CYPRUS INTERNATIONAL UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

Exam Proctoring System
(E-Proctoring)

By

Burak SARPKAYA

Alim YOGURTCU

Sait Bugra AKSAK

Umut BOLAT

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Nicosia, NORTH CYPRUS

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BURAK SARPKAYA (CPE)

ALIM YOGURTCU (CPE)

SAIT BUGRA AKSAK (CPE)

UMUT BOLAT (MIS)

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APPROVED BY:

Dr. Devrim Seral

Özet

Uzaktan ve çevrimiçi sınavların sayısındaki artışla birlikte, bu çalışmada sınav katılımcılarının kopya çekme eğilimini önlemek için önerilen yeni bir çevrimiçi gözetleme sisteminden bahsedilmektedir. Geliştirme aşaması başlamadan önce, en önemli ve gerekli özellikleri elde etmek için; sınav katılımcıları tarafından doldurulan formlar ve anketler kullanılmıştır. Tezde bu teknolojilerin nasıl çalıştığı ile ilgili bilgiler, sistemin özellikleri ile birlikte detaylı olarak anlatılmaktadır.

Anahtar Sözcükler: Uzaktan eğitimde güvenli sınav ortamı, kopya engellemek için gözetmen sistemi

Abstract

With the increase in the number of remote and online exams, this study discusses a new online proctoring system proposed to prevent the tendency of exam takers to cheat. Before the development phase begins, to obtain the most important and necessary features; forms and questionnaires filled in by the test takers were used. In the thesis, information about how these technologies work is explained in detail along with the features of the system.

Key Words: Secure and dependable exam environment, proctoring system to prevent cheating

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1.   CHAPTER ONE
INTRODUCTION

1.1.   Understanding the problem

With the increase of the corona virus all over the world, Almost every school has switched to distance learning. The aim of distance education, to reduce the number of cases and to continue the education of schools. But with the distance education, security of exams and reliability of exam results are becoming the main problem. Since the exams as well have started to be done online, since the proctors cant see the exam participant or check if they are doing the exam by themself with their own answers but not from the internet, there was nothing to keep exam participants from cheating on the exams.

1.2.   Finding a solution

To prevent cheating on the exams proctors should be able to watch on the participants, they should be able to see what they are actually doing on the screen, if they left the exam tab from the browser to find answer, if they left the computer to someone they hired or someone they know to solve and answer questions instead of them or telling the correct answers for participant, there is can be even more creative ways to obtain correct answers that proctors can't even imagine. To prevent this kind of cheating actions a way required, a way that will help proctors to check on exam participants. To obtain this goal, the best solution is creating a proctoring system which has specific futures to help proctors to watch all participants and give them no other option but to do their exams without cheating.

1.3.   The aim of the thesis

With this thesis our aim is explaining the proctoring system for how is it made, what tools are used, what type of problems encountered during development stage, how

many of it solved and how many of it didn't solved, how is it works, what are the profits and loss for using this system, from now on what will be happen.

This objective will be able to see the connection in all the details contained in the project in this thesis development process of the functioning of the project. The project examines the shortcomings in the action taken in order to complete the project. Talking about every step is one of the objectives of this thesis.

1.4.   The purpose of this report was

There are too many ways to attend an online exam, like computer applications, mobile applications, web browsers ...etc. To avoid wasting time and extra costs we prepare this document to analyze from every angle, decide necessary platforms and usable technologies, create an efficient road path and make good use of our time.

1.5.   Justification for the proposed system was

System will be able to be used for any type of exams that includes questions with answers, tests. Mainly target the organizations like schools, government, businesses that take their employees by exams…etc, basically every organization that wants a safe, fair, dependable place to do the exams.

Usage of this system will be simple and reliable. Prevent the participants from cheating, keep their seriousness even if it's an online exam and help organizations to organize their exams.

2. CHAPTER TWO
THESIS OUTLINE

At the beginning, before the development stage for the proctoring system starts, a feasibility report is prepared. In this report researches made for the system features and usable technologies. In this chapter some parts of this report are briefly explained.

2.1. User interface description from report:

User interface will be simple and usable by anyone that wants to organize an exam. After the login process, proctors are going to create their exam room to watch over participants. Proctor will manage the participants and exam room.Then send the room information to the participants to join the room.

2.2. Presearch of existing technologies

At the plan stage of the system, to decide and understand the related technologies to the topic, researches made for the already existing technologies and systems. Those searches was about:

2.2.1. Camera Face Track Systems

In this title research was made about the existing Face Track systems with the camera. To avoid cheating, proctors must be able to see students' faces via camera. But following hundreds of participants at the same time with a camera is impossible. So one of the possible solutions for this problem is using a smart camera system that is gonna track participants face movements.

2.2.2. *Track Off Application and Web Browser Tabs*

Another important feature for the system is tracking open applications in the background. Searched for currently available software for use on the system and collected under this title.

2.2.3. *Speech Recognition Software*

How can a proctor understand if the participant is alone in the room or there is no one telling him answers from the background ? Speech recognition softwares are can be a handful of technologies in these situations. Therefore research results are collected here.

2.3. Considerations

Before the development stage the research about important features that a proctoring system should have was made and they are written in this section. Those features was:

2.3.1. *Simplicity*

Since the system mostly targets schools and any organization that makes online exams, simplicity is the most important feature. So the system can be used by anyone easily without any complex requirements or mind blowing user interface. Therefore research is required to learn how to provide a plain looking user interface with minimal components.

2.3.2. *Security*

The system will contain exam questions, so security is another major feature. To provide a secure exam system, research had to be made.

2.3.3. *Platforms*

In today's standards almost everyone has access to a computer. But for the times where participants don't have access to a computer, making the system accessible from most of the platforms will increase user capacity and help all the users to participate in online exams.

2.3.4. *Performance*

Making the system as light as possible would play an important role in removing the computer system requirement constraint to run properly and users will have easier access to the system.

2.4. Analysis

Analysis for already existing systems made in this section. These analysis are about;

2.4.1. *Market Analysis*

The market analysis for the already existing proctoring systems aims to get brief information about their market movements, the average value of a proctoring system on the current application market.

2.4.2. Technical Analysis

To have more information about proctoring systems, learn how they work, which technologies are used, what kind of features they have and which platforms are able to access the system; to get those information research made about existing proctoring systems and all the collected data considered here.

2.4.3. Financial Analysis

The purpose of financial analysis was getting information for a proctoring systems financial potential. How much it costs to develop, publish and make advertisements, how much income can be earned and what is the possible lifecircle of the system.

3.   CHAPTER THREE
RELATED WORKS

3.1.   Application Type

The system is developed as Web Application and Windows Presentation Foundation.

Since every participant cant have computers that have the features to satisfy complex and heavy applications the best way to reach more participants is using a light web application. Therefore the system developed as a web application.

3.2.   Used Languages

The list of languages used while developing the system are as shown in Table 3.1 Programming languages:

Table 3.1 Programming Languages

Languages	C#	JavaScript	CSS	Bootstrap	HTML

3.3.   Development IDE and Technology

Visual Studio ASP.Net MVC.

MVC means Model, View and Controller. The idea behind the MVC is making a clear separation between those three types to have more organized code structure. So ASP.Net MVC is used for better separation between code types and more effective teamwork.

Since the ASP.Net MVC was developed by Microsoft, their main IDE which is visual studio has the full support for MVC application development. So it's best to use visual studio for developing ASP.Net MVC apps.

3.4.   ASP.NET MVC Futures

Table 3.2 depicts all the created and used files during the development stage.

Table 3.2 created and used files

Folder	Index
Controllers	AccountController.cs
Models	Account.cs AccountContext.cs
Views/Account	Login.cshtml ExamPage.cshtml Teacher.cshtml
Views/Shared	_Layout.cshtml
Scripts	Main.js
Styles	Main.css

3.4.1. Controllers

Controllers are kept in this folder.

3.4.1.1. AccountController.cs

This controller is used for creating a connection with the database to check and verify username and password.

3.4.2. Models

Database models kept in this folder.

3.4.2.1. Account.cs

Account.cs acts as a blueprint of the database. Declarations are made here.

3.4.2.2. AccountContext.cs

This file is for creating a bridge between dataserver and model.

3.4.3. Views/Account

Views that are shown on the user's screen are kept here.

3.4.3.1. Login.cshtml

This file contains the structure for the login screen.

3.4.3.2. *ExamPage.cshtml*

This file contains the structure of the exam page that participants see.

3.4.3.3. *Teacher.cshtml*

This file contains the structure of the exam page that proctors see.

3.4.4. *Views/Shared*

Shared views contain common design for all pages. Those files are kept in this folder.

3.4.4.1. *_Layout.cshtml*

This file is used for the common design used in login.cshtml, exampage.cshtml and teacher.cshtml.

3.4.5. *Scripts*

Javascript files are kept in this folder.

3.4.5.1. *Main.js*

It contains javascript functions for common usage in all views.

3.4.6. Styles

Cascading Style Sheets (CSS) are kept here.

3.4.6.1. Main.css

This file contains all the css codes.

3.5. Technologies

To develop a reliable and cheating free proctoring system, there are some technologies that are required and used. Those are:

3.5.1. Required Technologies

The system requires features and technologies that will help proctors to check on participants, to do that after the research for the best suitable technologies, those are the ones suitable for the system; a camera technology to watch on the participant through the exam, a screen tracking technology that checks on the participants screen continuously, a face detection system to keep tracking participant face, a listening technology to listen around of the participants, a communication technology to keep on contact with participants via chat and microphone, a log system to track entrance to the exam.

Being able to watch the participant via camera is one of the core technologies to prevent cheating. The proctor will be able to see what the participant is doing, if the person that participated in the exam is the right person but not an imposter, if there are people around the participant to help with the answers or if the participant checks the answers from the lecture notes or not. So for the proctors, checking on the participant with the camera is very helpful to prevent cheating

A tracking system to track on the participant to see if they leave the page to find answers of the exam questions or not and if the participant leaves warns the proctor about it is another helpful technology.

Since proctors can't see participants around even with a camera, a technology required to keep on tracking his face's direction to see if the participant looks only screen to solve exam questions or looks around to find the answers.

Also another core future is being able to listen around the participant to hear if there are people around the participant to tell the answers of the exam questions.

For the updates about the exam questions, warning about the participants' acts, and answer questions that come from participants about the exam there is a communication system required. So proctor can reach participants to tell them these things.

To make the tracking of participants easier, a log technology for taking the log of participants that enters the exam is required. The log record will be about regular things like how long their exam takes, when they enter or leave and so on.

3.5.2. *Technologies that has been used*

The technologies that used in the system are:

3.5.2.1. *RtcMultiConnection*

RtcMultiConnection is an open-source WebRTC service with a wrapper library[1]. The RtcMultiConnection service is used for video, voice and chatting features in the system. After the RtcMultiConnection permission to use the camera and microphone system starts to record the participant and send the live footage to the proctor via service.

Tensorflow is the face tracking system that was made by Google Brain Team[2]. Since the system should help proctors to keep checking on the participants, tensor flow becomes handy. The algorithm detects the eyes, nose, ears, mouth and chin of the participant, and tracks the position of the participant's face according to those points. To detect participants face Tensorflows Blaze Face detection extension is used.

Blazefaze is a lightweight model that detects faces in images Blaze Face makes use of modified Single Shot Detector architecture with a custom encoder[3]. The model may serve as a first step for face-related computer vision applications, such as facial keypoint recognition[4].

When the participant enters the room, the system locates some points of participants' faces. Those points are eyes, nose, ears, mouth and chin. From those points it saves the location of the nose and makes the calculations depending on its location on the x and y axis.

The rotation degree limits are calculated at the time of participants login according to the nose's degree. For the calculations:

- Top side: Nose location + 10.
- Bottom side: Nose location - 20.
- Left side: Nose location - 15.
- Right side: Nose location + 15.

If the nose location exceeds any of those limits, the system warns the proctor immediately about that proctor.

3.5.3.   *Toastr*

Toastr is a javascript library for Gnome/Growl type non-blocking notifications. This library is used for alerts like room opened or closed alerts, participants entrance, focus and face track alters[5].

When the exam begins, whenever a participant leaves the exam tab for the first time, the system shows an unfocus alert in the red box.

For the face detect system, it works the same way as unfocus alert, if the participant moves his face away from given border values the system shows face detect alert.

Blue and orange toasters are for information like if the room is opened or closed.

3.6. Supported Platforms

Table 3.3 depicts platforms where the system can be used.

Table 3.3 Supported Operating Systems and Description

Browser	Operating System	Description
Google Chrome	Mac, Linux/Ubuntu, Windows, Android	Fully Supported
Firefox	Mac, Linux/Ubuntu, Windows, Android	Fully Supported
Safari	Mac, iOS	Requires version 11 or higher
Edge	Windows10	Fully Supported
Opera	Mac, Linux/Ubuntu, Windows, Android	Fully Supported
Application	Windows 10	Requires Webview2 Runtime

3.7. Diagrams

Use case, Sequence, Data Flow, Flow Chart diagrams shown at the following section.

