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An Interactive and Advanced Online Exam Platform For Both Teachers and Students

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Abstract

The world of education is constantly transforming with the advancement of technology. Today, in addition to traditional methods, digital tools have begun to be widely used to support education and training processes. In this context, online electronic quiz applications play a very important role in evaluating student performance and enriching the learning experience. In this study, an online quiz application was developed using nextjs, tailwindcss and prisma technologies, respectively. The app introduced a solution that allows teachers to create interactive and customizable quizzes for their lessons. Our application offers teachers the flexibility to determine the desired number of questions for each quiz, along with the option to choose courses and topics. Additionally, teachers can add and edit their own questions. Teachers can evaluate students' in-depth understanding with questions they select from a wide pool of questions and create quizzes that suit their learning objectives. By adding their own questions, teachers can create quizzes that better suit course materials and student needs, further personalizing students' learning. In this way, both the student and the teacher can apply the quiz efficiently and quickly.

Keywords: "Education, nextjs, online quiz."

1. Introduction

With developing technology, the way and speed of accessing information has also changed. Today, the most common method used to access information in the easiest way is the internet. Distance education and distance exam applications are now carried out over the internet [1]. Online online exams are known as an administration method in which exam content is distributed, analyzed and reported using the Internet. It is very important for both the student and the teacher to check the measurement and evaluation results correctly. It is known that traditional assessment and evaluation and many different alternative tools are used to evaluate student success [2]. Secure field exams go beyond browser-based testing to ensure the safety of test items and are carried out in test centers that require high levels of security or in specially designated places such as high schools and conference centers [3]. In a different study, the features of a web-based exam were determined in detail [4]. Using elements such as videos in online education can help both those with limited literacy skills and individuals with a visual learning style [5]. In a different study, it was emphasized that student monitoring tools in web-based exam systems should be easy, fast and usable [6]. In a study of online exams, it was reported that there was a small difference between students' choice of web-based assessment and the traditional method [7]. It has been reported that there are some limitations encountered in online exams. Some of these include exams requiring computer and internet access, as well as security issues [8]. Measurement and evaluation are used effectively in planning and directing education and measuring students' success [9]. Compared to classical tests, interactive multimedia tests reflect the student's learning performance better [10]. Karakaya stated that there are many academic studies on online exam systems. It has been reported that online examination systems also increase the quality of learning in many cases, compared to classical methods, depending on the field of use, purpose, size and student profile [11]. Distance education is used at all levels of formal and non-formal education systems in the education systems of nations around the world [12]. Applications have revealed that people's test results on the internet are almost the same as their test results in the classroom environment, and that students prefer tests on the internet [13-14]. An online web-based file tracking system for lawyers was developed [15]. A detailed web-based advanced taxi appointment management system was developed [16]. A web-based expert system-based application was made in a different field [17].

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This study differs from other studies in that it offers personalized experience, advanced analytics and reporting, real-time interaction, and different exam types and formats. The aim of this study is to develop a safe, effective and efficient online exam model for teachers and students to conduct and evaluate exams.

2. Material and Methods

The software technologies used in this study are as follows;

Next.js: Next.js, a React-based framework, enables the development of SEO-friendly, fast web applications with features such as server-side rendering and static site generation.

TailwindCSS: It is a utility-first CSS framework, meaning it offers the ability to quickly style using ready-made classes. In this way, developers can create more flexible and customizable designs.

Prisma: It is a modern ORM (Object-Relational Mapping) tool, used to facilitate and optimize database operations. It offers developers the opportunity to write type safety and efficient queries when working with SQL databases.

In this study, a dynamic online quiz software was developed. The technologies used to perform the work are nextjs, tailwindcss and prisma. The interfaces and explanations of the developed web-based application are made respectively. The general interface of the application is shown in Fig. 1.

Fig. 1. General Interface

A useful interface has been developed where teachers can see how many students, how many questions, how many classes and categories there are and where they can easily access other tools. The database relationships of the developed application are shown in Fig. 2.

