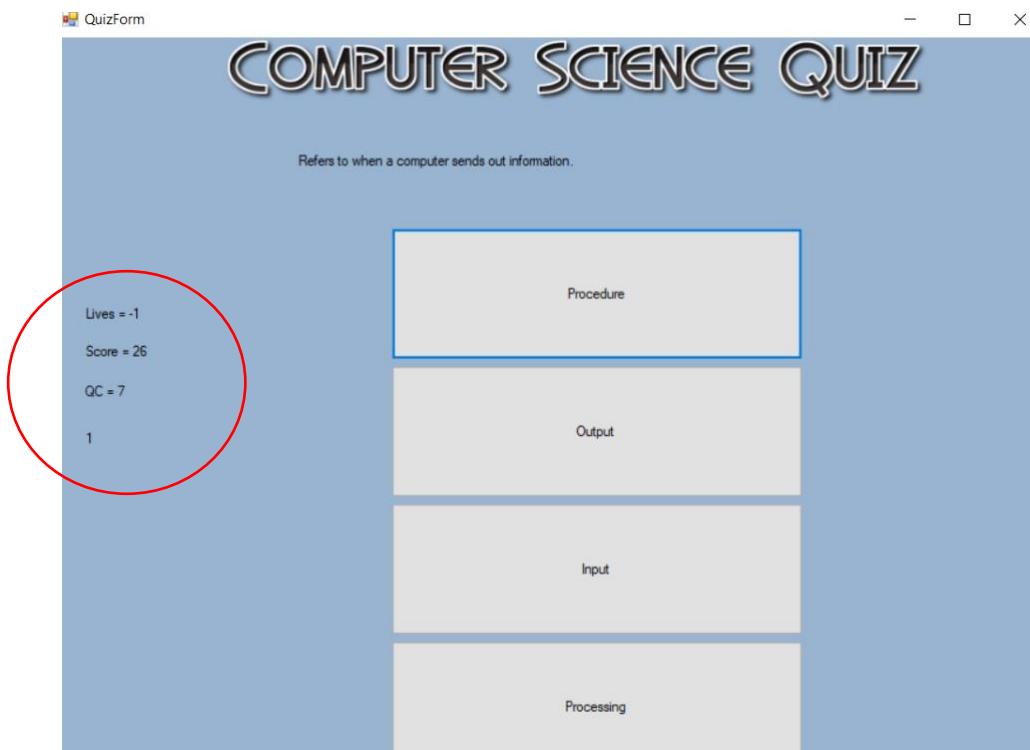
This way QuizForm can update the datatable so a variable will not have to be taken from QuizForm. & this can also be something I put in the stats section which I will eventually make. However, I do not want to have to repeat this for each topic test so I will try to fix this in a shorter way.

I will replace the "close()" command with ".hide" again. I initially changed it to close() as I thought it would fix QuizForm2 opening for no reason.

91 | Me.Hide() 'closes current form

Test No	What is being tested	Expected Outcome	Actual Outcome
34a	QuizForm2	HighscoreLabel will display Highscore.	<p>ScoreLabel works & it shows the score just achieved, however HighscoreLabel didn't work & its show 0 as the value from Highscore despite that not being true. I also checked the database & the highscore updated to a value that was lower than the previous highscore.</p> <p>When testing PlayButton, after clicking it, QuizForm2 did not show up again until the quiz finished. However, the score, questionscompleted & lives all retained their values from the previous use of the quiz.</p>





This was directly after PlayButton was clicked.

To fix these values being retained from the previous use of the quiz, I believe a good way of doing this is to close QuizForm before it is shown again, as this should restart it.

```

12     Private Sub PlayButton_Click(sender As Object, e As EventArgs) Handles PlayButton.Click
13         Close() 'closes current form
14         QuizForm.Close() 'closes quizform so it restarts
15         QuizForm.Show() 'shows QuizForm
16     End Sub

```

The only way it would keep replacing the highscore with the new score, no matter whether it was bigger or not, would be if the datatype remained DBNull, no matter what was in there

```
72     highscore = CInt(dt.Rows(0)(5))
```

So I will try using the "CINT" function

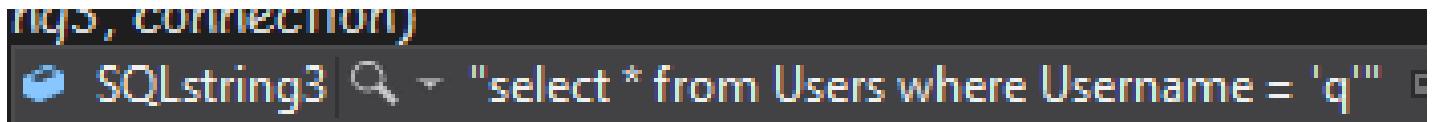
Test No	What is being tested	Expected Outcome	Actual Outcome
34a	QuizForm2	HighscoreLabel will display Highscore.	Highscore was not fixed. When testing PlayButton, after clicking it, its variables reset as required.

```

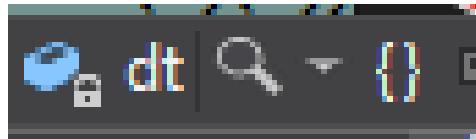
72     highscore = CInt(dt.Rows(0)(5)) ✘
73     Timer1.Stop() 'stops t Exception Unhandled
74     finalscore = score * (I
75     finalscore1 = finalscor System.InvalidCastException: 'Conversion from type 'DBNull' to type
76     highscore1 = highscore 'Integer' is not valid.'

```

I am not sure as to why it says its type is DBNull as I didn't have this issue before. I cannot find a way of fixing this as there should not be any problem as it is has a value in this account (username = q).



I was not able to fix this & I would have had to move on due to time restraints, despite this being apart of my essential features, until I noticed it seemed to only be a problem with the Data Table "dt".

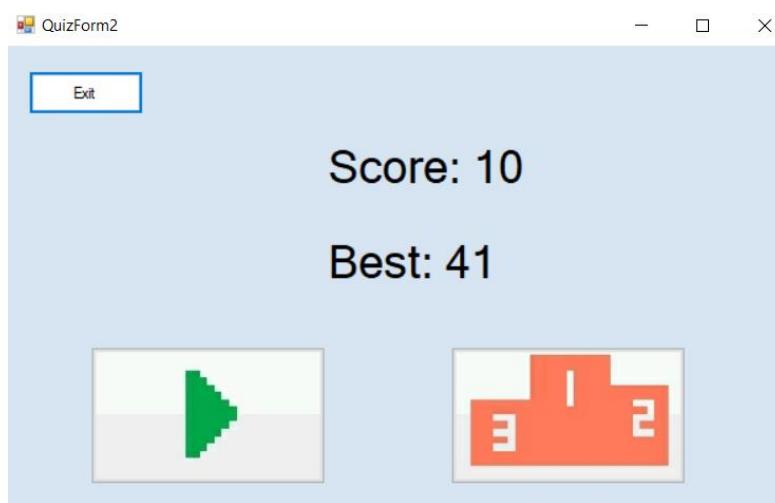


This was empty even after it was supposed to be filled. & I am not even sure if this was what I thought it meant, however, while trying to find a solution, I was attempting everything I thought could possibly fix it, which would have been pointless to document.

I then defined a new DataTable, which I just named df, & used that in its place,

```
If questionscompleted >= 10 Or lives <= 0 Then 'if 10 questions have been completed or lives = 0
Dim df As New DataTable 'defines dt as a new instance of the DataTable class
Dim SQLString3 As String = "select * from Users where Username = '" & Form1.variableName & "'"
'Defines variable sqlString1 As data type String, which contains the Command To read all from the data table Users where username is equal to the username they signed in with
connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
DataAdapter = New OleDb.OleDbDataAdapter(SQLString3, connection)
df.Clear()
DataAdapter.Fill(df)
connection.Close()
highscore = CInt(df.Rows(0)(5))
```

Test No	What is being tested	Expected Outcome	Actual Outcome
34b	QuizForm2	HighscoreLabel will display Highscore.	Highscore was fixed. However, after pressing the exit button, QuizForm2 kept showing up, with a random score which was negative.



And the new datatable somehow caused it to finally work.

To fix Form2 repeatedly showing up with a random score, I changed the exitbutton code

```
2  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
3      Close() 'closes current form
4      QuizForm.Close() 'closes quizform
5      StudentForm.Show() 'shows student form
6  End Sub
```

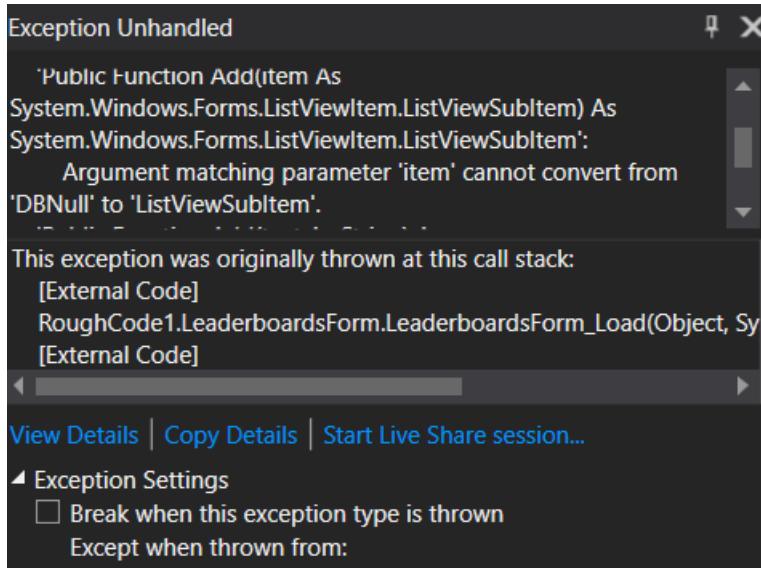
So that the forms actually closed rather than being hidden.

I then tried to get the leaderboard form working, through having a listview like I used for the study section so I added a listview to the form & began coding.

```
1  Imports System.Data.OleDb
2  Public Class LeaderboardsForm
3      'defines variables
4      Dim connection As OleDbConnection
5      Dim command As OleDbCommand
6      Dim data_reader As OleDbDataReader
7  Sub ListViewSetup()
8      'add columns to the listview
9      ListView1.Columns.Add("Users", 500, HorizontalAlignment.Left)
10     ListView1.Columns.Add("HighScore", 500, HorizontalAlignment.Left)
11     'Display listview in details view
12     ListView1.View = View.Details
13     'display grid lines
14     ListView1.GridLines = True
15     'allow full row selection
16     ListView1.FullRowSelect = True
17 End Sub
```

```
19  Private Sub LeaderboardsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
20      'setup listview
21      ListViewSetup()
22      'connect to ms.access database
23      connection = New OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb")
24      connection.Open()
25      'reading data from Questions table
26      command = New OleDbCommand("SELECT * FROM Users", connection)
27      data_reader = command.ExecuteReader
28
29      'adds data to listview
30      If data_reader.HasRows Then
31          While data_reader.Read
32              Dim newitem As New ListViewItem()
33              newitem.Text = data_reader.GetValue(1) 'first column
34              newitem.SubItems.Add(data_reader.GetValue(5)) 'second column
35              ListView1.Items.Add(newitem)
36          End While
37      End If
38  End Sub
39
40 End Class
```

Test No	What is being tested	Expected Outcome	Actual Outcome
35	ListView in LeaderboardsForm	Will display username and highscore columns.	DBeNull error. Also QuizForm2 kept opening.



As this has been coded in a different way to how I made the connection with the highscore, there will be a different problem which I believe may be that the value is Null for at least one of the rows. To fix this I will edit all the current highscore values to 1 & change the sign up button to set "1" as the highscore for new accounts.

```
Dim sqlString As String = "select * from Users"
sqlString = "Insert into Users ([Username], [Password], [HighScore])"
'inserts a value into highscore column to prevent dbnull error elsewhere in the program
sqlString &= " values ('"
sqlString &= UsernameTextBox.Text & "','""
sqlString &= PasswordTextBox.Text & "','""
sqlString &= "1" & "')"
connection.Open()
```

& to fix QuizForm2 from opening, I added the code QuizForm.Close() to the leaderboards button.

Test No	What is being tested	Expected Outcome	Actual Outcome
35a	ListView in LeaderboardsForm	Will display username and highscore columns.	Test was successful; just need to adjust size of columns, listview & add an exit button. As well as

			change the leaderboards to only show members of the same class, so those who have the same teachercode.
--	--	--	---

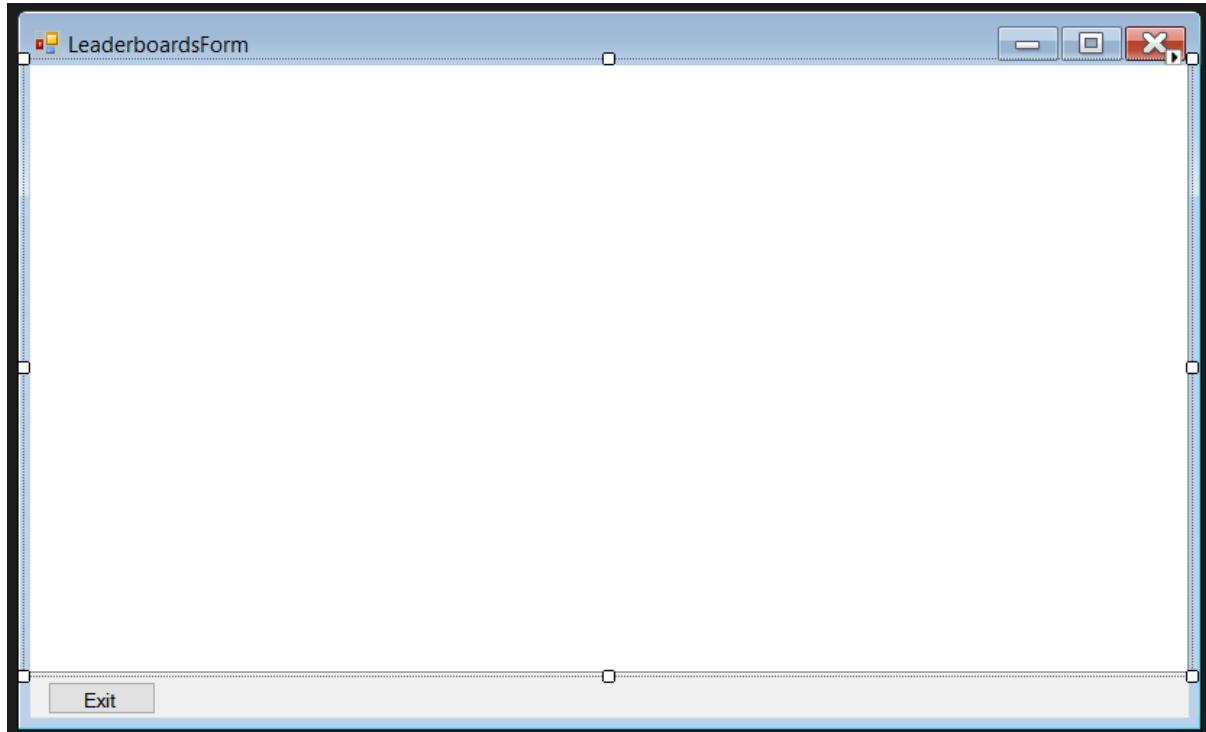
new user created through sign up button with highscore value set as 1



LeaderboardsForm

Users	HighScore
Adam	55
q	50
ss	1
JOSHUSH	1
jotaro	1
dio	1
BobbyShmurda	1
itachi	1
Ob1to	1
Obitobito	1
fortniteplayer	1

I will now just slightly resize the ListView & add an exit button with similar code to all other exit buttons.



```

40  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
41      'closes form & shows previous form again
42      Close()
43      QuizForm2.Show()
44  End Sub

```

I will now have to change the LeaderboardsButton in QuizForm2 as it will need to hide QuizForm2 rather than close it so that the score & highscore isn't displayed as 0 when the exit button is used.

```

19  Private Sub LeaderboardsButton_Click(sender As Object, e As EventArgs) Handles LeaderboardsButton.Click
20      Hide() 'hides current form
21      QuizForm.Close() 'closes quizform
22      LeaderboardsForm.Show() 'shows LeaderboardsForm
23  End Sub

```

Test No	What is being tested	Expected Outcome	Actual Outcome
36	ExitButton in LeaderboardsForm	Will display the same score & highscore in QuizForm2 as shown previously.	Test was successful



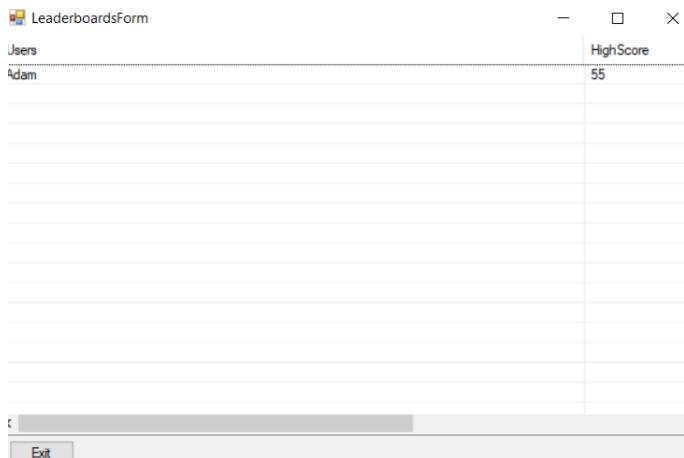
Showed this before pressing leaderboards button & after pressing exit button in leaderboardform as required.

I will now add code to make the leaderboards only show class members.

```
command = New OleDbCommand("SELECT * FROM Users where TeacherID = '" & Form1.Teachercode & "'", connection)
```

& I will add a help button as a Usability feature to let users know they will see leaderboards once they add a teacher code as they may be confused

Test No	What is being tested	Expected Outcome	Actual Outcome
37	ListView in LeaderboardsForm	Will display only highscores of those in the same class	Test was successful



CLIENT INTERVIEW & ANALYSIS

CRAIG BRIDGENS

Said he thought it would be best if I add something that prevents questions from repeating as he got 2 of the same question whilst testing the quiz.

This is something that I will add as soon as possible as I believe this is quite important & I believe it should be simple enough to do by creating an array that stores all row values that have been used through the quiz session.

Said he wondered where was the implementation of the feature that took into consideration different difficulties for different students depending on their performance.

This is something I had previously said I would try to put into the quiz however, due to time restrictions it seems it will be unlikely that I will be able to do so as well as the graphs showing the students performance, due to the complexity of the tasks.

JOSH FRASER

Also requested that I add something to prevent repeating questions as he experienced this as well.

Both stakeholders have requested this so I will try to make this a priority and complete it soon.

Suggested I add sound to the program whenever buttons are clicked on.

I will take this into consideration and likely add a few sound effects as this should not be a difficult task.

CHANGES

Preventing repeating questions:

I firstly created an array to store the row number of the questions that have been used.

```
34 | 'array containing the row numbers that have been used  
35 | Dim usedquestions(9) As Integer
```

I then added code to the question() subroutine.

```

55   v = Int(Math.Floor((106 - 1) * Rnd() + 1) 'defines v as integer and sets it to a randomly generated number between 1 & 106
56

57   If questionscompleted > 0 Then
58     If usedquestions.Contains(v) Then 'if array usedquestions contains the randomly generated number
59       While usedquestions.Contains(v)
60         Randomize() ' initializes random number generator
61         v = Int(Math.Floor((106 - 1) * Rnd() + 1) 'defines v as integer and sets it to a randomly generated number between 1 & 106
62       End While
63       usedquestions(questionscompleted) = v 'sets the current questionscompleted as element where v is its value
64     Else
65       usedquestions(questionscompleted) = v 'sets the current questionscompleted as element where v is its value
66     End If
67   Else
68     usedquestions(0) = v
69   End If

```

After a random value for v has been generated, if a question hasn't been completed yet, questionscompleted = 0, therefore the else part of the first IF statement will be run when the first question runs. This will set the first element of the usedquestions array to the first value of v that has been generated.

After a question has been completed & the subroutine is called, either lines 59-63 or 64-66 will be run. It will check if the array usedquestions contains the new randomly generated value for v, if it randomly generates the same value of v as it did in any of the previous times the subroutine was called, usedquestions.contains(v) will be true & lines 59-63 will run which will keep generating random values for v until the usedquestions array doesn't already contain the new value of v. Once it has generated a value not contained in the array, it adds the new value of v to the array so that the new value cannot be repeated either. The position of each element is determined by the integer questionscompleted and it will have incremented each time a new question comes up & there will only be 10 questions that need to be displayed so the array is big enough.

If the array didn't contain the new value of v, it simply adds the new value of v to the array as it doesn't have to generate a new one.

It is difficult to test considering there are over 100 possible questions, therefore I will test this once I have created the topic quizzes in Prototype 4.

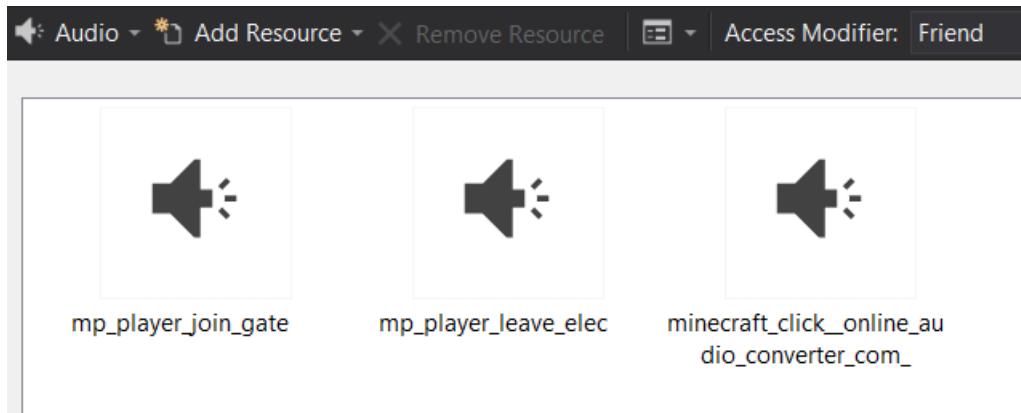
After prototype 4,

Test No	What is being tested	Expected Outcome	Actual Outcome
I1	Topic1QuizForm	Questions will not repeat.	Test was successful.

There are only around 12 possible questions & in a test where I answered 10 questions, none repeated therefore it is unlikely that the changes were unsuccessful.

Sound effects

I downloaded the Minecraft click sound and converted it to a wav file. I then added it into the resources folder of the project



Then added the following line of code to all the navigation buttons in the program, apart from exit buttons, so the sound plays whenever a button is clicked in this program:

```
My.Computer.Audio.Play(My.Resources.minecraft_click_online_audio_converter_com_, AudioPlayMode.Background)
```

When an exit button is clicked, the modern warfare 3 leaving lobby sound effect will be played.

```
Closes current form & shows previous form again
My.Computer.Audio.Play(My.Resources.mp_player_leave_elec, AudioPlayMode.Background) 'plays audio
```

Test No	What is being tested	Expected Outcome	Actual Outcome
I2	Audio playing	Will play the audio as the button is pressed	Test was successful however the next form loads before the audio is played when non-exit buttons are clicked, despite the audio line of code being before the lines that close the current form and shows the next

I tried changing AudioPlayMode to WaitToComplete, however it didn't make a difference.

I then trimmed the audio file to get rid of the half a second where there is no sound on audiotrimmer.com.

Test No	What is being tested	Expected Outcome	Actual Outcome

!2a	Audio playing	Will play the audio as the button is pressed	Test was successful & audio played as the button was pressed.
-----	---------------	--	---

After this, I added kahoot 10 second countdown music to the quiz.

```
38 | My.Computer.Audio.Play(My.Resources.KAHOOT_Music_10_Second_Countdown_33, AudioPlayMode.Background)
```

It starts playing within the quiz() subroutine.

Then when an answer button is clicked, it stops playing before the question() subroutine is called again

```
My.Computer.Audio.Stop()
question() 'presets new question
```

& then it is stopped when the quiz is over

```
115 | My.Computer.Audio.Stop()
116 | Me.Hide() 'closes current form
117 | QuizForm2.Show() 'shows QuizForm2
118 | End If
```

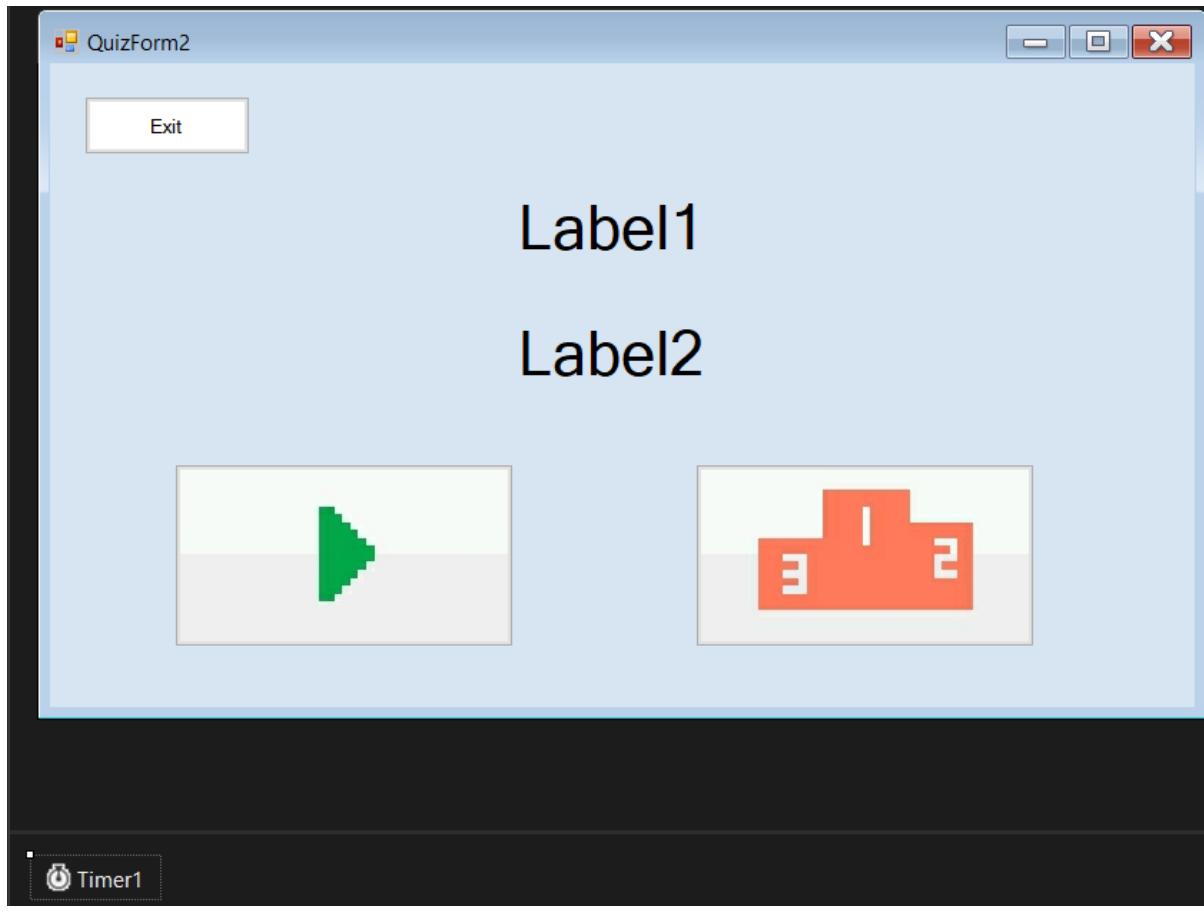
Test No	What is being tested	Expected Outcome	Actual Outcome
I3	Audio playing	Will play the audio as each question begins & when a new question starts, it will restart	Test was successful however the audio keeps playing when the next form opens despite the my.computer.audio.stop() command.

To try to fix this, I added "my.computer.audio.stop()" in the quizform2_Load() subroutine.

```
8 | Private Sub QuizForm2_Load(sender As Object, e As EventArgs) Handles MyBase.Load
9 |
10 |     My.Computer.Audio.Stop()
```

Test No	What is being tested	Expected Outcome	Actual Outcome
I3a	Audio playing	Audio will stop when quiz is over	It was not fixed

My next attempt to fix this is to add a timer to QuizForm2. This will be used to continuously run the command to stop audio playing.



```
8 Private Sub QuizForm2_Load(sender As Object, e As EventArgs) Handles MyBase.Load
9     Timer1.Interval = 1 'sets the interval to 1/1000th of a second
10    Timer1.Start() 'Timer starts functioning
```

```
1 Public Class QuizForm2
2     Dim milisecond As Integer = 0 'defines milisecond as integer set to value 0
```

```
29 Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
30     My.Computer.Audio.Stop() 'stops any audio playing
31     milisecond += 1 'adds 1 to integer milisecond
32     If milisecond = 1000 Then 'if milisecond = 1000
33         Timer1.Stop() 'timer is stopped
34     End If
35 End Sub
```

This will run the stop audio command a thousand times, ensuring the audio is stopped. I didn't leave it to continuously run forever as this optimises the code slightly.

Test No	What is being tested	Expected Outcome	Actual Outcome
---------	----------------------	------------------	----------------

!3b	Audio playing	Audio will stop when quiz is over	Worked as expected
-----	---------------	-----------------------------------	--------------------

I also made these changes to the topic quiz.