3.7.1. Use Case Diagram

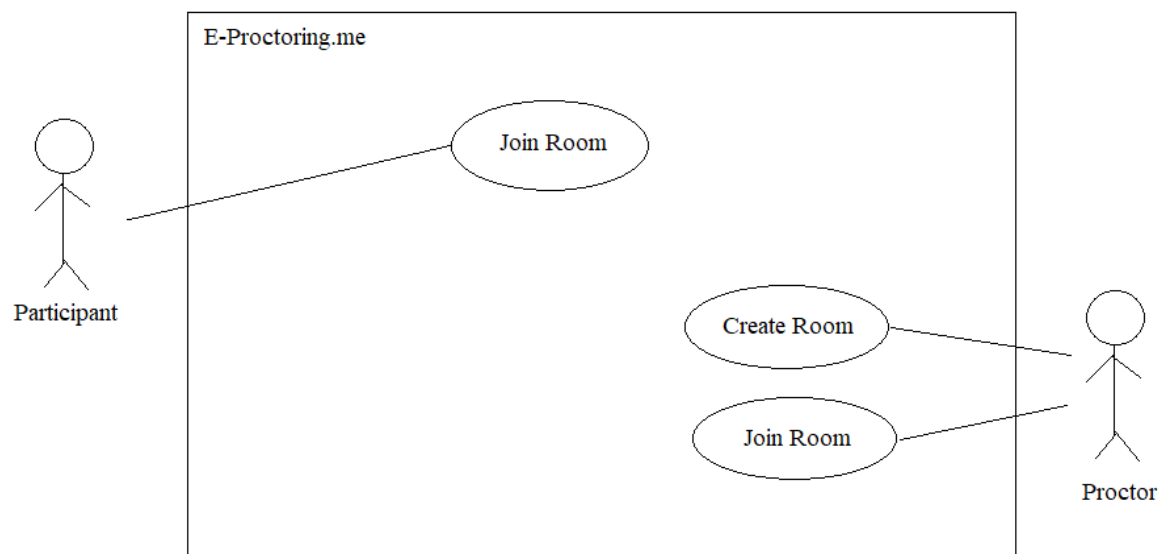The following figure 3.1 shows Use-Case Diagram of the proctoring system.

E-Proctoring.me

Join Room

Participant

Create Room

Join Room

Proctor

Figure 3.1 Use-Case Diagram

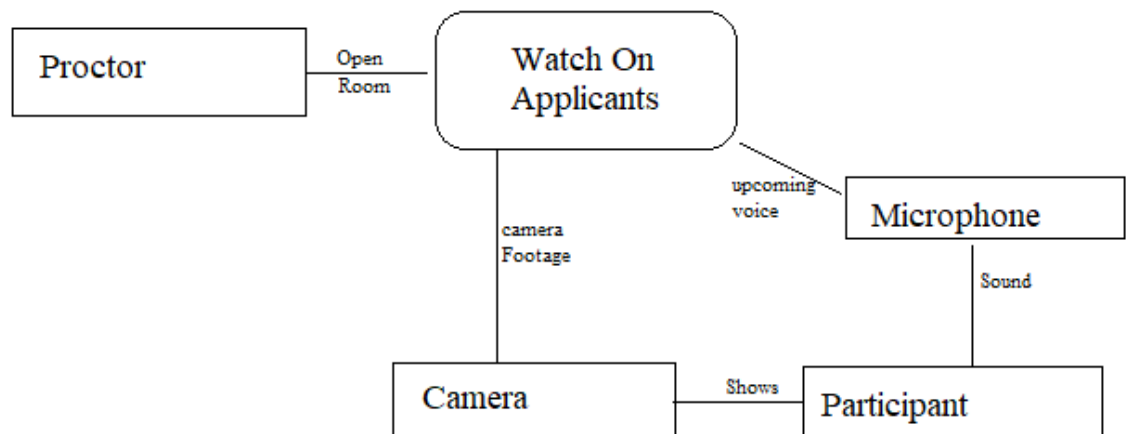Following figure 3.2 is a data flow diagram of systems video and voice streaming.

Figure 3.2 Data-Flow Diagram of Video and Voice streaming

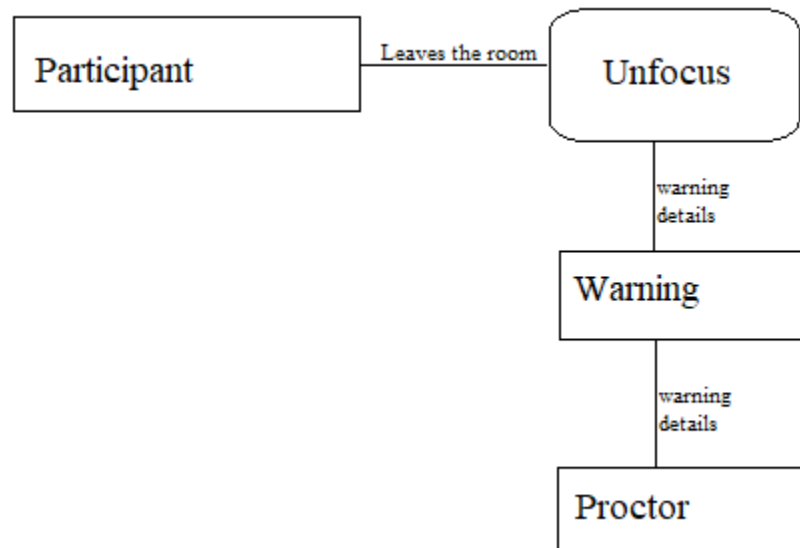Following figure 3.3 is a data flow diagram of the browser focus tracking part.

Figure 3.3 Data-Flow Diagram of browser focus tracking

3.7.3. *Flowchart*

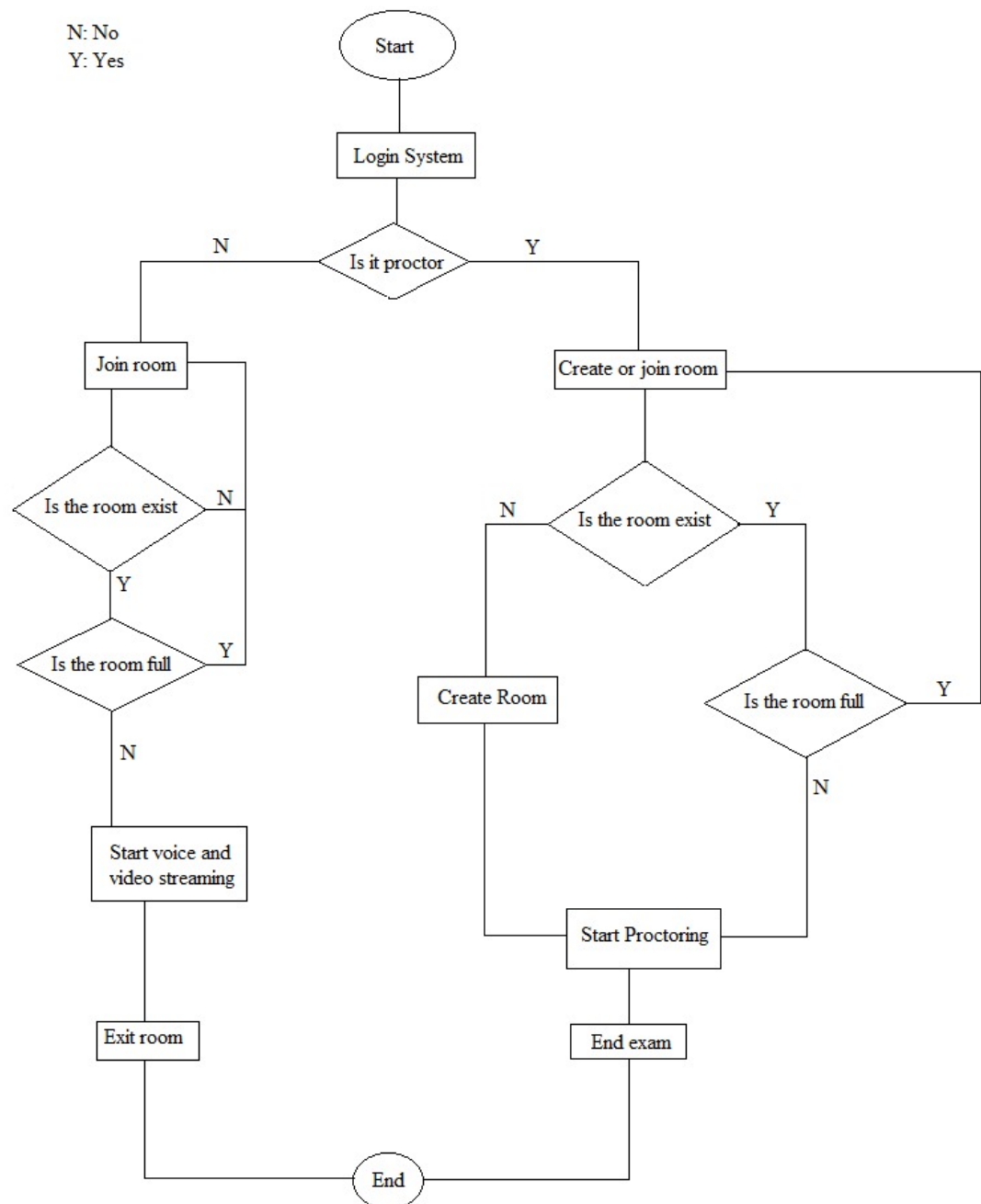Following figure 3.4 is the flowchart of the system's algorithm.

Figure 3.4 Data-Flow Diagram of systems algorithm

The system starts from the login system. After a successful login to the system, it checks if the current user is a proctor or not.

If its a proctor, directs the user to the create or join room screen of the teacher view. In here proctor can create a room by entering necessary information. If that information is already used to open an exam room by a different proctor, the system makes the proctor join that room if the room is not full. After the creation of the exam room proctoring system starts to watch over participants in that room.

If it's a participant, the system directs the user to the join room screen of the Exam Page view. Participant enters the necessary info to find and enter the exam room. If the room exists and the capacity of the room is not full, the participant enters the room and starts the video and voice streaming towards the proctor.

At the end of the exam, the participant simply leaves the room where for the proctor they close the room to access and finish the exam.

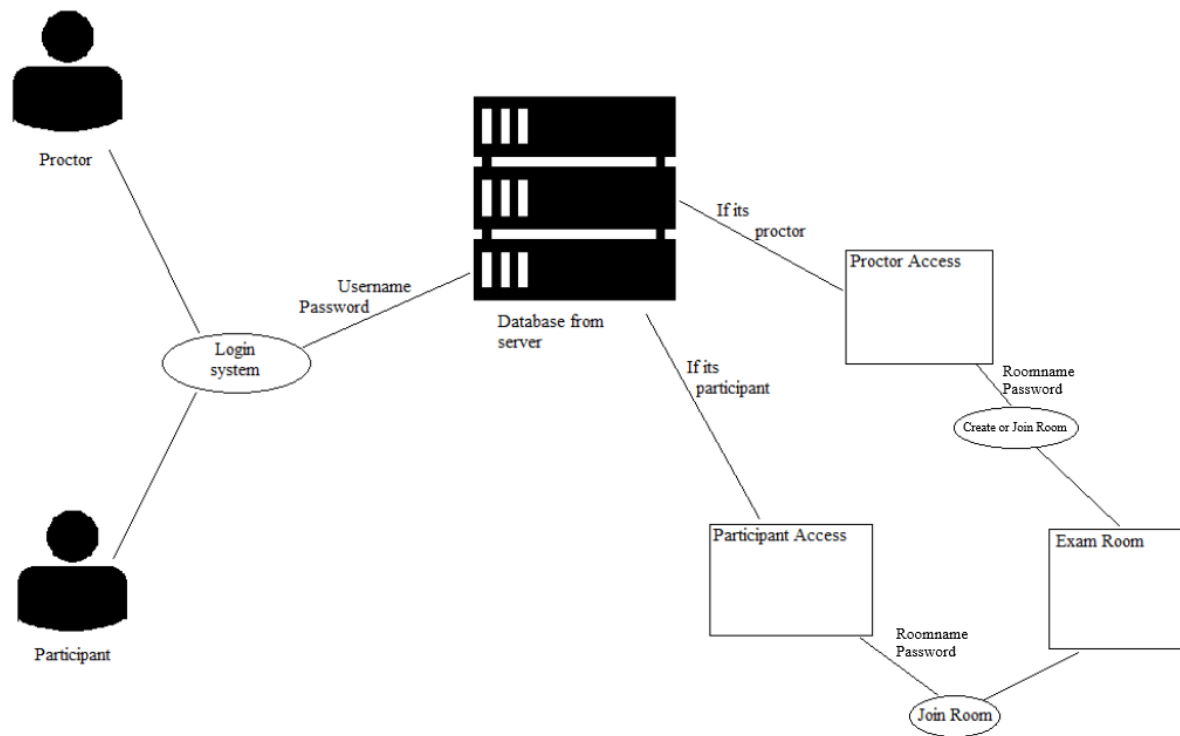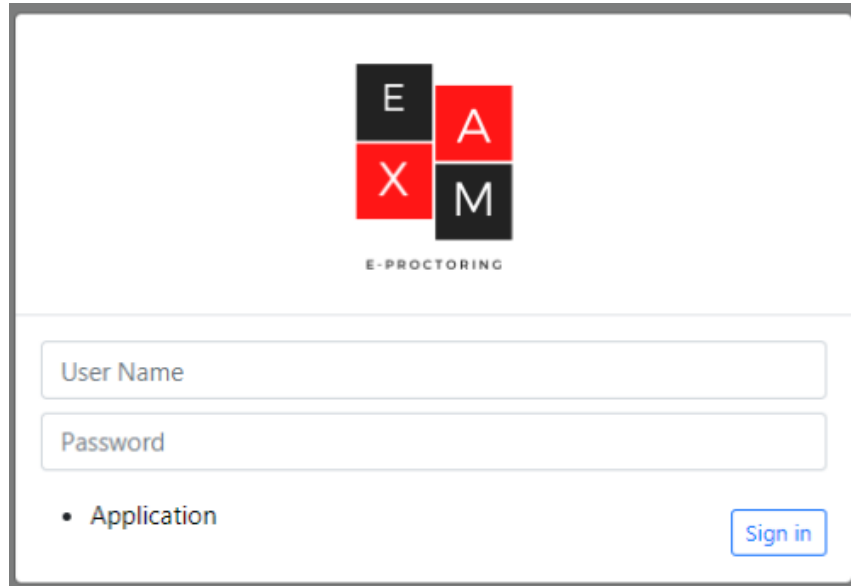The following figure 3.5 represents business logic.