Quiz-quizuser Relationship:

- When creating a quiz, a quizuser table is created for each user, so there is a one-to-many relationship.
- The id column of the quiz table references the quiz table as foreign.

Quiz-user Relationship:

- A user can have more than one quiz, and since a quiz can also have more than one user, there is a many-to-many relationship.
- The id column of the user table and the id column of the quiz table are located in the userquiz table as foreign keys.

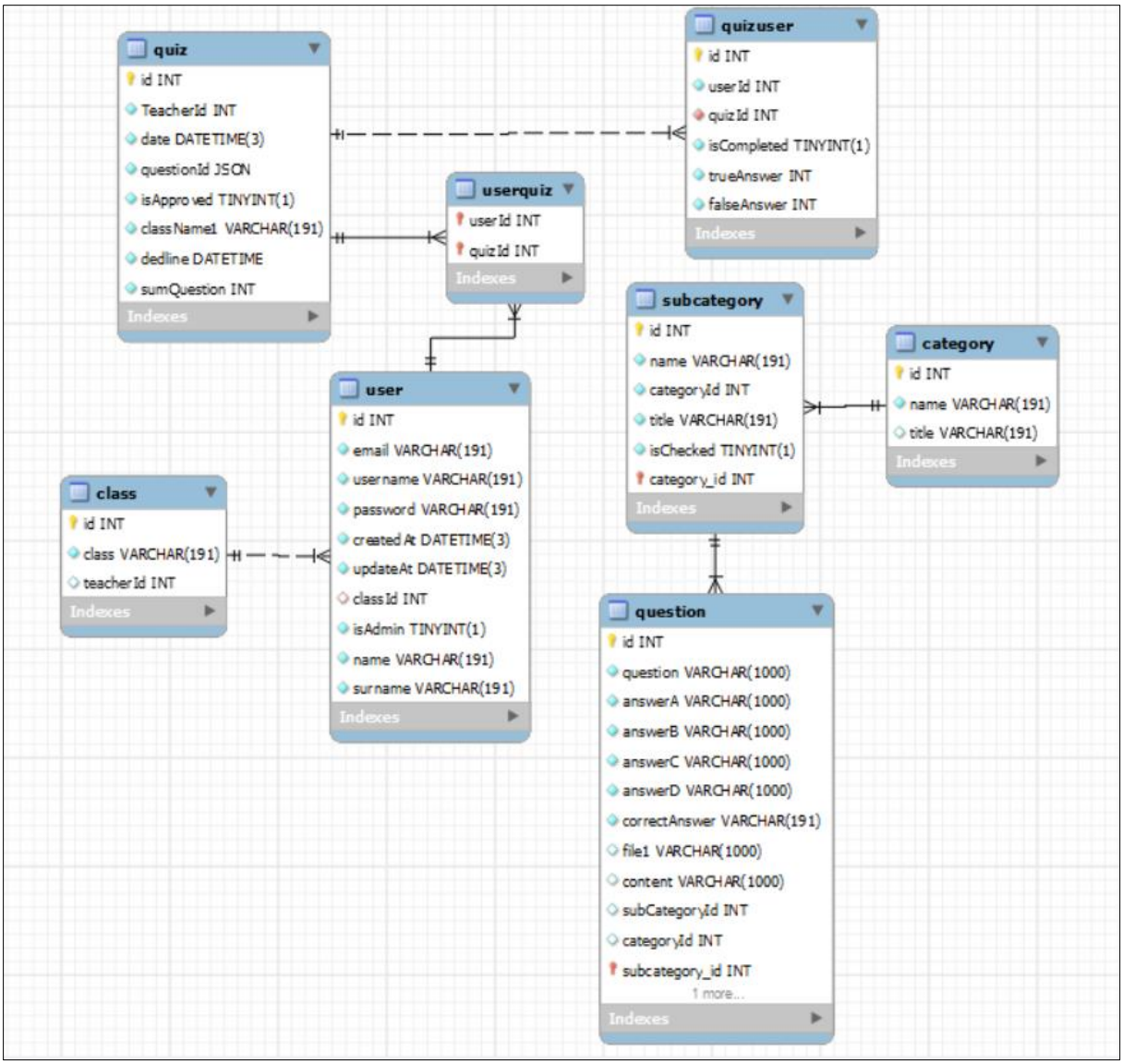


Fig. 2. Relationships between tables

User-class Relationship:

