

EBIODEX: A USEFUL MOBILE TOOL IN THE FIELD OF BIOTECHNOLOGY E-LEARNING ECOSYSTEM

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Abstract

*As technology evolves and we evolve with it, this means using optimal equipment. Thus, certain segments of the education area in the field of biotechnology could be improved. For example, the teaching support could be managed much better by teachers and students through mobile applications. The aim of the paper is to describe the making of an electronic mobile application suitable in the field of e-learning education. **eBIODEX** is an application for smartphones and tablets, integrated in the e-learning system of the Faculty of Biotechnologies, which will contain theoretical courses and working protocols for the various laboratories that are carried out within the faculty. It is hoped that the **eBIODEX** application will be a modern and friendly alternative to having the study materials accessible to the students of the Faculty of Biotechnologies.*

Key words: biotechnology, e-learning, education, internet, mobile application.

INTRODUCTION

Biotechnology is a technology that uses biological systems, living organisms or parts of them to develop or create different products. According to the European Federation of Biotechnology: *"The integrated use of biochemistry, microbiology and engineering sciences in order to achieve technological application of the capabilities of microorganisms, cultured tissue, cells"* is the definition of Biotechnology (European Federation of Biotechnology - EFB, 1981).

Nowadays, biotechnology covers many different disciplines (for example, genetics, biochemistry, molecular biology, etc.). New technologies and products are developed every year in the fields of eg. Biomedicine (development of new drugs and therapies), agriculture (development of genetically modified plants, biofuels, biological treatment), industrial biotechnology (production of chemicals, paper, textiles and food) or bioinformatics.

"Bioinformatics is the application of information technology and information technology in the field of molecular biology. The term bioinformatics was developed by Paulien Hogeweg in 1979 for the study of computer processes in biotic systems." (Toma, 2016)

"The main purpose of bioinformatics is to increase the understanding of biological processes.

Its primary use since at least the late 1980s has been in genomics and genetics, especially in those areas of genomics that involve large-scale DNA sequencing. Bioinformatics now involves the creation and development of databases, algorithms, computational and statistical techniques and theory for solving formal and practical problems resulting from the management and analysis of biological data." (Gobalan, 2016).

Biotechnology combines disciplines such as genetics, molecular biology, biochemistry, embryology and cell biology, which in turn are related to practical disciplines such as chemical engineering, information technology and robotics (Toma, 2016).

The aim of the paper is to describe the making of an electronic mobile application suitable in the field of e-learning education.

Every one of us has forgotten at least once in our books/books, but the phone has already reached our extension, so having an application that does not require internet connection and which will have all the necessary information for the user will no longer be available. There were excuses like: "I didn't get xerox with the

lab work", "nobody told me we needed them today", etc.

Thus, came up with the idea of **eBIODEX**. **eBIODEX** is an application for smartphones and tablets, integrated in the e-learning system of the Faculty of Biotechnologies, which will contain theoretical courses and working protocols for the various laboratories that are carried out within the faculty.

Although it is not the first application developed within the Faculty of Biotechnologies (Toma, 2018), but also because these learning elements were very well received by the students of the faculty (Margarit, 2016), this application is intended as an additional tool available to students who come to supplement the benefits offered to them by the e-learning platform of the Faculty of Biotechnologies (Toma, 2013).

It is hoped that the eBIODEX application will be a modern and friendly alternative to having the study materials accessible to the students of the Faculty of Biotechnologies.

MATERIALS AND METHODS

The platform used to develop the application is Unity.

Unity is an engine for creating 3D games. Unity can be used by anyone who wants to create mobile applications for phone, desktop, web and 3D games.

Unity 3d initially started from the collaboration between programmers Nicholas Francis from Denmark and Joachim Ante from Germany. Working on his own game engine, Francis had problems implementing a shader system (a shader is a program that does shading on 3D objects). He asked for assistance on the Mac OpenGL message board. Ante answered a few hours later. As it turned out, Ante was also working on his own game engine. The two developers decided to change their projects and start with the creation of a single engine: Unity (Unity official WebPage).

This solution was chosen over solutions like AndroidStudio because it offers several benefits such as:

- It is excellent for multi-platform development. Cross-development platforms are currently being developed. They are really time

consuming and require a lot of effort to develop native applications. Platforms, such as Unity, have made this process quite simple and easy to use compared to previous versions. Using cross-platform development, a single script can be compiled and used for many platforms.

- It is also easier to use compared to many other technologies. There are so many other complicated technologies that become tougher as we use them. Unity is an exception here.

- Unity's technical support is very efficient.

Another reason for choosing Unity was that if Android Studio was used the developed application would become strictly restricted to phones and tablets using the Android Operating System (Android Studio webpage).