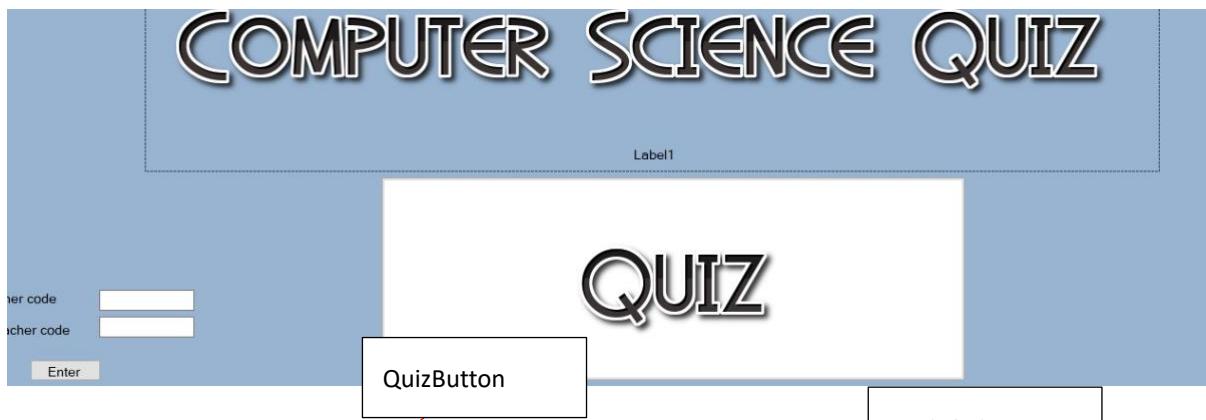
PROTOTYPE 4

I firstly created 2 forms

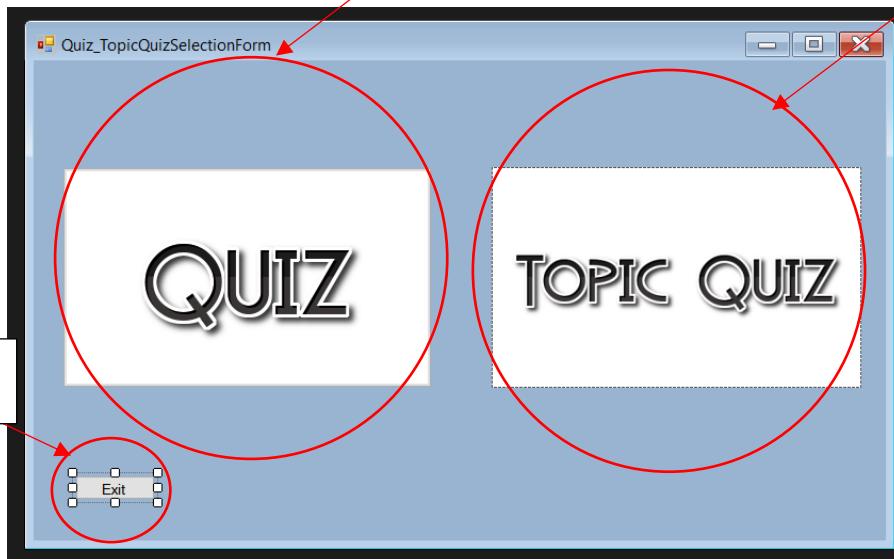
Quiz_TopicQuizSelectionForm

TopicQuizSelectionForm

The first will be a menu to choose between the normal quiz or the topic quizzes, & the 2nd will be the menu that allows the user to choose which topic quiz they would like.



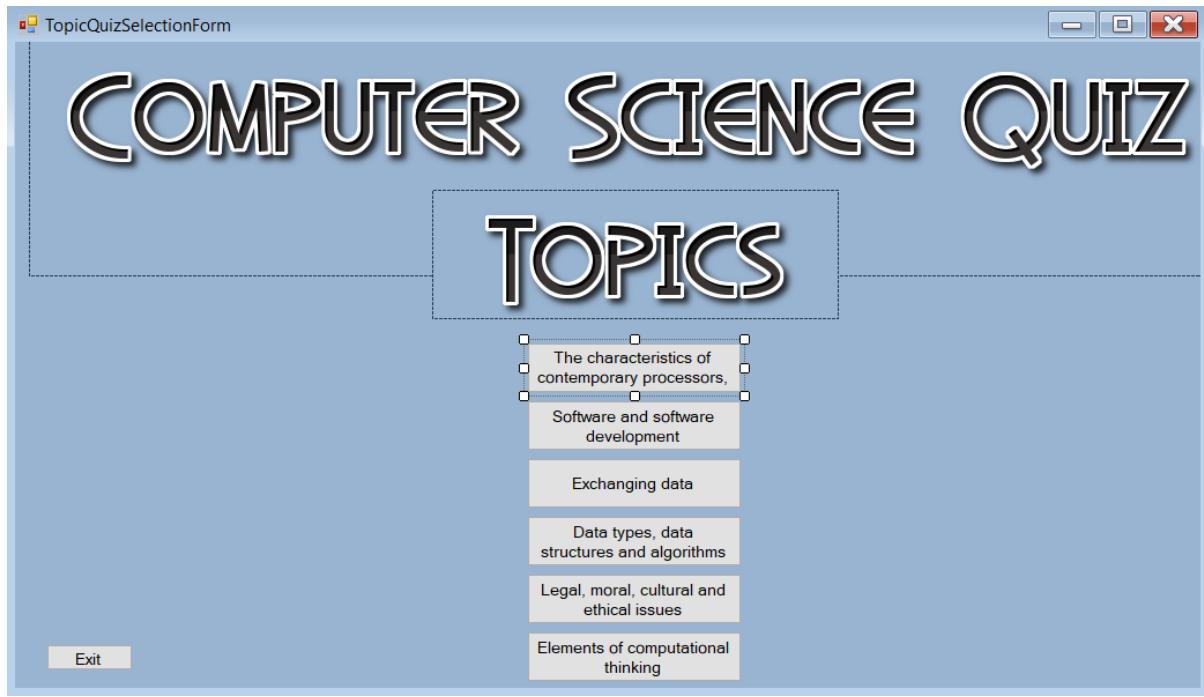
The quiz button in studentform will now show Quiz_TopicQuizSelectionForm rather than TopicQuizSelectionForm



The quiz button (QuizButton) will open quizform & the topic quiz button (TopicQuizButton) will open TopicQuizSelectionForm. The exit button (ExitButton) works as always.

The topic quiz button is actually a picturebox as that allowed me to size it in a more appropriate way so that it looked better.

TopicQuizSelectionForm is just a menu to choose the topics and therefore it had a similar purpose to StudyForm so I have made it look the same as studyform as there would be no need to change the selection menu design.



I then created a form called Topic1QuizForm. This form will be the same as quizform however, it will only contain questions from the first topic.

I then realised that I needed to create columns for the highscore of each topic quiz & change the sign up form code so that it set 1 as the default value of each highscore to avoid errors.

User ID	Username	Password	Teacher?	Teacher ID	HighScore	Topic1HS	Topic2HS	Topic3HS	Topic4HS	Topic5HS	Topic6HS
1	Adam	Adam1234		A3X5G	55						
21	q	q			50						
24	ss	Boruto			30						
25	JOSHUSH	JOSHUSH			1						
27	jotaro	Armaan			1						
28	dio	brando			1						
30	BobbyShmurda	Hello1234			1						
31	itachi	Bruh14			1						
36	Ob1to	AdAm1233			1						
37	Obitobito	Adam1234			1						
38	fortniteplayer	Adam1234			1	0	0	0	0	0	0
*	(New)										

All new columns have the data type Number. I then manually added 1s to avoid errors in testing with accounts that have already been created.

	Topic1HS	Topic2HS	Topic3HS	Topic4HS	Topic5HS	Topic6HS	C
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	1	1	1	1	1	1	1
	0	0	0	0	0	0	0

Updated SignUpForm code for when an account is being created:

```

43 | If dt.Rows.Count = 0 Then 'if there are no teachers with that username then it will allow them to sign up with that username
44 | Dim sqlString As String = "select * from Users"
45 | sqlString = "Insert into Users ([Username], [Password], [HighScore], [Topic1HS], [Topic2HS], [Topic3HS], [Topic4HS], [Topic5HS], [Topic6HS])"
46 | 'inserts a value into highscore columns to prevent dbnull error elsewhere in the program
47 | sqlString &= " values ('"
48 | sqlString &= UsernameTextBox.Text & "','"'
49 | sqlString &= PasswordTextBox.Text & "','"'
50 | sqlString &= "1" & "','"'
51 | sqlString &= "1" & "','"'
52 | sqlString &= "1" & "','"'
53 | sqlString &= "1" & "','"'
54 | sqlString &= "1" & "','"'
55 | sqlString &= "1" & "','"'
56 | sqlString &= "1")"
```

I then added code to the new form so that it was the same as QuizForm with minor changes.

```
65 | Dim SQLstring1 As String = "SELECT * FROM Questions WHERE TopicID = 1"
```

This will select only questions from topic 1 for the quiz whereas in QuizForm it would read all from the entire Questions table.

```
    'finalscore < highscore & Then
    Dim SQLstring2 As String = "UPDATE Users set [Topic1HS] = '" & finalscore
```

Where QuizForm updated highscore column, this will update the Topic1HS column.

```
Me.Hide() 'hides current form
Topic1QuizForm2.Show() 'shows Topic1QuizForm2
```

Once the quiz is completed, it shows a new form I will create “Topic1QuizForm2” rather than QuizForm2 which quizform showed.

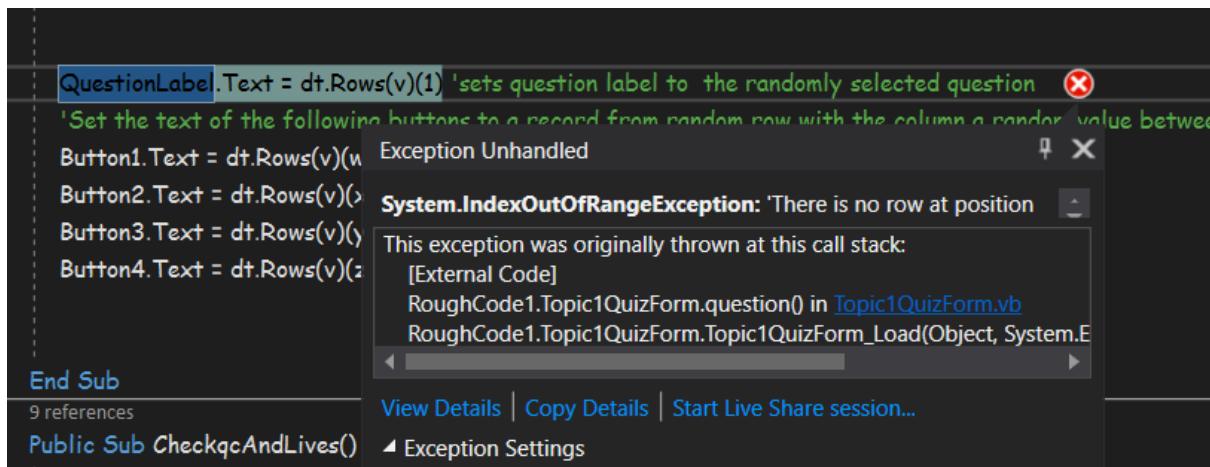


```

14 0 references
15 Private Sub Topic1QuizForm2_Load(sender As Object, e As EventArgs) Handles MyBase.Load
16     ScoreLabel.Text = "Score: " & Topic1QuizForm.finalscore1 'scorelabel text will say the text in speech marks and the finalscore variable from Topic1QuizForm
17     HighscoreLabel.Text = "Best: " & Topic1QuizForm.highscore1 'Highscorelabel text will say the text in speech marks and the highscore variable from Topic1QuizForm
End Sub

```

Test No	What is being tested	Expected Outcome	Actual Outcome
38	Topic1QuizForm	Will work just like QuizForm but only for topic1 questions.	Test was unsuccessful. Error as row wasn't found for random question selection.



This has likely occurred as I forgot to change the range of numbers that v could be. In quizform, the range was between 1 & 106, however in the case for Topic1QuizForm, there are not 107 questions for topic 1, therefore I have to change this.

```

54 v = Int(Math.Floor((11 - 1) * Rnd() + 1) 'defines v as integer and sets it to a randomly generated number between 1 &
55
56 If usedquestions.Contains(v) Then 'if array usedquestions contains the randomly generated number
57     While usedquestions.Contains(v)
58         Randomize() ' initializes random number generator
59         v = Int(Math.Floor((11 - 1) * Rnd() + 1) 'defines v as integer and sets it to a randomly generated number between
60     End While
61 Else
62     usedquestions(questionscompleted) = v 'sets the current questionscompleted as element where v is its value
63 End If

```

Test No	What is being tested	Expected Outcome	Actual Outcome
38a	Topic1QuizForm	Will work just like QuizForm but only for topic1 questions.	Test was mostly successful. Worked as required however didn't update Topic1HS column. Also carried on after quiz was completed and gave an error.

This was due to the fact I got a score of 25 which was less than 30 (high score on regular quiz for the account I was testing on) & it compared final score with the highscore from the regular quiz instead of with the Topic1HS value. To fix this, I changed this line of code:

```
94 highscore = CInt(df.Rows(0)(6))
```

It previously had "6" as a "5", it should now compare finalscore with the highscore from Topic1HS.

```

v = Int(Math.Floor((11 - 1) + 1) * Rnd() + 1) 'Defines v as integer and sets it to a randomly generated number between 1 and 11
If usedquestions.Contains(v) Then 'if array used
    While usedquestions.Contains(v)
        Randomize() ' initializes random number
        v = Int(Math.Floor((11 - 1) + 1) * Rnd() + 1)
    End While
Else
    usedquestions(questionscompleted) = v 'sets the current questionscompleted as element where v is its value
End If

```

To stop this from happening I just closed Topic1QuizForm when Topic1QuizForm2 loads, after Topic1QuizForm2 has taken the data it needs from Topic1QuizForm.

```

14 Private Sub Topic1QuizForm2_Load(sender As Object, e As EventArgs) Handles MyBase.Load
15     ScoreLabel.Text = "Score: " & Topic1QuizForm.finalscore1 'scorelabel text will say the text in speech marks and the finalscore variable from Topic1QuizForm
16     HighscoreLabel.Text = "Best: " & Topic1QuizForm.highscore1 'Highscorelabel text will say the text in speech marks and the highscore variable from Topic1QuizForm
17     Topic1QuizForm.Close() 'closes topic1 quizform
18 End Sub

```

Test No	What is being tested	Expected Outcome	Actual Outcome
38b	Topic1QuizForm	Will work just like QuizForm but only for topic1 questions.	Test was successful.

I then created a form called “Topic1LeaderboardsForm” where it compares students high scores for the topic1quiz to others in their class in a listview.

I added code to the Leaderboards button in Topic1QuizForm2 to hide the current form and show the new form

```

2 Private Sub LeaderboardsButton_Click(sender As Object, e As EventArgs) Handles LeaderboardsButton.Click
3     'hides current form & shows Topic1LeaderboardsForm
4     Hide()
5     Topic1LeaderboardsForm.Show()
6 End Sub

```

I added a listview to the form & repeated the code for the regular leaderboards form, with minor differences.

```

ListView1.Columns.Add("Users", 500, HorizontalAlignment.Left)
ListView1.Columns.Add("Topic1HighScore", 500, HorizontalAlignment.Left)

```

This will make the 2nd column displayed be called Topic1HighScore instead of HighScore.

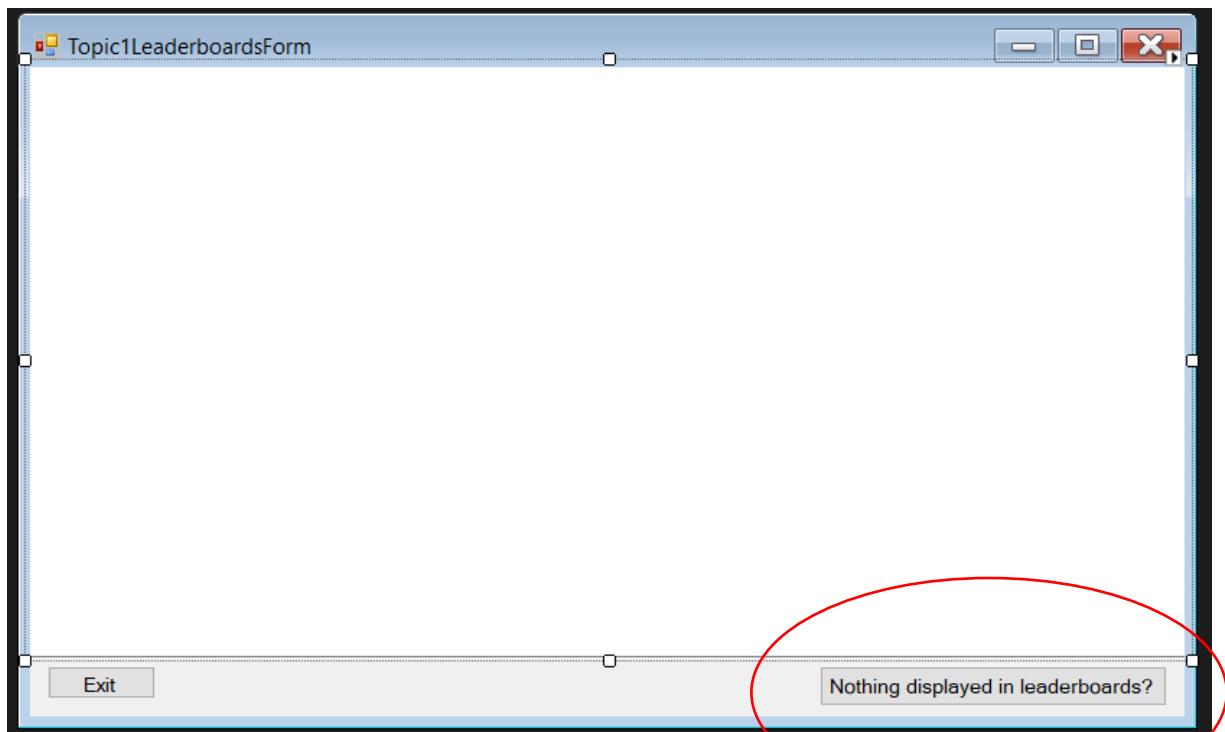
```
newitem.SubItems.Add(data_reader1.GetValue(6)) 'second column
```

This gets the column value of 6 rather than 5 for the 2nd listview column.

ExitButton:

```
0 references
42  Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
43      'closes form & shows previous form again
44      Close()
45      Topic1QuizForm2.Show()
46  End Sub
```

I then realised that some people may get confused when they see nothing in their leaderboards form, so for the topic quizzes as well as the regular quiz, I will add a button that explains why there may be nothing in the leaderboards. This is an extra **usability feature**.

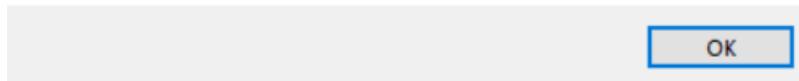


```
53  'msgbox to let the user know why the leaderboards may be empty
54  MsgBox("If there is nothing displayed in the leaderboards, it is likely because you are not associated with a class. Assign a teacher by entering their teacher code in the main menu
55  & this will enable you to view the highscores of your classmates.")
56  End Sub
```

Test No	What is being tested	Expected Outcome	Actual Outcome
---------	----------------------	------------------	----------------

39	Topic1LeaderboardsForm	Will work just like LeaderboardsForm but only for topic1 highscores. & button1 displays message	Test was successful.
----	------------------------	---	----------------------

If there is nothing displayed in the leaderboards, it is likely because you are not associated with a class. Assign a teacher by entering their teacher code in the main menu & this will enable you to view the highscores of your classmates.



I then added code for the play button in Topic1QuizForm2:

```

22  Private Sub PlayButton_Click(sender As Object, e As EventArgs) Handles PlayButton.Click
23      Close() 'closes current form
24      Topic1QuizForm.Close() 'closes topic1quizform so it restarts
25      Topic1QuizForm.Show() 'shows topic1QuizForm
26  End Sub

```

It will close current form, close topic1quizform & open topic1quizform. It closes topic1quizform before opening it again to ensure that it restarts.

& exit button:

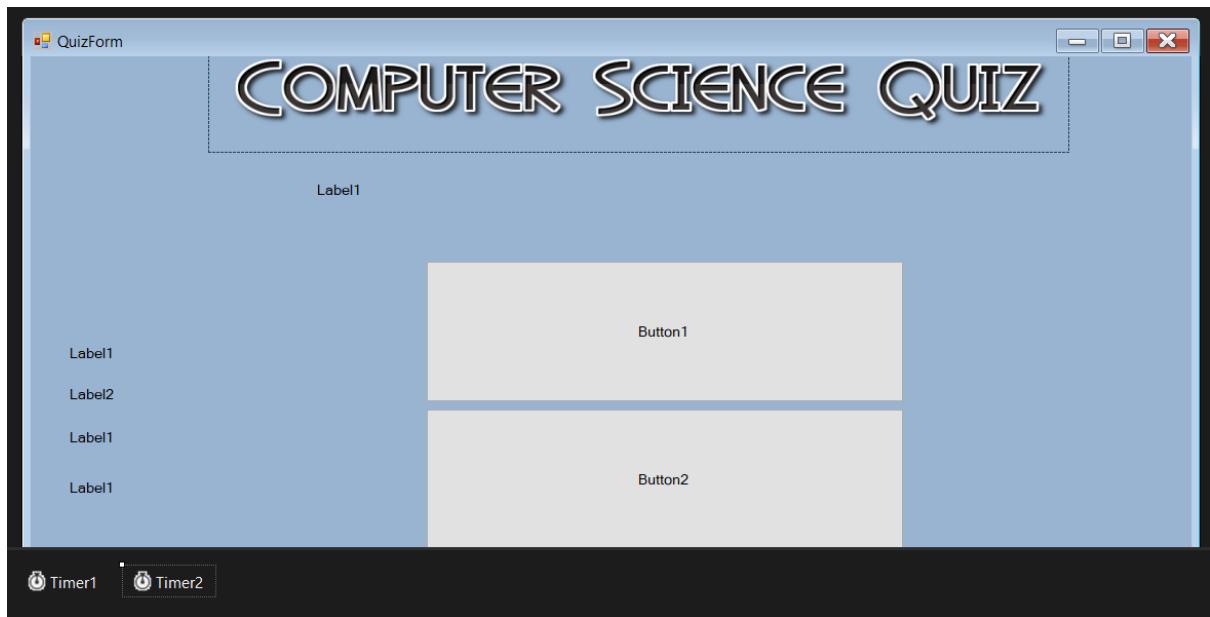
```

8   Private Sub ExitButton_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
9       'closes topic1quizform and current form & shows the TopicQuizSelectionForm
10      Topic1QuizForm.Close()
11      Close()
12      TopicQuizSelectionForm.Show()
13  End Sub

```

I then would have to add questions to the database so there was a minimum of 10 questions per topic to avoid errors when it doesn't want to repeat a question & all I would have to do is repeat these steps for each topic but make minor changes to specify it to the individual topic, however I cannot due to time restrictions. I started on doing this but I realised that it would be too long of a process.

I will now create a stats form called StatsForm. Initially, I intended to have a label displaying total time spent on the program, however I now think that this will not be of any benefit as students can simply leave the program open. Instead I will have a label displaying the total time spent on the quiz. Before I can do this, I must add a 2nd timer to the quiz that keeps track of how many seconds were spent on the quiz.



```

37     'integer variable used to keep track of how many seconds is spent on quiz
38     Dim timetracker As Integer = 0
  
```

I then defined a variable as an integer that can be the value of seconds that will have passed

```

134     Timer2.Interval = 1000 'sets the interval to 1 second
135     Timer2.Start() 'Timer starts functioning
  
```

When the form loads, it sets the interval between the timer ticking to 1 second & start the timer

```

263     Private Sub Timer2_Tick(sender As Object, e As EventArgs) Handles Timer2.Tick
264         timetracker += 1
265     End Sub
  
```

Whenever the timer ticks, it adds 1 to the variable

I then added a column to the datatable Users with datatype Long Number, named it “Seconds”, and manually added a value of 1 to all existing users.

	Seconds
1	1
1	1
1	1
1	1
1	1
1	1
1	1
1	1
1	1
1	1
0	0

I then defined a variable to store the value of total seconds once it has been read from the database

40	'integer variable to store the current total number of seconds from database
41	Dim totalsecs As Integer

I then added code to the CheckqcAndLives() subroutine so that in the case the quiz was over, it would run:

```

120 My.Computer.Audio.Stop() 'stops audio
121 Timer2.Stop() ' stops 2nd timer
122
123 sqlstring3 = "select * from Users where Username = "" & Form1.variablename & """
124 'Defines variable sqlstring1 As data type String, which contains the Command To read all from the data table Users where username is equal to the username they signed in with
125 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
126 DataAdapter = New OleDb.OleDbDataAdapter(sqlstring3, connection)
127 df.Clear()
128 DataAdapter.Fill(df)
129 connection.Close()
130 totalsecs = df.Rows(0)(12) 'equal to value of total seconds already in database
131 totalsecs += timetracker 'adds current session time to previous value
132
133 Dim SQLString5 As String = "UPDATE Users set [Seconds] = "" & totalsecs 'updates database to new value of seconds
134 SQLString5 &= "" WHERE [Username] = "" & Form1.variablename & """
135 'Defines variable sqlstring5 As data type String, which contains the Command To Update the Column Seconds where Username is equal to that of the User currently signed in
136 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
137 DataAdapter = New OleDb.OleDbDataAdapter(SQLString5, connection)
138 dt.Clear()
139 DataAdapter.Fill(dt)
140 connection.Close()
141 Me.Hide() 'closes current form
142 QuizForm2.Show() 'shows QuizForm2
143 End If
144 End Sub

```

The additional code reads the value of seconds stored in the database & then set the integer variable totalsecs to contain the value from the database. It then adds the amount of seconds that have elapsed during the current session of the quiz to the variable, by adding the timetracker variable onto it.

It then updates the database to add on the new value with the additional amount of seconds in the columns "Seconds" for the user that is signed in.

40	QuizForm time tracker	Will successfully update the database in the correct column to have the amount of seconds elapsed added onto the previous value stored in the database.	Test was successful.
----	-----------------------	---	----------------------

Seconds	1	1	20

Added on the amount of seconds I was in the quiz

Seconds	1	1	26

And then when I did the quiz again, it added addition amount of seconds without resetting anything.

I then added an additional column “QuizzesCompleted” with data type Long Number & manually changed all accounts to have the value 1 stored in them to avoid DBNull errors. I repeated the general process for the last one however this doesn’t require a timer.

```
43     'integer variable to keep track of total amount of quizzes completed  
44     Dim qc As Integer
```

```
145
146 sqlstring3 = "select * from Users where Username = '" & Form1.variablename & "'"
147 'Defines variable sqlstring3 As data type String, which contains the Command To read all from the data table Users where username is equal to the username they signed in with
148 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
149 DataAdapter = New OleDb.OleDbDataAdapter(sqlstring3, connection)
150 df.Clear()
151 DataAdapter.Fill(df)
152 connection.Close()
153 qc = df.Rows(0)(13) 'equal to value of total quizzes completed already in database
154 qc += 1 'adds 1 to the number of questions completed
155
156
157 Dim SQLString6 As String = "UPDATE Users set [QuizzesCompleted] = '" & qc 'updates database to new value of Quizzes completed
158 SQLString6 &= " WHERE [Username] = '" & Form1.variablename & "'"
159 ''Defines variable sqlstring6 As data type String, which contains the Command To Update the Column QuizzesCompleted where Username is equal to that of the User currently signed
160 connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
161 DataAdapter = New OleDb.OleDbDataAdapter(SQLString6, connection)
162 dt.Clear()
163 DataAdapter.Fill(dt)
164 connection.Close()
```

It reads the database and sets qc to the value of QuizzesCompleted then adds 1 to it as this code will only be run once the quiz is over.

It then updates the database column value for the user who is signed in to the new number of quizzes completed.

I also made these changes to the topic quizzes.

41	QuizForm questions completed tracker	Will successfully update the database in the correct column to have the amount of quizzes completed.	Test was successful.
----	--------------------------------------	--	----------------------

	Seconds	QuizzesCompleted
1	1	1
1	1	1
1	37	3

After attempting a couple quizzes,

To create a label that says the mean score of the 10 previous quiz attempts, I would have to create 10 additional columns, have an integer variable for each of the columns and set their value through a connection to the database, change each of the variable values each time a quiz is completed so that it moves up like a queue and then have it update the database for each of the columns. However this feature would be quite time consuming therefore I have decided to leave it out.

I then changed the SignUpForm form's code to set the initial value of the "Seconds" & "QuizzesCompleted" to 1 when a new account is created as **validation** to avoid errors.