- Each user can have a class and each class can have more than one user, so there is a one-to-many relationship.
- The id column of the class table references the user table as foreign.

Category-subcategory Relationship:

- While each subcategory can belong to one category, each category can have more than one subcategory.
- The id column of the category table references the subcategory table as foreign.

Question-subcategory Relationship:

- While each question has a subcategory, each subcategory can have more than one question.
- The id column of the subcategory table references the question table as foreign.

The flow diagram of the developed application is shown in Fig. 3.

A part of the code block of the developed application was shown in Algorithm-1. We collect the subcategories selected in the code section into an array. Then, we reach the id part by querying with prisma, and by collecting the id parts in an array and making a where query on the question table, we obtain all the questions belonging to those subcategories, divided into categories. Then, we create the quiz dynamically by randomly selecting as many questions as the number of questions entered by the teacher from each category. Code block-1 in table 1, the code block that is a part of the quiz creation process was shown.

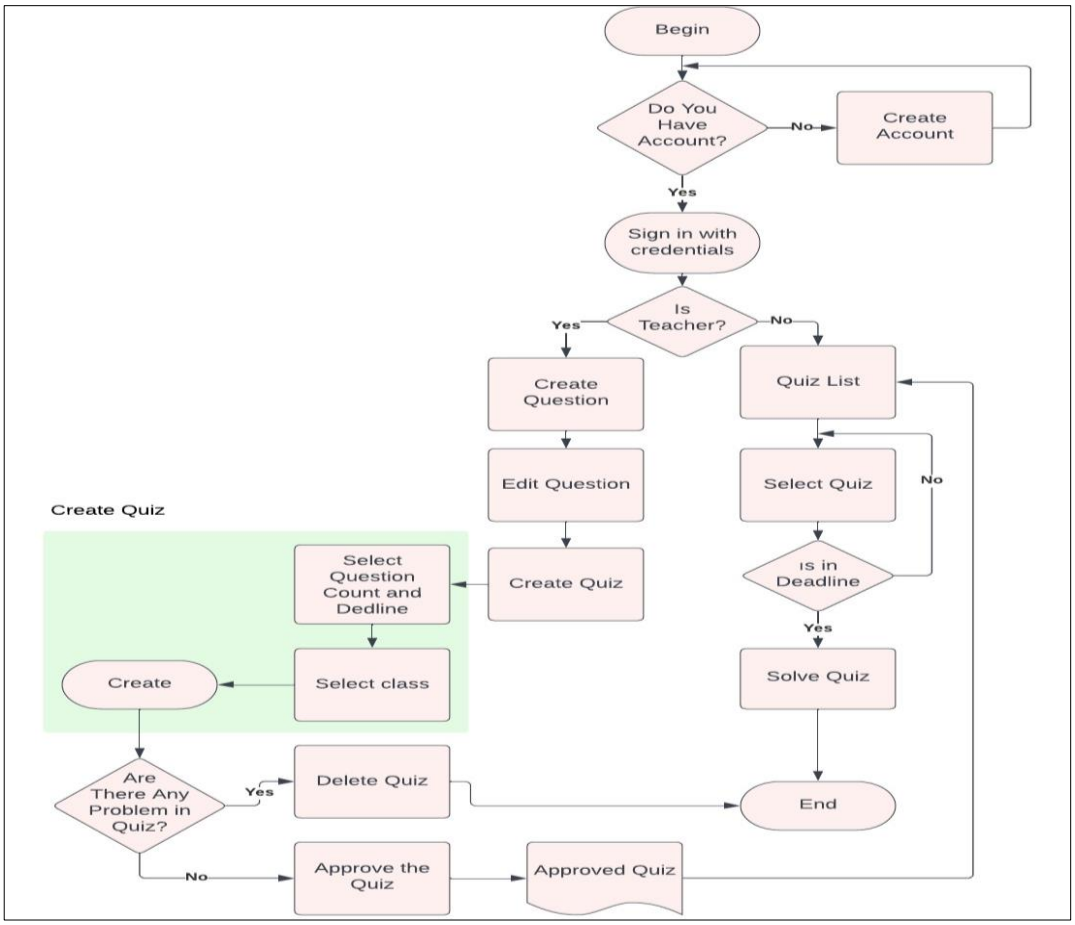


Fig. 3. Flow diagram of the developed application

Table 1. Code Block-1 Quiz Creation

Code Block-1: Quiz Creation

```
export const getCheckedSubCategory=async(formData:any)=>{
……
 if(!math && !relegion && !science && !english && !turkish && !history …))…..
……...
if (science) Then
  {const science1←science.split(",")
  science1.map((item:any)=>(
  arr.push(item)))
end if
  } …….
const subCategory←await  prisma.subCategory.findMany({
              where:{title:{in:[...arr]}}})
const subCategory1←subCategory.map((item:any)=>( arr1.push(item.id)
……
await prisma.quiz.create(
  {data←{
  questionId←[...question1],
  TeacherId←teacherId1,
  className1←classes,
  Deadline←date1.toISOString(),
  sumQuestion:top
   }
          ……
```

Fig. 4 shows the interface where teachers can create class-based quizzes by selecting the number of questions, topic and quiz time.

Fig. 4. Quiz creation interface

Our app allows teachers to create a quiz by choosing the course topic they want to include and the number of questions per lesson. Exams are assigned on a class-by-class basis and require a specific deadline. Fig. 5 shows an interface with quizzes created by teachers and waiting to be approved. Additionally, teachers can perform various operations through this interface.