Figure 3.5 System Structure

Users login system via username and password. Identification happens in the database. If the entered username and password combination identified as proctor user gets proctor access, but if the combitaniton identified as participant user gets participant access. For the proctors they are directed to the create room screen to create an exam room for the participants. For the participants, they can only join rooms. So after the login section participants are directed to the page where they input room information and enter the room.
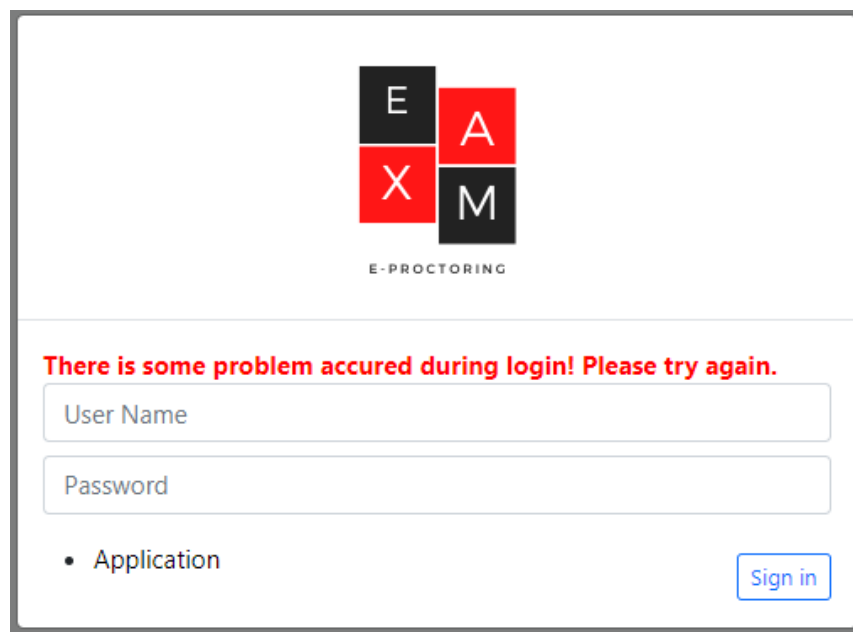
3.8.   Web Application Interface

The introduction of the user interface explained below.

3.8.1.   Common Interface

Image 3.1 Login section from login page

Image 3.2 Login section with error from login page

This image 3.7 and image 3.8 are taken from the login screen, the first view that the user will encounter. The participant and proctor will use this screen to log into the system. The required information which are username and password to log in the system are required here.
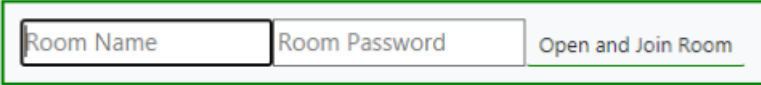
3.8.2. *Proctor Interface*

Image 3.3 Open and Join room section of proctoring

This screen for opening a new room or joining into an already existing room.

Image 3.4 Online users and chat-images-log section for proctor

Online users list and chat/send image/ room log screen.

On the online users side proctor can see the participants in the room with their information like name, surname and student number.

On the right side there are 3 buttons that separate chat, send pictures and log of the room. The chat is where participants and proctors communicate with each other via text, the send picture part is for participants to send an image at the necessary times and the log for keeping a log of participants that enters or exits the room.
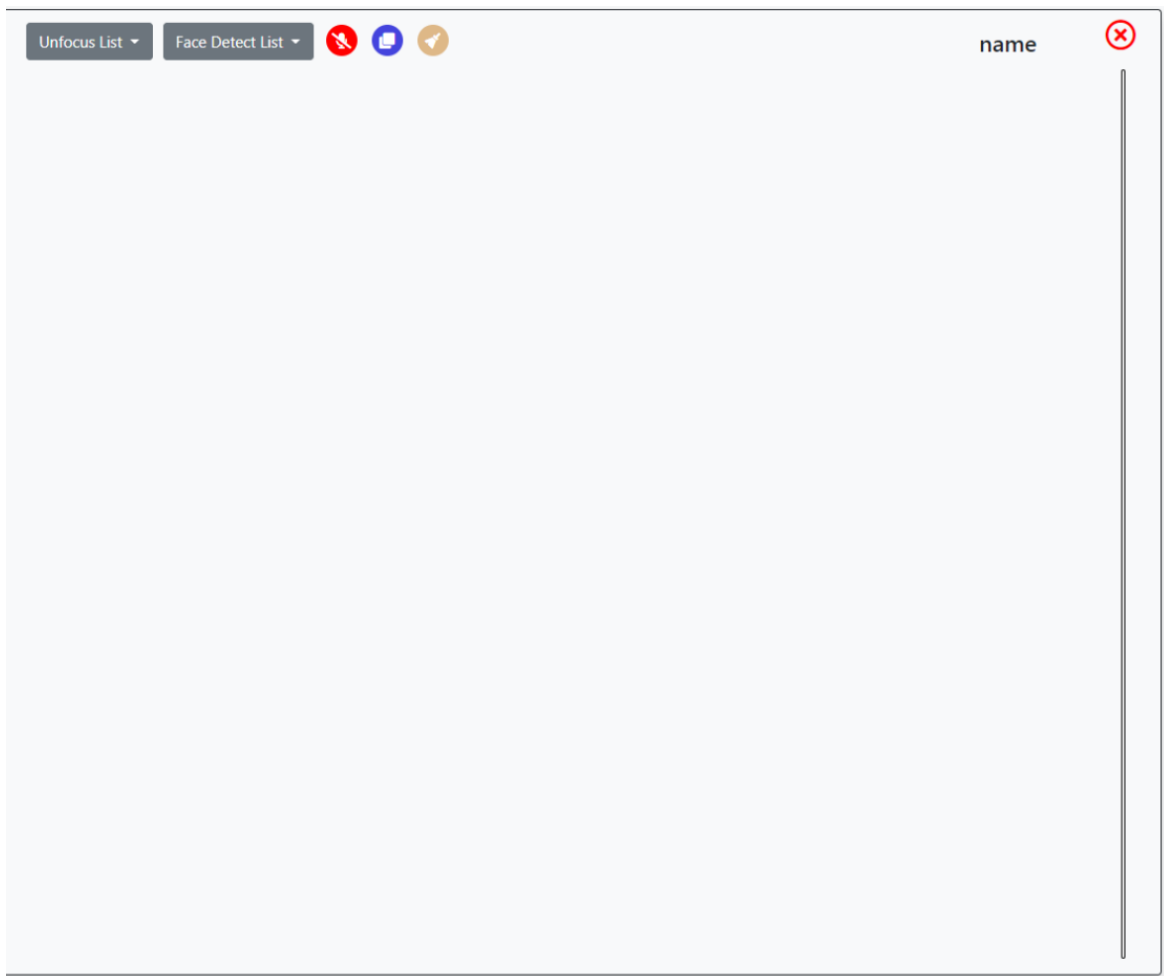
Image 3.5 proctoring section for proctor

At this section, proctors will be able to see participants via camera. Participants' cameras will be shown in this section of the screen.

There are 5 buttons at the top to do some functions.

3.8.3.   Dropdown Buttons

These buttons open different lists depending on the participants' cheating acts.

- ○ **Unfocus List:** Proctors can see participants that left and how long they left the exam page.
- ○ **Face Detect List:** Proctors can see the participants that turn their face away from the screen and how long they looked away.

3.8.4.   Normal Buttons

These buttons helps the proctors to mute or unmute their voices, copying the room information and cleaning all alerts
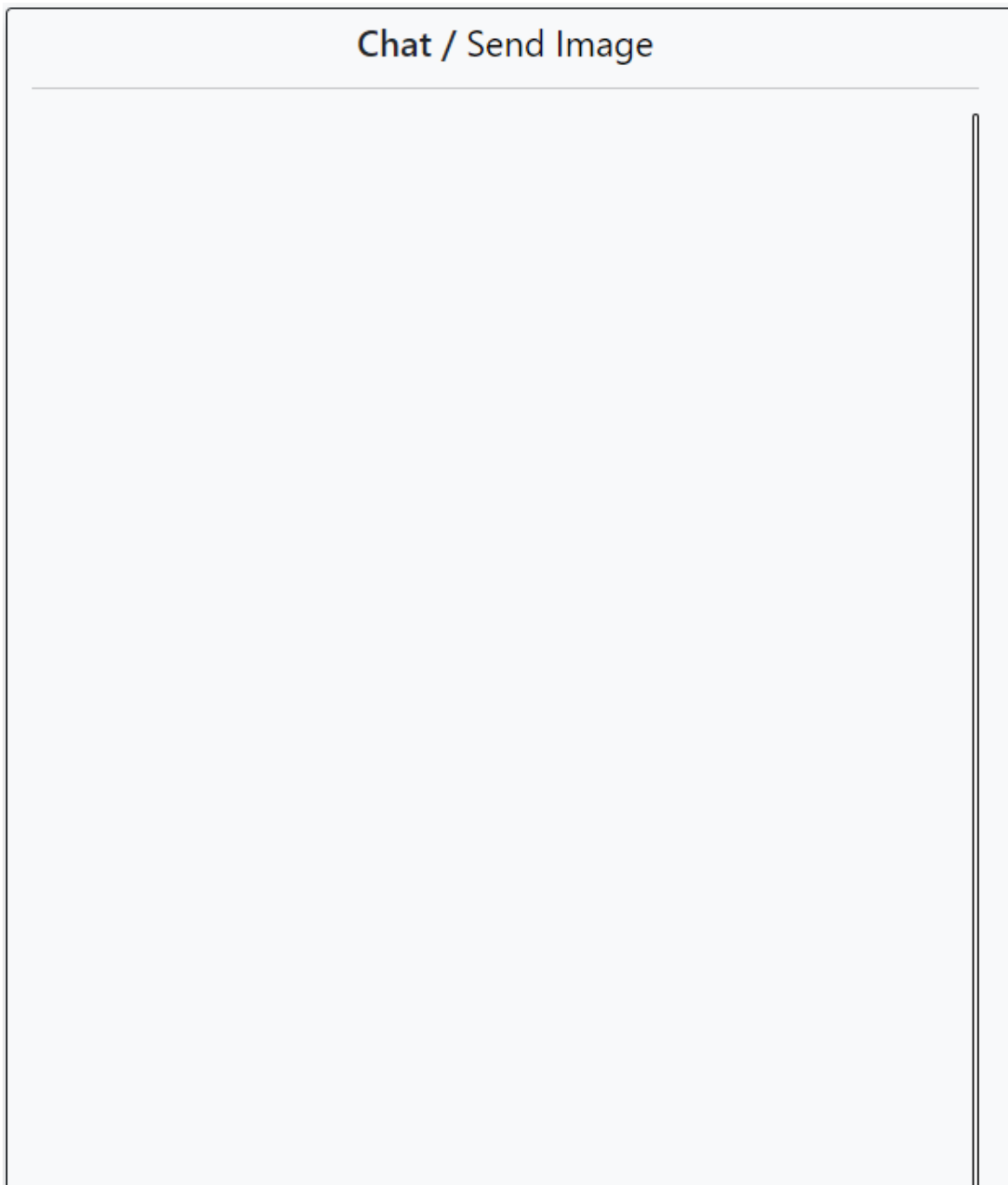
Image 3.6 the chat-send image section for participant

This section is divided into two with chat and send images buttons.

At the chat participants can communicate with the proctors and other participants.

At the send image section if proctor wants an image from participants they can send it from this section.

Image 3.7 Exam and camera view section for participant

This section contains questions of the exam and their own camera view.

At the top right participants can see the room name and at the end of the exam they can leave the room via exit button.

3.9. WPF Application

WPF application opens our website via Microsoft Edge Webview2.

The setup file can be downloaded from the link on the login page.

In addition to the web application, it closes certain applications that are open in the background one by one every 1 second.

3.10. Encountered Problems and Solutions
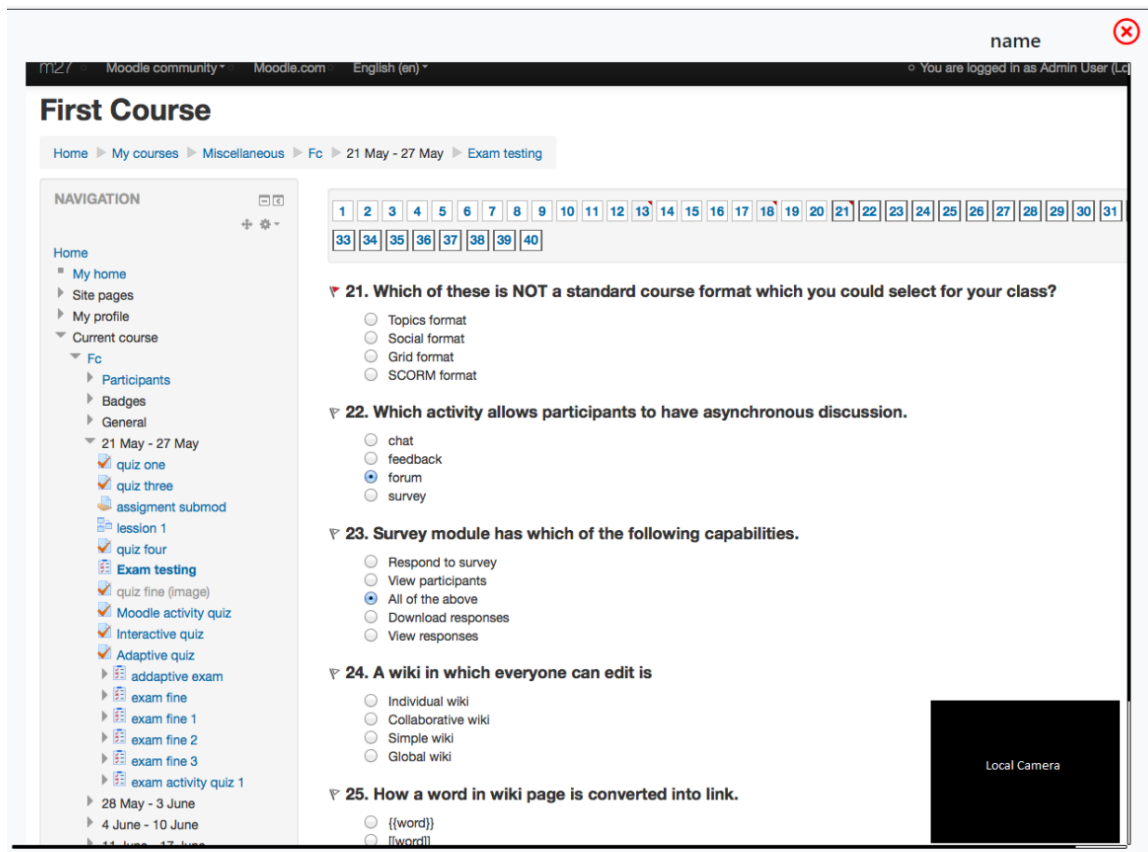
During the development stage, from time to time many problems are encountered, while some of them are fixed, there are still some problems that can't be fixed yet.