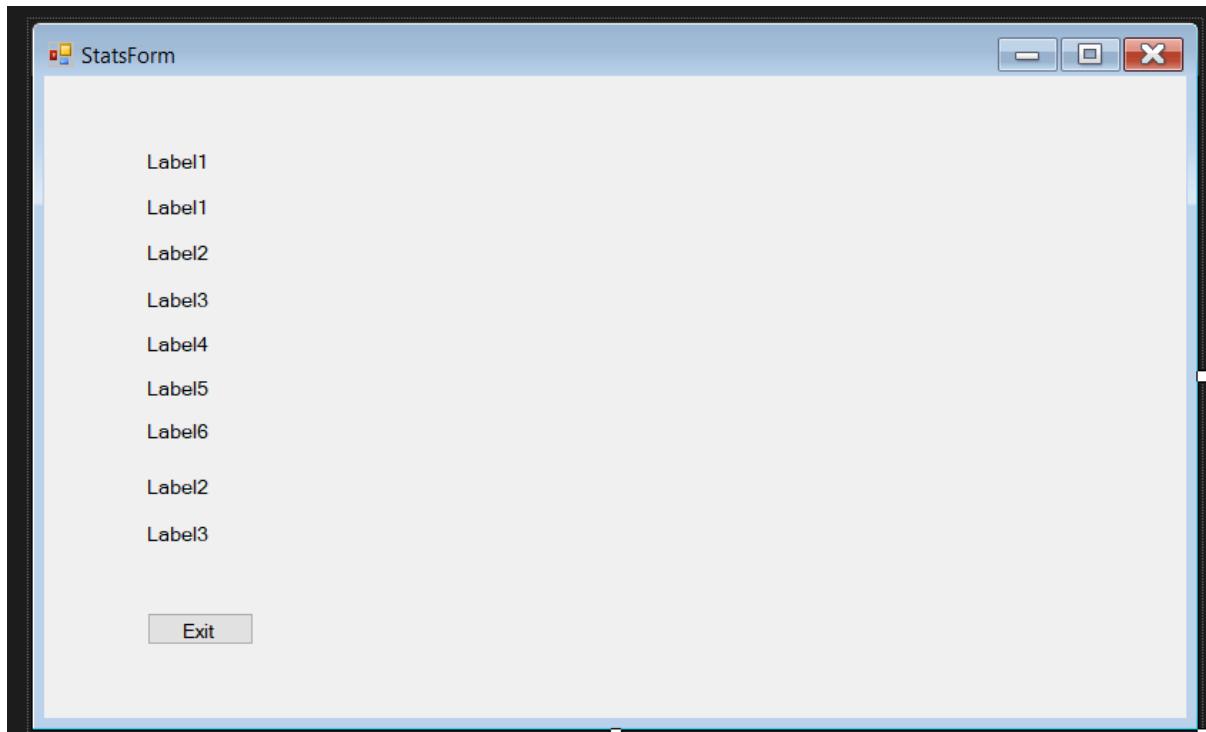
```

44 Dim sqlString As String = "select * from Users"
45 sqlString = "Insert into Users ([Username], [Password], [HighScore], [Topic1HS], [Topic2HS], [Topic3HS], [Topic4HS], [Topic5HS], [Topic6HS], [Seconds], [QuizzesCompleted])"
46 'inserts a value into columns that store numerical values to prevent dbnull error elsewhere in the program
47 sqlString &= " values ('"
48 sqlString &= UsernameTextBox.Text & "', ''"
49 sqlString &= PasswordTextBox.Text & "', ''"
50 sqlString &= "1" & "', ''"
51 sqlString &= "1" & "', ''"
52 sqlString &= "1" & "', ''"
53 sqlString &= "1" & "', ''"
54 sqlString &= "1" & "', ''"
55 sqlString &= "1" & "', ''"
56 sqlString &= "1" & "', ''"
57 sqlString &= "1" & "', ''"
58 sqlString &= "1" & "')"
```

I then thought about the possibility of a username having a dbNull error if the username was "0" since other database columns have had this issue and so I tested this at the same time.

42	<p>SignUpForm if Seconds & QuizzesCompleted values will be set to 1.</p> <p>Also Form1 trying to Sign in with username "0".</p>	<p>Will sign up with default values set to 1 for these 2 columns.</p> <p>Will not give a dbNull error when trying to sign in.</p>	Worked as expected.
----	---	---	---------------------

I then added labels to StatsForm & an exit button.



```

1  Public Class StatsForm
2      Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb") 'defines connection as a new instance
3      'of the OleDb.OleDbConnection class with the specified string that says its Provider and source, linking my database to the program
4      Dim dt As New DataTable 'defines dt as a new instance of the DataTable class
5      Dim DataAdapter As New OleDb.OleDbDataAdapter 'defines DataAdapter as a new instance of the OleDb.OleDbDataAdapter class
6      Dim sqlstring3 As String 'defines variabke as a string, will be used for sql commands
7      Dim highscore As Integer 'defines variable highscore as integer, will be used to store highscore
8      Dim qc As Integer 'defines qc as integer, will be used to store number of quizzes completed
9      Dim totaltime As Integer 'defines totaltime as integer, will be used to store total amount of time spent on quizzes
10     Dim Topic1HS As Integer 'defines Topic1HS As Integer, will b used to store highscore on topic1quiz
11     Dim Topic2HS As Integer 'defines Topic2HS As Integer, will b used to store highscore on topic2quiz
12     Dim Topic3HS As Integer 'defines Topic3HS As Integer, will b used to store highscore on topic3quiz
13     Dim Topic4HS As Integer 'defines Topic4HS As Integer, will b used to store highscore on topic4quiz
14     Dim Topic5HS As Integer 'defines Topic5HS As Integer, will b used to store highscore on topic5quiz

```

```

16  Private Sub StatsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
17  SQLstring3 = "select * from Users where Username = '" & Form1.variablename & "'"
18  'Defines variable sqlstring1 As data type String, which contains the Command To read all from the data table Users where username is equal to the username they signed in with
19  connection.Open() 'opens the database connection with the property settings by the connectionString that I defined for connection
20  DataAdapter = New OleDb.OleDbDataAdapter(sqlstring3, connection)
21  Dim df As New DataTable 'defines df as new datatable
22  df.Clear() 'clears datatable
23  DataAdapter.Fill(df)
24  connection.Close()
25  highscore = CInt(df.Rows(0)(5)) 'sets variable to HighScore value
26  totaltime = df.Rows(0)(12) 'sets variable to Seconds value
27  qc = df.Rows(0)(13) 'sets variable to QuizzesCompleted value
28  Topic1HS = df.Rows(0)(6) 'sets variable to Topic1HS column value
29  Topic2HS = df.Rows(0)(7) 'sets variable to Topic2HS column value
30  Topic3HS = df.Rows(0)(8) 'sets variable to Topic3HS column value
31  Topic4HS = df.Rows(0)(9) 'sets variable to Topic4HS column value
32  Topic5HS = df.Rows(0)(10) 'sets variable to Topic5HS column value
33  Topic6HS = df.Rows(0)(11) 'sets variable to Topic6HS column value
34  HighScoreLabel.Text = "Highscore: " & highscore
35  TotalTimeLabel.Text = "Amount of spent in quizzes: " & Math.Round((totaltime / 60), 2) & " minutes"
36  NumQuizzesLabel.Text = "Amount of quizzes completed: " & qc
37  Topic1HSLabel.Text = "Topic 1 Highscore: " & Topic1HS
38  Topic2HSLabel.Text = "Topic 2 Highscore: " & Topic2HS
39  Topic3HSLabel.Text = "Topic 3 Highscore: " & Topic3HS
40  Topic4HSLabel.Text = "Topic 4 Highscore: " & Topic4HS
41  Topic5HSLabel.Text = "Topic 5 Highscore: " & Topic5HS
42  Topic6HSLabel.Text = "Topic 6 Highscore: " & Topic6HS
43  End Sub

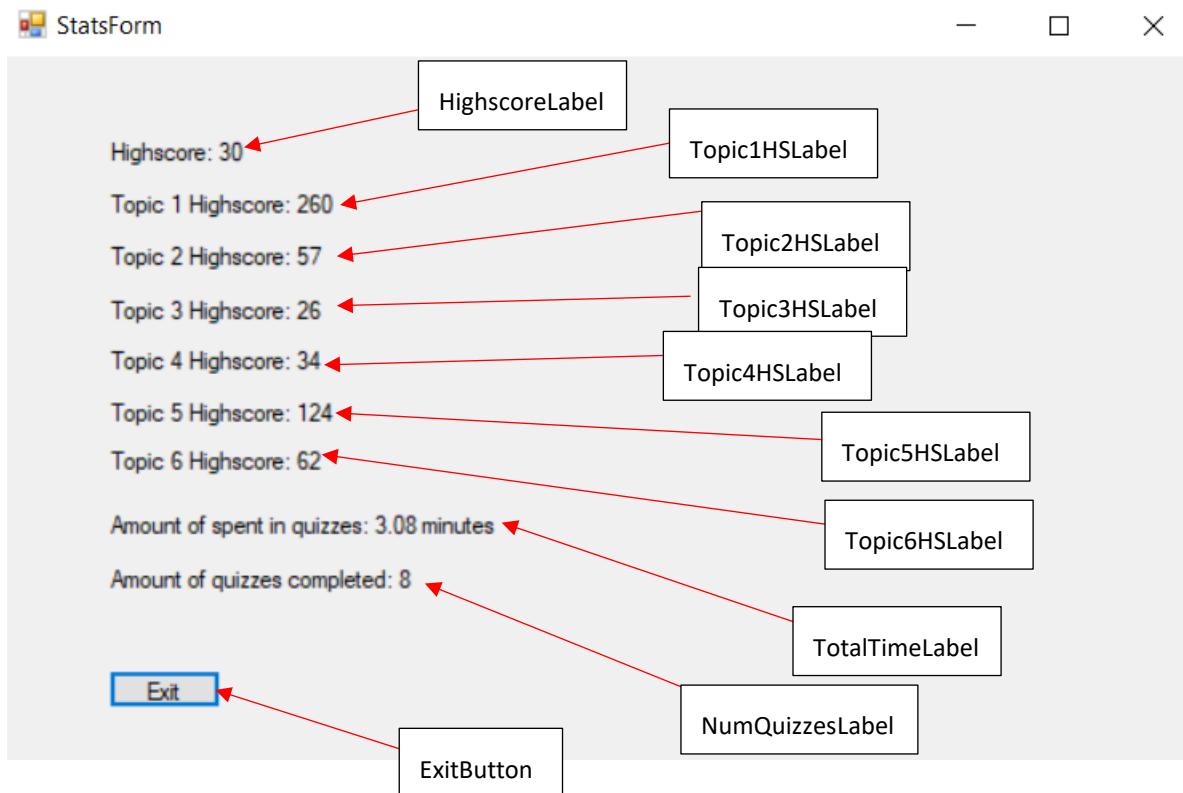
```

I publicly defined all the database connection variables needed, then all variables I would need for displaying information from database in the labels.

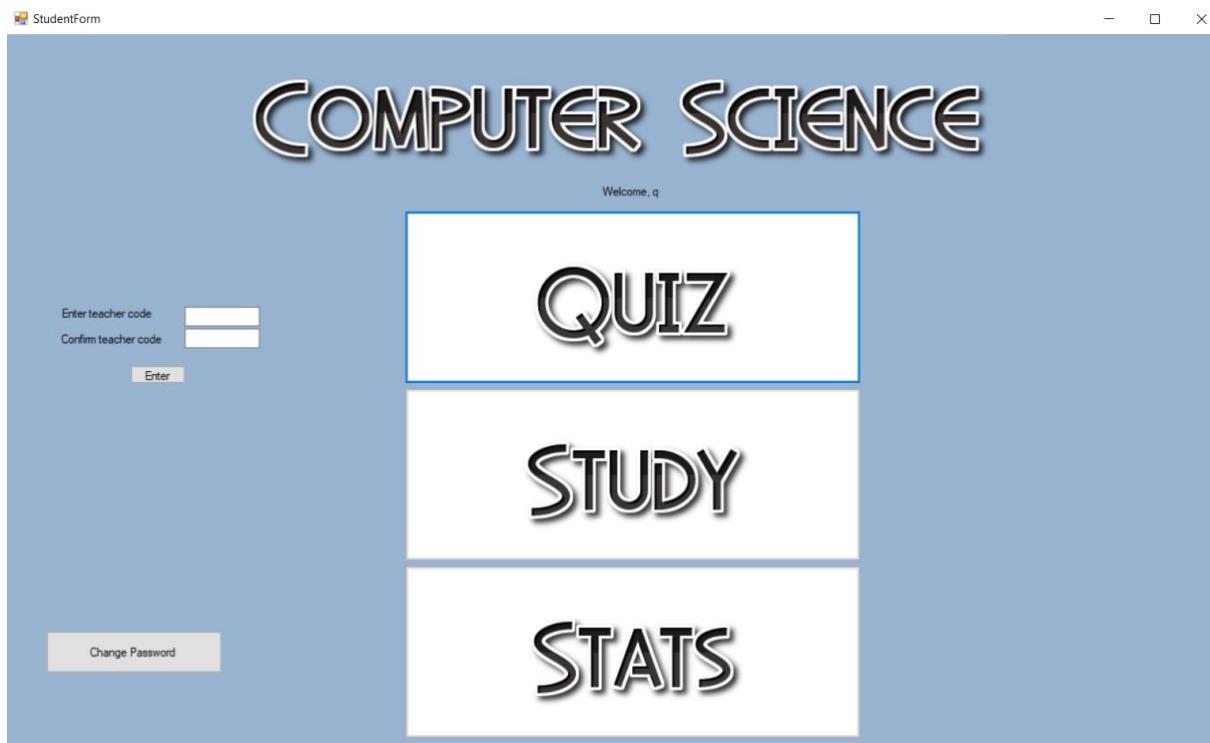
Then, when the form loads, I had it read the information from the datatable for the user who is signed in and stored all relevant information in the variables associated with each piece of information, & then display the information through the labels in the way I wanted, with the time on quiz being shown in the format of minutes to 2dp as this will be more useful to users than showing the total amount of seconds.

The exit button code was the same as always, closes current form & opens previous form.

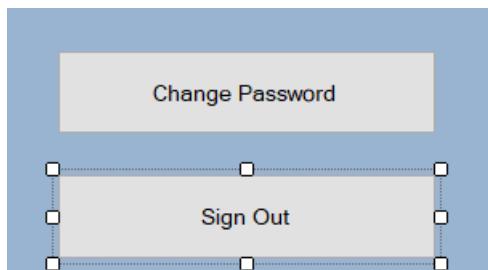
43	StatsForm	Will display the information in the format I intended as stated when developing it. & exit button will work	Worked as expected. But missed out a word in TotalTimeLabel which I will fix.
----	-----------	---	---



I then added a picture to the button that leads to StatsForm in StudentForm so the students know where the button leads & to make it look better.



I finally added a sign out button to make use of the program easier if 2 students are sharing a computer & want to switch to each others account without having to close the program.

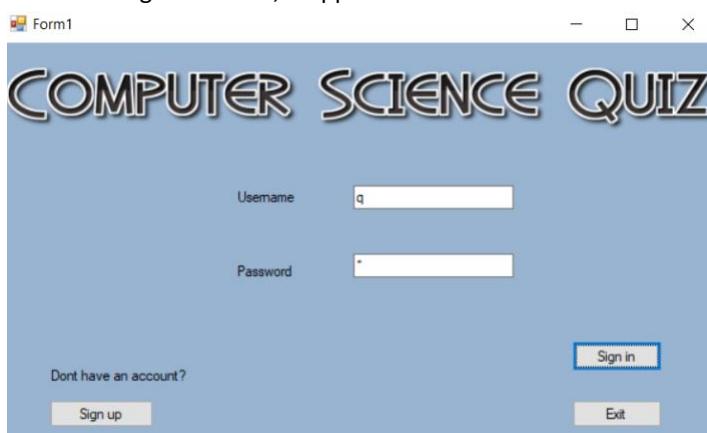


```

129  Private Sub SignOutButton_Click(sender As Object, e As EventArgs) Handles SignOutButton.Click
130      'closes current form & shows previous form
131      Close()
132      Form1.Show()
133  End Sub

```

When testing the button, it appears the textboxes hadn't cleared so I will fix this.



This is because I had only thought about clearing the textboxes when it was entered incorrectly as previously there wasn't a way of signing in again after the first time, therefore clearing the textboxes was pointless.

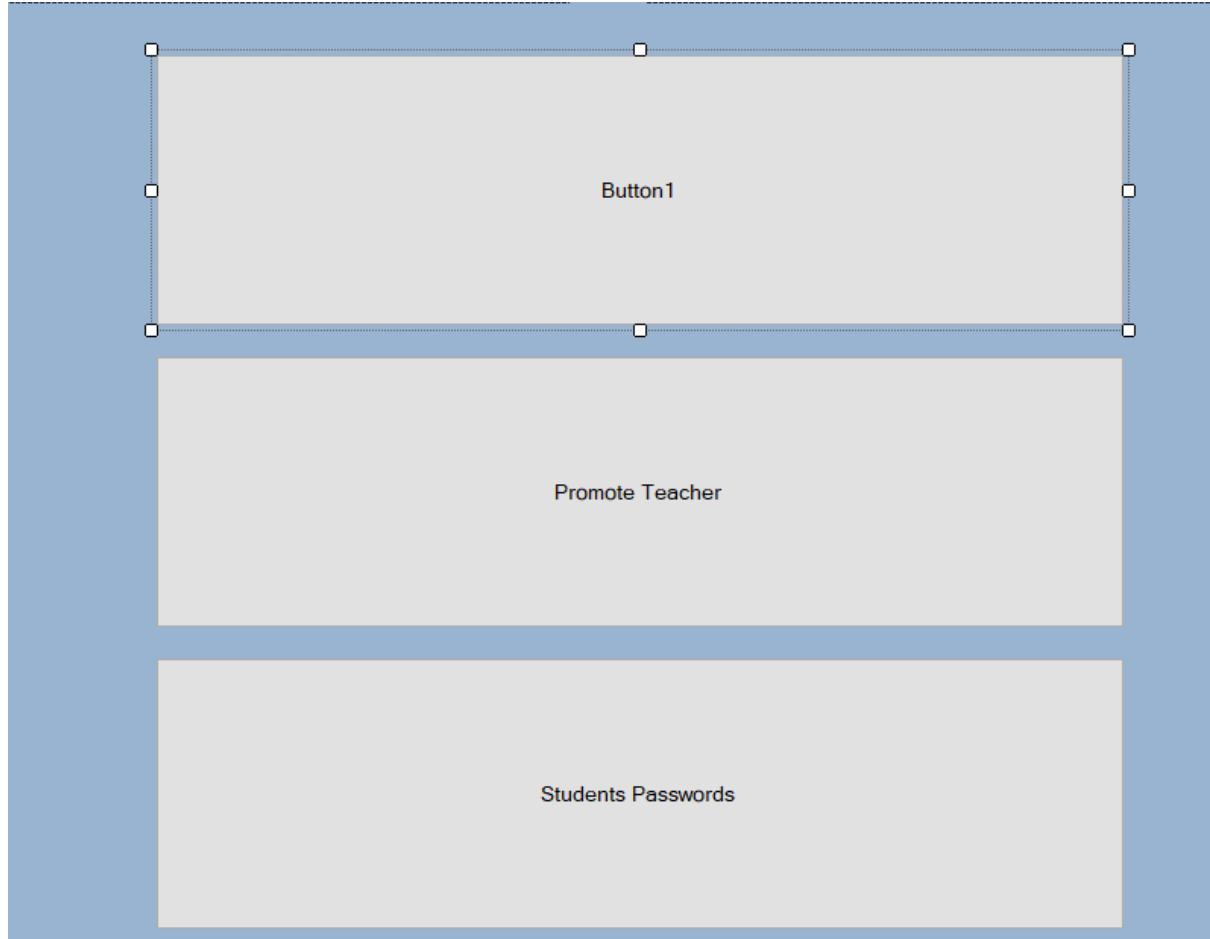
I simply added the following code to the sign up button in Form1 so it clears when the sign in attempt was successful.

```
35 |     PasswordTextBox.Text = "" 'clears PasswordTextBox  
36 |     UsernameTextBox.Text = "" 'clears UsernameTextBox  
37 |     Me.Hide()  
38 |     variablename = UsernameTextBox.Text 'variablename is e  
39 |     TeacherForm.Show()
```

```
61 |     PasswordTextBox.Text = "" 'clears PasswordTextBox  
62 |     UsernameTextBox.Text = "" 'clears UsernameTextBox  
63 |     StudentForm.Show() 'shows studentform
```

All the main features have pretty much been made, now I will just add the ability for teachers to view the stats of their students.

I added pictures to the buttons on the main menu of TeacherForm.

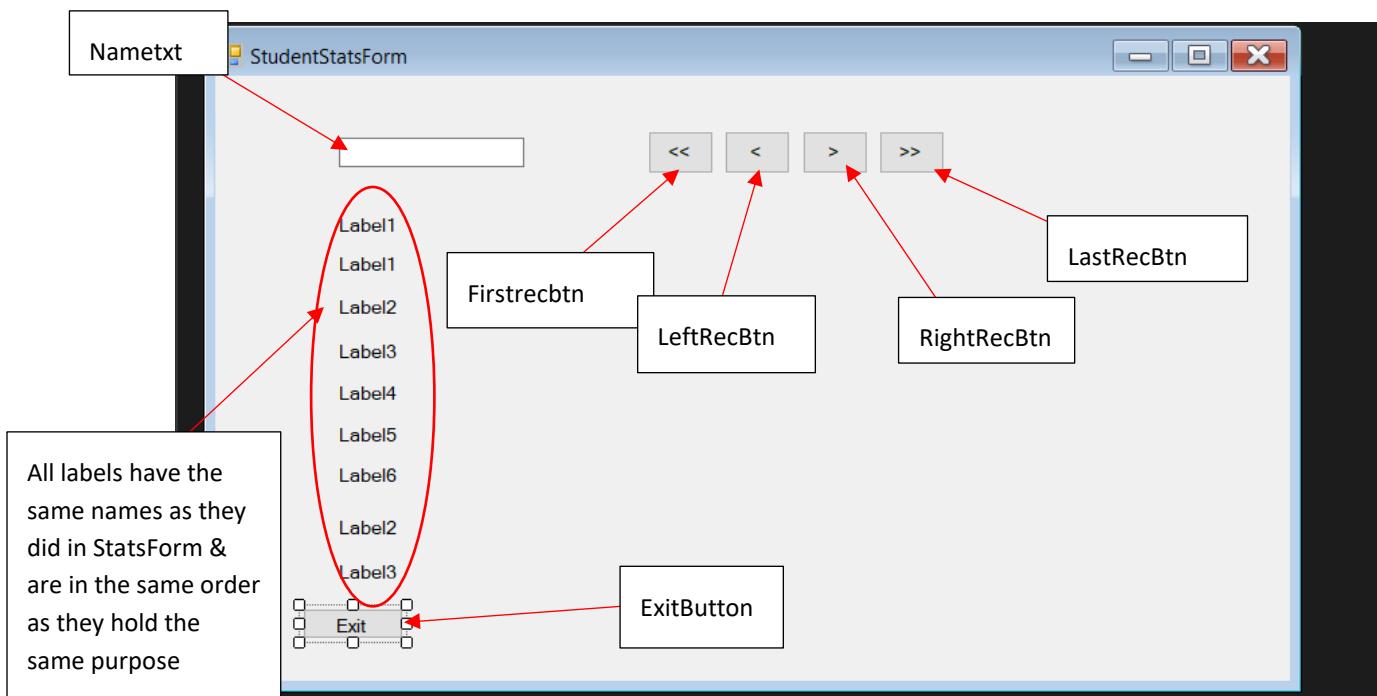


STUDENT STATS

PROMOTE TEACHER

STUDENT PASSWORDS

I then created a new form called StudentStatsForm & added code to the top button to close current form and open StudentStatsForm.



I have made this form similar to StatsForm, however I have added a textbox & buttons so the teacher can navigate through the database to see the stats of each student.

```

1 Public Class StudentStatsForm
2     Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb")
3     Dim df As New DataTable
4     Dim dataadapter As New OleDb.OleDbDataAdapter
5     Dim rownumber As Integer = 0 'defines integer variable to represent row number which will change depending on whether they press left or right navigation buttons
6     Dim highscore As Integer 'defines variable highscore as integer, will be used to store highscore
7     Dim qc As Integer 'defines qc as integer, will be used to store number of quizzes completed
8     Dim totaltime As Integer 'defines totaltime as integer, will be used to store total amount of time spent on quizzes
9     Dim Topic1HS As Integer 'defines Topic1HS As Integer, will b used to store highscore on topic1quiz
10    Dim Topic2HS As Integer 'defines Topic2HS As Integer, will b used to store highscore on topic2quiz
11    Dim Topic3HS As Integer 'defines Topic3HS As Integer, will b used to store highscore on topic3quiz
12    Dim Topic4HS As Integer 'defines Topic4HS As Integer, will b used to store highscore on topic4quiz
13    Dim Topic5HS As Integer 'defines Topic5HS As Integer, will b used to store highscore on topic5quiz
14    Dim Topic6HS As Integer 'defines Topic6HS As Integer, will b used to store highscore on topic6quiz

```

First I defined variables for database connection, then variable to represent the row number which is what will be used to determine the account that is being displayed, & variables to use to store the values taken from the database.

```

15     Public Sub displayrecord()
16         nametxt.Text = df.Rows(rownumber)(1) 'textbox text value
17         highscore = CInt(df.Rows(rownumber)(5)) 'sets variable to HighScore value
18         totaltime = df.Rows(rownumber)(12) 'sets variable to Seconds value
19         qc = df.Rows(rownumber)(13) 'sets variable to QuizzesCompleted value
20         Topic1HS = df.Rows(rownumber)(6) 'sets variable to Topic1HS column value
21         Topic2HS = df.Rows(rownumber)(7) 'sets variable to Topic2HS column value
22         Topic3HS = df.Rows(rownumber)(8) 'sets variable to Topic3HS column value
23         Topic4HS = df.Rows(rownumber)(9) 'sets variable to Topic4HS column value
24         Topic5HS = df.Rows(rownumber)(10) 'sets variable to Topic5HS column value
25         Topic6HS = df.Rows(rownumber)(11) 'sets variable to Topic6HS column value
26         HighScoreLabel.Text = "Highscore: " & highscore
27         TotalTimeLabel.Text = "Amount of spent in quizzes: " & Math.Round((totaltime / 60), 2) & " minutes"
28         NumQuizzesLabel.Text = "Amount of quizzes completed: " & qc
29         Topic1HSLabel.Text = "Topic 1 Highscore: " & Topic1HS
30         Topic2HSLabel.Text = "Topic 2 Highscore: " & Topic2HS
31         Topic3HSLabel.Text = "Topic 3 Highscore: " & Topic3HS
32         Topic4HSLabel.Text = "Topic 4 Highscore: " & Topic4HS
33         Topic5HSLabel.Text = "Topic 5 Highscore: " & Topic5HS
34         Topic6HSLabel.Text = "Topic 6 Highscore: " & Topic6HS
35     End Sub

```

Subroutine that will be run each time the button is pressed & the teacher has the intention of displaying a different student, will take the values from database & display information in labels.

```

0 references
36 Private Sub firstrecbtn_Click(sender As Object, e As EventArgs) Handles firstrecbtn.Click
37     'displays the first account
38     rownumber = 0
39     displayrecord()
40 End Sub
        0 references
41 Private Sub lastrecbtn_Click(sender As Object, e As EventArgs) Handles lastrecbtn.Click
42     'displays the last account
43     rownumber = df.Rows.Count - 1
44     displayrecord()
45 End Sub
        0 references
46 Private Sub leftrecbtn_Click(sender As Object, e As EventArgs) Handles leftrecbtn.Click
47     'if it was the first account then it cannot go left again
48     If rownumber = 0 Then
49         rownumber = rownumber
50     Else
51         'if it was not the first account then the rownumber can decrease to show the previous account
52         rownumber -= 1
53         displayrecord()
54     End If
55 End Sub
        0 references
56 Private Sub rightrecbtn_Click(sender As Object, e As EventArgs) Handles rightrecbtn.Click
57     'if it was the last possible account then it cannot go right again
58     If rownumber = df.Rows.Count - 1 Then
59         rownumber = rownumber
60     Else
61         'if it was not the last possible account then the rownumber can decrease to show the next account
62         rownumber += 1
63         displayrecord()

```

All navigation buttons coded. Firstrecbtn puts row number to 0, Lastrecbtn puts it to the number of last row.

Leftrecbtn checks if it is already the first record & if so, doesn't do anything, otherwise it decreases row number by 1 and updates the variables & labels by running displayrecord() subroutine.

Rightrecbtn checks if it is already the last record & if so, doesn't do anything, otherwise it increases row number by 1 and updates the variables & labels by running displayrecord() subroutine.

```

0 references
67 Private Sub StudentStatsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
68     'reads all information from users datatable
69     Dim sqlstring As String = "SELECT * FROM Users"
70     connection.Open()
71     dataadapter = New OleDb.OleDbDataAdapter(sqlstring, connection)
72     df.Clear()
73     dataadapter.Fill(df)
74     connection.Close()
75 End Sub

```

When the form loads, it creates the connection to the database.