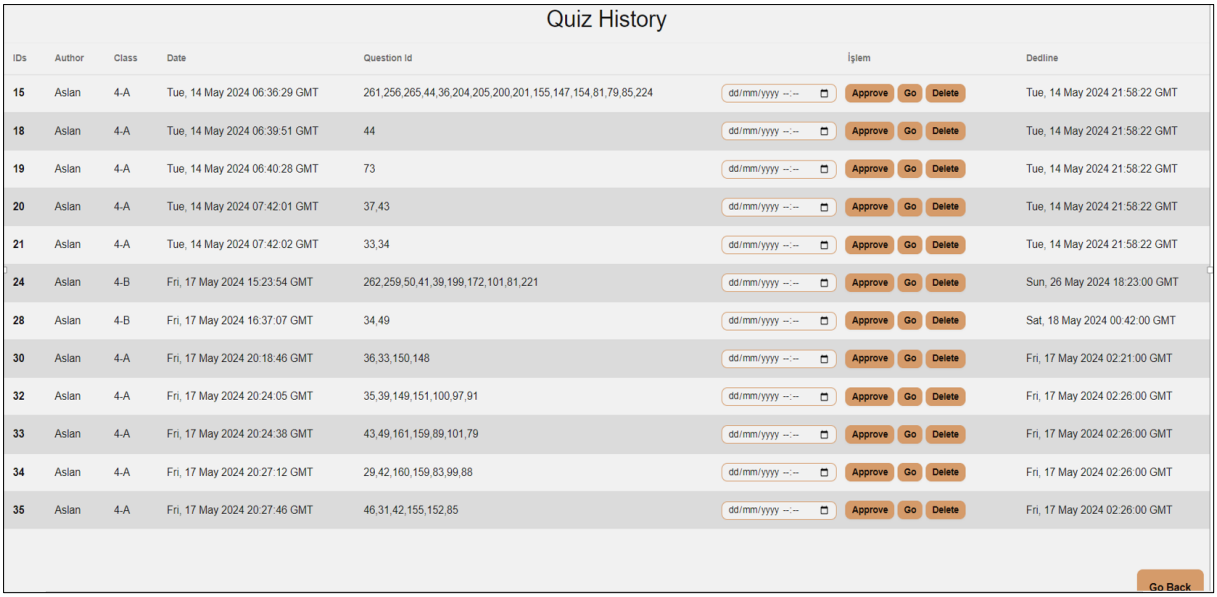


Fig. 5. Quiz list for teachers

The quiz list page contains quizzes waiting to be approved. The teacher checks the questions in the quiz and if everything is correct, starts the quiz by choosing a deadline. Fig. 6 shows an interface where teachers can add questions.