To create the application was used Visual Studio 2017, an application that belongs to Unity (i.e. the programming side) for eBIODEX. The program interface looks like this (Figure 1):

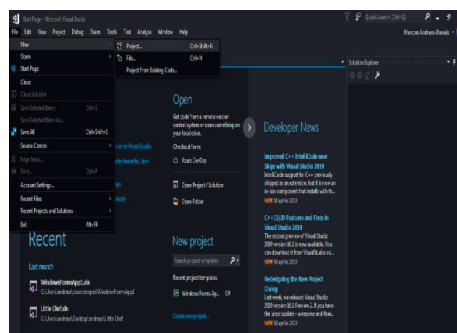


Figure 1. Interface for Visual Studio 2017

The menu interface appears in the following form (Figure 2):

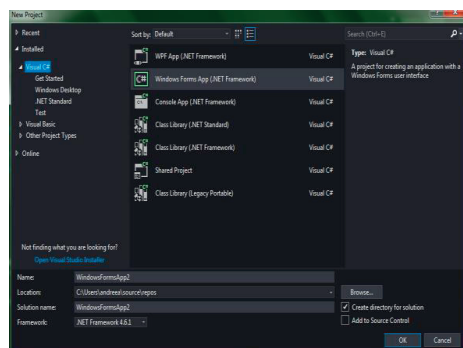


Figure 2. Interface for Menu in Visual Studio 2017

Once selected, the program builds a skeleton / base represented below in the figure where, with the help of the tools provided by the program, they can insert various pieces depending on the final purpose of the application. One of the first screen capture of the base of application is look like this (Figure 3):

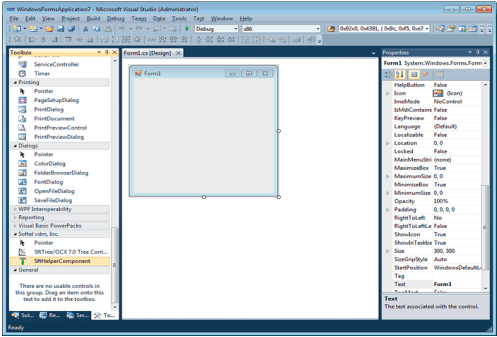


Figure 3. Screen capture

RESULTS AND DISCUSSIONS

Initially it was intended that the program interface would allow us to login with username and password. To do this, it was necessary to download another program. Be it MySQL, Microsoft Access or FireBird. But because it is desired that this application be a free tool, it was decided that this should not be done for time being. But in order to keep this as an open option for the future the next thing was to use one of the containers offered by the program so that the menu is only visible when certain requirements are fulfilled in the code. This process is much more efficient in terms of the memory used and the code. So when you want to log in the application with your username and password, it is not necessary to change all the functions performed by the menu items but only those of the container (which will be transmitted automatically to the component parts). But for now, for this version of the mobile application, on the home page there is only the logo and a button that sends to the main menu of the application. The main menu of the application is depicted in Figure 4.



Figure 4. The main menu of eBIODEX

In the first phase of the menu design, a discipline selector, a PDF reader and several buttons were added, plus a display box that together formed a computer. Because the program is meant to display protocols for certain engineering disciplines that are based on multiple calculations, a computer is useful for solving calculation formulas. But I was disappointed again with my own computer. The program code looks like in the figures below (some fragments are shown in Figures 5-8).

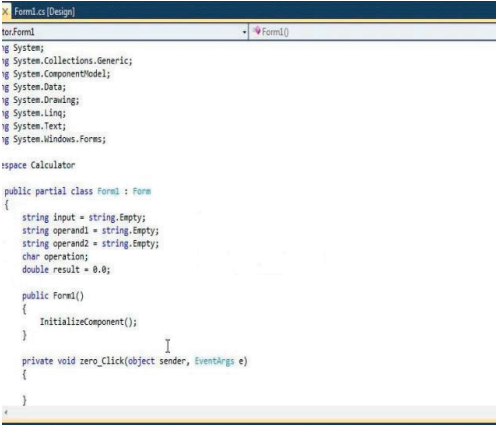


Figure 5. Screen capture of the programming code

```
Form1.cs (Design)
torForm1
- [V]dot_Click(object sender, EventArgs e)
{
    input += "9";
}

private void six_Click(object sender, EventArgs e)
{
    input += "6";
}

private void seven_Click(object sender, EventArgs e)
{
    input += "7";
}

private void eight_Click(object sender, EventArgs e)
{
    input += "8";
}

private void nine_Click(object sender, EventArgs e)
{
    input += "9";
}

private void dot_Click(object sender, EventArgs e)
{
    input += ".";
}
```

Figure 6. Screen capture of the programming code

```
Form1.cs (Design)
torForm1
- [V]minus_Click(object sender, EventArgs e)
{
    private void divide_Click(object sender, EventArgs e)
    {
        operand1 = input;
        operation = "/";
        input = string.Empty;
    }

    private void star_Click(object sender, EventArgs e)
    {
        operand1 = input;
        operation = "*";
        input = string.Empty;
    }

    private void plus_Click(object sender, EventArgs e)
    {
        operand1 = input;
        operation = "+";
        input = string.Empty;
    }

    private void minus_Click(object sender, EventArgs e)
    {
        operand1 = input;
        operation = "-";
        input = string.Empty;
    }
}
```