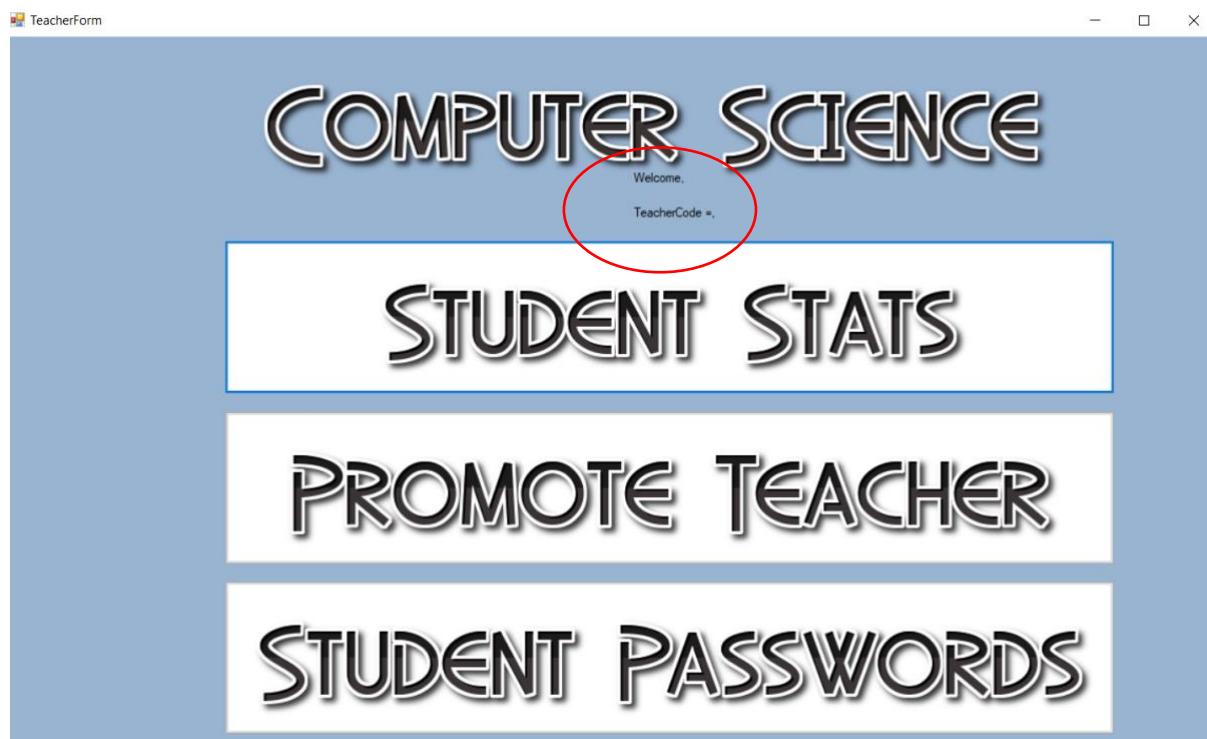
```

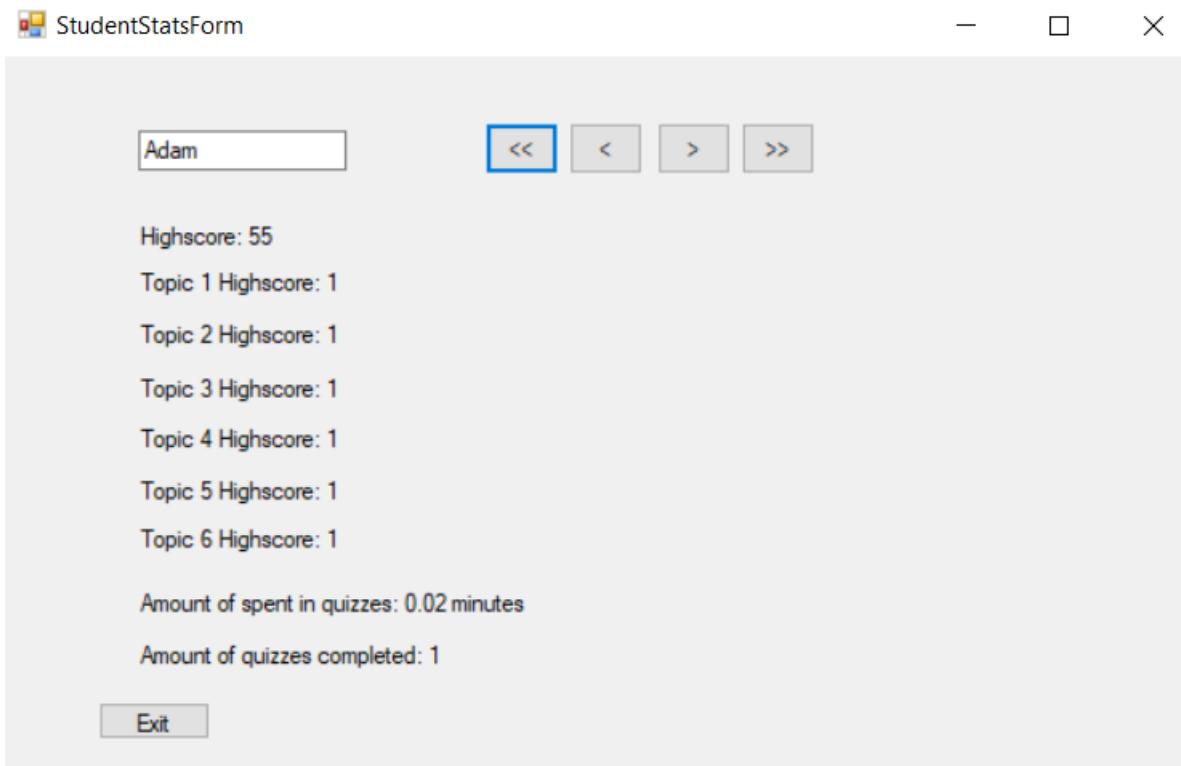
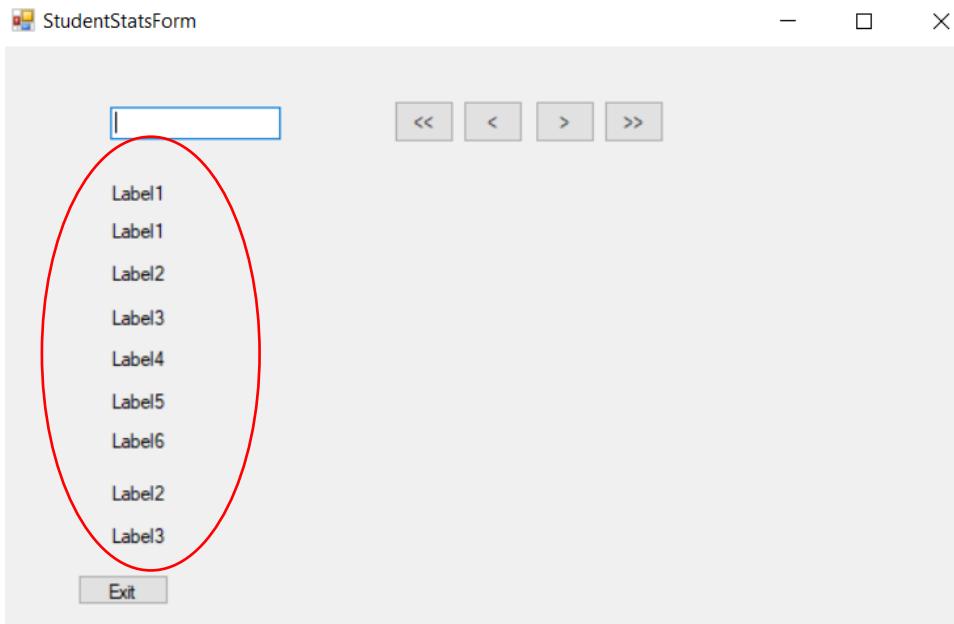
77  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles ExitButton.Click
78      'closes current form and opens previous form
79      Close()
80      TeacherForm.Show()
81  End Sub

```

Exit button functions same as always.

43	StudentStatsForm	Will display the information in the format I intended as stated when developing it, with navigation buttons working, left buttons navigating upwards & right buttons going down the datatable. & exit button will work	Worked as expected. But before pressing any buttons, all labels displayed default text. Also when first signing in, TeacherForm labels didn't display text correctly.
----	------------------	--	--





<< < > >>

Highscore: 50

Topic 1 Highscore: 1

Topic 2 Highscore: 1

Topic 3 Highscore: 1

Topic 4 Highscore: 1

Topic 5 Highscore: 1

Topic 6 Highscore: 1

Amount of spent in quizzes: 0.02 minutes

Amount of quizzes completed: 1

<< < > >>

Highscore: 30

Topic 1 Highscore: 260

Topic 2 Highscore: 57

Topic 3 Highscore: 26

Topic 4 Highscore: 34

Topic 5 Highscore: 124

Topic 6 Highscore: 62

Amount of spent in quizzes: 3.08 minutes

Amount of quizzes completed: 8

0	<input type="button" value="<<"/> <input type="button" value="<"/> <input type="button" value=">"/> <input style="outline: 2px solid blue;" type="button" value=">>"/>
<p>Highscore: 29</p> <p>Topic 1 Highscore: 1</p> <p>Topic 2 Highscore: 1</p> <p>Topic 3 Highscore: 1</p> <p>Topic 4 Highscore: 1</p> <p>Topic 5 Highscore: 1</p> <p>Topic 6 Highscore: 1</p> <p>Amount of spent in quizzes: 0.37 minutes</p> <p>Amount of quizzes completed: 2</p>	
<input type="button" value="Exit"/>	

To fix the teachercode label in TeacherForm, I had to reorder the code in Form1 when teacherform is being opened as the variable used for Teachercode was only defined after the form was opened, therefore it is unable to display it.

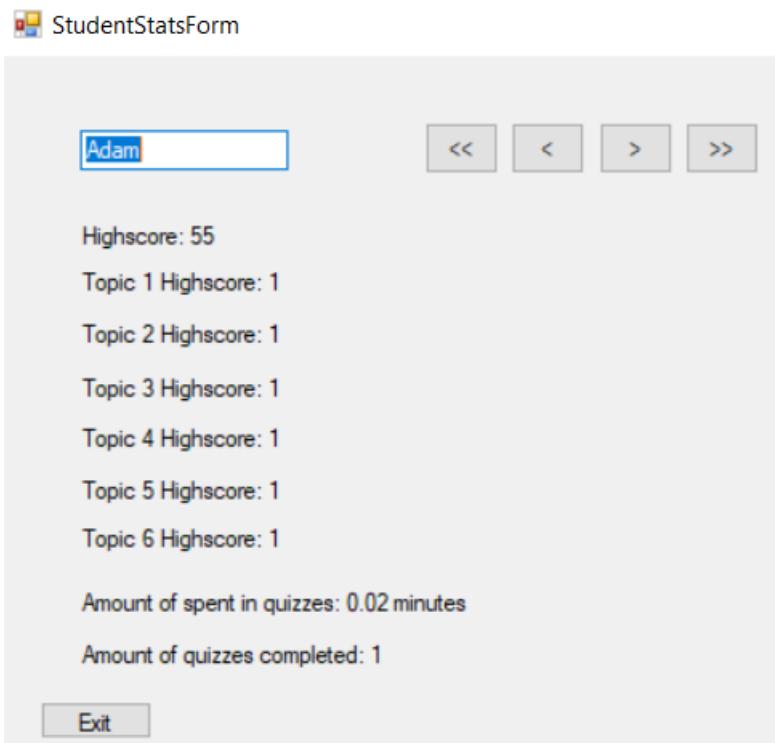
To fix the welcome label, I also had to change the ordering as I only defined it to UsernameTextBox.text in Form1 after I had cleared the textbox.

To fix the StudentStatsForm labels showing default text such as “Label1, Label2 etc”, I had the displaylabels() subroutine run when the form loads.

43a	StudentStatsForm	Will display the information in the format I intended as stated when developing it, with navigation buttons working, left buttons navigating upwards & right buttons going down the datatable. & exit button will work	Worked as expected.
-----	------------------	--	---------------------

Welcome, Boris
TeacherCode = A3X5G

Labels worked properly.



Displayed first student upon loading.

CLIENT INTERVIEW & ANALYSIS

CRAIG BRIDGENS

Said he thought the ability to navigate through the database was good, however would also like a search function for when a teacher would like to search for a specific student.

This is a good idea that I will add to the program as this will be a **usability** feature for the teachers.

Said he thought I should also tailor the program so that it only shows the teachers own students who are connected through the teachercode.

I will also change the code to specify only the teachers own class is viewed as it would be slightly pointless and time consuming for teachers to navigate through the entire database & try to find their students. This is something I have done elsewhere in the program such as for leaderboards where it only shows the highscores of their own class, but forgot to do for the statsform.

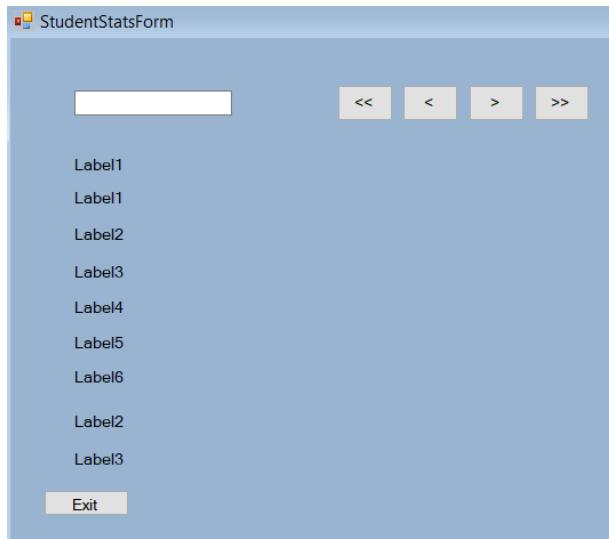
JOSH FRASER

Suggested I change the back colour to keep the colour scheme more consistent throughout the program.

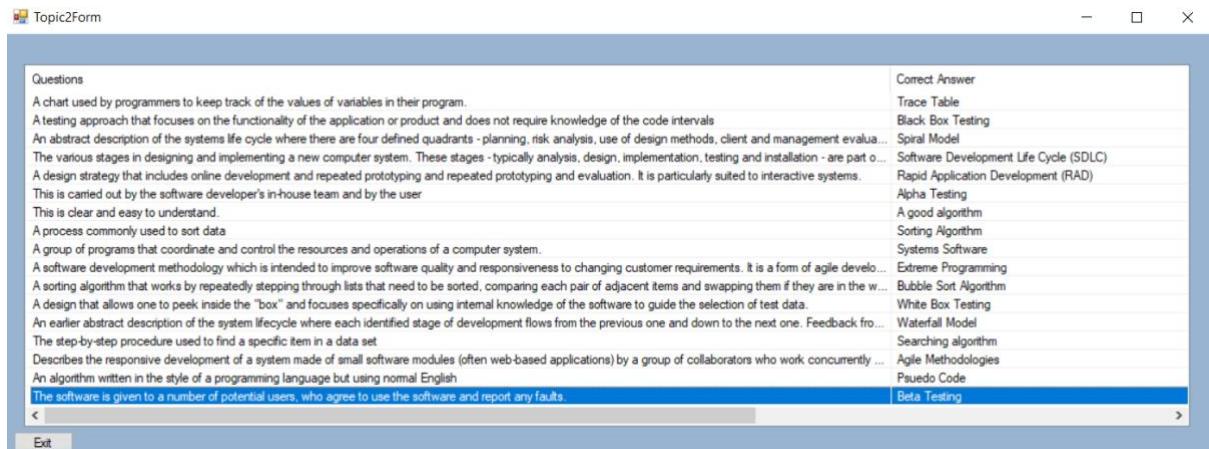
I will change the back colour of this form to ActiveCaption & check the rest of the forms.

CHANGES

Changing back colour

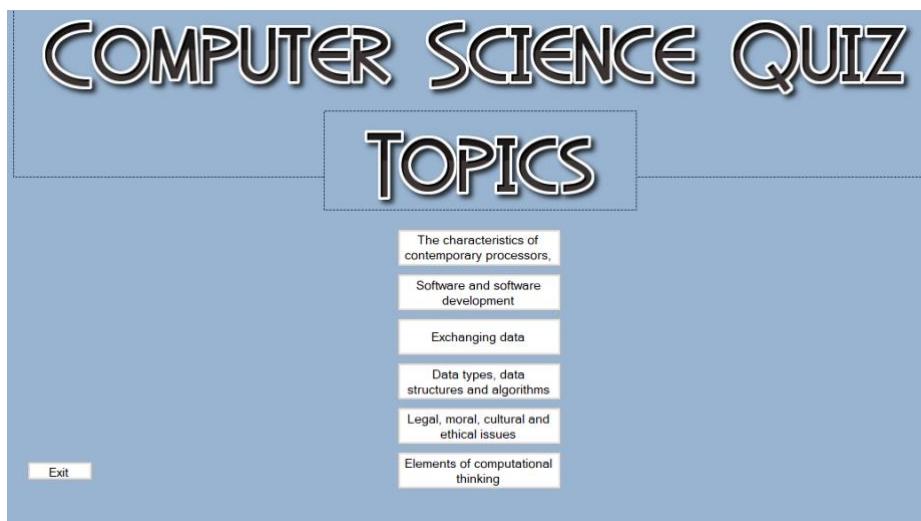


The topic forms were completely white so I made the listview slightly smaller and changed the back colours of them.



I then changed all the buttons to have a white background colour as some were white and some were grey such as the exit buttons in the forms shown as well as the navigation buttons.

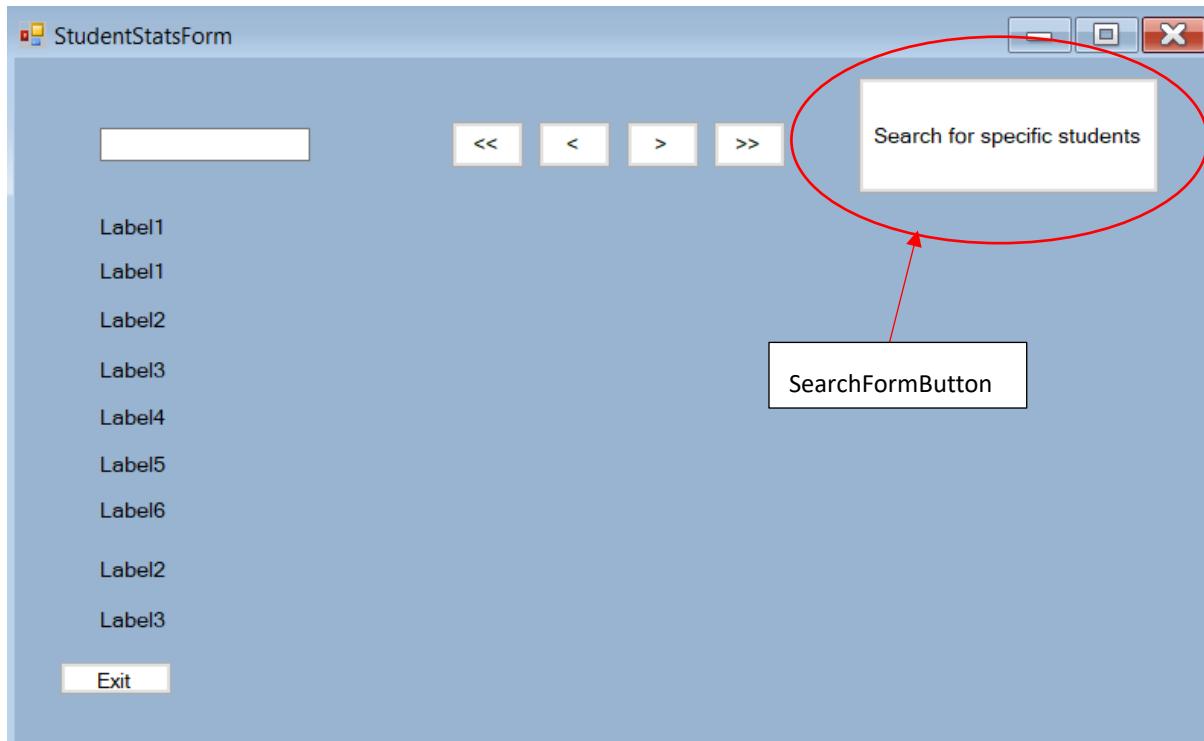
Example:



All buttons are white now

Search for student function

First I added a button called "SearchButton" to StudentStatsForm that leads to a new form I made called "SearchStudentStatsForm". I have made 2 forms, separating the navigation and search functions as this will make it easier to code.



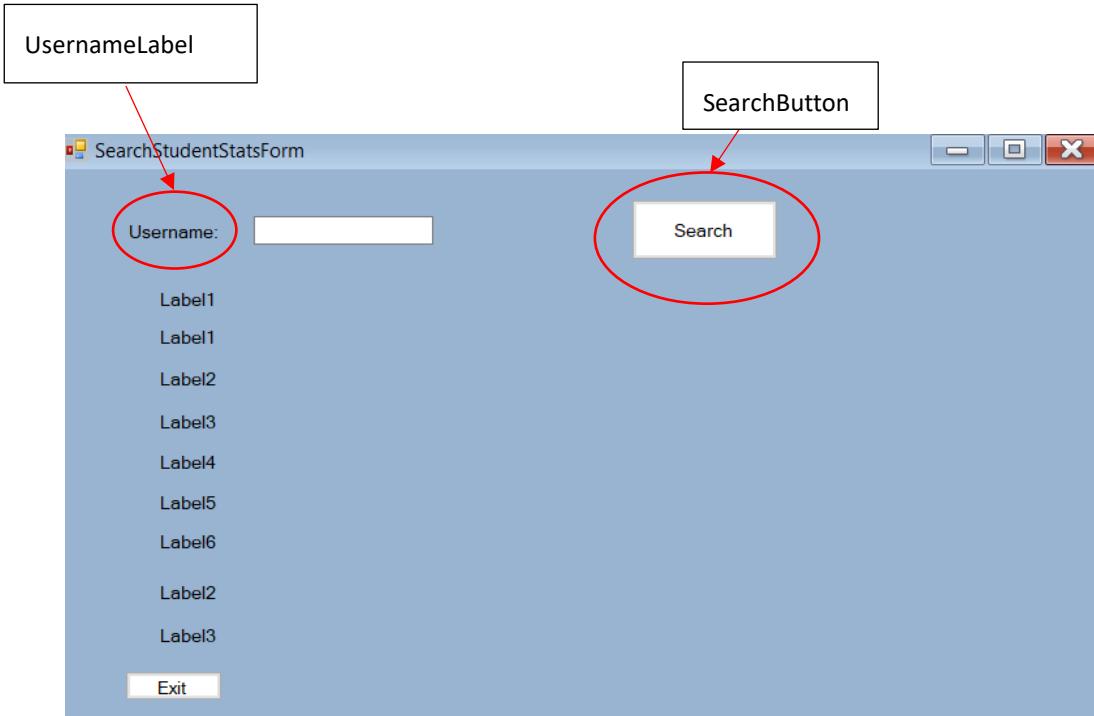
```
0 references
84  Private Sub Button1_Click_1(sender As Object, e As EventArgs) Handles SearchFormButton.Click
85      'closes current form shows searchstudentstatsform
86      Close()
87      SearchStudentStatsForm.Show()
88  End Sub
```

SearchStudentStatsForm:

It is similar to StudentStatsForm but is doesn't have the navigation buttons & has a button to search for the student they want to view the stats of.

I also added an extra label to indicate what the teacher should enter into the textbox.

The rest of the labels & the textbox & exit buttons have the same name as they did in StudentStatsForm as they have the same purpose.



The variables that have been defined in the class, outside subroutines are the same as in StudentStatsForm.

```

1  Public Class SearchStudentStatsForm
2      Dim connection As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=RoughCode1DB.accdb")
3      Dim df As New DataTable
4      Dim dataadapter As New OleDb.OleDbDataAdapter
5      Dim rownumber As Integer = 0 'defines integer variable to represent row number which will change depending on whether they press left or right navigation buttons
6      Dim highscore As Integer 'defines variable highscore as integer, will be used to store highscore
7      Dim qc As Integer 'defines qc as integer, will be used to store number of quizzes completed
8      Dim totaltime As Integer 'defines totaltime as integer, will be used to store total amount of time spent on quizzes
9      Dim Topic1HS As Integer 'defines Topic1HS As Integer, will b used to store highscore on topic1quiz
10     Dim Topic2HS As Integer 'defines Topic2HS As Integer, will b used to store highscore on topic2quiz
11     Dim Topic3HS As Integer 'defines Topic3HS As Integer, will b used to store highscore on topic3quiz
12     Dim Topic4HS As Integer 'defines Topic4HS As Integer, will b used to store highscore on topic4quiz
13     Dim Topic5HS As Integer 'defines Topic5HS As Integer, will b used to store highscore on topic5quiz
14     Dim Topic6HS As Integer 'defines Topic6HS As Integer, will b used to store highscore on topic6quiz

```

It has the same code in the public sub displayrecord() as used in StudentStatsForm.

```

35  Private Sub SearchStudentStatsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
36      'loads the stats of the first row
37      displayrecord()
38  End Sub

```

When it loads it displays the stats of the first row so that the labels do not display their default text upon loading.

```

0 references
40 Private Sub Button1_Click(sender As Object, e As EventArgs) Handles SearchButton.Click
41     'reads all information from users datatable where username is the one that has been searched for
42     Dim sqlstring1 As String = "SELECT * FROM Users WHERE Username = '" & nametxt.Text & "'"
43     connection.Open()
44     dataadapter = New OleDb.OleDbDataAdapter(sqlstring1, connection)
45     df.Clear()
46     dataadapter.Fill(df)
47     connection.Close()
48
49     'updates labels to display the stats of the student that has been searched for
50     displayrecord()
51
52 End Sub

```

When the search button is clicked, it gets the information from the database & runs the displayrecord() subroutine. So that the variables declared outside the subroutines are set to the information for the student that has been searched for & the labels used these to display it.

The exit button has the same function as always.

44	SearchStudentStatsForm	Will display the stats of the student that has been searched for.	Error as form loads.
----	------------------------	---	----------------------

This is likely due to the fact that it tries to run the displayrecord() subroutine before it has taken information from a database, therefore I will add code that creates a connection to the database & reads information from the datatable Users before the displayrecord() sub is run.

```

35 Private Sub SearchStudentStatsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
36     'reads all information from users datatable
37     Dim sqlstring As String = "SELECT * FROM Users"
38     connection.Open()
39     dataadapter = New OleDb.OleDbDataAdapter(sqlstring, connection)
40     df.Clear()
41     dataadapter.Fill(df)
42     connection.Close()
43     'loads the stats of the first row
44     displayrecord()
45 End Sub

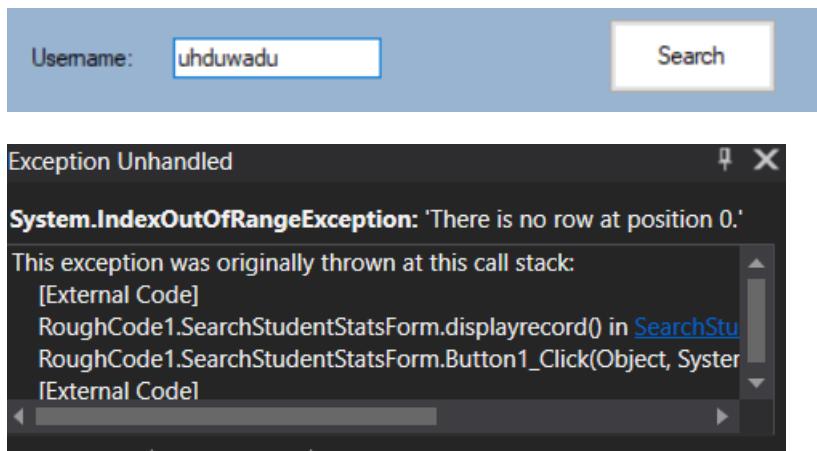
```

44a	SearchStudentStatsForm	Will first display the first user in the datatable, then display the stats of the student that has been searched for.	Worked as required but there is an error when a name that doesn't exist in the datatable is searched.
-----	------------------------	---	---

Username:

Highscore: 30
Topic 1 Highscore: 260
Topic 2 Highscore: 57
Topic 3 Highscore: 26
Topic 4 Highscore: 34
Topic 5 Highscore: 124
Topic 6 Highscore: 62
Amount of spent in quizzes: 3.08 minutes
Amount of quizzes completed: 8

When “ss” was searched, it shows their stats, but when the following was searched, it gave an error.



Furthermore I will have to add **validation** prevent this error.

I have added an IF statement that checks if no rows are found with the username equal to the one entered by the teacher. If none are found, a msgbox is displayed to notify them that the student doesn't exist, then the textbox is cleared. If the student is found then it can run the displayrecord() sub.

```

47  Private Sub Button1_Click(sender As Object, e As EventArgs) Handles SearchButton.Click
48      'reads all information from users datatable where username is the one that has been searched for
49      Dim sqlstring1 As String = "SELECT * FROM Users WHERE Username = '" & nametxt.Text & "'"
50      connection.Open()
51      dataadapter = New OleDb.OleDbDataAdapter(sqlstring1, connection)
52      df.Clear()
53      dataadapter.Fill(df)
54      connection.Close()
55      If df.Rows.Count = 0 Then 'if there are no students with that username
56          MsgBox("Student doesn't exist") 'display msgbox
57          nametxt.Text = "" 'clears textbox
58          Exit Sub
59      Else
60          'updates labels to display the stats of the student that has been searched for
61          displayrecord()
62      End If
63  End Sub

```

If there are no users in the database then SearchStudentStatsForm as well as StudentStatsForm will be of no use to them & will cause errors, therefore I have decided to not allow access to these forms if no students exist.

In StudentStatsForm,

```

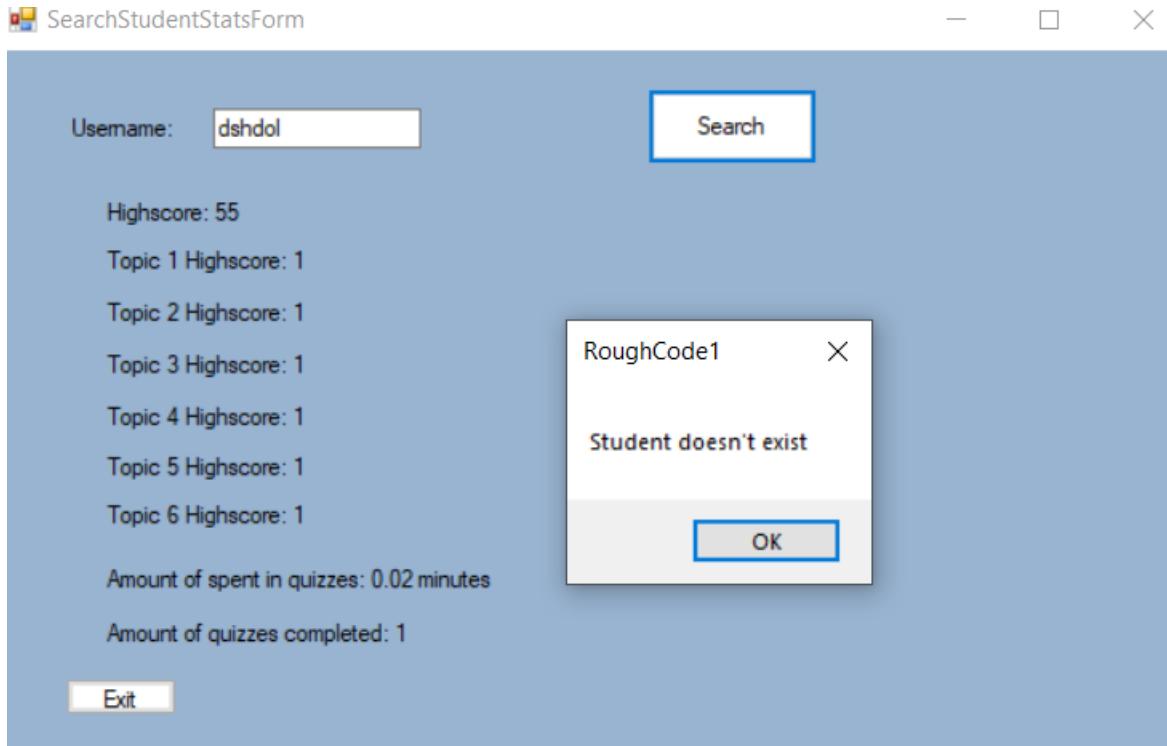
0 references
67  Private Sub StudentStatsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
68      'reads all information from users datatable
69      Dim sqlstring As String = "SELECT * FROM Users"
70      connection.Open()
71      dataadapter = New OleDb.OleDbDataAdapter(sqlstring, connection)
72      df.Clear()
73      dataadapter.Fill(df)
74      connection.Close()
75      If df.Rows.Count = 0 Then 'if no students exist
76          MsgBox("No students exist") 'msgbox displayed to notify the teacher
77          nametxt.Text = "" 'textbox clears
78          'exit button code is run
79          Close()
80          TeacherForm.Show()
81      Else
82          displayrecord()
83  End Sub

```

So If no students exist in the database it will automatically close the form and open teacherform again. I do not have to add this to SearchStudentStatsForm as that can only be accessed through StudentStatsForm which already has this validation.