Teachers can add questions to the question pool. Fig. 7 shows an interface where questions can be listed and edited.

They can edit the added questions as shown in Fig. 7. Fig. 8 shows an interface with a list of previously solved or expired quizzes created for students.

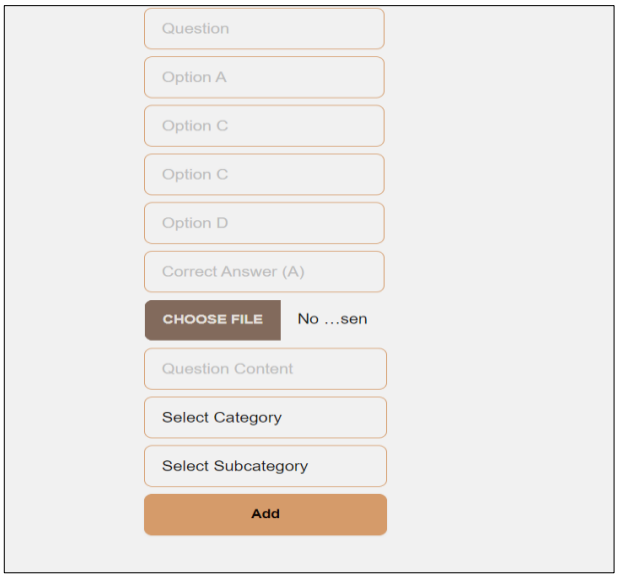
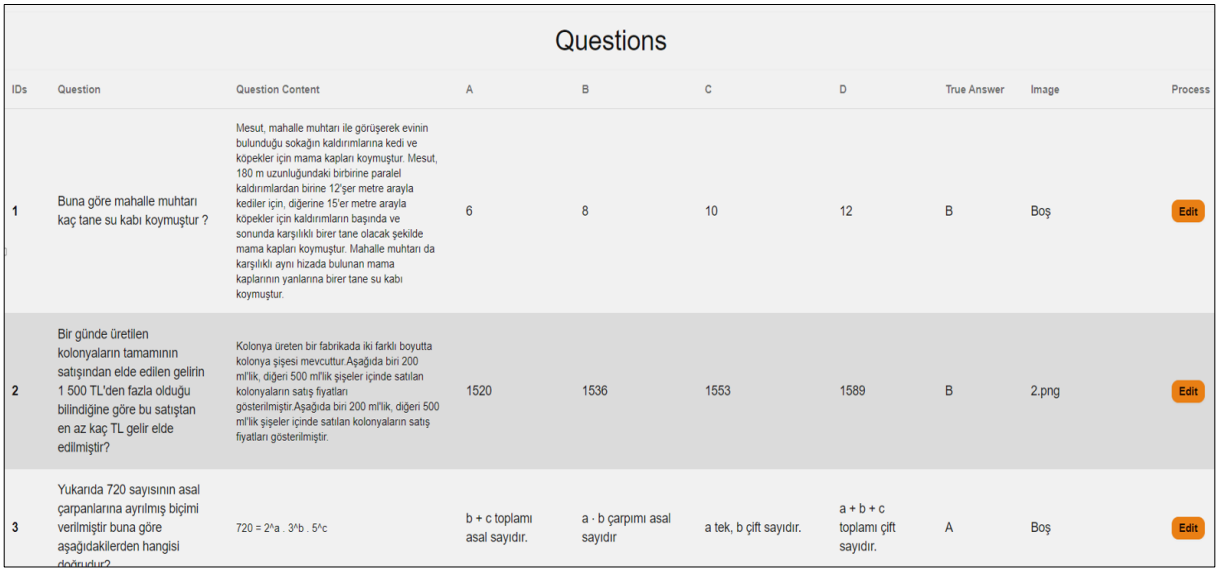