3.10.1. Encountered problems without any solution

In this section, problems that couldn't be fixed are explained.

3.10.1.1. Camera Frame Problem

A plan was made for the camera frames where during the exam if the participant spoke or there was some noise that the voice streaming caught some sound from the environment in which the participant took the exam the frames of the camera footage were supposed to turn red, orange or blue depending on the error type. But the library RtcMultiConnection had the problem where if there are multiple participants, the colors don't pop up properly. So until the future updates of the library this feature is removed from the system.

3.10.2. Solved Problems

In this section, fixed problems are explained.

3.10.2.1. *NAT problem*

Some countries use network address translation (NAT) to map an IP address space into another by modifying network address information in the IP header of packets while they are in transit across a traffic routing device. So while RtcMultiConnection gets the live video footage from those countries, the connection makes trouble at sending live video footage. To fix it TURN servers are used.

TURN (Traversal Using Relay NAT) servers is a protocol that assists in traversal of network address translators or firewalls for multimedia applications. It may be used with the Transmission Control Protocol and User Datagram Protocol. It is most useful for clients on networks masqueraded by symmetric NAT devices.

4.   CHAPTER FOUR
SURVEY

This survey was prepared to collect information about online education and online exams. This study will contribute to the proctoring system on the development stage.

A total of 100 participants participated in the survey.

After the pandemic, almost all countries switched to online education. Together with that, some infrastructure problems have occurred. One of them is the insufficiency of the online exam system.

We have created a survey with the aim of getting the views of people who face those situations.

In this survey, it can be seen how necessary it is to develop a proctoring system to prevent cheating. We reached this conclusion as a result of the following findings.

4.1.   Findings

The survey's analysis results are gathered at this section, comments were written about the questions and results are explained briefly.

4.1.1. *Age*

Figure 4.1 represents the age distribution that shows that the majority are in the 20-30 age range, as shown in the chart below.
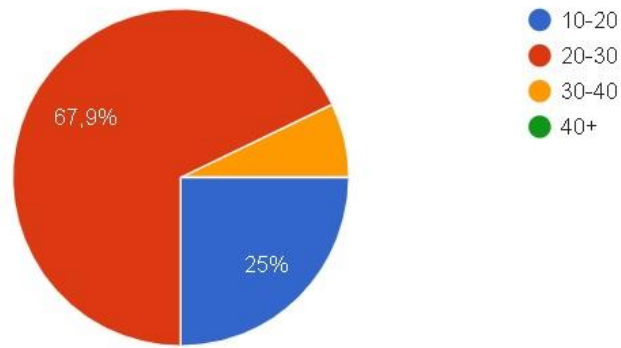

Figure 4.1 Age distribution

4.1.2. *Education*

In this chart, we see that those who participated and answered the survey were college students in general.
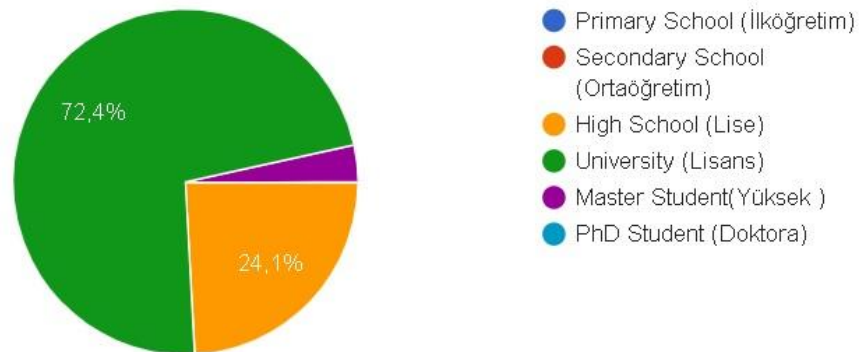

Figure 4.2 Education Level

4.1.3. *Cheated*

In this chart, we tried to get the answer to the question that interests us the most.

The Question Was As Followed; I cheated on at least one of the online exams to the date.
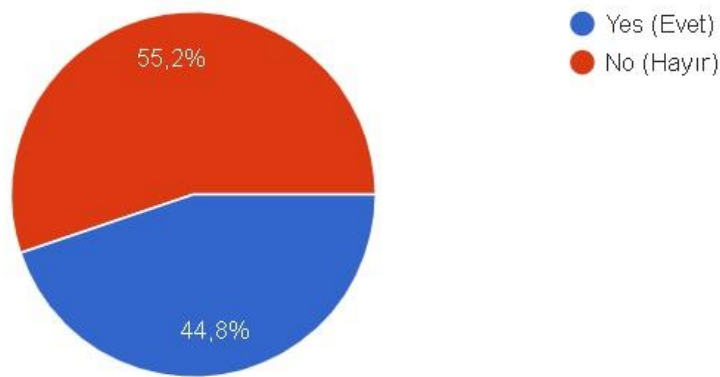
Figure 4.3 Cheated Level

Since participation in the survey is anonymous, we believe in the accuracy of these answers, and we saw that almost 1 out of 2 people who took the online exam were able to cheat.

Based on this, we have been thinking a lot about how to prevent this, and have considered this data during the construction of the program.

In our survey, we received some opinions and suggestions from participants; fair scoring is generally requested, that no one can cheat in the exams and where exam evaluation is done evenly across all participants.

In Figure 4.4 question "**I was able to adapt easily to the distance learning process.**" answer distribution was shown.

In this question, what we wanted to learn from users was whether they had difficulty participating in online exams, that is, getting feedback about the adaptation time.in general, most people have noted that they can adapt, so they have shown us that they can adapt without any support during the adaptation period.
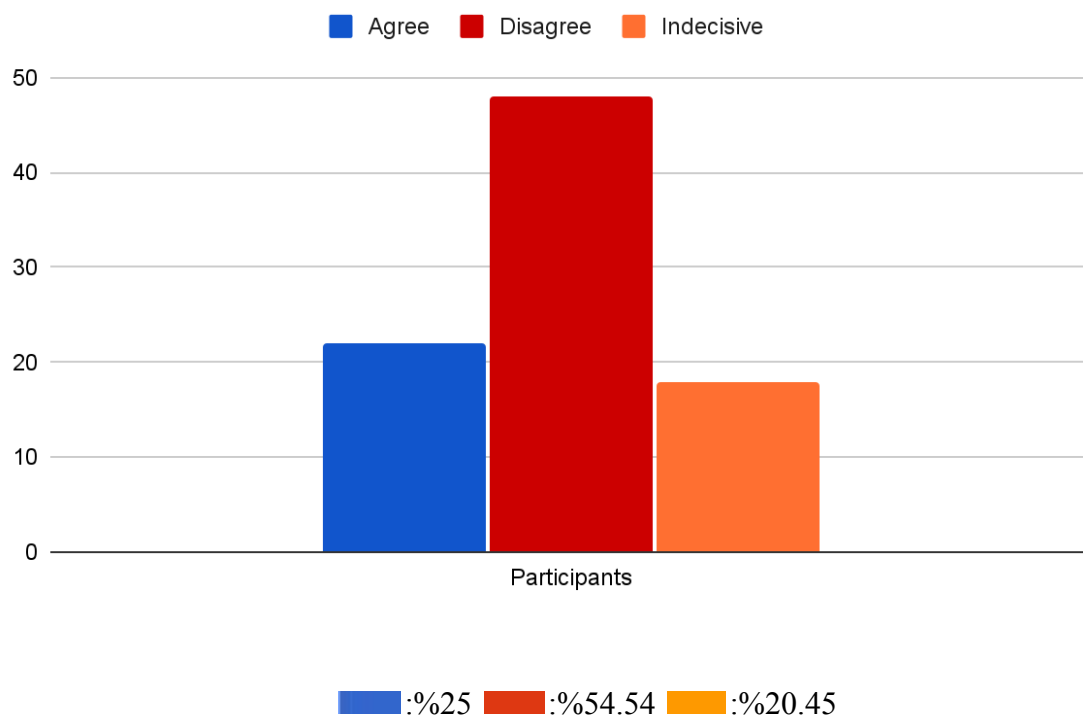
Question 1 Answer Distribution

:%25   :%54.54   :%20.45

Figure 4.4 Question P1,Q1 answers distribution.

In Figure 4.5 question " **In the distance learning process, I was able to easily communicate with the instructor and get feedback."** answer distribution was shown.

In fact, in this question, as in the first question, we voted for the user to adapt to online training and communicate with instructors.The results are very close to each other, so it shows that most users have experienced problems communicating with instructors.
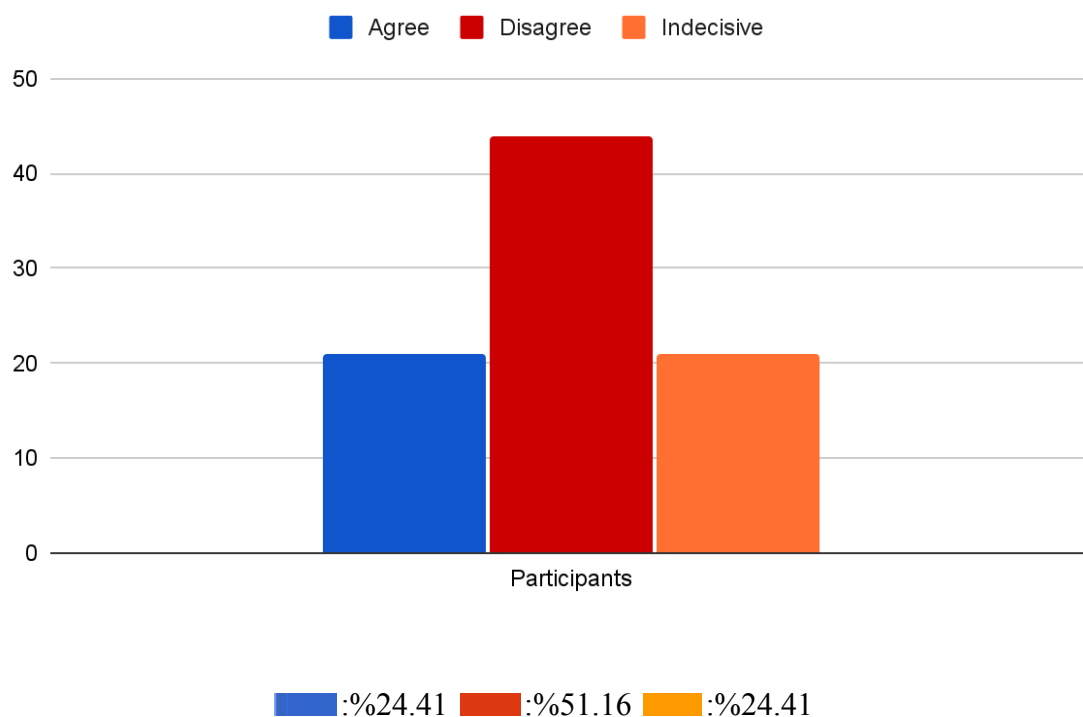
Question 2 Answer Distribution

:%24.41   :%51.16   :%24.41

Figure 4.5 Question P1,Q2 answers distribution.

In Figure 4.6 question " The questions in the online exam were more understandable."answer distribution was shown.

Answers to this question show that the questions can be understood by students. We thought that this question might be relevant to our program because we thought that sometimes it might be necessary to intervene in question types to block copies.

Question 3 Answer Distribution

■ Agree ■ Disagree ■ Indecisive

:%29.54 :%53.40 :%17.04

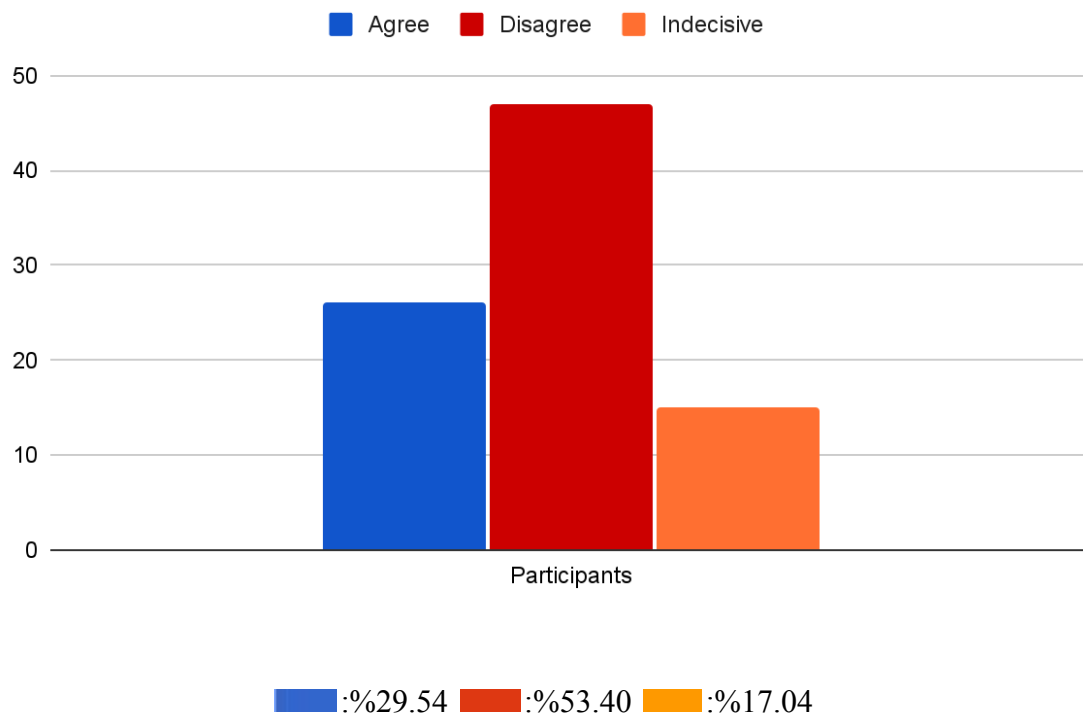**Figure 4.6 Question P1,Q3 answers distribution.**

In Figure 4.7 question " **I prefer an online exam to a paper and pen exam.**"answer distribution was shown.