44b	SearchStudentStatsForm	Will first display the first user in the datatable, then display the stats of the student that has been searched for & will display	Worked as required.
-----	------------------------	---	---------------------

		msgbox when a student that doesn't exist is searched for.	
--	--	---	--



Setting StudentStatsForm to only show the associated students stats

I will only add this to StudentStatsForm and not SearchStudentStatsForm as it will affect usability, to have the teacher navigate through students who are not their own, however when searching for a student, it doesn't affect usability.

```
    References
    Private Sub StudentStatsForm_Load(sender As Object, e As EventArgs) Handles MyBase.Load
        'reads all information from users datatable
        Dim sqlstring As String = "SELECT * FROM Users"
        connection.Open()
        dataadapter = New OleDb.OleDbDataAdapter(sqlstring, connection)
        df.Clear()
        dataadapter.Fill(df)
        connection.Close()
```

When StudentStatsForm loads, it first checks if there are any values in the datatable Users at all.

```

75     If df.Rows.Count = 0 Then 'if no students exist
76         MsgBox("No students exist") 'msgbox displayed to notify the teacher
77         nametxt.Text = "" 'textbox clears
78         Close() 'form is closed
79         TeacherForm.Show() 'shows teacherform again
80     Else
81         sqlstring = "SELECT * FROM Users WHERE TeacherID = '" & Form1.Teachercode & "'" 'selects only the teachers students
82         connection.Open()
83         dataadapter = New OleDb.OleDbDataAdapter(sqlstring, connection)
84         df.Clear()
85         dataadapter.Fill(df)
86         connection.Close()
87         If df.Rows.Count = 0 Then 'if no students exist
88             MsgBox("No students exist") 'msgbox displayed to notify the teacher
89             nametxt.Text = "" 'textbox clears
90             'sets labels to the following as it looks better than having them all set to "label1, label2, etc"
91             HighScoreLabel.Text = "Highscore: "
92             TotalTimeLabel.Text = "Amount of spent in quizzes: "
93             NumQuizzesLabel.Text = "Amount of quizzes completed: "
94             Topic1HSLLabel.Text = "Topic 1 Highscore: "
95             Topic2HSLLabel.Text = "Topic 2 Highscore: "
96             Topic3HSLLabel.Text = "Topic 3 Highscore: "
97             Topic4HSLLabel.Text = "Topic 4 Highscore: "
98             Topic5HSLLabel.Text = "Topic 5 Highscore: "
99             Topic6HSLLabel.Text = "Topic 6 Highscore: "
100            'navigation buttons hidden as you cannot navigate if there are no associated students
101            firstrecbtn.Hide()
102            leftrecbtn.Hide()
103            rightrecbtn.Hide()
104            lastrecbtn.Hide()

```

If there aren't any students signed up to the program at all, it displays a msgbox saying no students exist, clears textbox, closes the form & goes back to TeacherForm, as there is nothing for the Teacher to do in StudentStatsForm as well as SearchStudentStatsForm.

However if there are students in the datatable Users, it reads all the data from the datatable where they are associated with the teacher who is signed in. If there aren't any students that are associated, there is a msgbox displayed saying "No students exists", the textbox is cleared & all labels are set to what is shown in the code, as this looks nicer as a default value than "Label1, Label2, etc".

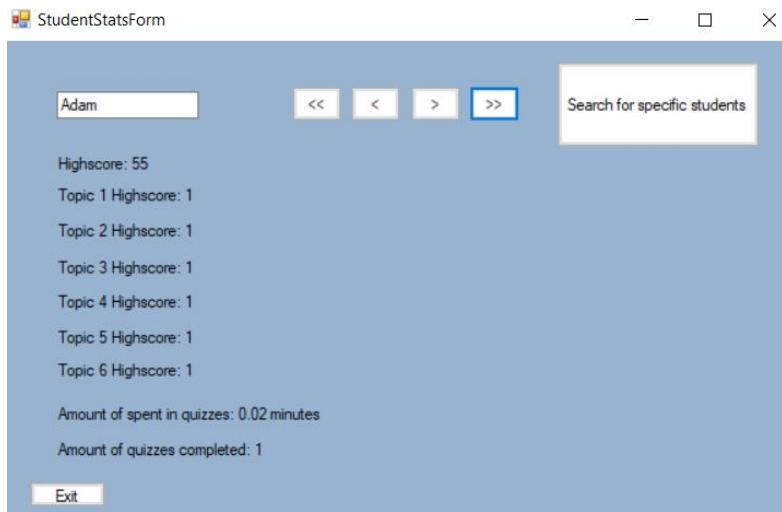
It then hides the navigation buttons as they cannot navigate through the program if no students from their class exist, because this form is only for students in the teacher's class. It doesn't exit the form and go to the previous form as they can still use SearchStudentStatsForm, even if there are no students associated with them.

```

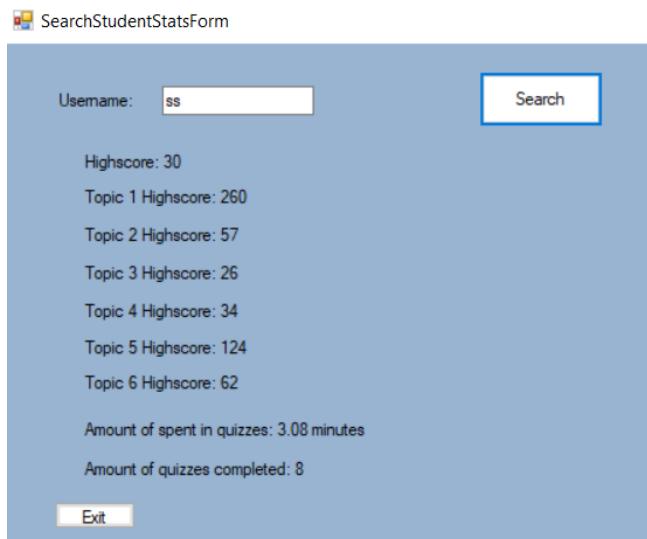
105     Else
106         'if there are students then it can run displayrecord() sub
107         displayrecord()
108     End If

```

If they do have associated students it runs displayrecord() subroutine.



Only associated account with the teacher, cannot navigate through as there aren't any other accounts to look at, however can search for any accounts as required.

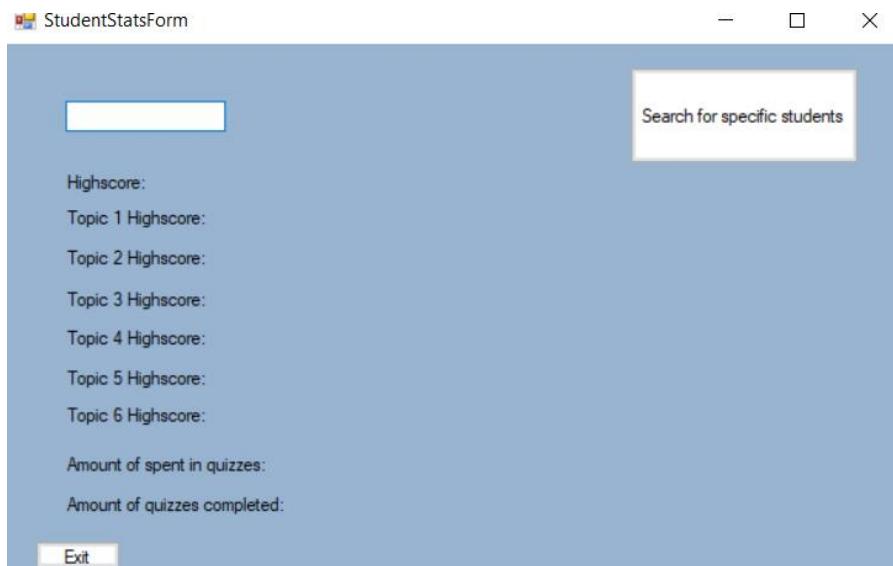


When using an account with no associated students,

RoughCode1 X

No students exist

OK



As required.

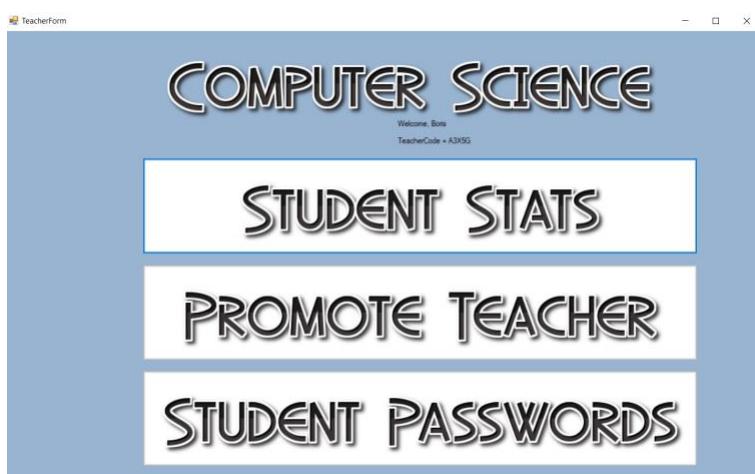
& then I deleted all students from the database to test what it would do in that situation & the following occurred:

Username	Password	Teacher?	TeacherID	HighScore	Topic1HS	Topic2HS	Topic3HS	Topic4HS	Topic5HS	Topic6HS	Seconds	QuizzesComp
RoughCode1					0	0	0	0	0	0	0	0

No students exist



& re opened TeacherForm



As required.

I then finally realised there is no exit button in TeacherForm which I will now add & I need to add sound effects to this button & I will add them to all the new navigation buttons I have added since I first added sound.

```

27  Private Sub Button2_Click(sender As Object, e As EventArgs) Handles SignOutButton.Click
28      'closes current form & shows previous form
29      My.Computer.Audio.Play(My.Resources.mp_player_leave_elec, AudioPlayMode.Background)
30      Close()
31      Form1.Show()
32  End Sub

```

FINAL TESTING

TESTING FOR FUNCTIONALITY AND ROBUSTNESS

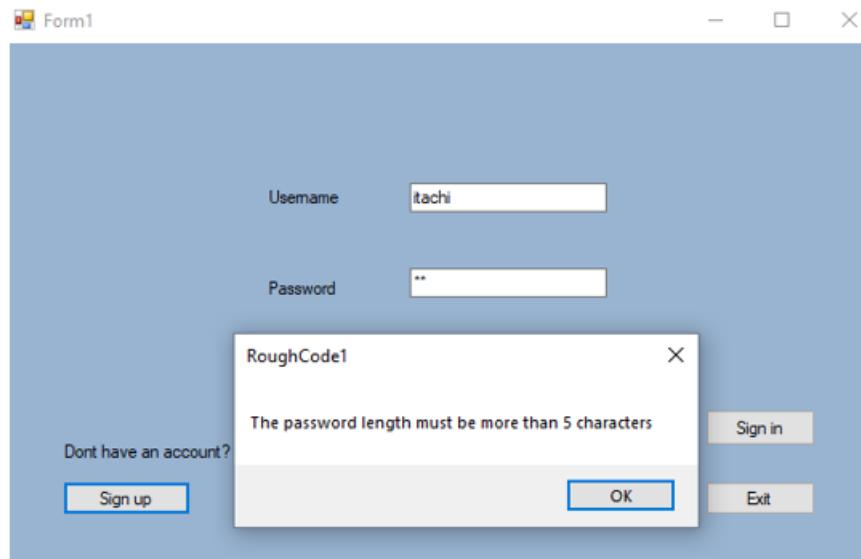
Form1

Test number	What is being tested	Test Data	Expected Result	Actual Result – Works? Yes/No
1	When signing up, the user cannot enter a password with less than 5 characters	In-dev test 11	Msgbox displayed telling them the problem with the password, & will not allow them to sign up	Works as required

Screenshot

FINAL TESTING LINK 1

11	Sign up button with a password with less than 5 characters	Will not create a new user & will display messagebox	Did not create a new user & displayed messagebox as required
----	--	--	--



And no new records were added to the database.

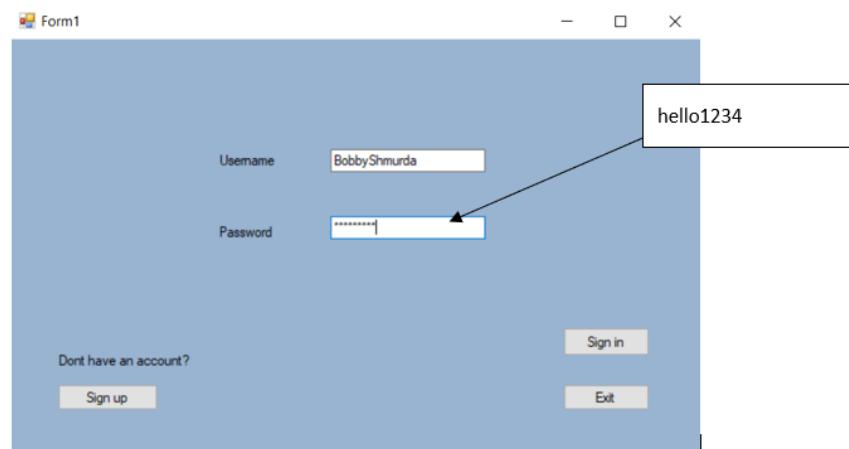
This test was sufficient as the same code was used for the sign up button once its location was moved

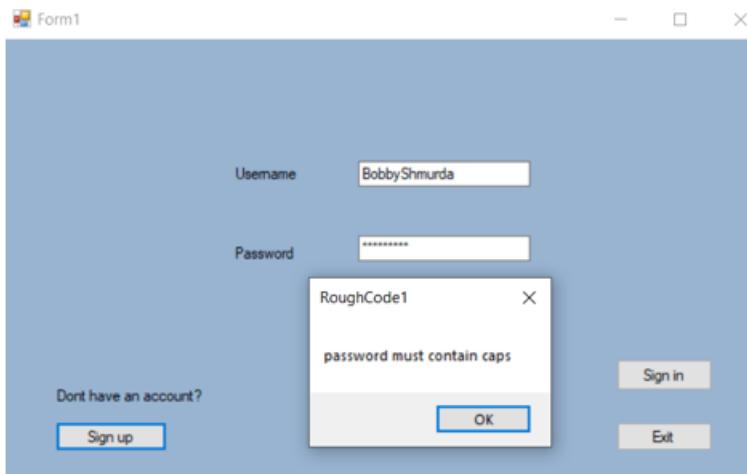
2	When signing up, the user cannot enter a password that doesn't contain any capital letters	In-dev test 13	Msgbox displayed telling them the problem with the password & will not allow them to sign up	Works as required
---	--	--------------------------------	--	-------------------

Screenshot:

FINAL TESTING LINK 2

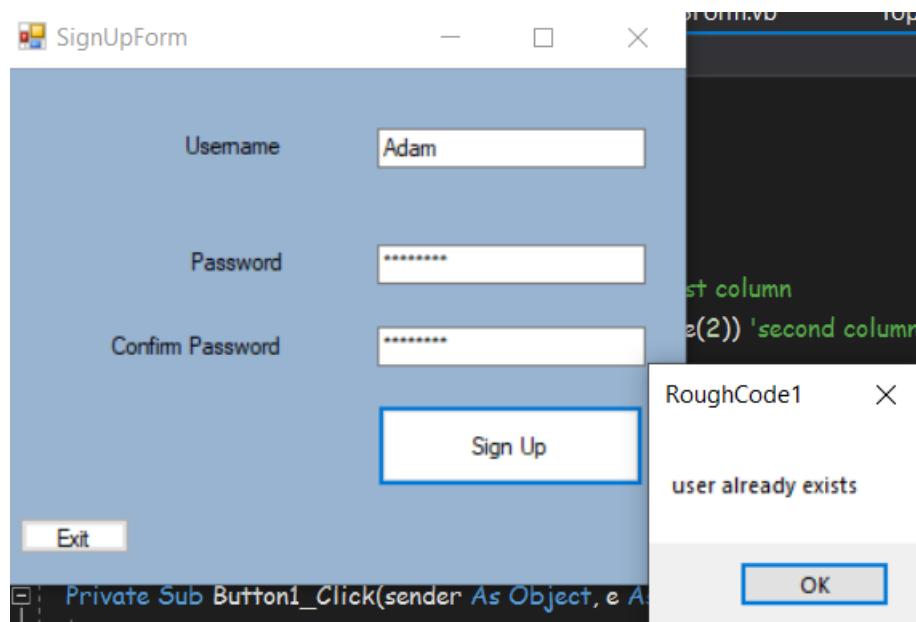
13	Sign up button with a password without capital letters included	Will not create a new user & will display messagebox	Did not create a new user & displayed msgbox as required
----	---	--	--



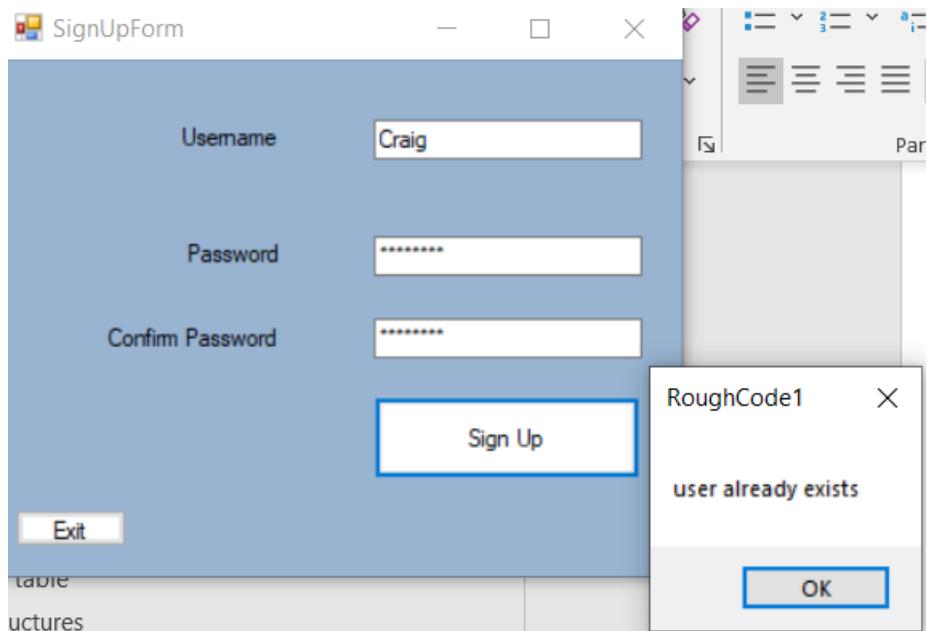


And no records added to database as required

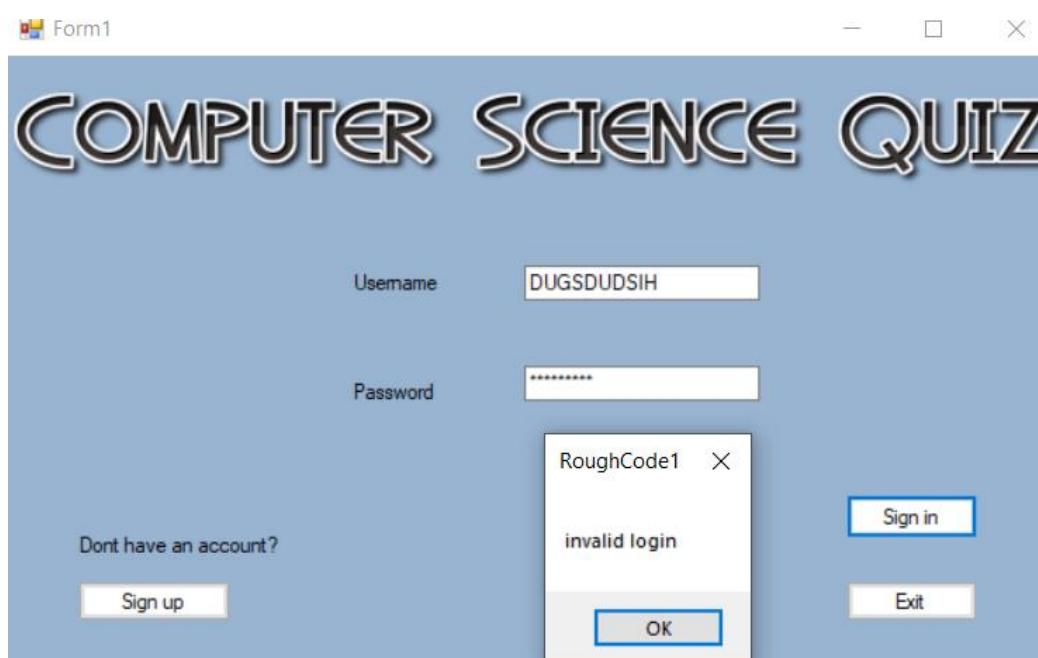
3	User cannot sign up with a Username that already exists in the student datatable	Will make a record with Username "Adam" and try and sign up again with the same username	Msgbox displayed telling them the problem with the username & will not allow them to sign up	Works as required
---	--	--	--	-------------------



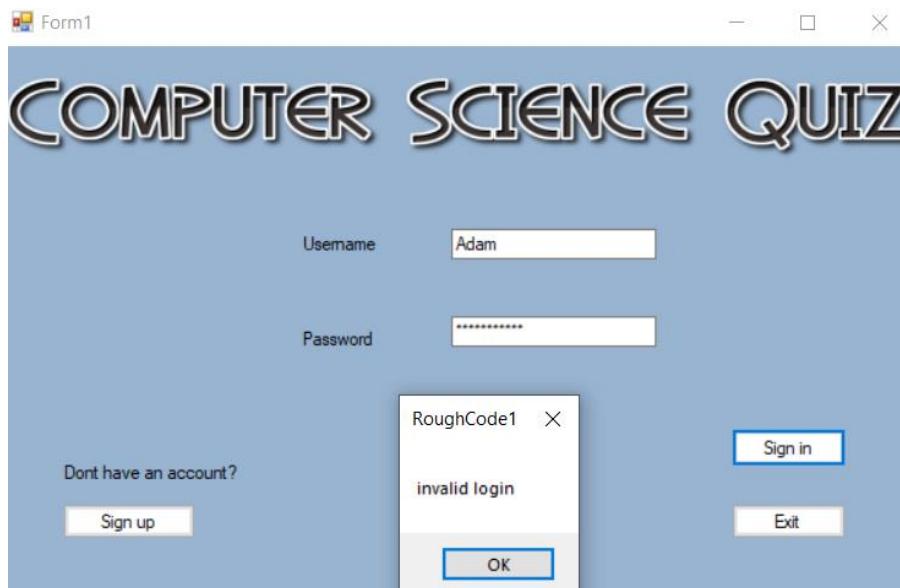
4	User cannot sign up with a Username that a teacher already possesses.	I will make a teacher account with Username "Craig" & try to sign up as a student with that account.	Msgbox displayed telling them the problem with the username & will not allow them to sign up	Works as required
---	---	--	--	-------------------



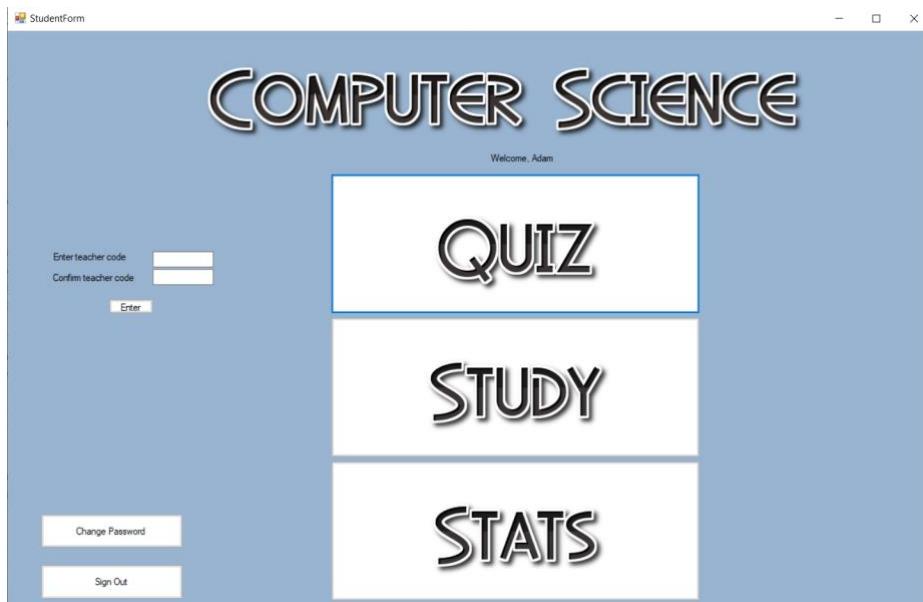
5	User cannot sign in with a username that doesn't exist in that database	I will try and sign in with an account that doesn't exist	Msgbox displayed telling them the problem with the username & will not allow them to sign in	Yes
---	---	---	--	-----



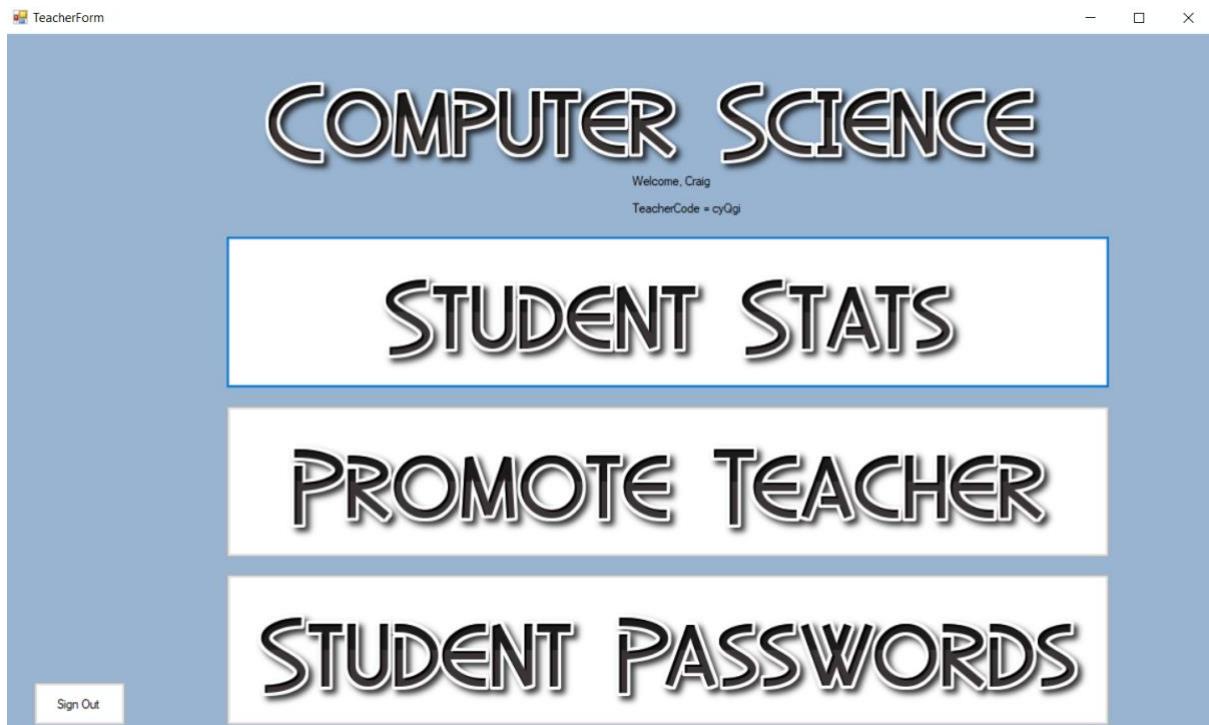
6	User cannot sign in when they input a username that exists in the database, but a password that is not associated with it	I will input an incorrect password for an account that exists.	Msgbox displayed telling them there is a problem with the login details & will not allow them to sign in	Yes
---	---	--	--	-----



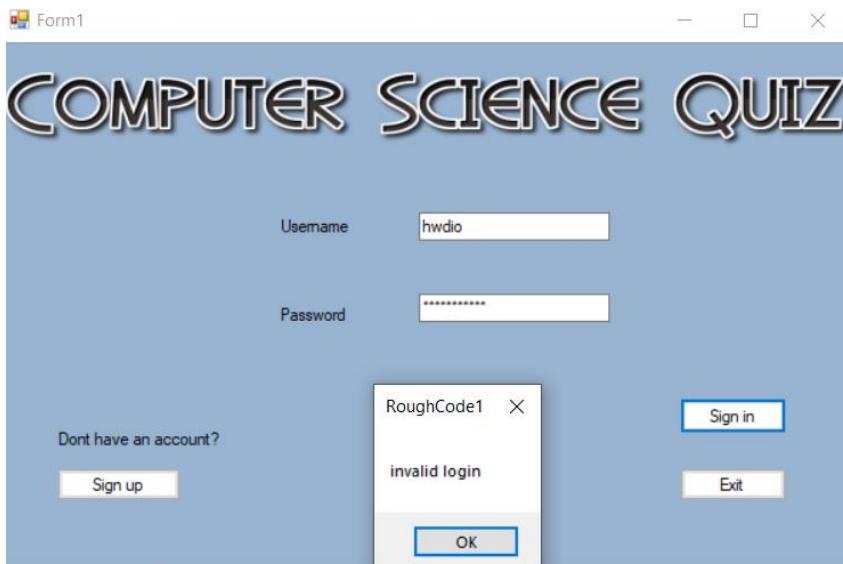
7	Student can sign in when there is a valid username and associated password	I will sign in with a student account that exists in the database	StudentForm displayed and login form hidden	Yes
---	--	---	---	-----



8	Teacher can sign in when there is a valid username and associated password input.	I will sign in with an account that exists in the teacher datatable	TeacherForm displayed and login form hidden	Yes
---	---	---	---	-----



9	Sign In button with incorrect student username & correct password for another user entered	I will attempt to sign in with a username in the database & a password for a different student account.	Msgbox displayed telling them there is a problem with the login details & will not allow them to sign in	Yes
---	--	---	--	-----

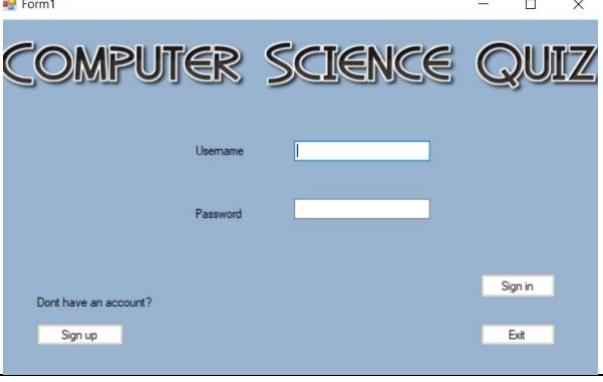


Student Form

Test number	What is being tested	Test Data	Expected Result	Actual Result – Works? Yes/No
10	QuizButton	Clicking it	Will close StudentForm & open Quizform	Not exactly, but works in the way that I want it to after I decided to make some changes.