Fig. 6. Question adding interface



Questions

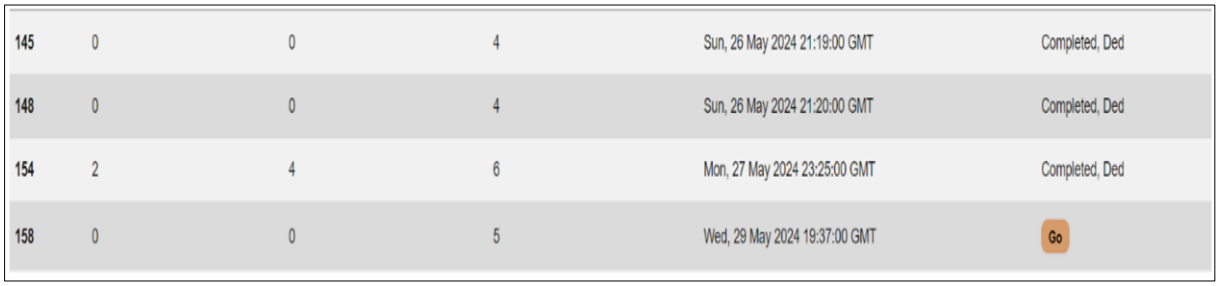
IDs	Question	Question Content	A	B	C	D	True Answer	Image	Process
1	Buna göre mahalle muhtarı kaç tane su kabı koymuştur ?	Mesut, mahalle muhtarı ile görüşerek evinin bulunduğu sokağın kaldırımlarına kedi ve köpekler için mama kapları koymuştur. Mesut, 180 m uzunluğundaki birbirine paralel kaldırımlardan birine 12'şer metre arayla kediler için, diğerine 15'er metre arayla köpekler için kaldırımların başında ve sonunda karşılıklı birer tane olacak şekilde mama kapları koymuştur. Mahalle muhtarı da karşılıklı aynı hizada bulunan mama kaplarının yanlarına birer tane su kabı koymuştur.	6	8	10	12	B	Boş	Edit
2	Bir günde üretilen kolonyaların tamamının satışından elde edilen gelirin 1 500 TL'den fazla olduğu bilindiğine göre bu satıştan en az kaç TL gelir elde edilmiştir?	Kolonya üreten bir fabrikada iki farklı boyutta kolonya şişesi mevcuttur.Aşağıda biri 200 ml'lik, diğeri 500 ml'lik şişeler içinde satılan kolonyaların satış fiyatları gösterilmiştir.Aşağıda biri 200 ml'lik, diğeri 500 ml'lik şişeler içinde satılan kolonyaların satış fiyatları gösterilmiştir.	1520	1536	1553	1589	B	2.png	Edit
3	Yukarıda 720 sayısının asal çarpanlarına ayrılmış biçimi verilmiştir buna göre aşağıdakilerden hangisi doğrudur?	720 = 2^a . 3^b . 5^c	b + c toplamı asal sayıdır.	a · b çarpımı asal sayıdır	a tek, b çift sayıdır.	a + b + c toplamı çift sayıdır.	A	Boş	Edit