In this question, we wanted to compare the voter with the difference that the voters did not prefer the online exam. We thought about the result of this question to find the reasons for this result.
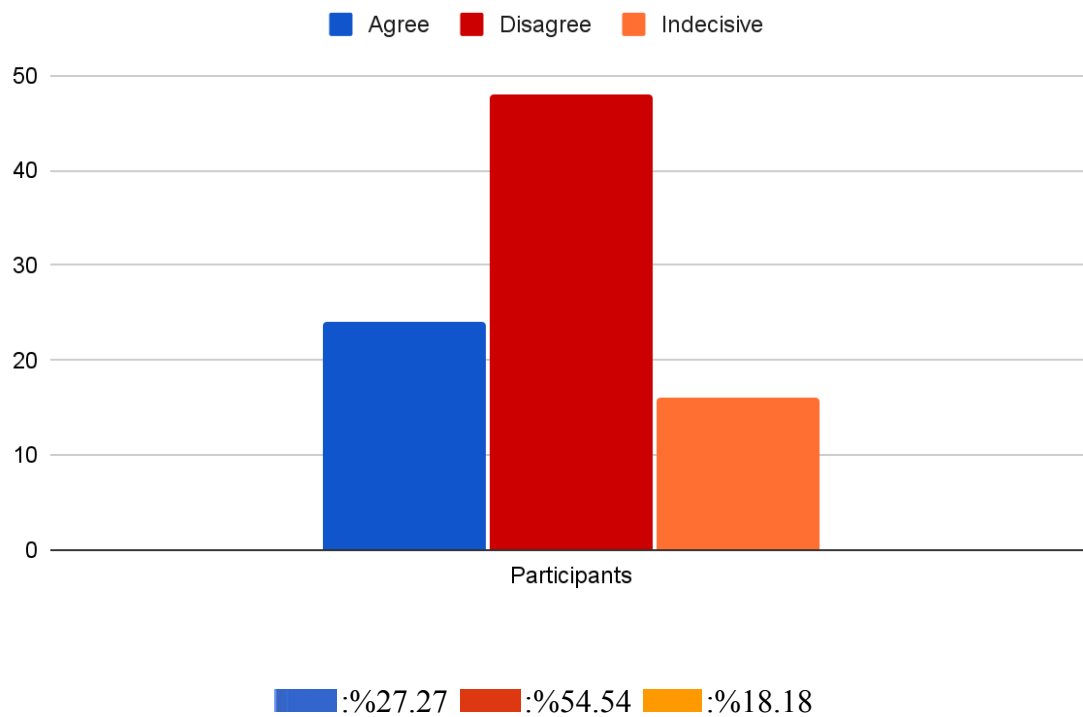
Figure 4.7 Question P1,Q4 answers distribution.

In Figure 4.8 question "**I like the fact that the exam is online.**"answer distribution was shown.

In this question, which is similar to the previous question, half of the users marked that they were satisfied with online exams, while the other half stated that they were dissatisfied.

Question 5 Answer Distribution

:%31.03   :%54.02   :%14.94

Figure 4.8 Question P1,Q5 answers distribution.

In Figure 4.9 question "**I want all exams to be online.**"answer distribution was shown.

The question here is more marked by the fact that all exams are online.We thought about what the reasons might be, whether it might have anything to do with the copy.

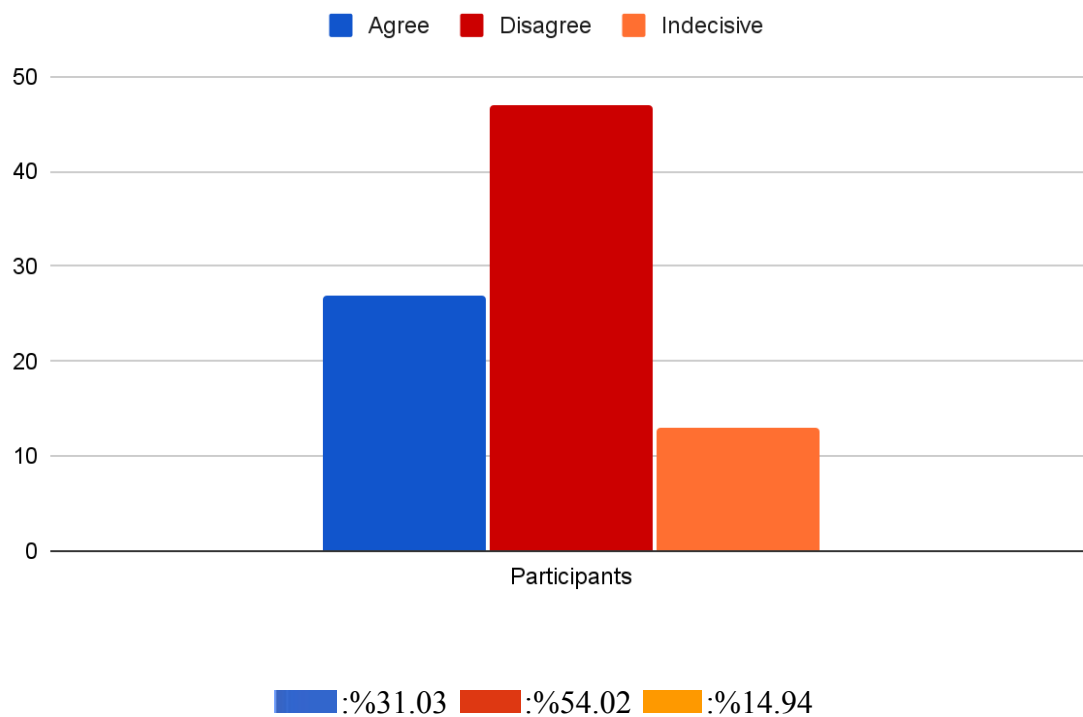Question 6 Answer Distribution
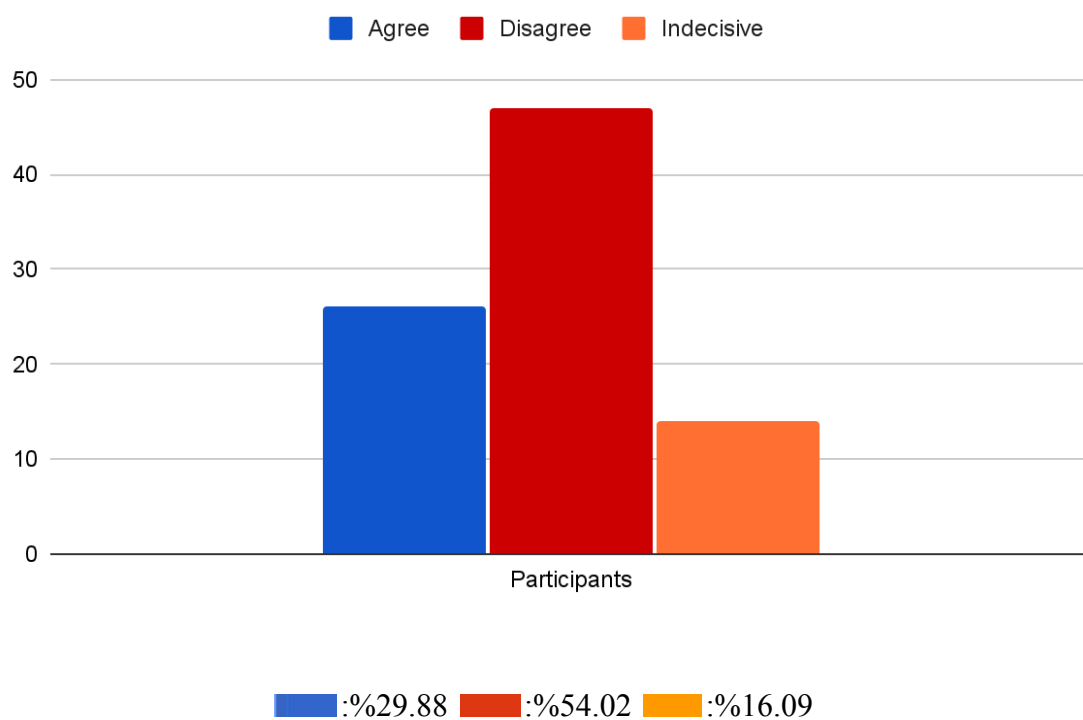
Figure 4.9 Question P1,Q6 answers distribution.

In Figure 4.10 question "**The online exam was effective and useful.**"answer distribution was shown.

In the question here, we wanted to find out if users had problems using online exams. We saw that there is a group that thinks that online exams are useless and ineffective.

Question 7 Answer Distribution

:%29.21   :%51.68   :%19.10
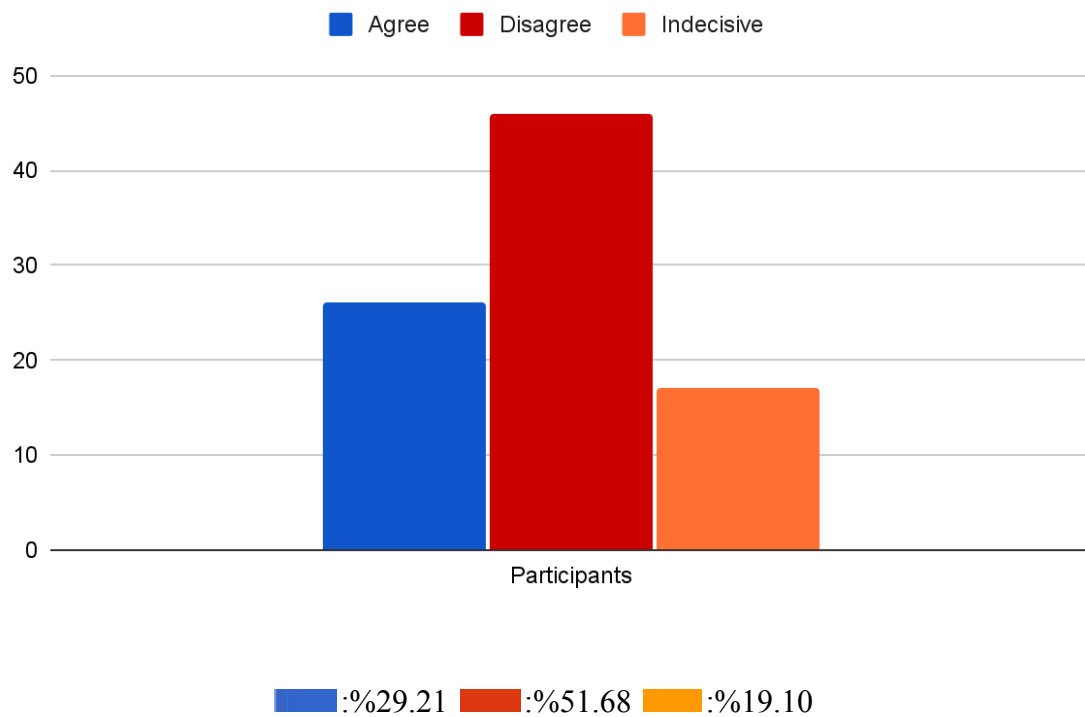
Figure 4.10 Question P1,Q7 answers distribution.

In Figure 4.11 question "**I was more worried about the exam in the online exam.**" answer distribution was shown.

In this question, we wanted to find out if users had concerns when entering the online exam, and in the answers we received, the majority flagged that they did not have concerns.approaching anxiety could have been a big problem.

Question 8 Answer Distribution

■ Agree ■ Disagree ■ Indecisive

■ :%25.28   ■ :%54.02   ■ :%20.68
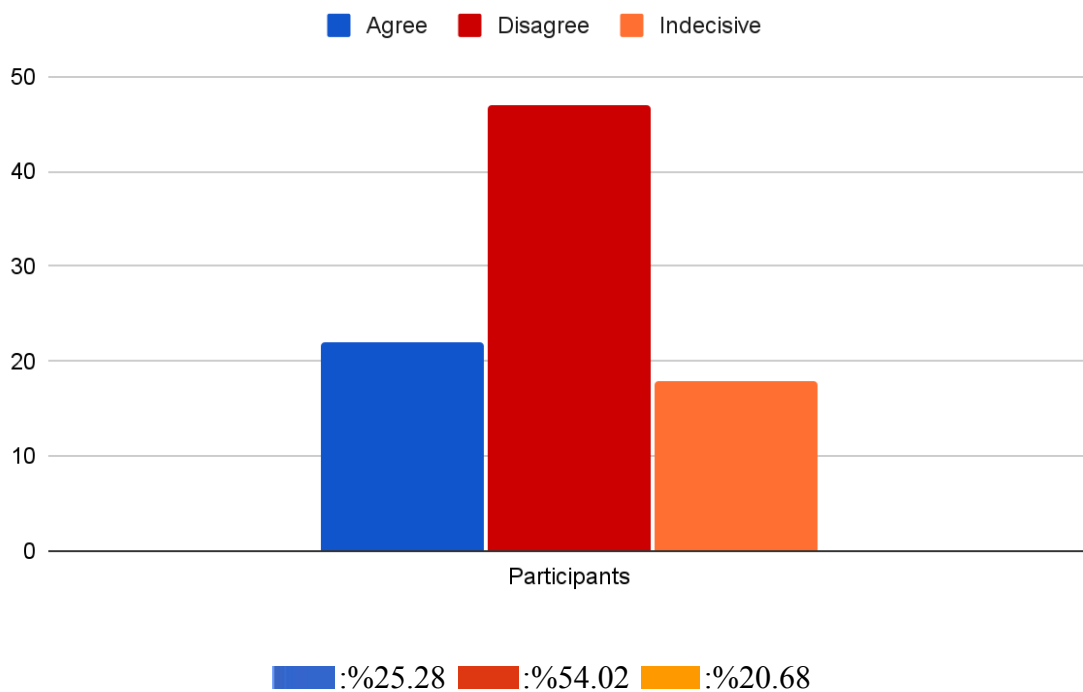
Figure 4.11 Question P1,Q8 answers distribution.