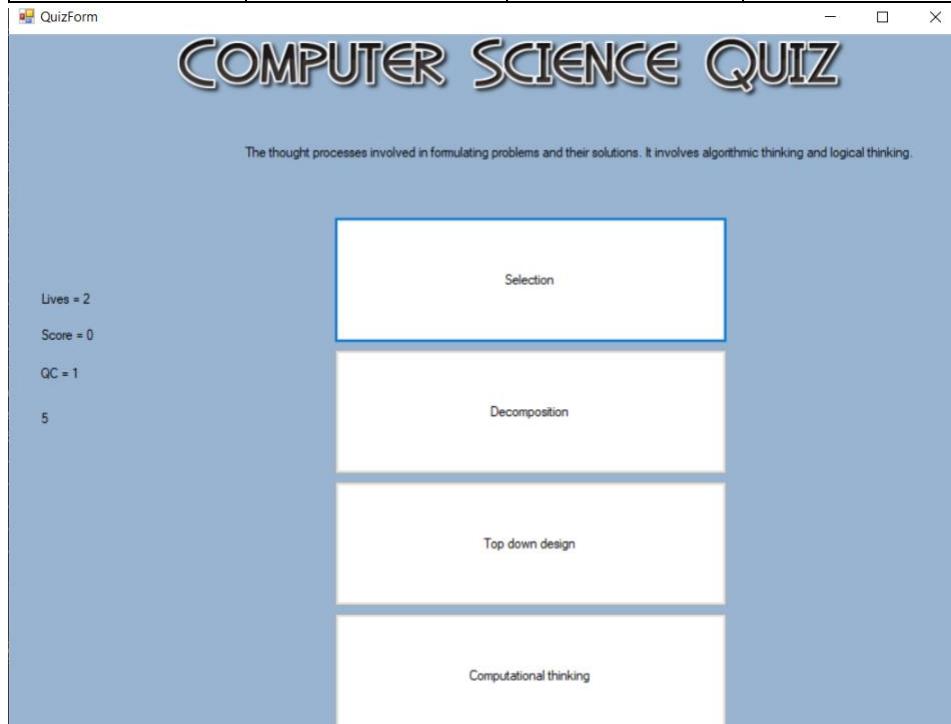


11	StudyButton	Clicking it		Will close StudentForm & open StudyForm	Yes
12	StatsButton	Clicking it		Will close StudentForm & open StatsForm	Yes

13	ExitButton	Clicking it		Will close StudentForm & open Form1 again	Yes
----	------------	-------------	--	---	-----

QuizForm

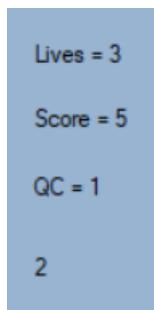
Test number	What is being tested	Test Data	Expected Result	Works?
14	QuestionLabel & Buttons	Loading the form	Will present a random question in QuestionLabel & text in buttons will be the associated potential answers. & Correct Answer will be a random button	Yes



15	Correct Answer Button	Clicking it	Will add a particular number to Score variable, that depends on how many seconds remaining. Will then present new question.	Yes
----	-----------------------	-------------	---	-----

Score variable is displayed in a label:

After answering a question correctly

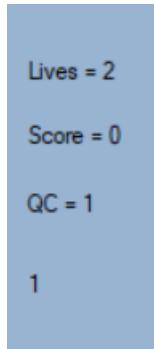


& it presented a new question

16	Incorrect Answer Buttons	Clicking it	Will take 1 away from Lives variable. Will present a new question.	Yes
----	--------------------------	-------------	--	-----

Lives variable is displayed in a label

After restarting the quiz & getting a question wrong



17	Timer	Not clicking anything	Will take 1 away from lives after 10 seconds and presents a new question.	Yes
----	-------	-----------------------	---	-----

After 10 seconds & not selecting a potential answer

Lives = 2	Score = 0	QC = 1	1	
18	Lives variable	Lose all lives	Will end quiz	Yes

After all lives lost, quiz ends & this form is presented

QuizForm2

Exit

Score: 0

Best: 8

19	Highscore	Achieve a highscore greater than current highscore	When achieving a score greater than current highscore, it will update highscore to new highscore	Yes
----	-----------	--	--	-----

QuizForm2

Exit

Score: 12

Best: 8

Username	Password	Teacher?	TeacherID	HighScore
Adam	Adam1234	<input type="checkbox"/>		12

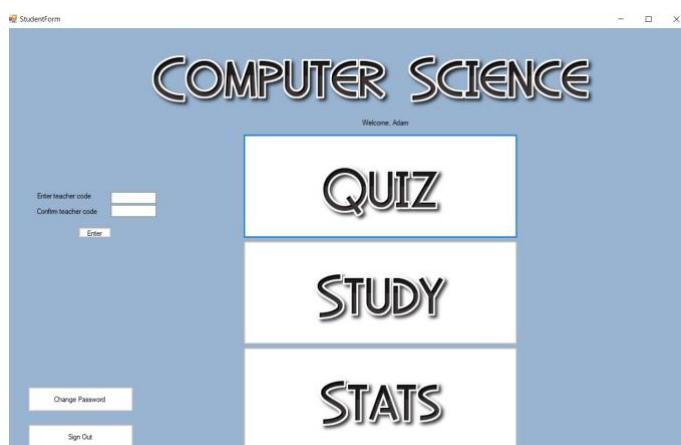
QuizForm2

Test number	What is being tested	Test Data	Expected Result	Works?
20	ScoreLabel HighscoreLabel	Loading the form	ScoreLabel will show the score just achieved in the quiz & HighscoreLabel will show the highscore before the quiz was just attempted	Yes

As seen in previous test

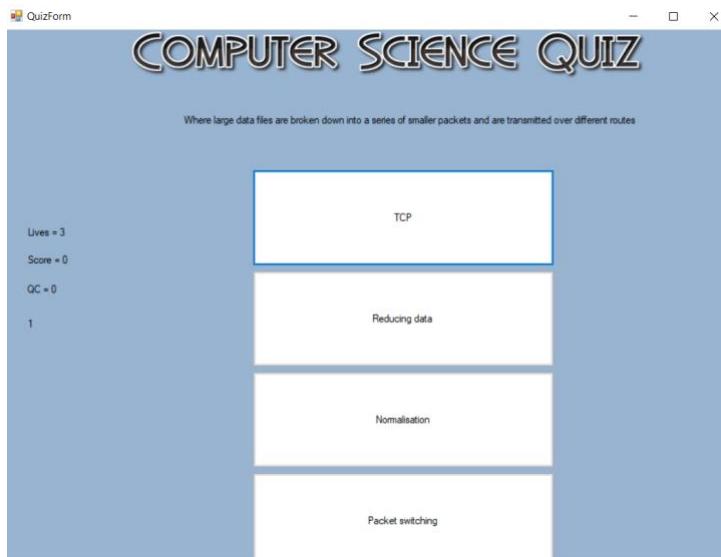


21	ExitButton	Clicking it	Will close the form & open student form again	Yes
----	------------	-------------	---	-----



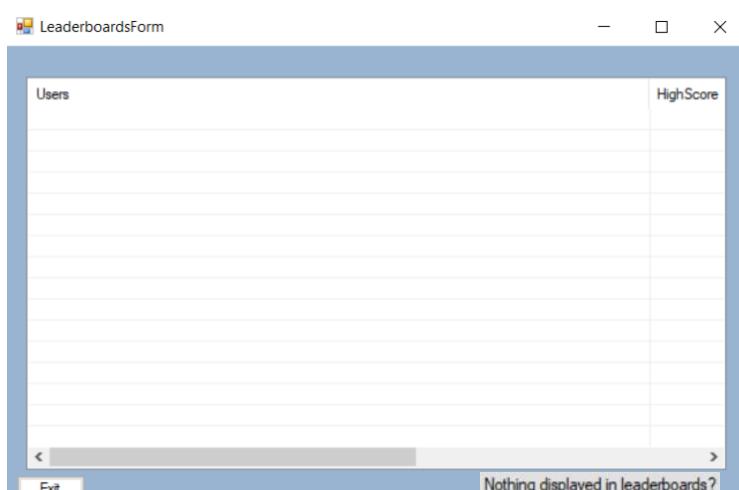
22	Replay Button	Clicking it	Will restart Quiz by closing current form & open QuizForm again	Yes
----	---------------	-------------	---	-----

After clicking PlayButton in QuizForm2



23	LeaderboardsButton	Clicking it	Will display a messagebox containing highscores.	Not as I said in design, but works as I intended after I decided to change it. Opens a new form & Uses a listbox as required.
----	--------------------	-------------	--	---

Testing during development also shows it working. It is empty during this test as the account is not associated with a teacher.



The button on the bottom right of the screen is there as a usability feature & displays the following message

RoughCode1

X

If there is nothing displayed in the leaderboards, it is likely because you are not associated with a class. Assign a teacher by entering their teacher code in the main menu & this will enable you to view the highscores of your classmates.

OK

TeacherForm

Test number	What is being tested	Test Data	Expected Result	Works?
24	LeftButton	Clicking it	Value in textboxes will change to the record previous to the one that is currently displayed. But upon loading, it should already be the first record value so in that case, the button should not change anything.	No but because I decided to change how I was going to structure this form.

25	RightButton	Clicking it	Value in textboxes will change to the record after to the one that is currently displayed & when it gets to the last one, the button should not change anything.	No but because I decided to change how I was going to structure this form.
----	-------------	-------------	--	--

26	ExitButton	Clicking it	Will close the form and open previous form	Yes, but decided to call it "SignOutButton" instead.
----	------------	-------------	--	--

StudyForm

Test number	What is being tested	Test Data	Expected Result	Works?
-------------	----------------------	-----------	-----------------	--------

27	TopicListBox & ContinueButton	Choosing a value from the ListBox and clicking continue	Will open a form related to the topic clicked.	No but because I decided to change how I was going to structure this form.
28	ExitButton	Clicking it	Will close current form and open StudentForm again	Yes

Topic Forms

Test number	What is being tested	Test Data	Expected Result	Works?
29	Lables & Scroll bar	Choosing a value from the ListBox and clicking continue in StudyForm	The labels will contain all the questions and associated correct answers from the particular topic, next to each other & if scroll bar works	No but because I decided to change how I was going to structure this form.

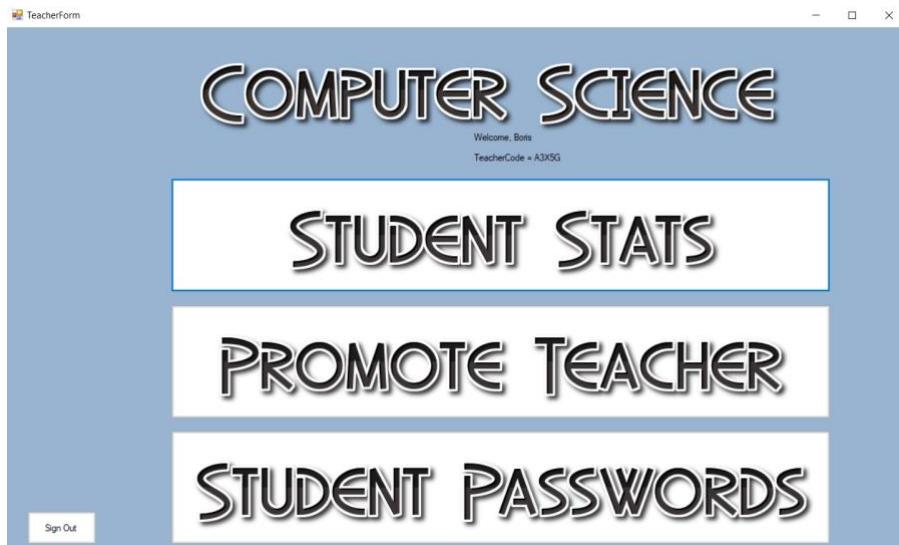
Additional tests that weren't thought of during design section

TeacherForm

Test number	What is being tested	Test Data	Expected Result	Works?
30	Buttons For navigation & ListView in StudentPasswordForm	Clicking the buttons	Student Stats button will lead to StudentStatsForm as long as students exist in the database, otherwise a messagebox will be displayed and it will return to Teacherform.. If students exist but there are no associated students, It will display the messagebox but will allow access to the form.	Yes

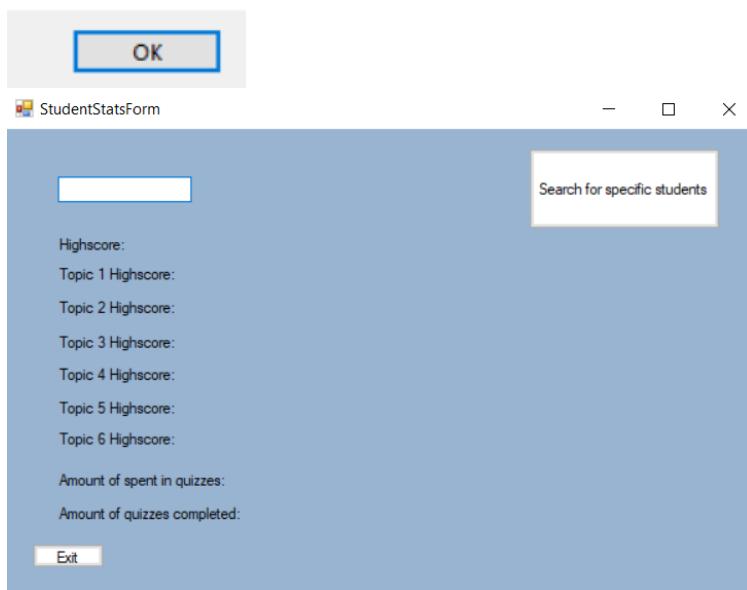
			PromoteTeacherButton will lead to PromoteTeacherForm. StudentPasswordsForm will lead to StudentPasswordsForm.	
--	--	--	--	--

Student Stats button:

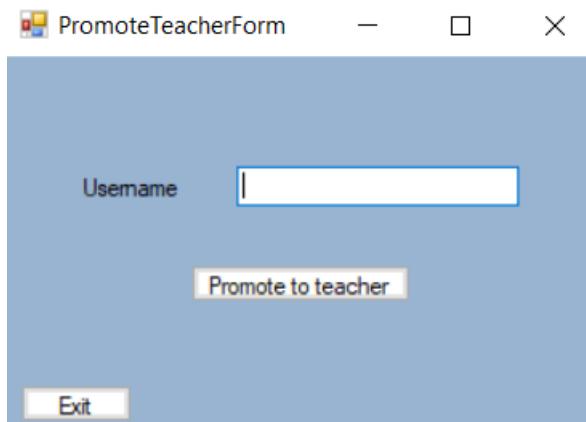


RoughCode1 X

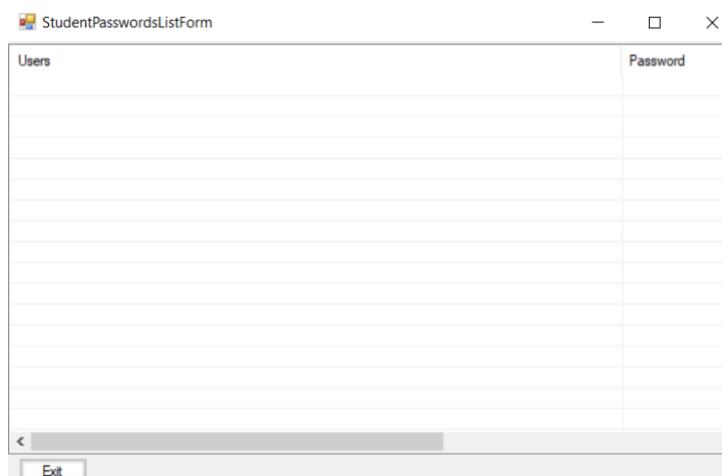
No students exist



Promote Teacher Button:



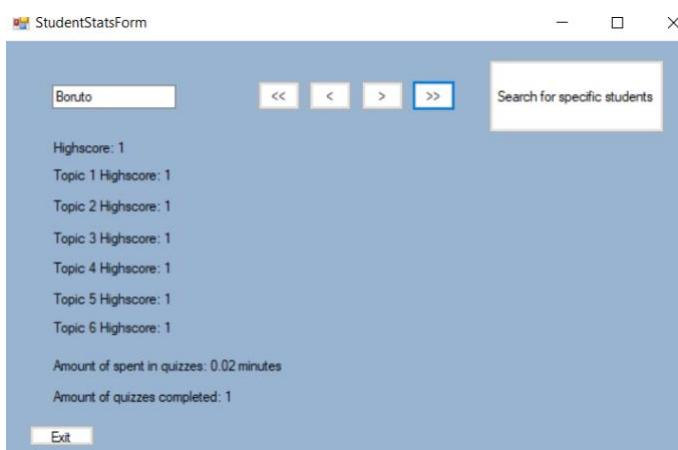
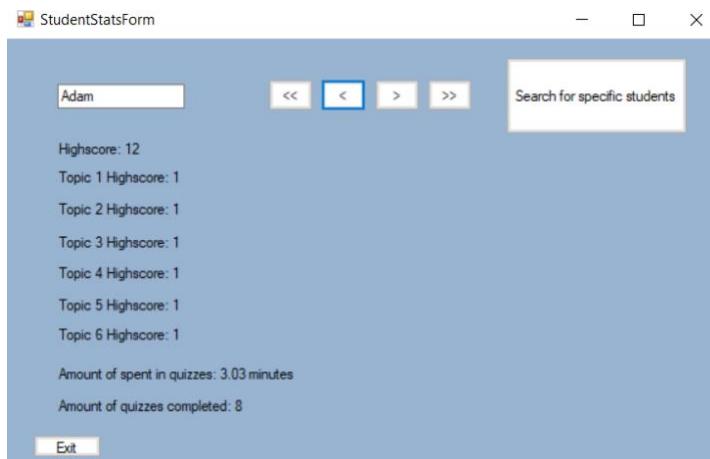
Student Passwords Button:



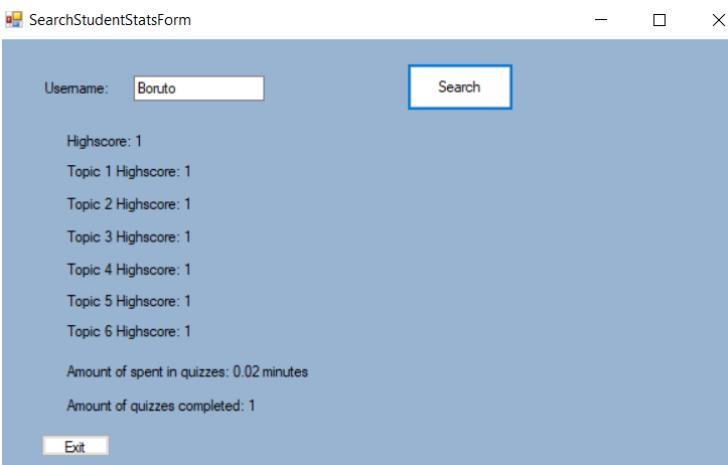
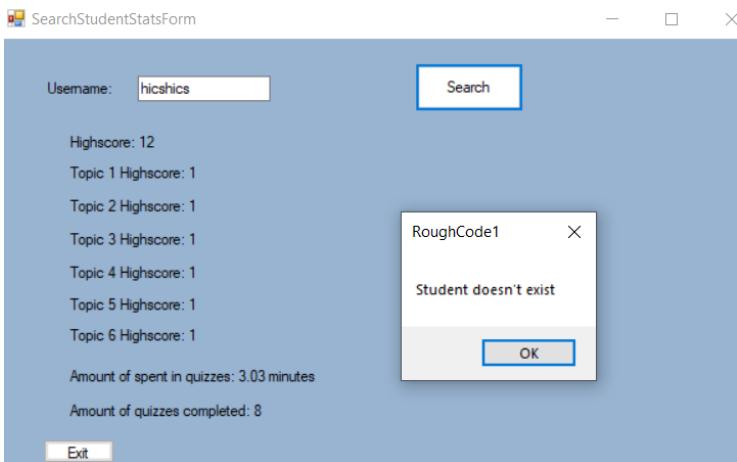
None shown currently as there aren't any associated students, but is shown to work properly during development & shows Usernames and Passwords of students associated with the teacher, but when a student is associated,



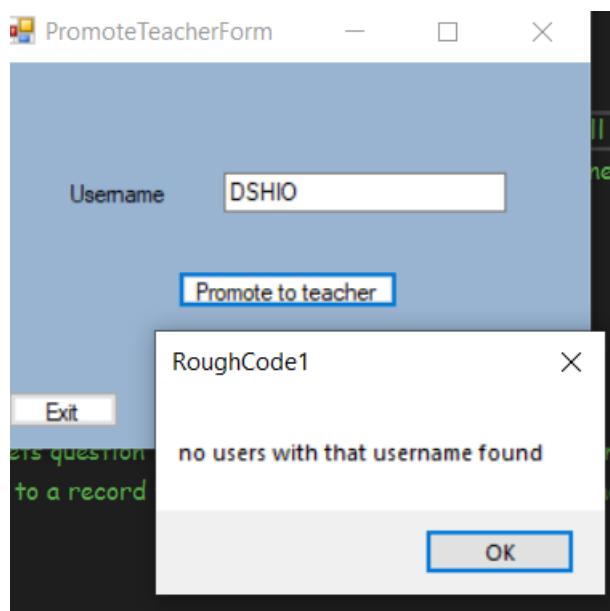
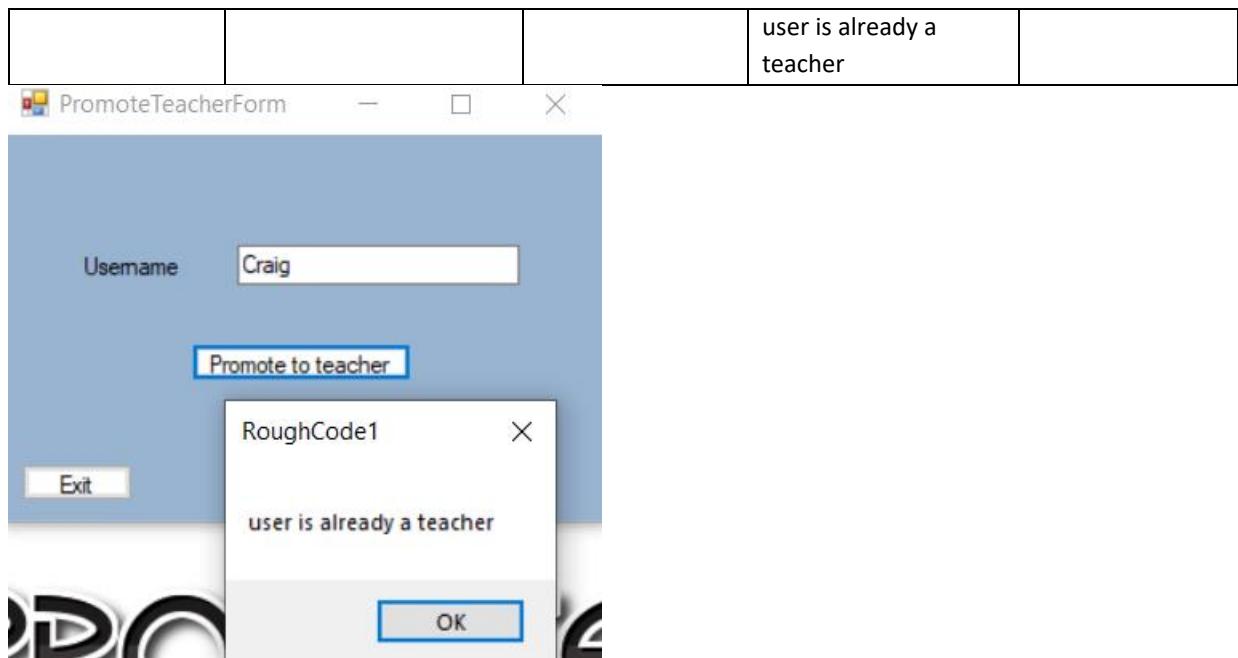
Test number	What is being tested	Test Data	Expected Result	Works?
31	StudentStatsForm	Navigation Buttons	After I associate students to this teacher, it will allow me to scroll through the Students & view their stats.	Yes



Test number	What is being tested	Test Data	Expected Result	Works?
32	SearchStudentStatsForm	Will search for a student.	If I search for a student that doesn't exist, it will display a msgbox, but if I search for a student that exists, it will display their stats.	Yes

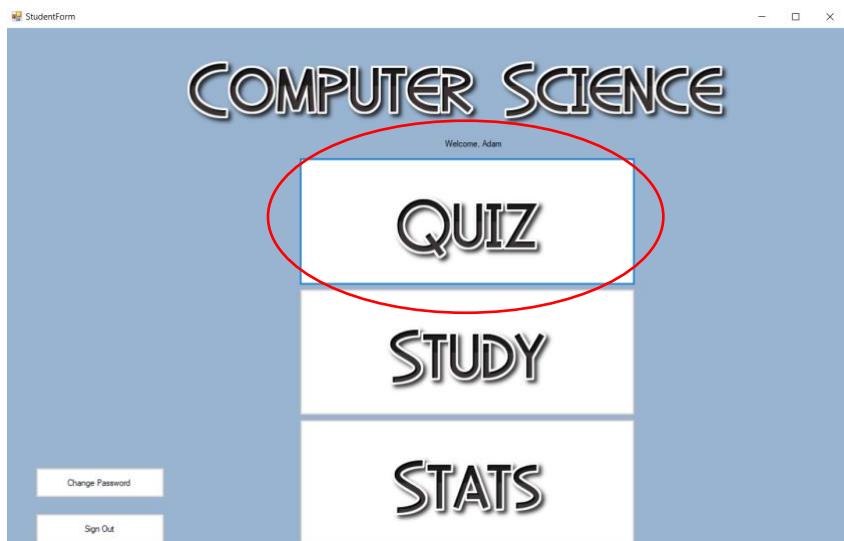


Test number	What is being tested	Test Data	Expected Result	Works?
33	PromoteTeacherForm	Will type usernames into textbox & press promote button	If I type in a username that exists, it will promote them. If I type a username that doesn't exist, it will display a msgbox to notify me. & if I try and promote a teacher, a msgbox will notify me that the	Yes



TopicQuizSelectionForm

Test number	What is being tested	Test Data	Expected Result	Works?
34	Topic Quiz 1	Will navigate to TopicQuiz1Form & complete questions	Will work just like QuizForm but only giving questions from Topic1	Yes

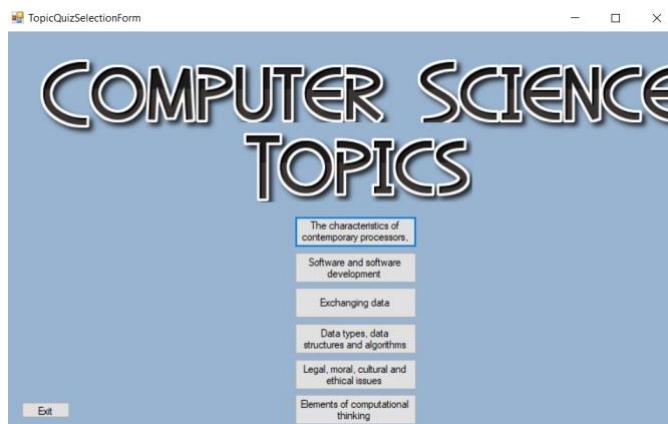


Quiz Button leads to Quiz_TopicQuizSelectionForm

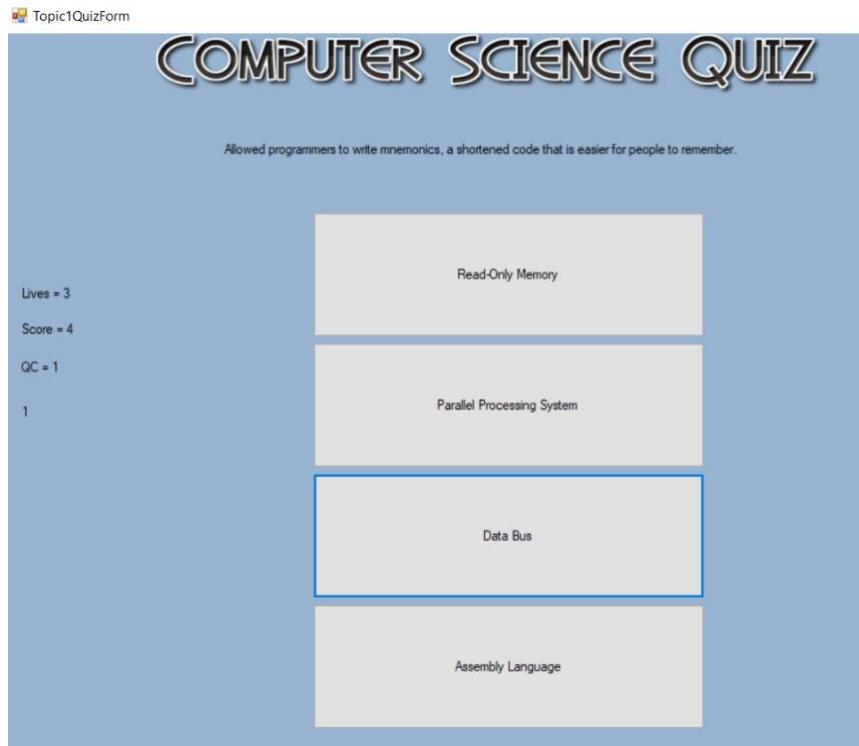


Where the user can either choose to do the normal quiz or do a topic quiz.