Fig. 7. Question list interface

IDs	True Answer Count	False Answer Count	Sum Question Count	Dedline	Process
5	2	19	21	Sat, 18 May 2024 21:08:00 GMT	Completed, Ded
7	0	0	23	Fri, 17 May 2024 00:22:00 GMT	Completed, Ded
14	0	0	7	Sat, 18 May 2024 17:43:00 GMT	Completed, Ded
18	2	5	7	Sat, 18 May 2024 17:43:00 GMT	Completed, Ded
23	2	4	6	Sun, 19 May 2024 19:34:00 GMT	Completed, Ded
28	1	3	4	Wed, 22 May 2024 12:43:00 GMT	Completed, Ded
35	0	0	4	Wed, 22 May 2024 12:47:00 GMT	Completed, Ded
40	0	0	4	Wed, 22 May 2024 12:47:00 GMT	Completed, Ded
44	0	0	5	Wed, 22 May 2024 18:30:00 GMT	Completed, Ded
47	0	0	5	Wed, 22 May 2024 18:30:00 GMT	Completed, Ded
54	0	0	5	Wed, 22 May 2024 18:30:00 GMT	Completed, Ded
60	0	0	5	Wed, 22 May 2024 18:30:00 GMT	Completed, Ded

Fig. 8. List of passive quizzes for students

The quiz list for students looks like Fig. 8. From this screen, students can follow their quiz history and scores. Fig. 9 shows the quiz that has not been solved before and has not expired for students.



145	0	0	4	Sun, 26 May 2024 21:19:00 GMT	Completed, Ded
148	0	0	4	Sun, 26 May 2024 21:20:00 GMT	Completed, Ded
154	2	4	6	Mon, 27 May 2024 23:25:00 GMT	Completed, Ded
158	0	0	5	Wed, 29 May 2024 19:37:00 GMT	Go

Fig. 9. Quizzes active for students

If there is a newly added quiz, it will appear as in Fig. 9 and you can start solving the quiz by clicking the go button. Fig. 10 shows the question interface that students use to solve quizzes.

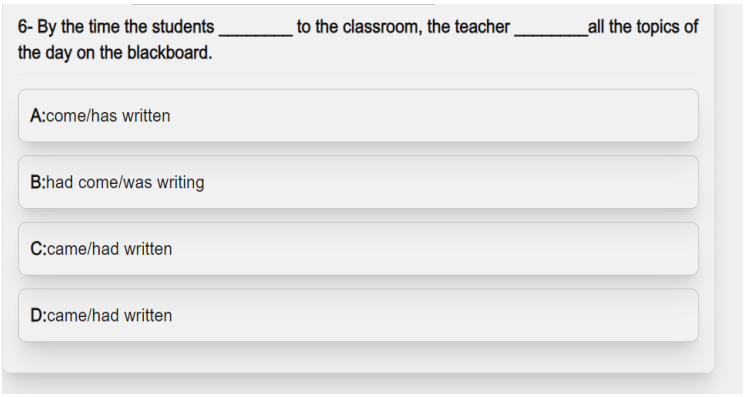


Fig. 10. Question view for students

The questions appear as in Fig. 10. Each question must be answered. If the answer is not given, the question cannot be passed. Fig. 11 shows the question to which the student answered incorrectly.