In Figure 4.12 question "**It was hard for me to adapt to the online exam.**"answer distribution was shown.

In this question, users stated that they could not adapt to online exams because of the difficulty of the interface used or the difficulties that the online environment can bring. With the result of this question, we thought that we could create a simple interface to our own exam application.

Question 9 Answer Distribution

:%33.70   :%49.43   :%16.85

Figure 4.12 Question P1,Q9 answers distribution.

In Figure 4.13 question "**The choice of questions in the online exam was appropriate.**" answer distribution was shown.

In our question about the questions in the online exam, the majority answered positively, so the choice of the instructors ' questions indicates that they do not cause problems in the online exams. For this reason, the conclusion is that instructors make choices according to the online exam in question selection.

Question 10 Answer Distribution
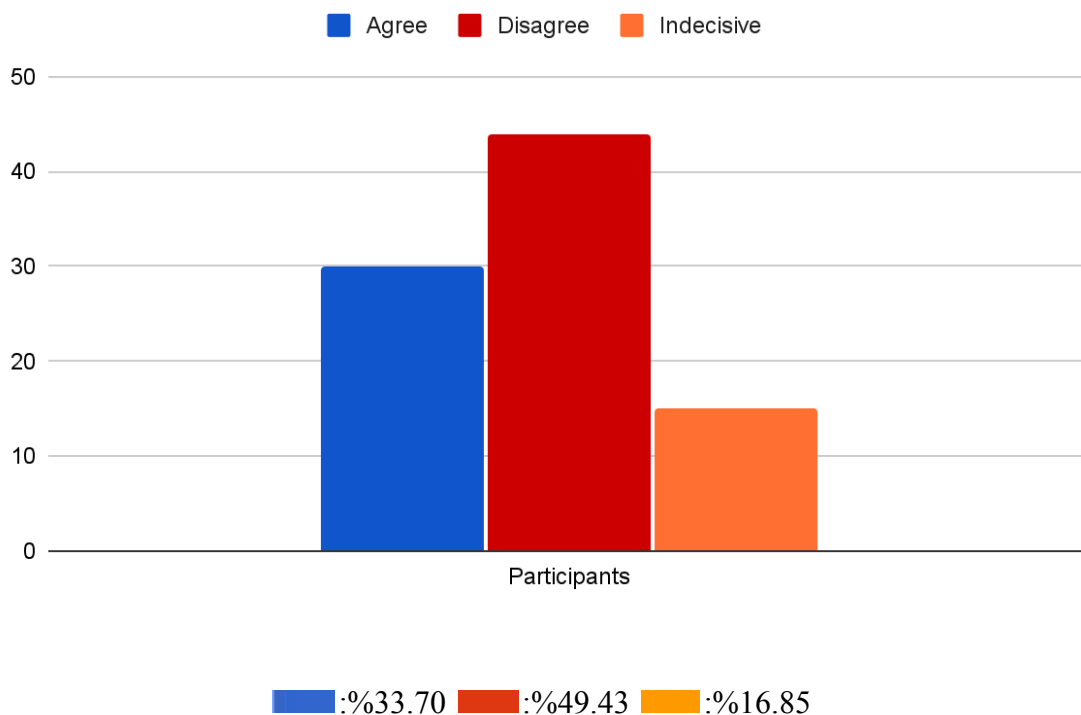
:%35.63 :%47.12 :%17.24
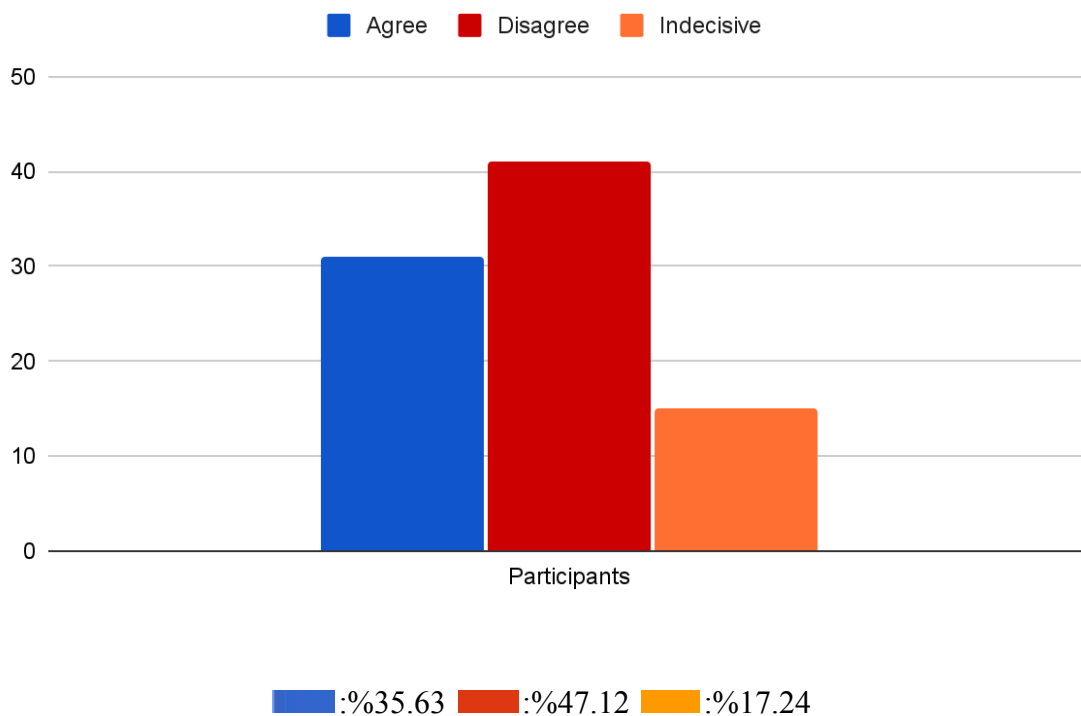
Figure 4.13 Question P1,Q10 answers distribution.

In Figure 4.14 question "**The difficulty of the questions in the online exam was appropriate.**" answer distribution was shown.

In this question, which is similar to the previous question, we wanted to get an idea about the difficulty of the questions. One part of the participants marked it difficult, while the other part marked it not difficult, and we realized that the result we drew from here showed that the person knew how much he studied for this lesson.

Figure 4.14 Question P1,Q11 answers distribution.

4.2.   Program Questions

The questions on Page two of our survey actually contained questions that we needed answers to develop a better system. According to the results of the questions here, we could think about what we can add to the program.

Detailed analysis of the questions is as indicated below.

In Figure 4.15 question "**I'm happy with the platform used for online testing in your school.**"answer distribution was shown.In this question, participants noted that schools are not satisfied with the majority of students who use the platform used in online exams.there may be many reasons for this, but we thought that the biggest reason for this was not a fair form of exam, so we decided to design a platform where everyone could take a fair exam.Even more, most people voted undecided on the questions about the program, so it shows us that the platforms used in online exams do not provide users with confidence.

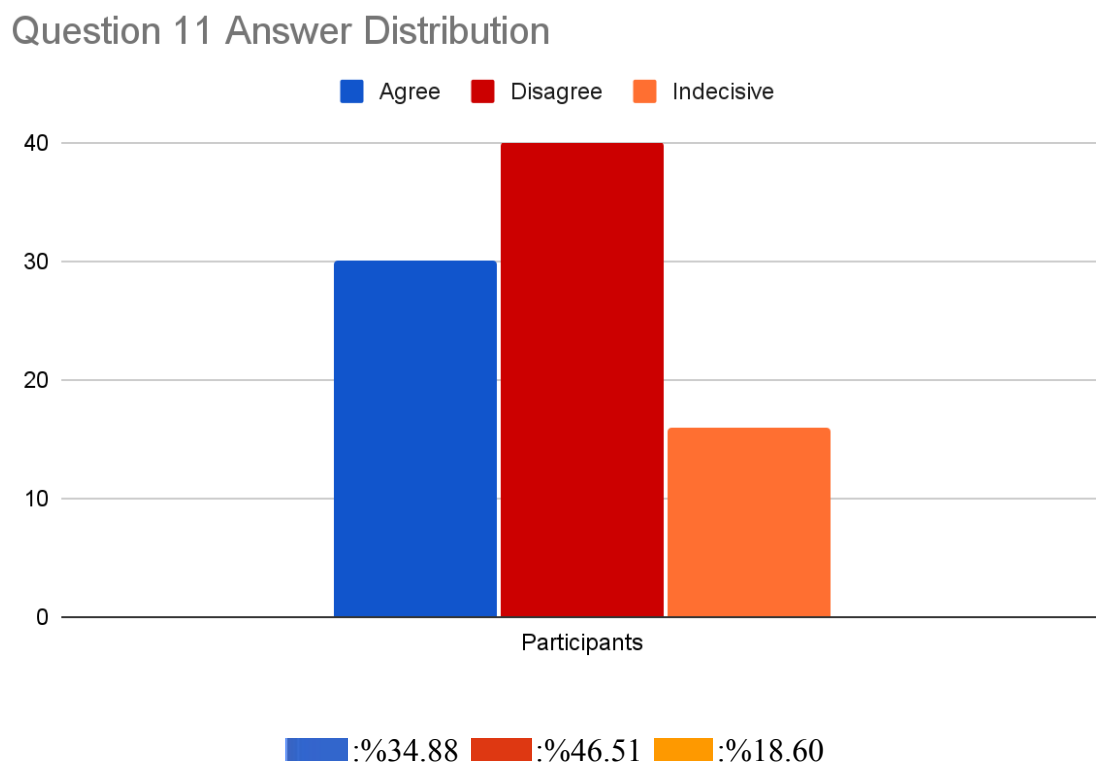Question 1 Answer Distribution

:%19.35   :%41.94   :%38.70
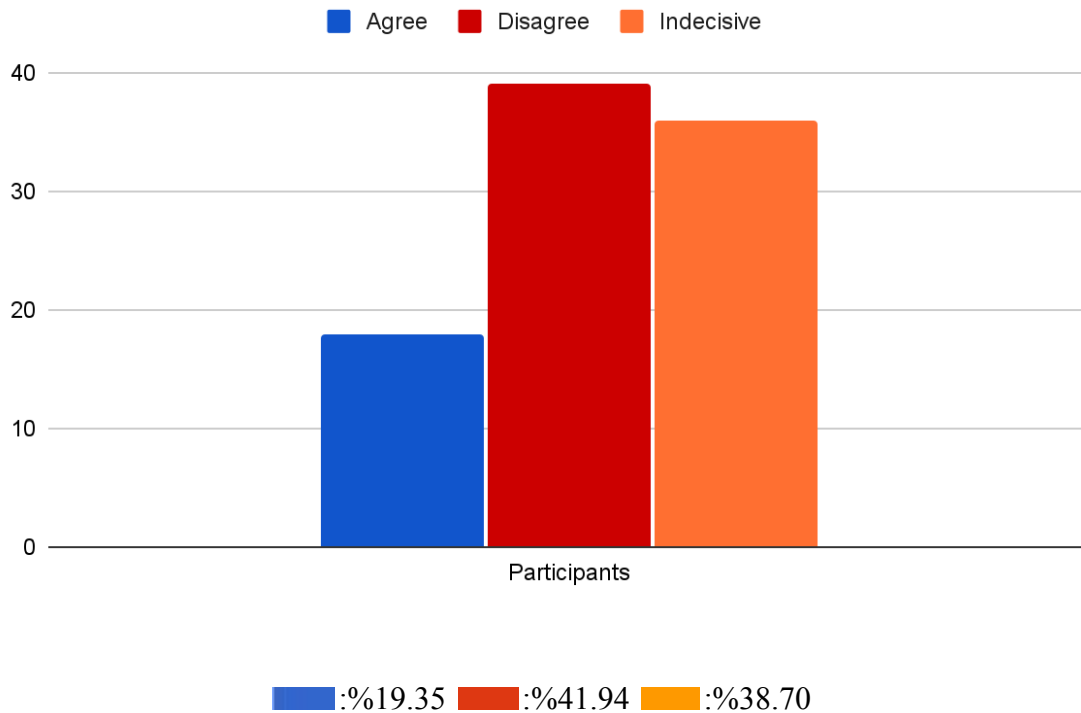
Figure 4.15 Question P2,Q1 answers distribution.

In Figure 4.16 question "**I believe that there is equality in the online exams I take.**" answer distribution was shown.

As can be seen from the chart, most people have chosen that there is no equality or are marked as undecided, the number of people who believe that it is equal is very small, so there are some problems on online exam platforms that push people to this idea.