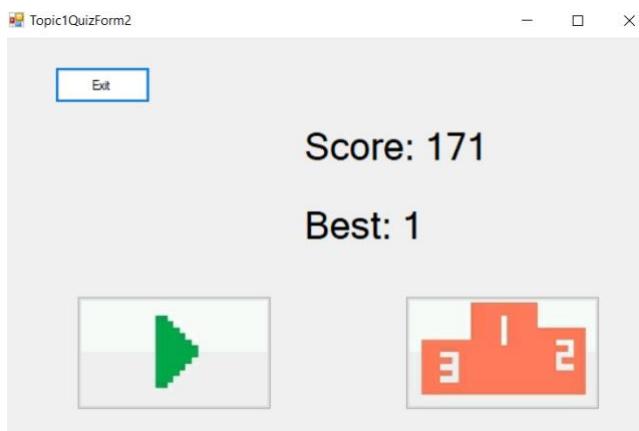
After selecting TopicQuiz, it will take you to this menu



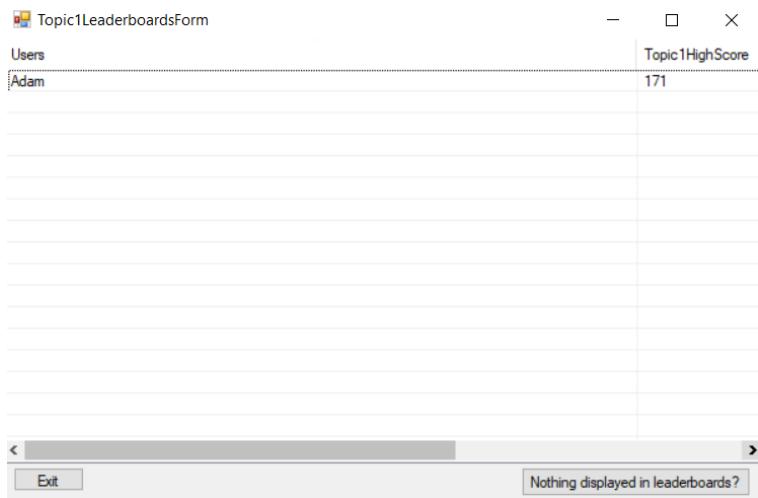
Where I can choose the first topic which will take me to Topic1QuizForm



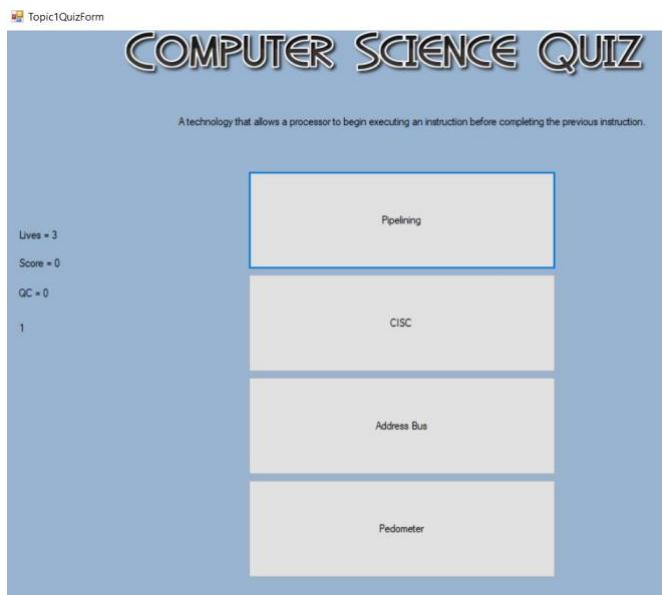
& It only presented Topic1 questions as required. Then once the quiz ended, took me to Topic1QuizForm2.



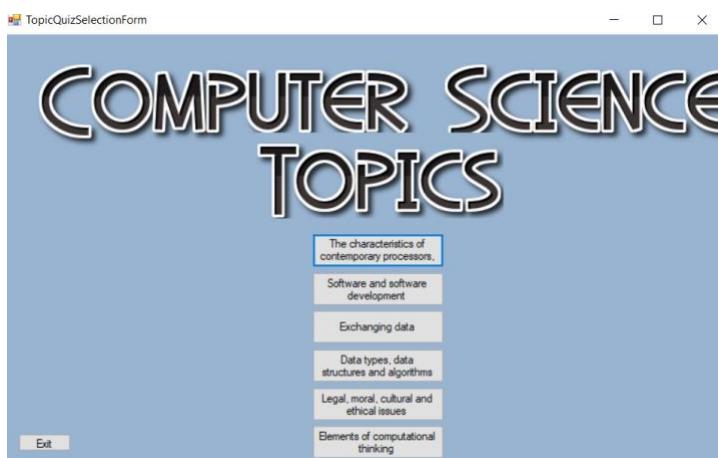
Leaderboards button took me to this form



Play button restarts the quiz



& Exit Button takes me back to the form before Topic1QuizForm

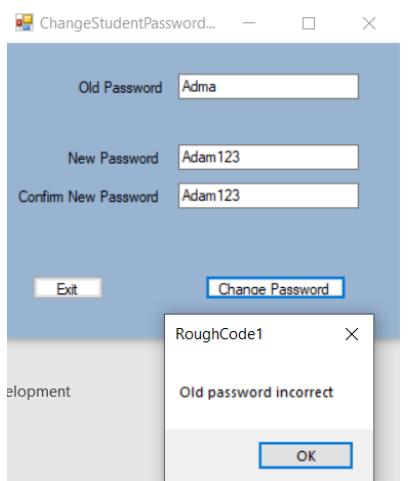
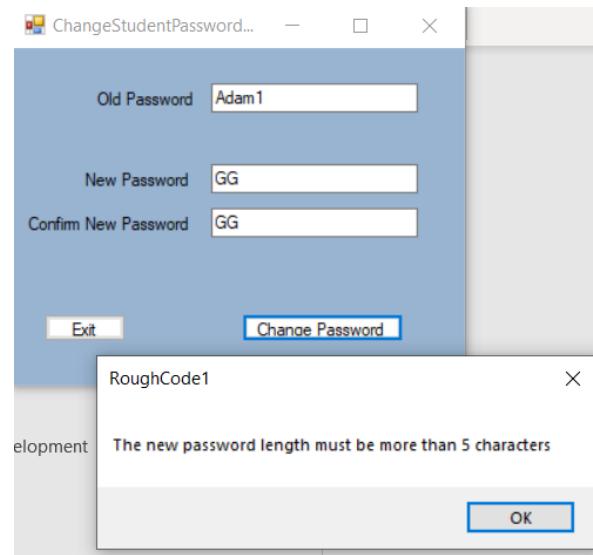
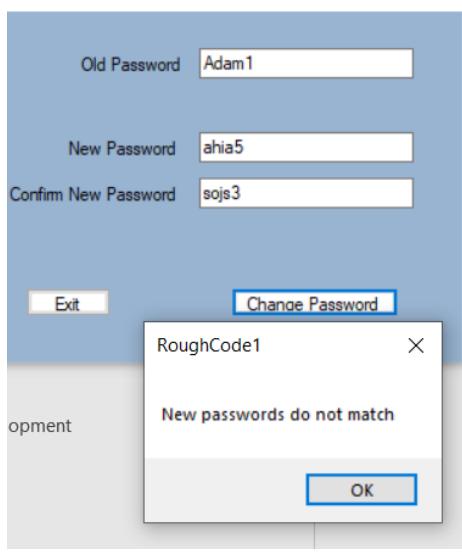
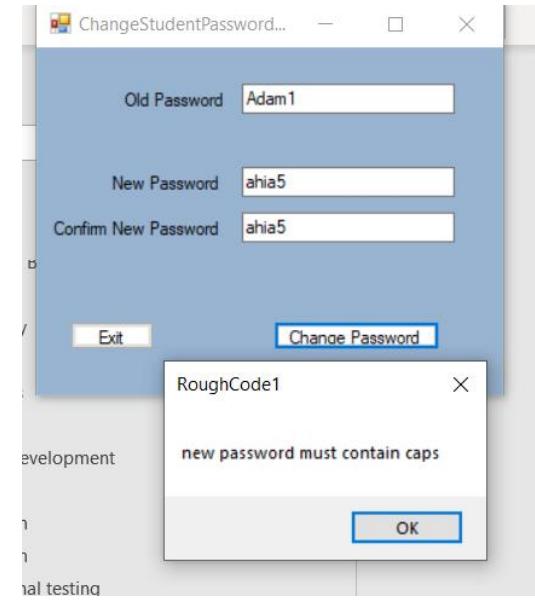
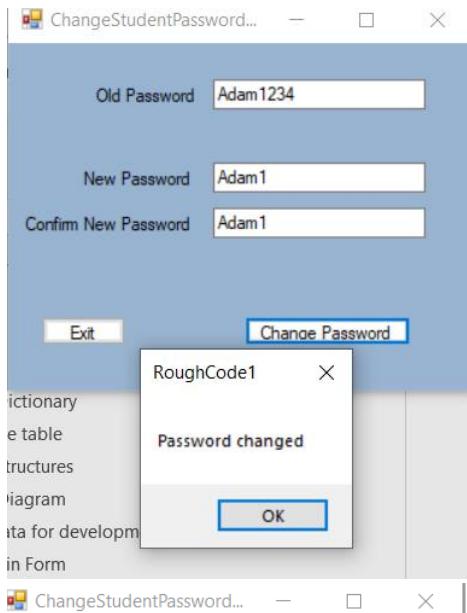


Test number	What is being tested	Test Data	Expected Result	Works?
35	Rest of Topic Quizzes	Screenshots	Will work just like QuizForm but only giving questions from their respective topics	No, was unable to complete for all due to time restrictions

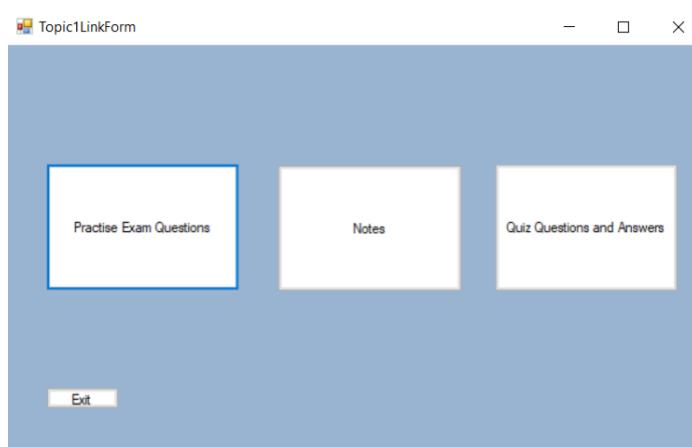
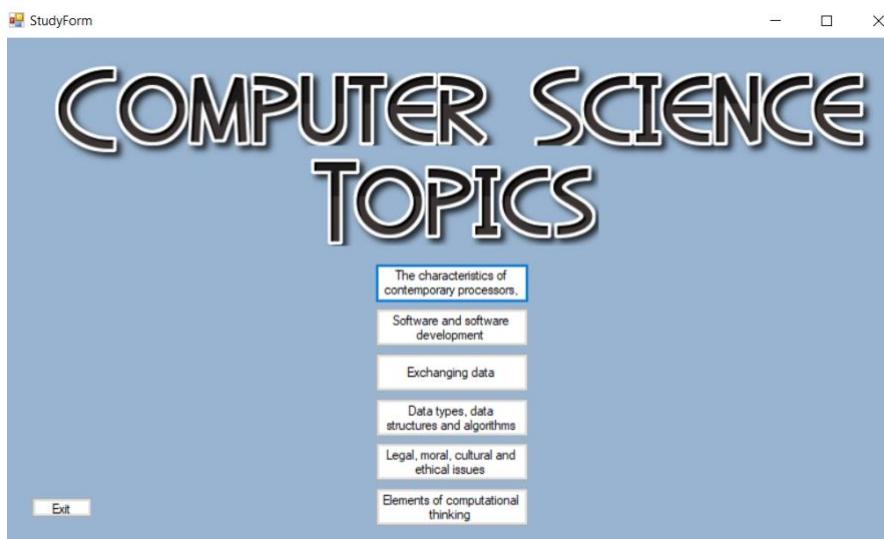
Just closes the form after any of the other buttons are clicked as I didn't have time to create topic quizzes for each

```
0 references
18 Private Sub Topic2_Click(sender As Object, e As EventArgs) Handles Topic2.Click
19     'plays audio
20     My.Computer.Audio.Play(My.Resources.minecraft_click2, AudioPlayMode.WaitToComplete)
21     'hides current form and opens topic2quizform
22     Close()
23     'Topic2QuizForm.Show()
24 End Sub
```

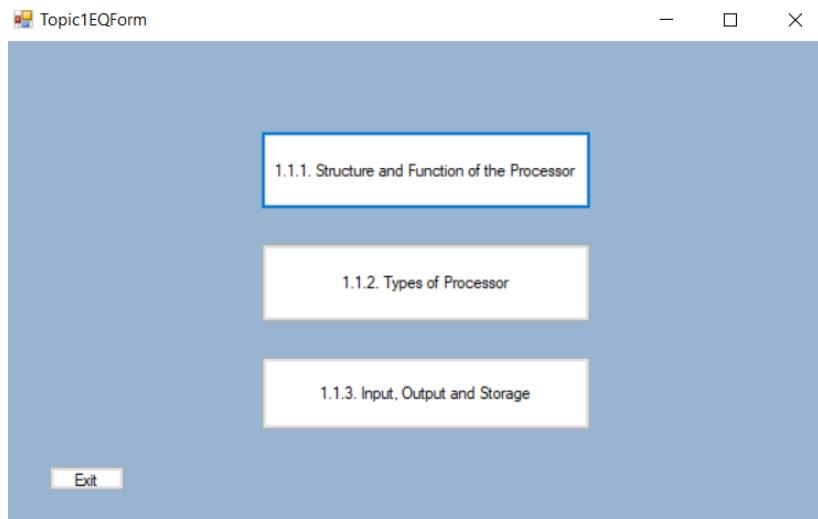
Test number	What is being tested	Test Data	Expected Result	Works?
36	Change Password Feature	Screenshots	Will present a form that allows me to change the password, but presents a msgbox if New password & Confirm New Password text boxes don't match, or if passwords are invalid according to rules I set in SignUpForm with minimum length and capitals, or if I type current password incorrectly into first textbox.	Yes



Test number	What is being tested	Test Data	Expected Result	Works?
37	Study Feature – Topic1	Screenshots	Will present a form that allows me to choose which topic I wish to study & then after choosing topic1, It will take me to a different form that presents 3 different buttons that lead to 3 different forms – 1 for Notes, 1 for exam questions & 1 to see the Quiz Questions and Answers.	Yes



Pracitse Exam Questions Button:



Each of which opens a pdf containing exam questions related to the text in the button in a default application, first button for example opens:

Unit 1: Components of a Computer
 (1a. Components and Performance of Processors, A Level Only Content)
 Marks: /9

Answer all the questions.

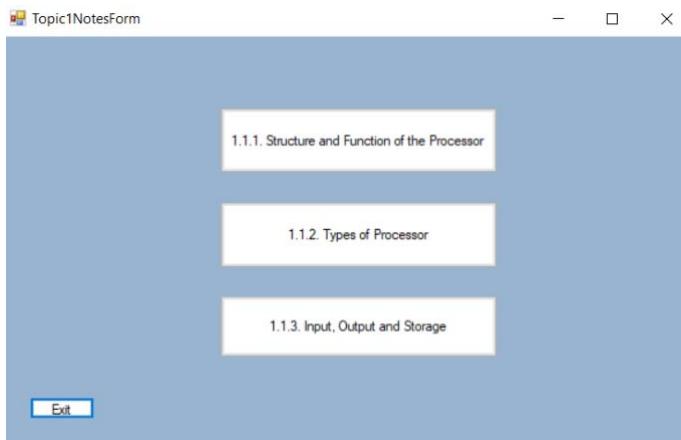
1(a). The following is a program written using the Little Man Computer instruction set.

```

start LDA one
      OUT
      LDA zero
      OUT
      LDA count
      SUB one
      STA count
      BRP start
      HLT
one DAT 1
zero DAT 0
count DAT 3
  
```

Explain, giving an example, how pipelining in a CPU could speed up the execution of this program.

NotesButton:



Opens a very similar interface but each of these buttons opens a pdf containing notes for the topics rather than exam questions.

Quiz Questions And Answers Button:

Leads to this form

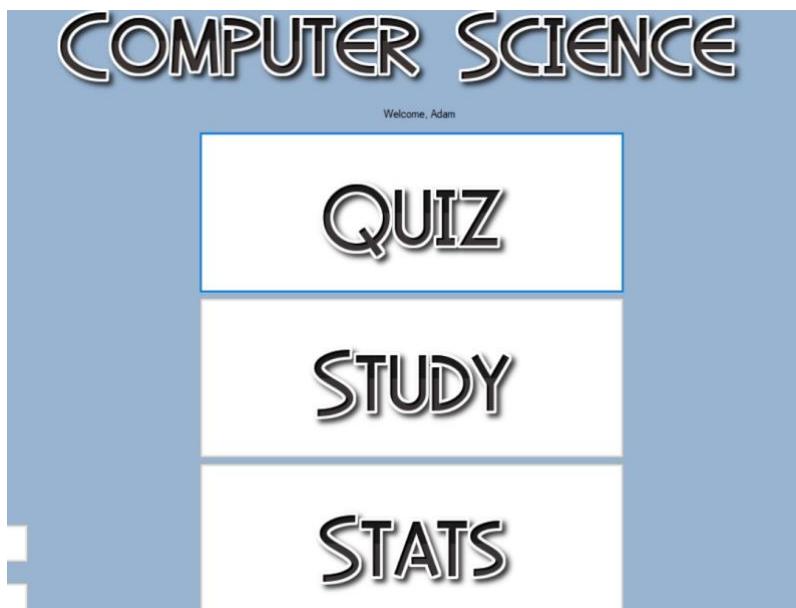
Questions	Correct Answer
What is the purpose of an ALU?	To perform arithmetic and logic operations
What is the Central Processing Unit?	A silicon chip located on the motherboard that executes instructions
A storage device that typically uses flash memory to store data, instructions, and information and that contains no moving parts.	Solid State Drive
Stores data as microscopic light and dark spots on the disk surface such as CD, DVD, and Blu-ray storage technologies.	Optical Storage
Allows programmers to write mnemonics, a shortened code that is easier for people to remember.	Assembly Language
Very high-speed storage structures built into the CPU chip set and are often used to store timing and state information for the CPU to maintain control over processes.	Registers
The contents of the CIR are sent to the control unit and _____.	Decode
This processor type has lower energy requirements, and can go into "sleep mode" when not actively processing.	RISC
Small, high-speed storage locations in a processor that temporarily hold data and instructions.	Registers
A technology that allows a processor to begin executing an instruction before completing the previous instruction.	Pipelining
Used by CPUs for communicating with other devices within the computer.	Control Bus
Primary storage which is fast, relatively expensive, and volatile.	Random Access Memory

Exit

Test number	What is being tested	Test Data	Expected Result	Works?
38	Study Feature – Rest of Topics	Clicking on each topic in StudyForm	Will present a form that allows me to choose which topic I wish to study & then after choosing topic1, It will take me to a different form that presents 3 different buttons that lead to 3 different forms – 1 for Notes, 1 for exam questions & 1 to see the Quiz Questions and Answers.	Unfortunately not, due to time restrictions. Only goes directly to quiz questions and answers for rest of the topics apart from Topic 2.

TESTING FOR USABILITY

Test number	What is being tested	Input/Action	Expected Result	Actual Result
1	Main Menu with large buttons in a very visible font	-	Makes it easier for users to see what buttons will do what or take them where	As expected



Test number	What is being tested	Input/Action	Expected Result	Actual Result
-------------	----------------------	--------------	-----------------	---------------

2	Password textbox value set to asterisks for security to make it easier for the user to use their own accounts without anyone else gaining access to it	Whenever anything is typed into a password textbox	All characters are replaced by asterisks on screen	As expected
---	--	--	--	-------------

Username

Password

Test number	What is being tested	Input/Action	Expected Result	Actual Result
3	Replay Button after Quiz is completed	Replay button can be clicked	Restarts the quiz, saving time rather than having to go exit and start quiz again.	As expected



Test number	What is being tested	Input/Action	Expected Result	Actual Result
4	Replay Button after Quiz is completed	Replay button can be clicked	Restarts the quiz, saving time rather than having to go exit and start quiz again.	As expected

Test number	What is being tested	Input/Action	Expected Result	Actual Result
5	All msgboxes	When a button is clicked	Msgbox notifies the user of what has happened or what is happening.	As expected

All have been evidenced throughout the program for example, tests for the login form & test 23 & test 34 in Testing For Functionality and Robustness.

Test number	What is being tested	Input/Action	Expected Result	Actual Result
6	Textboxes when something is entered incorrectly or correctly	When a button is clicked after entering something into a textbox	Textboxes are cleared when the button to submit is clicked.	As expected

This will help for example when they have to try and enter a different password, as they may not remember what they typed with the asterisks present.

Test number	What is being tested	Input/Action	Expected Result	Actual Result
7	A confirmation Textbox	When signing up or changing password or adding a Teachercode	I have included a confirmation textbox for important inputs. They are unlikely to mistype it if they have to type it the same way twice	As expected

For example:

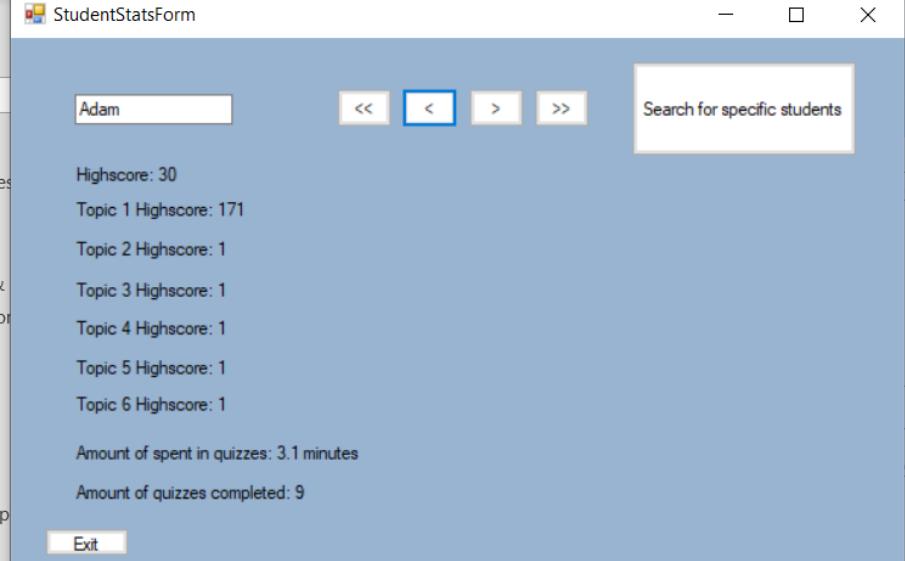
Old Password

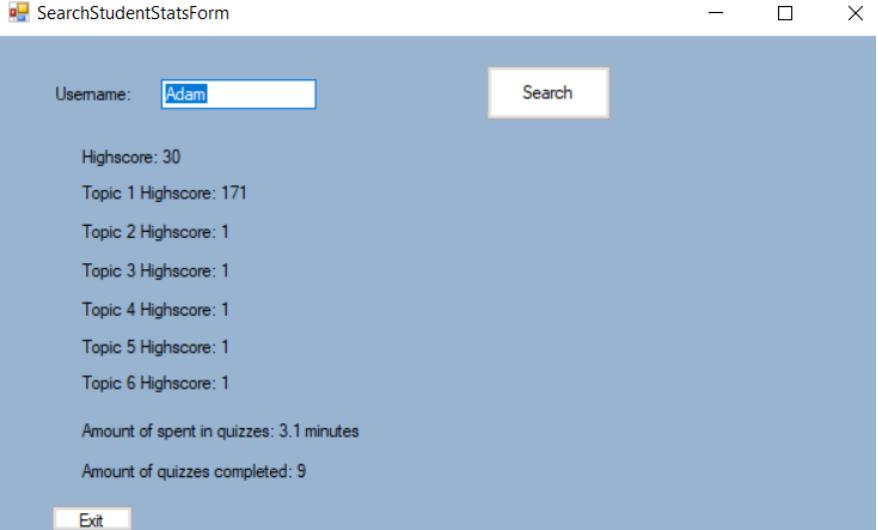
New Password

Confirm New Password

Test number	What is being tested	Input/Action	Expected Result	Actual Result
8	Correct Answer Button being in a random position with each question & no repeating questions in the Quiz Forms	Clicking QuizButton that leads to QuizForm or button that leads to Topic1QuizForm	I had to use a random number generator in conjunction with a set of integer variables, an array & database & it would lead to what is being tested to work.	As expected

Test number	What is being tested	Input/Action	Expected Result	Actual Result
9	Student Stats Feature	Clicking the buttons to navigate the database in StudentStatsForm & searching for a student in SearchStudentStatsForm	When navigating the database in StudentStatsForm, only shows the teachers own students as this makes it easier to use & they don't need to keep going through students that aren't relevant to them. & they can search for any student with SearchStudentStatsForm as that doesn't affect usability but it gives them more ability to do things.	As expected

A screenshot of a Windows application window titled "StudentStatsForm". The window has a light blue header bar with the title. Below the header, there is a search bar containing the name "Adam". To the right of the search bar are four small buttons: '<<', '<', '>', and '>>'. To the right of these buttons is a text input field labeled "Search for specific students". The main content area displays various statistics for the user "Adam":
Highscore: 30
Topic 1 Highscore: 171
Topic 2 Highscore: 1
Topic 3 Highscore: 1
Topic 4 Highscore: 1
Topic 5 Highscore: 1
Topic 6 Highscore: 1
Amount of spent in quizzes: 3.1 minutes
Amount of quizzes completed: 9
At the bottom left is an "Exit" button.

A screenshot of a Windows application window titled "SearchStudentStatsForm". The window has a light blue header bar with the title. In the top-left corner, there is a label "Username:" followed by a text input field containing "Adam". To the right of the input field is a "Search" button. The main content area displays the same statistics as the previous window for the user "Adam":
Highscore: 30
Topic 1 Highscore: 171
Topic 2 Highscore: 1
Topic 3 Highscore: 1
Topic 4 Highscore: 1
Topic 5 Highscore: 1
Topic 6 Highscore: 1
Amount of spent in quizzes: 3.1 minutes
Amount of quizzes completed: 9
At the bottom left is an "Exit" button.

STAKEHOLDERS TESTING & EVALUATION

I then asked my stakeholders to use the program and see how easy it is to use.

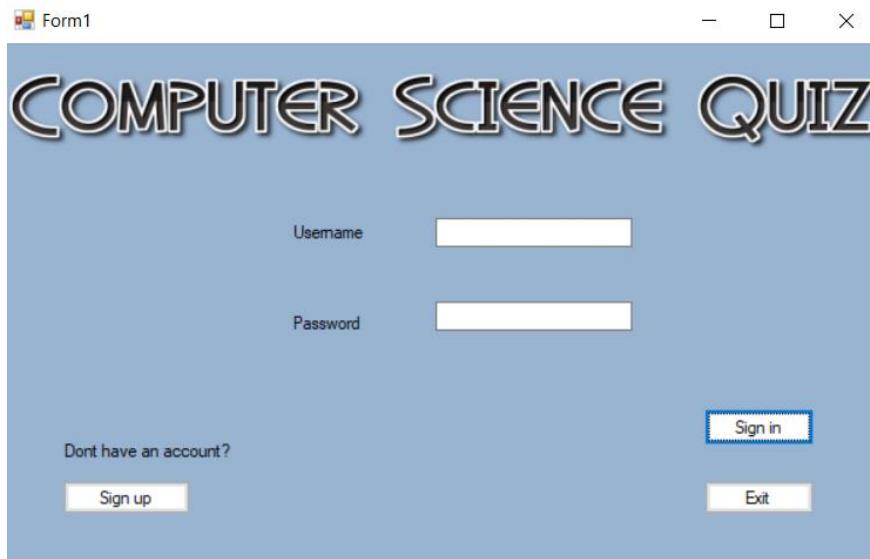
LOGIN SYSTEM

They appreciated the separation between sign in form and sign up forms.