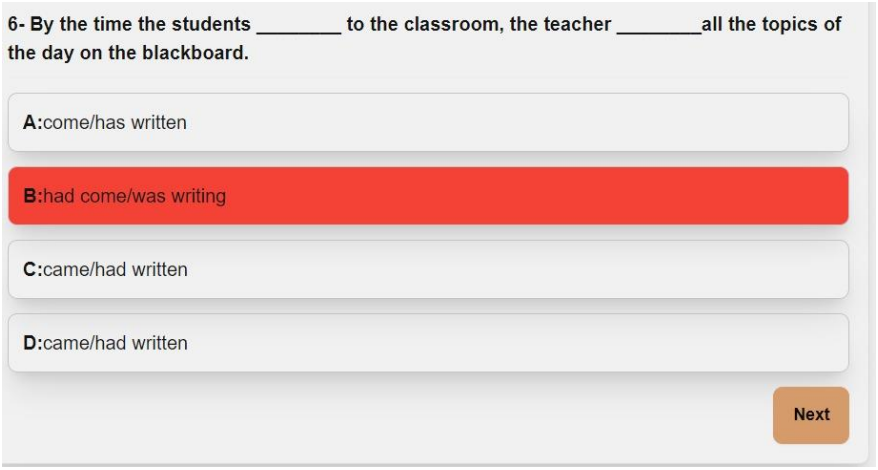


Fig. 11. Wrongly answered question view

If the question is answered incorrectly, it appears as in Fig. 11. Fig. 12 shows the question that the student answered correctly.

If the question is answered correctly, it looks like Fig. 12. Fig. 13 shows an interface where you can see your score and finish the quiz after the quiz is over.

After the quiz is over, the student can see their score, then press the finish quiz button and then return to the quiz list page by clicking "go back".

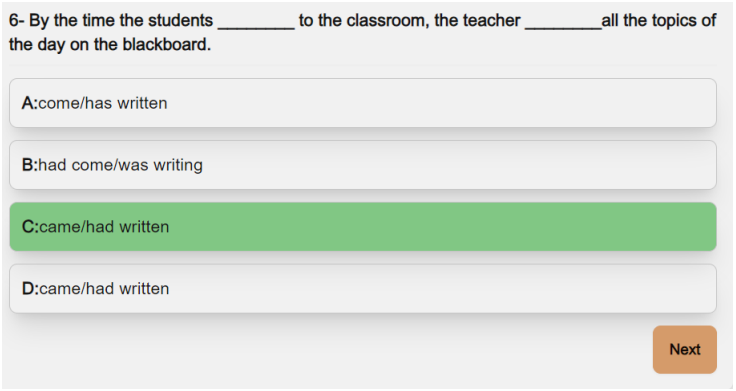


Fig. 12. View of the correctly answered question

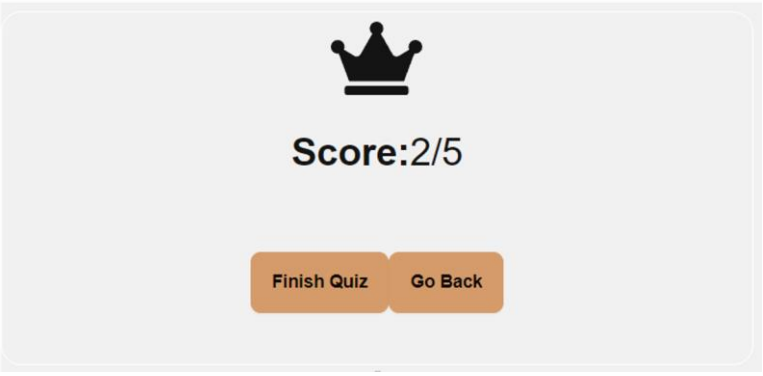


Fig. 13. End of exam interface

3. Conclusions And Future Works

In this study, a detailed and dynamic quiz application was developed. Our web-based application allows teachers to make class-based assignments and deactivate quizzes if they are not solved by the specified date. This process provides teachers with control and monitoring and encourages students to complete quizzes on time. As a result, our electronic quiz app helps teachers and students make their educational process more effective and efficient. It has great potential for tracking student success, customizing the learning experience, and increasing engagement. The ability of teachers to add and edit their own questions to the question pool is important for the dynamic aspect of the application. In future studies, the algorithm of displaying the questions to be answered by the student on the student screen can be realized with online smart exam systems. Add-ons such as artificial intelligence-supported evaluation, rich multimedia content, and gamification can be added to the interface.

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