Question 2 Answer Distribution

■ Agree   ■ Disagree   ■ Indecisive

■ :%17.02   ■ :%42.55   ■ :%40.42
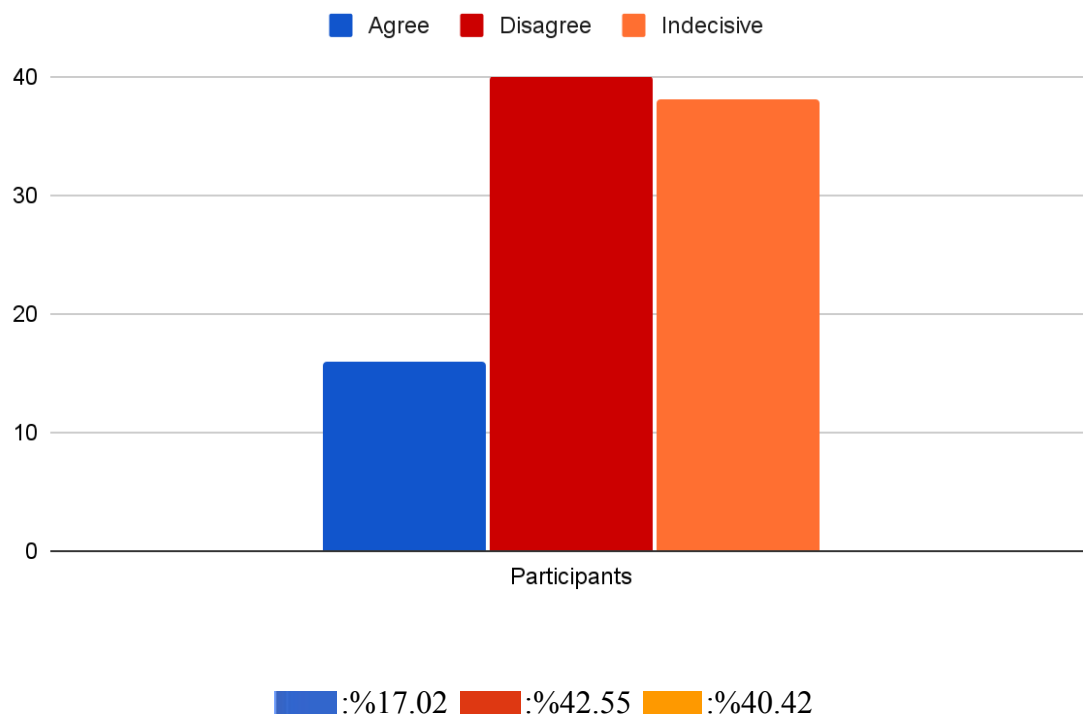
Figure 4.16Question P2,Q2 answers distribution.

In Figure 4.17 question "**My online exams are available for cheating."** distribution was shown.

In this question, we want to find out if the platform used also has or does not have the availability to cheat acts, but it is seen in the votes that most people are undecided to try to copy on platforms, so they are not sure if the system is cheatable or not.

Question 3 Answer Distribution

Figure 4.17 Question P2,Q3 answers distribution.

In Figure 4.18 question "**Copy blocking measures were taken on the online exam platform I entered."** distribution was shown.

If the answers to this question combine the votes of the undecided very close to each other with those who do not agree, we may think that the measures are not enough.

Question 4 Answer Distribution
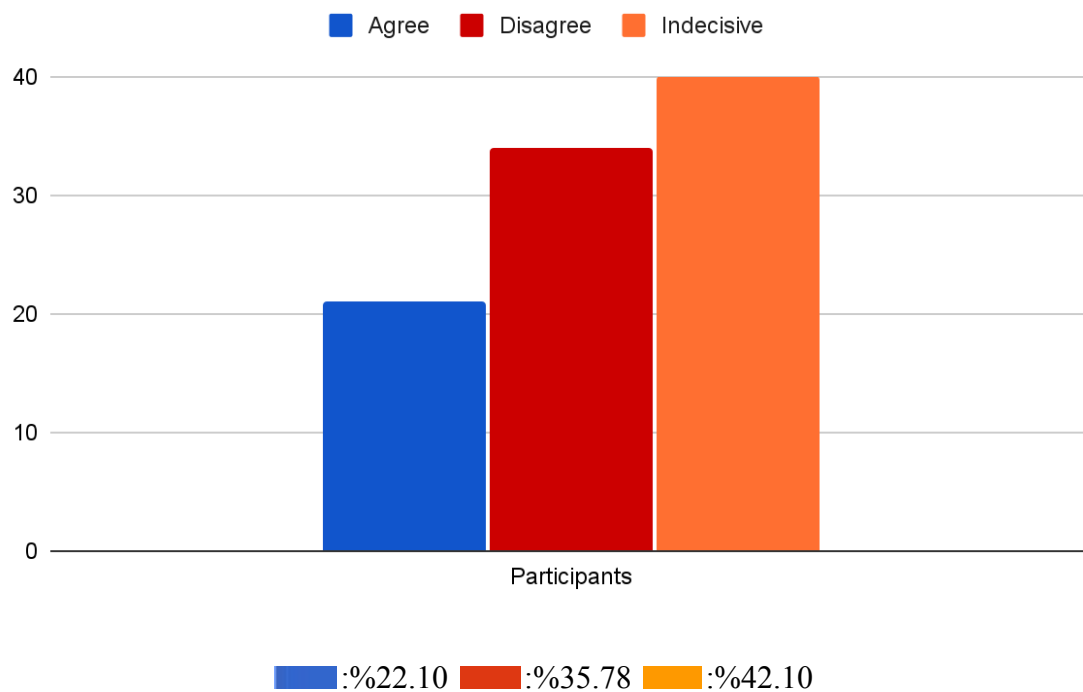
■ Agree ■ Disagree ■ Indecisive

■ :%30.43 ■ :%32.60 ■ :%36.95
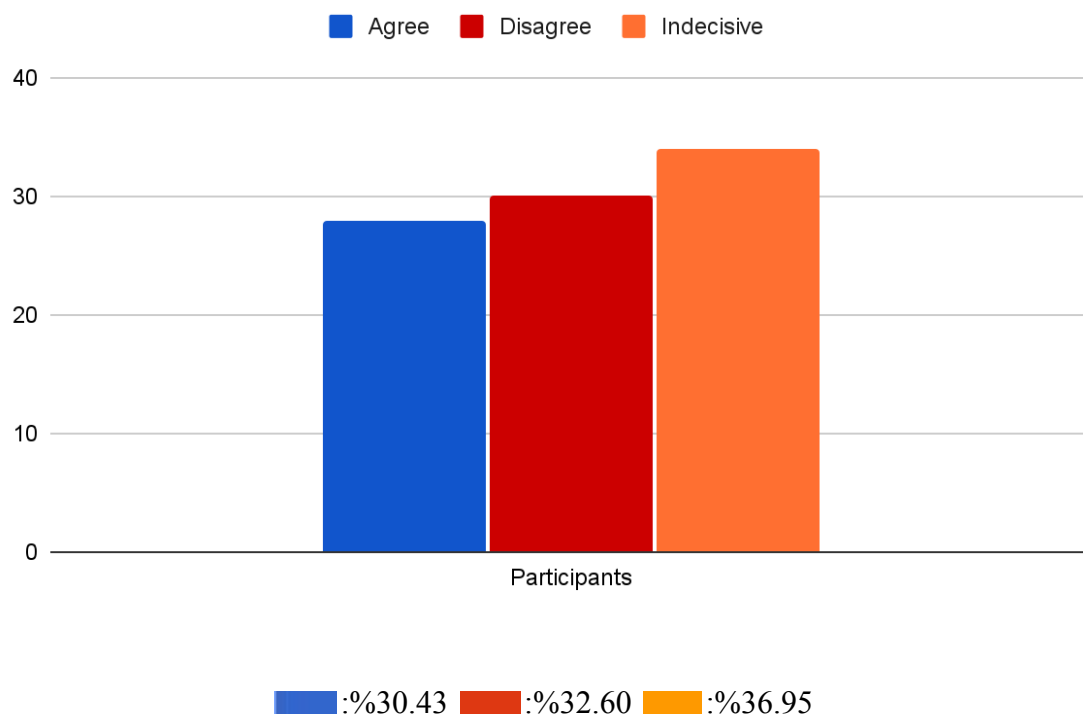
Figure 4.18 Question P2,Q4 answers distribution.

In Figure 4.19 question "**The measures taken on the online exam platform were sufficient for the individual exam.**" distribution was shown.

Although close answers are generally given to this question, which is a similar question to our previous question, if we evaluate the answers to the last three questions we can say that the measures are not considered sufficient.

Question 5 Answer Distribution
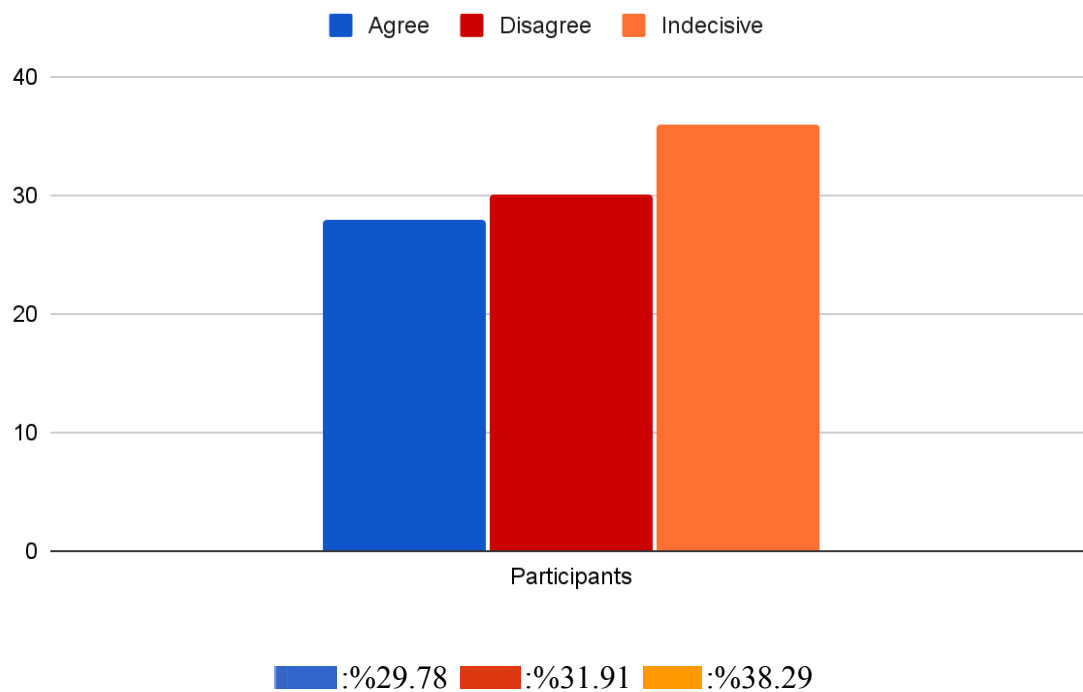
Figure 4.19 Question P2,Q5 answers distribution.

In Figure 4.20 question "**I think using a camera system when conducting an online exam will prevent the copy.**" distribution was shown.

The answers to this question, which is a question we care about, are available to those who don't want to use almost equal cameras, but we know that the camera will play a big role in blocking copies in our program.
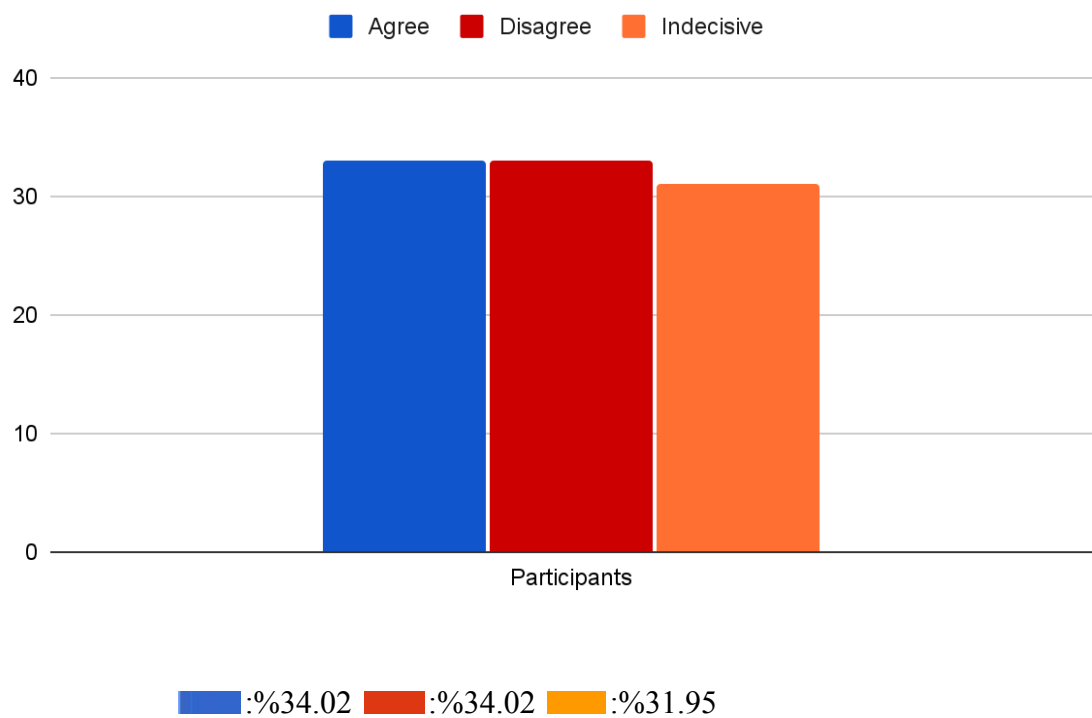
Figure 4.20 Question P2,Q6 answers distribution.

In Figure 4.21 question "**During the exam, it is more useful to reach the exam Observer.**" distribution was shown.

In the platform that we are investigating and used by many institutions, there is no option to contact the lecturer during the exam. We think this is very important, but the incoming votes show that users are undecided, but there are people who want this option.
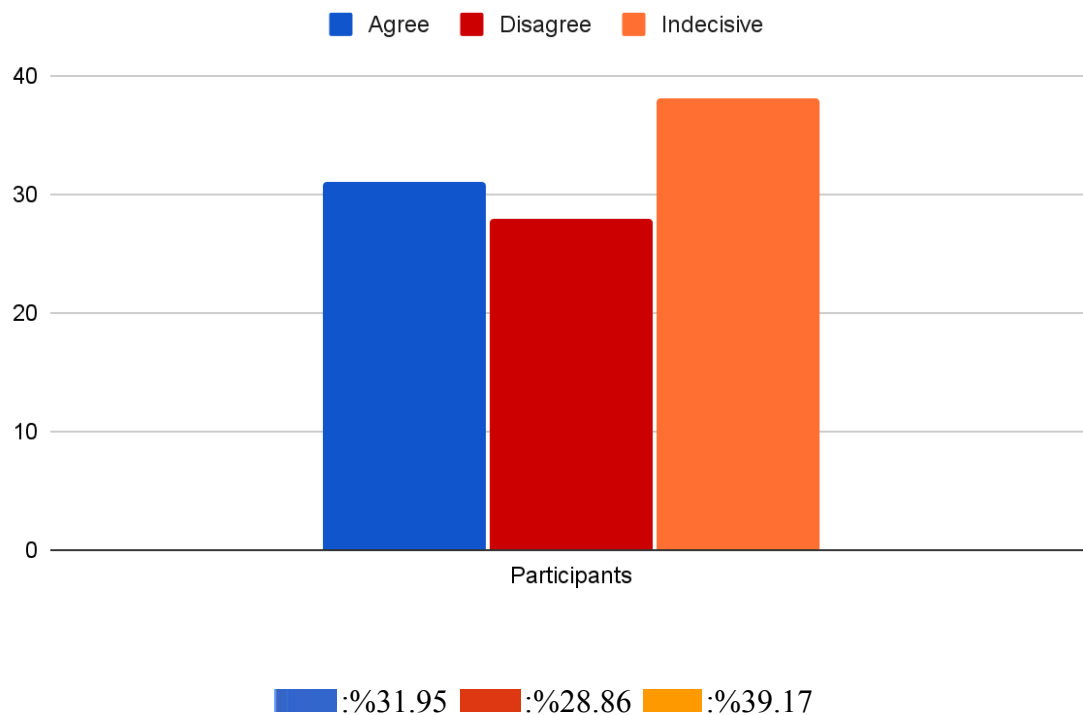
Figure 4.21 Question P2,Q7 answers distribution.