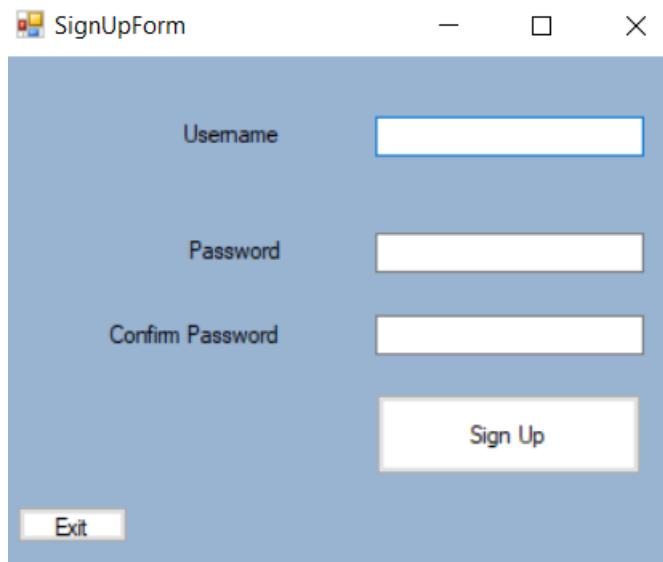
They liked the design, being simple & easy to use, as well as the colours & the logo.

They liked how the password characters are replaced by asterisks as it is being typed in, because of how it provides extra security and is something they are used to seeing in other login systems.

They liked how when the username or password was invalid, the textboxes were cleared, however one suggested to only have the password textbox clear, as that is the only textbox where you cannot see its value.



The only real criticism they had of the login system was that they couldn't use the enter key to run the SignInButton.click() subroutine. In further development I could add this feature. The main reason I didn't already add it was because there are multiple buttons on screen, however it is something that users are accustomed to, therefore it wouldn't affect usability in a negative way to add it.

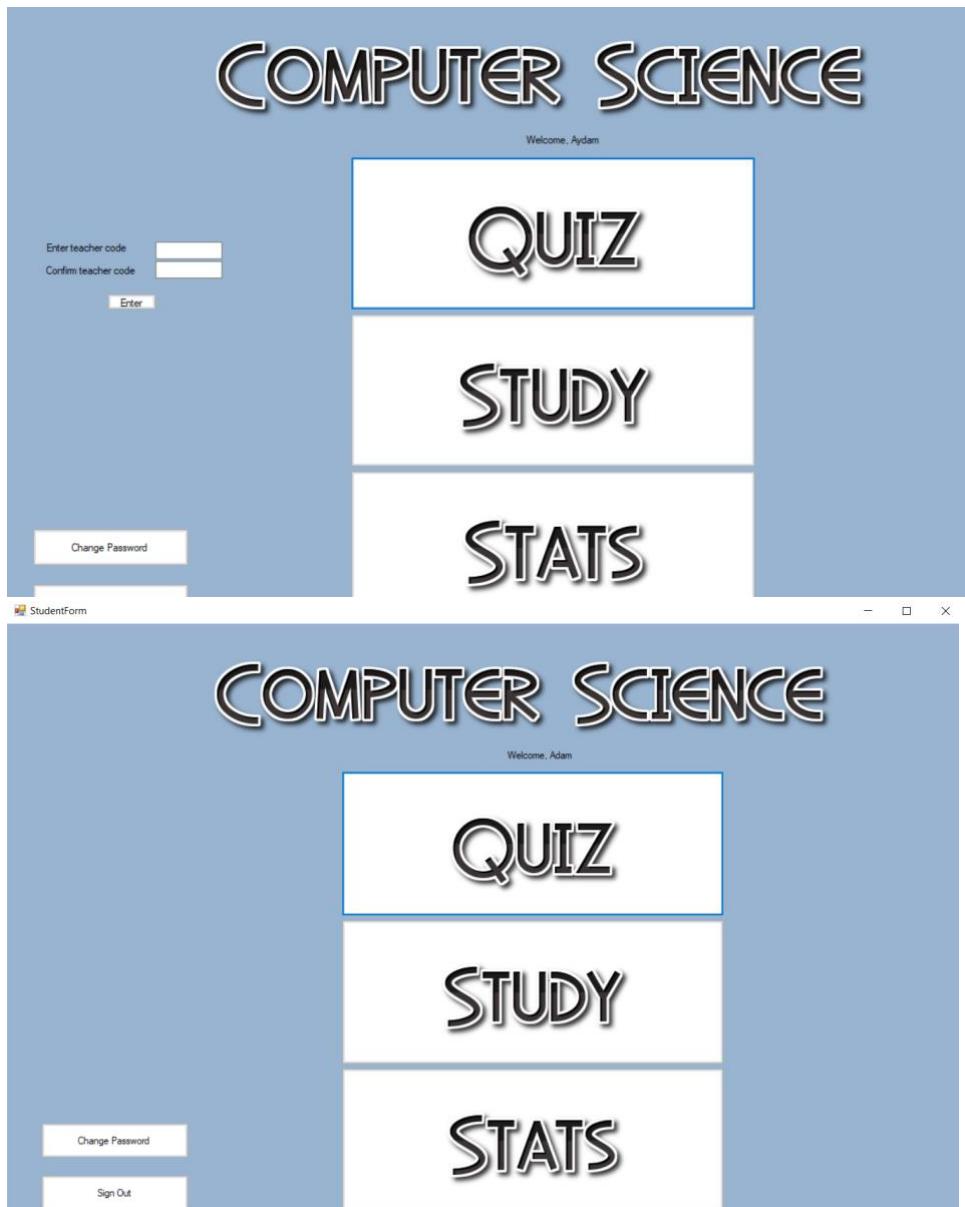


In the sign up form, they appreciated that you have to confirm the password you entered so that you are much less likely to have entered it incorrectly when signing up and liked that this was a separate form so that you don't have to type it twice whenever you want to sign in.

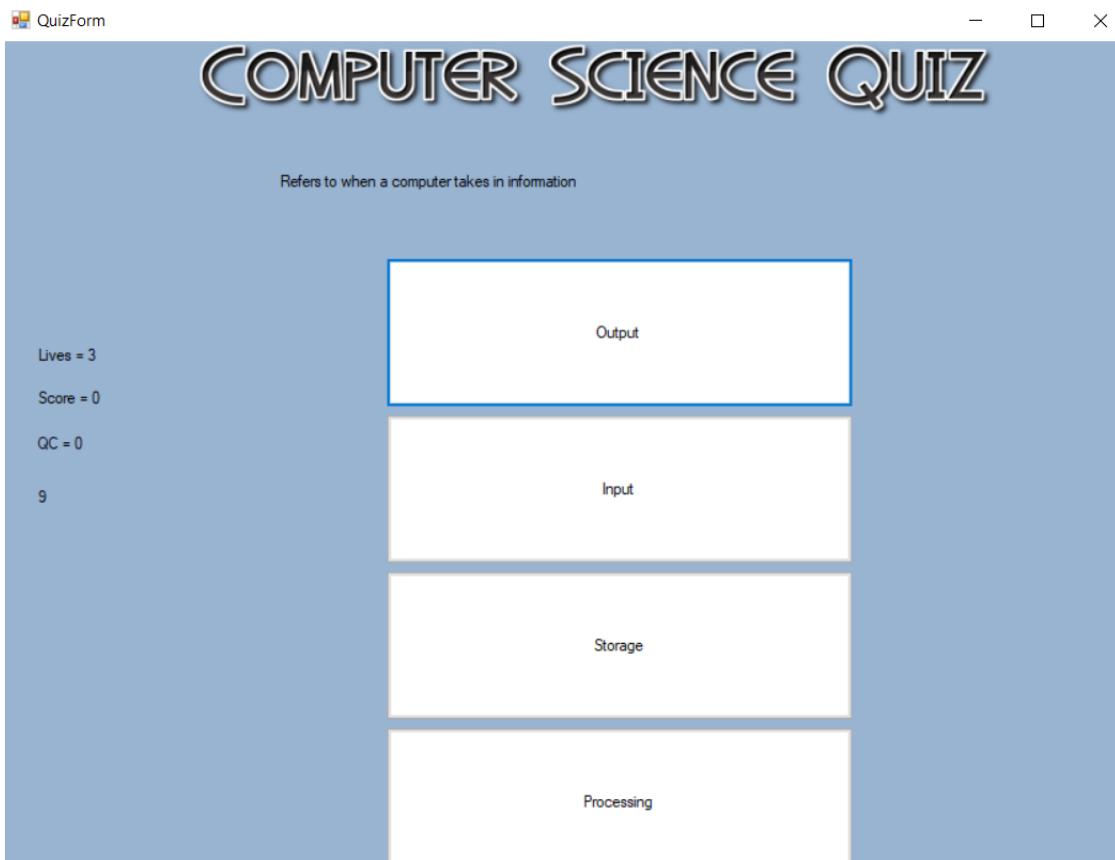
They also liked that there was an exit button if they accidentally clicked the sign up button.

They liked the logo font format in the buttons which are very big and clear to where they would likely lead the user, and the main logo at the top.

They liked how the teacher code textboxes and button disappeared after you have added a teacher, but they didn't like how it was on StudentForm at all & they suggested making an extra button that leads to a new form to add a teacher. This is definitely something I could possibly add in further development.



They appreciate the Change Password button, in case they want to change it for whatever reason & Sign Out Button in case they want to switch users, which they believed was very useful due to the time saving aspect of it.



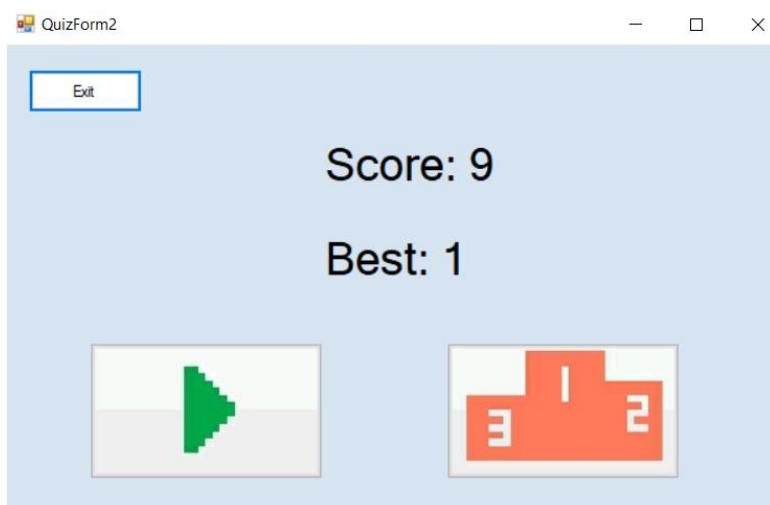
They appreciated how the correct answer was in a random place with each question and that questions weren't repeated.

They liked the size of the buttons & all the information on the left side, however they suggested increasing the size of the text in the labels & buttons, something that could be done easily.

They also wanted the label that is holding the question to be in a fixed space and for it to go down a line if the question is too long rather than the line going all the way to the right side of the form as that is something that happens sometimes.

They also thought an exit button would be a good addition in case they accidentally clicked on the button that leads to this form.

QUIZFORM2

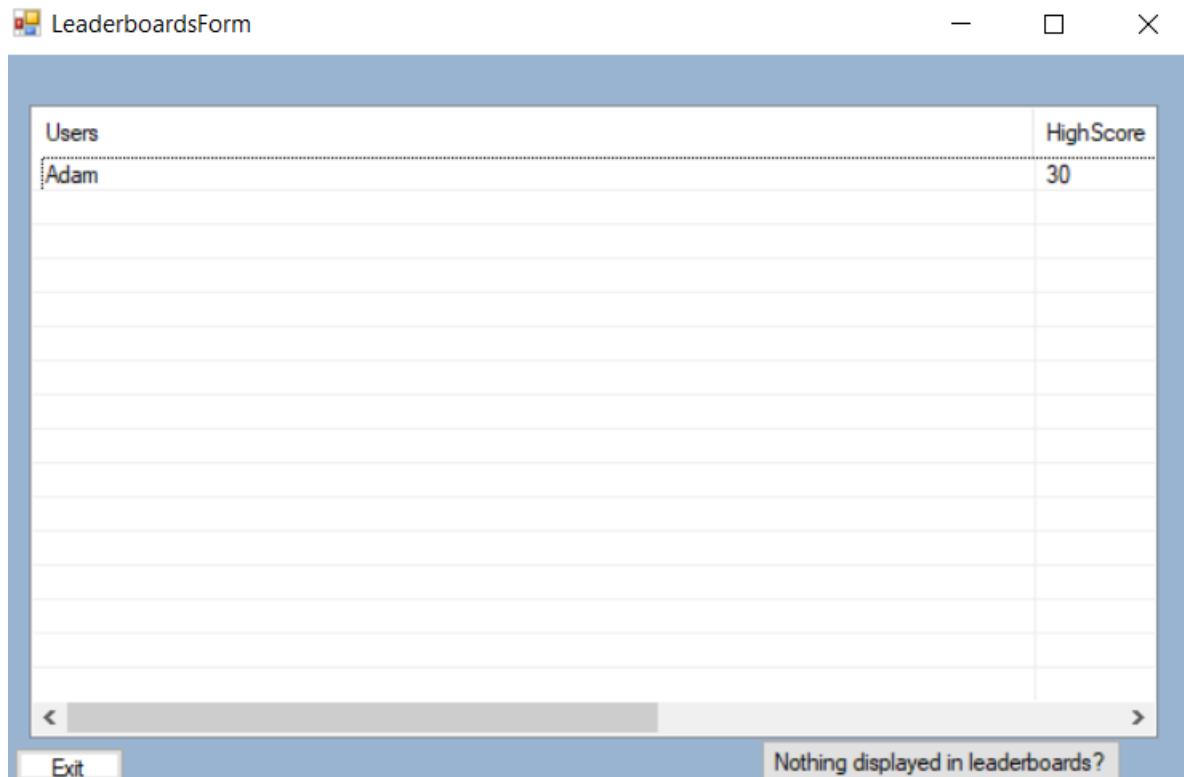


They didn't seem to have any complaints about this particular form. They liked the size and design buttons. They liked how it shows the score just achieved & their previous highscore.

They didn't know why their highscore was 1 before they attempted it but they didn't mind it too much & this was something I needed to do to avoid errors.

They liked how the play button saved them time if they wanted to attempt the quiz again & how they can check their fellow classmates highscores with the leaderboardform.

LEADERBOARDSFORM



They also appreciated the button which displayed the msgbox that explained why there may not be values in the listview and thought it was quite helpful.

STUDY SECTION

 StudyForm

- □ ×

COMPUTER SCIENCE TOPICS

The characteristics of contemporary processors.

Software and software development

Exchanging data

Data types, data structures and algorithms

Legal, moral, cultural and ethical issues

Elements of computational thinking

Exit

 Topic1LinkForm

- □ ×

Practise Exam Questions

Notes

Quiz Questions and Answers

Exit

They like the range of topics and how each has been separated out for the study section.

And they liked the multiple different study options for Topic 1 & 2, however they would like it to be available for all topics. This is something I could add with further development but I could not due to time restrictions.

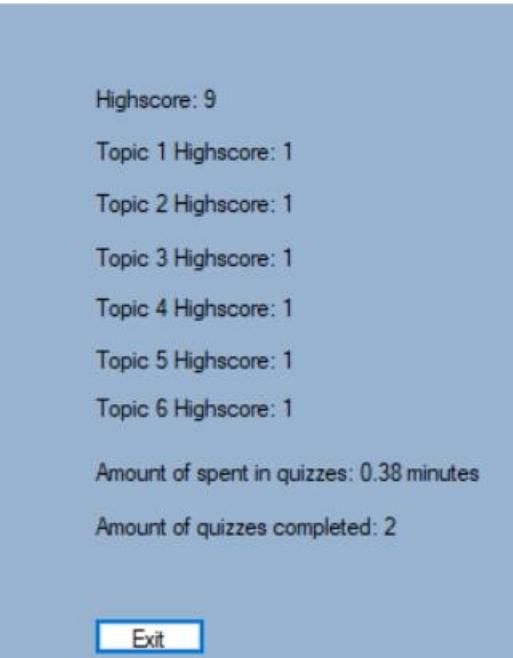
STATSFORM

 StatsForm

Highscore: 9
Topic 1 Highscore: 1
Topic 2 Highscore: 1
Topic 3 Highscore: 1
Topic 4 Highscore: 1
Topic 5 Highscore: 1
Topic 6 Highscore: 1

Amount of spent in quizzes: 0.38 minutes
Amount of quizzes completed: 2

Exit



They liked the range of information stored in statsform, didn't have any suggestions about it, but with further developments I personally would have added the mean score of the past 10 games.

STUDENTSTATSFORM & SEARCHSTUDENTSTATSFORM

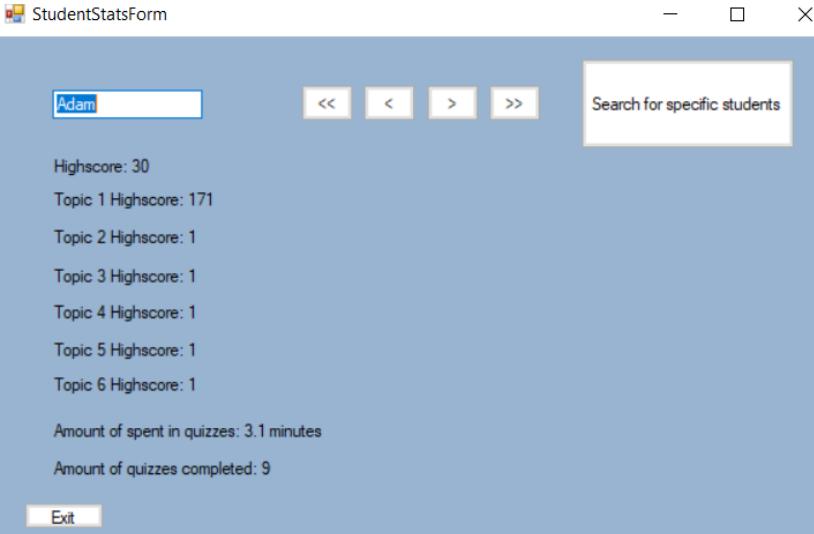
 StudentStatsForm

Adam << < > >> Search for specific students

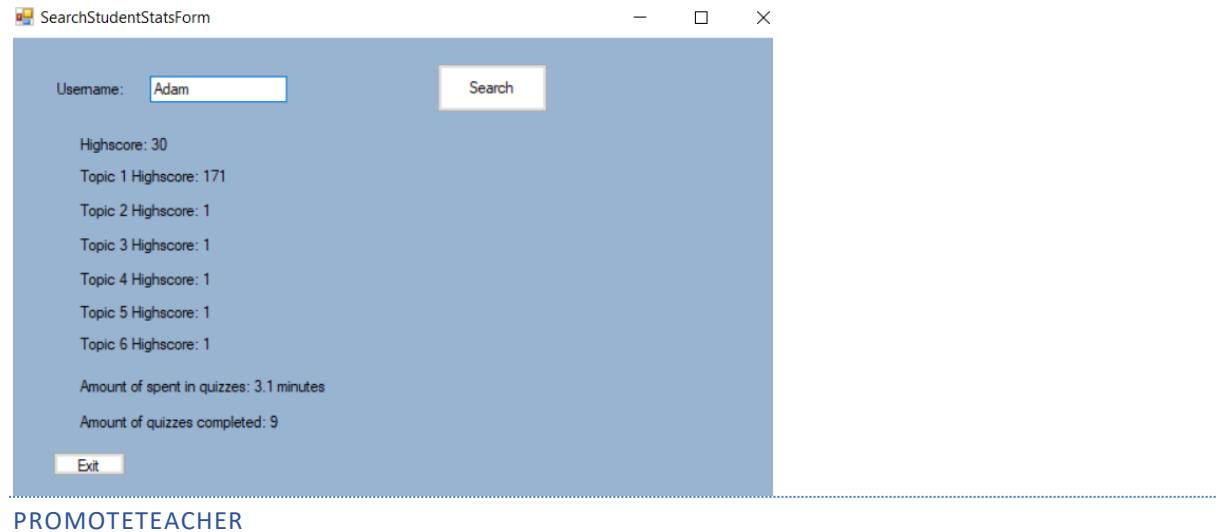
Highscore: 30
Topic 1 Highscore: 171
Topic 2 Highscore: 1
Topic 3 Highscore: 1
Topic 4 Highscore: 1
Topic 5 Highscore: 1
Topic 6 Highscore: 1

Amount of spent in quizzes: 3.1 minutes
Amount of quizzes completed: 9

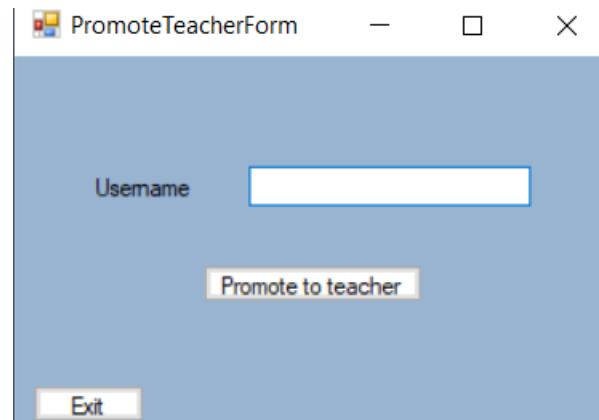
Exit



They liked how this form only has associated students to not waste the teachers time while navigating through, & they like how SearchStudentStatsForm has the ability to search for any student, but they said they would have preferred to search on the same form & the fact that a textbox was used in StudentStatsForm was slightly confusing. Perhaps I should have used a label in StudentStatsForm for the username of the students, however searching for a student along with navigating with the buttons would be harder to code but I might be able to do this with more time.



PROMOTETEACHER



They thought that this way of teachers making teacher accounts was slightly worse in terms of usability but they thought it was a good idea once I explained why I have set it out in this way (to avoid students signing up as teachers) & they didn't think it was too much of a hindrance so I would not change this.

STUDENTPASSWORDS

They thought this was a good idea as passwords can easily be recovered by the teacher if a student forgets & makes using the program easier if they cant remember their password, as they don't have to create a new account.

TEACHERFORM



They thought that the teachercode being displayed in the main menu for teachers was a good idea but they believe it is not too visible so a teacher might miss it. I could potentially increase the size of the label or create an extra button that leads to something that will display the teachercode to make it easier to see.

They also wondered why there was not a change password option for the teachers & suggested I also add something to help if a teacher forgets their password as well.

EVALUATION

SUCCESS CRITERIA EVALUATIONS

Success Criteria	Evaluation	Cross reference with testing
Menu	Criteria was met as stakeholders like the design & said it looked mostly professional	Testing for usability, stakeholders, StudentForm & TeacherForm
Log in page.	Criteria was met & works well	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Tests 1-9
An actual quiz	Criteria was met	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Tests 14-23

Study section	Criteria was met but not to its full potential due to time restrictions	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Tests 37 & 38
Back/Exit to menu button	Criteria was met, however I intended to have one in QuizForm which didn't happen but I could possibly add one in further development	Throughout the program I have exit buttons
Score system	Criteria was met. Score & final score variables in QuizForm which are compared to their highscore.	Evidenced TESTING FOR FUNCTIONALITY AND ROBUSTNESS Test 15
Sign up feature in the program	Criteria was met and users can sign up on the program to create records in the database	Testing for Usability, Login System
Teacher page	Criteria was met	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Tests 30-33
Data of each user saved	Criteria was met	All relevant data of each user is saved such as usernames, passwords, highscores, time spent on quizzes etc in a database
Feedback at the end of the quiz	Criteria was not met. By the time I had made the quiz, it didn't feel as important or useful, especially due to the fact they can look at the study section for all the questions and answers.	N/A
Lives system	Criteria was met. Lives system used in Quiz, 3 lives initially & when there are none remaining, the quiz ends	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Tests 16-18
Countdown Timer	Criteria was met, there is 10 seconds available to answer a question & if the question hasn't been answered in that time, the user loses a life & it skips to next question.	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Test 17
Sound Effects/ Music	Criteria was met. There is a sound effect when most buttons are clicked & there is music played during the quiz.	Prototype 3, Client Interview & Analysis Changes Test 12
Total of time spent on quizzes	Criteria was met. It keeps track of how long someone spends in quizzes & that value can be seen in StatsForm.	Testing For Usability, Stakeholders, StatsForm

Topic Quizzes	Criteria was partially met, was only able to make it for Topic 1 due to time restrictions, however making one for the rest of the topics would be a very similar process	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Test 34-35
A score for how well the student is doing on each topic	Criteria was not met as it would require a lot more code & would take a very long time to make something like that due to its complexity, but could perhaps be done with further development.	N/A
Coloured Feedback	Criteria was not met as there was not a form where I provided feedback as I no longer thought it was necessary.	N/A
Provide mock test papers	Criteria was partially met. Provided exam questions for Topic 1 & 2 in study sections, however did not do this for the rest of the topics due to time restrictions.	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Test 37-38
Keyboard usability	Criteria was unfortunately not met, but could possibly be added with further development.	N/A
Forgot Password	Criteria was partially met. Provided a way of password recovery & changing password but it requires connecting your account to a teacher who can then view your login information.	TESTING FOR FUNCTIONALITY AND ROBUSTNESS Test 30
Multiplayer quiz	Criteria was not met as I would not even know how to do this	N/A
Leaderboards	Criteria was met & there are leaderboards that students can check after they have attempted the quiz.	Testing for usability, LeaderboardsForm
Teachers can create quizzes for students	Criteria was not met but could possibly be added with further development, but would require a lot of time	N/A
The teacher can set work to be completed	Criteria was not met & I would not know how to implement this ability to communicate through the program	N/A

MAINTENANCE ISSUES AND LIMITATIONS

MAINTENANCE ISSUES

Due to the fact that this system is designed to be used by teachers & students, it will likely be set up in a school & as time goes on and many accounts are created, the database will get filled with a lot of information that it will keep, even after those student have left the school/ college & to keep storage requirements lower, it would be best to add code to remove inactive accounts after a certain amount of time. In addition, it would need new features & more resources added regularly to give students a reason to use this revision tool over others.

LIMITATIONS

During development some features could not be implemented due to time constraints or through limitations of Visual Basic. These being:

DIFFICULTY

By this, I am referring to a feature that took into consideration different difficulties for different topics for different students depending on their performance within each topic. This would be very complex to create as there would need to be various additional fields storing data & variables that would be taken into account to calculate what difficulty question should be presented to a particular user whenever they are presented with a new question. In addition to this, I would have to find more questions to add to the database that would be suitable for each difficulty & to be sure it was appropriate I would likely have to consult with my stakeholders & this entire process would take very long and therefore, due to time restrictions, I am unable to complete this feature.

TOPIC QUIZZES FOR EACH TOPIC

I fully intended on completing this feature, but I soon realised how it would be very time consuming after completing topic1 quiz & understood that my time would be better spent working on the rest of the program as this feature was not essential, was only in the “could” section of my success criteria in Analysis, & would take too significant an amount of time.

NOTES & EXAM QUESTIONS FOR EACH TOPIC

This is a feature that would be very easy to implement as there is not very much coding whatsoever, however the repetitive process of creating the many forms for each topic & gathering the related material was taking far too long for a feature that was not essential to the program, and only in the “could” section of my success criteria & I am certain I could easily complete this as well as the topic quizzes, given extra time.

TEACHER BEING ABLE TO CREATE QUIZZES

This is a feature I was initially unsure of how I would attempt to implement, however I think if I made it so teachers had the ability to create a new datatable, similar to the Questions datatable I have used, but specific to the teacher & then give them the ability to input values, it is possible I could have added this, given more time.

KEYBOARD USABILITY

This would potentially make usability better for the students when answering questions in the quiz & allow them to achieve higher scores if they could simply press a key on their keyboard, rather than having to move their mouse to click on a particular button. I am not entirely sure of how to implement this, as visual basic

doesn't seem to have a clear way of being able to detect which keys have been pressed, without the use of something like a textbox. However, this is a feature I would like to have had in the quiz.

A NEW FORM FOR ADDING A TEACHER

This is something my stakeholders suggested as they thought it was quite visually unappealing before they added a teacher in StudentForm & I could implement this quite easily.

TEACHER CHANGE PASSWORD & FORGOT PASSWORD

I didn't add the ability for teachers to change their password as it was simply something I forgot to do but then eventually ran out of time, however, as the stakeholders pointed out, I had nothing to restore access to accounts of teachers who forgot their passwords, & so I would likely either allow teachers to view each others passwords or I would implement a system with security questions, which would result in them being able to change passwords if the questions were correctly answered.

AVERAGE SCORE OF PAST 10 GAMES IN STATS FORM

This is something I wanted to add into the stats form to allow the user to see how good they are doing as of recent time, & I could have this for all topic quizzes as well, potentially & this could also be used in determining the difficulty of questions a user will be more likely to receive, if I were able to implement difficulty.

ADDITIONAL IMPROVEMENTS

Other than the limitations discussed previously being added in future development I felt the following improvements would also improve user experience:

VIDEOS TEACHING TOPICS IN STUDYFORM

This could have potentially been an idea that, if implemented, would be quite useful to a student revising computer science, as many students would find a video much more engaging than reading notes, & thus are more likely to learn from this.

VIDEOS SHOWING ALL MAIN FEATURES OF PROGRAM & HOW TO NAVIGATE & USE IT

Although I have made it simple enough for the average user to be able to work with, this could enhance usability & would get rid of any confusion with the program if everything had been explained & there were tutorials for how to use its features.

CUSTOMISATION OPTIONS

For example, I could allow the users to change the colour scheme, if they are unhappy with it & this could make the users enjoy their overall experience more & be more likely to continue to use the revision tool.