In Figure 4.22 question "**Tabs on exam platforms should be fixed to the screen when the exam starts and should not be switched to another tab.**" distribution was shown.

Looking at the incoming answers, participants think that this feature will have a huge role to prevent cheating acts..we've created a platform where we can avoid that.

Question 8 Answer Distribution

■ Agree   ■ Disagree   ■ Indecisive

Participants

■ :%51   ■ :%17   ■ :%32
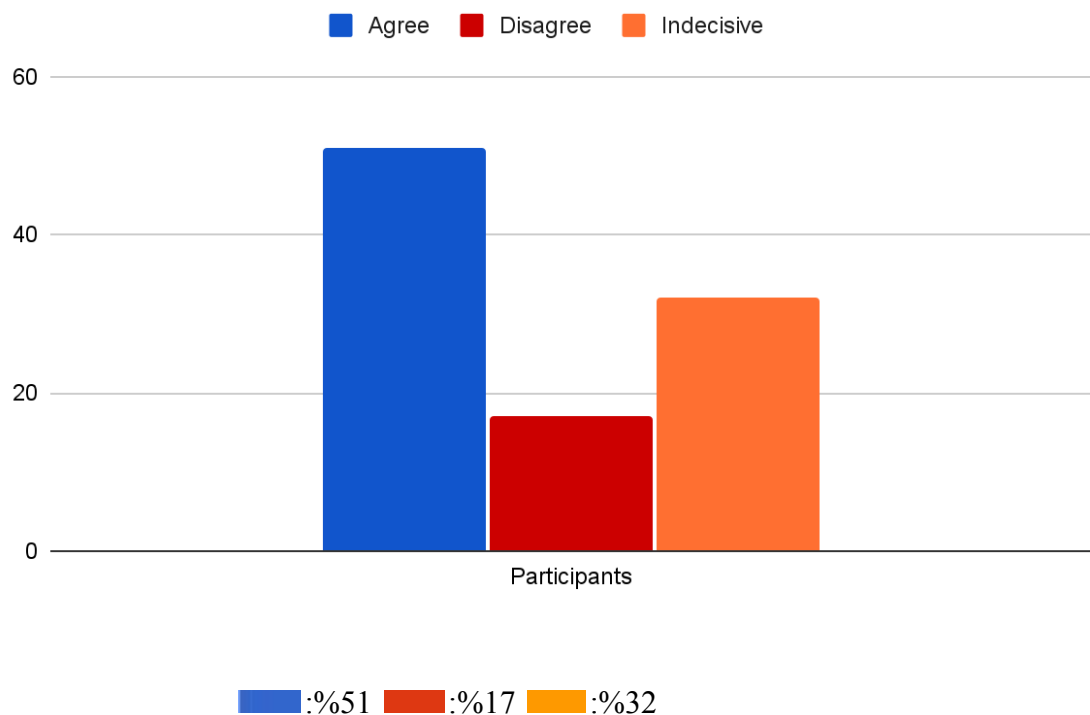
Figure 4.22 Question P2,Q8 answers distribution.

In Figure 4.23 question "**Online exams should be recorded with a live camera.**" distribution was shown.

When the answers are analyzed, they are more likely to be recorded and stored than used instantaneously.

Question 9 Answer Distribution
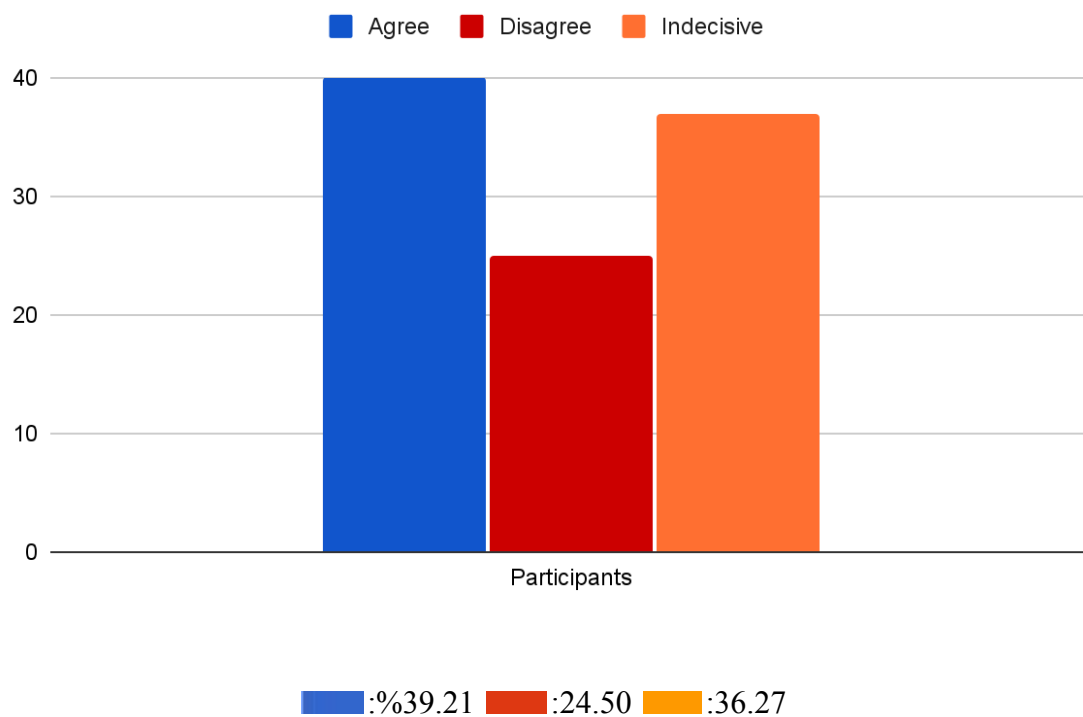
Figure 4.23 Question P2,Q9 answers distribution.

In Figure 4.24 question "**I think online exams can be copied.**" distribution was shown.

In our last question, although it is a general question, they can be copied on online exams. Majority of the answers say that if the participants want, they can easily cheat on the online exam. Our goal is not even to give such a thought on the platform we are going to do.

Figure 4.24 Question P2,Q10 answers distribution.

4.3. Some Suggestions From Participants of Survey

To get new ideas and recommendations about the proctoring system that we are going to build, at the end of the survey we asked for participants' suggestions.

The suggestion we got from participants can be grouped under three headings:

4.3.1. *A live camera footage*

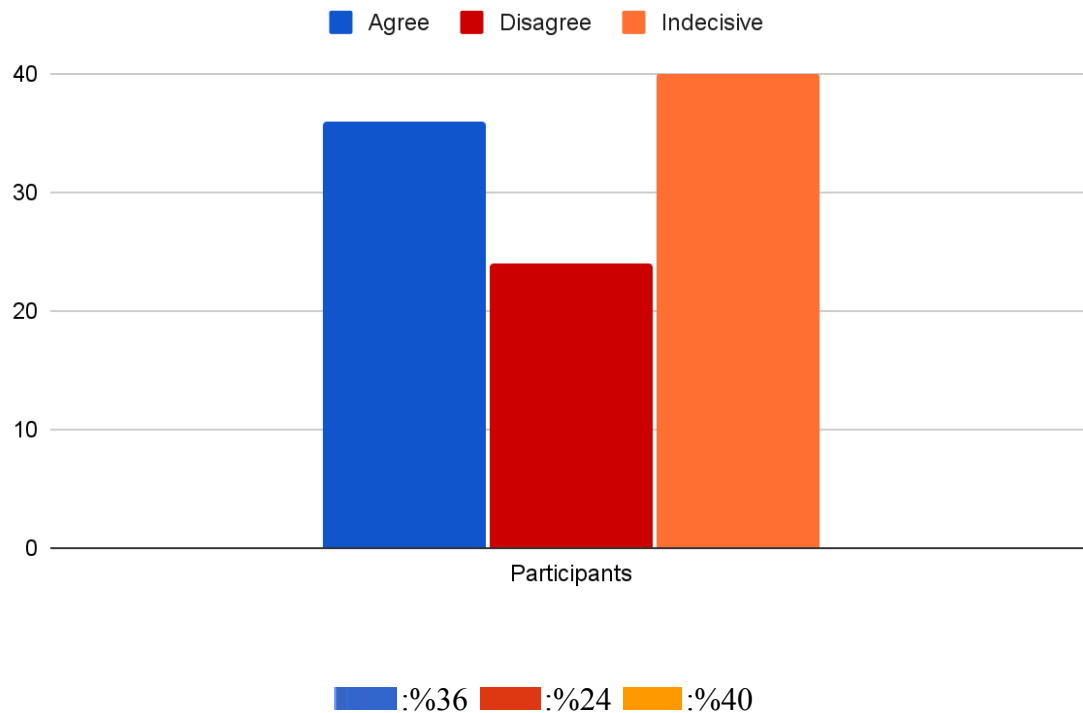The live camera footage is requested by most of the survey participants. So we can understand that most participants think a live camera footage will help to prevent huge amounts of cheating and make exam evaluation more fair.

4.3.2. *Communicate*

By this, we can see that participants request a way to communicate with proctor during the exam.

4.3.3. *Prevention of leaving the exam screen during the exam*

By this suggestion, participants think that the system should prevent people from leaving the exam page and search for the answers from the internet, course slides or any other information source.

During the development of the system, we always considered these suggestions to improve proctoring futures and online exam functionalities.

4.4.   Conclusion and Evaluation Of The Survey

The most appropriate questions were selected for the platform and answers were received by 100 people.The data obtained are summarized and evaluated in this report section.

As a result of the evaluation, they voted that most of the participants were available to cheat on online exam platforms. However, as a result of the evaluation, the majority thought that cheating was possible, while too many users remained undecided.We think that the solution to this instability is the platform we will build.

When a general assessment was made, it was decided that the factors of camera use on the platform and inability to separate from the exam screen should definitely be on the platform.

In the evaluation, it was found that more than half of the users were copied.our main goal is minimising this number as much as possible.

5.   CHAPTER FIVE
CONCLUSION AND FUTURE WORKS

With the developing technology, education from distance with computers has become possible. However the cheating methods from face to face exams as well developed and adapted to the distance education by exam participants. In order to prevent those adapted cheating methods, it's obvious that extra precaution should be taken. Our proctoring system aims to take those precautions to minimize adapted cheating acts by the exam participants.

Our proctoring system uses video and voice streaming, face position tracking algorithm, browser page focus tracking to successfully minimise cheating acts by the participants.

For the future of the system, with the ever-evolving technology there are new methods to prevent cheating acts of participants and make a much safer exam environment. For the future versions of the system, some features are:

- In the necessary situations proctors can be able to control participants computer remotely
- With the evolving camera quality and image capture angle, participants around can have wider angle for video streaming
- The system can be adapted to the institutions and organizations with changes.
- The used servers can be improved to have more reliable and faster connection with high capacity.

(Don't forget that those are only some of the addable enhancements...)

As long as the system is constantly updated and keeps up with today's technology, it's obvious that it will be successful.

6. REFERENCES

1. RTCMultiConnection about section, Muaz Khan, Jan 2016 [Online] Available:https://github.com/muaz-khan/RTCMultiConnection

2. Tensorflow, Sep 2021 [Online] Available: https://en.wikipedia.org/wiki/TensorFlow

3. Blaze Face,Jan 2020 [Online] Available: https://github.com/hollance/BlazeFace-PyTorch

4. Blaze Face,Dec 2019 [Online] Available: https://github.com/tensorflow/tfjs-models/blob/master/blazeface/README.md

5. Simple Javascript Notifications with toastr, John Papa, 30 Apr 2012 [Online] Available: https://johnpapa.net/toastr100beta/

APPENDIX I.

Page 1

Q1)I was able to adapt easily to the distance learning process.

Q2)In the distance learning process, I was able to easily communicate with the instructor and get feedback.

Q3)The questions in the online exam were more understandable.

Q4)I prefer an online exam to a paper and pen exam.

Q5)I like the fact that the exam is online.

Q6)I want all exams to be online.

Q7)The online exam was effective and useful.

Q8)I was more worried about the online exam.

Q9)It was hard for me to adapt to the online exam.

Q10)The choice of questions in the online exam was appropriate.

Q11)The difficulty of the questions in the online exam was appropriate.

Page 2

Q1)I'm happy with the platform used for online testing in your school.

Q2)I believe that there is equality in the online exams I take.

Q3)My online exams are available for cheating.

Q4)Copy blocking measures were taken on the online exam platform I entered.

Q5)The measures taken on the online exam platform were sufficient for the individual exam.

Q6)I think using a camera system when conducting an online exam will prevent the copy.

Q7)During the exam, it is more useful to reach the exam Observer.

Q8)Tabs on exam platforms should be fixed to the screen when the exam starts and should not be switched to another tab.

Q9)Online exams should be recorded with a live camera.

Q10)I think online exams can be copied.