Figure 7. Screen capture of the programming code

```
Form1.cs (Design)
torForm1
- [V]three_Click(object sender, EventArgs e)
{
    private void zero_Click(object sender, EventArgs e)
    {
        this.textBox1.Text = "";
        input += "0";
        this.textBox1.Text += input;
    }

    private void one_Click(object sender, EventArgs e)
    {
        this.textBox1.Text = "";
        input += "1";
        this.textBox1.Text += input;
    }

    private void two_Click(object sender, EventArgs e)
    {
        this.textBox1.Text = "";
        input += "2";
        this.textBox1.Text += input;
    }

    private void three_Click(object sender, EventArgs e)
    {
        this.textBox1.Text = "";
        input += "3";
        this.textBox1.Text += input;
    }
}
```

Figure 8. Screen capture of the programming code

The laboratories/seminars displayed in the program are currently only within the subject "Technologies for processing raw materials for plants and animals" of course used with the

agreement of Professor Ranga Ionut. These were scanned and saved locally in the resource folder of the program. It follows that in the immediate future, the application will be completed with materials from other disciplines, grouped by years of study, by specialization and by the type of study program.

Below is a partial sequence from the code that is the basis for the pdf display of the theoretical materials presented in pdf format present in the mobile application (Figure 9).

```
private void button1_Click(object sender, EventArgs e)
{
    if (comboBox1.SelectedItem == "Normalizarea laptei")
        aacroPDF1.LoadFile("C:/Users/andrea/source/repos/WindowsFormsApp1/4cc271c2-9a34-45b6-a1b6-53a430c1cfef - 1.pdf");
    else if (comboBox1.SelectedItem == "Calculul tehnologic privind laptele")
        aacroPDF1.LoadFile("C:/Users/andrea/source/repos/WindowsFormsApp1/4cc271c2-9a34-45b6-a1b6-53a430c1cfef - 1.pdf");
    else if (comboBox1.SelectedItem == "Calculul tehnologic privind smantana")
        aacroPDF1.LoadFile("C:/Users/andrea/source/repos/WindowsFormsApp1/4cc271c2-9a34-45b6-a1b6-53a430c1cfef - 3.pdf");
    else if (comboBox1.SelectedItem == "Calculul tehnologic privind branzeturile")
        aacroPDF1.LoadFile("C:/Users/andrea/source/repos/WindowsFormsApp1/4cc271c2-9a34-45b6-a1b6-53a430c1cfef - 4.pdf");
    else if (comboBox1.SelectedItem == "Determinarea indicelui de aciditate")
        aacroPDF1.LoadFile("C:/Users/andrea/source/repos/WindowsFormsApp1/4cc271c2-9a34-45b6-a1b6-53a430c1cfef - 5.pdf");
    aacroPDF1.Show();
}
```

Figure 9. Screen capture of the programming code

The mobile application looks, at this moment, as represented in the following figures (Figures 10-11).

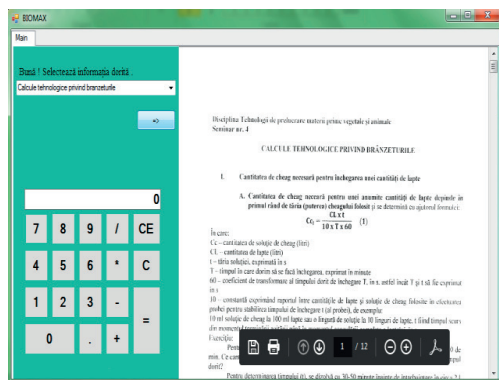


Figure 10. Screen capture of the application interface

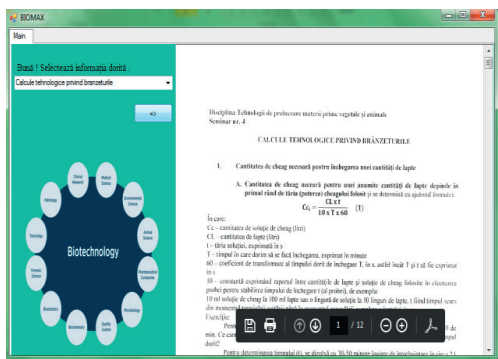


Figure 11. Screen capture of the application interface

The final result is a mobile application for Android and iOS smartphones and tablets suitable in the field of e-learning education which will contain theoretical courses and working protocols for the various laboratories that are carried out within the faculty.

CONCLUSIONS

Developing educational software to make the term biotechnology easier to understand for high school students in order to attract them to this field and potentially transform into new students within this faculty (Faculty of Biotechnologies) is a desiderate important to be achieved.

The described application can be improved by adding updates such as:

- Login with username and password;
- An integrated scientific computer;
- More information available;
- Self-assessment methods;
- A subunit of drawing for drawing and deepening the graphics;
- A database that stores the results obtained by each user in addition to an efficient way in which he can access them.

Also, collaboration with various projects in the field of ecology and environmental protection in order to educate the general public is one of the ideas for future applications.

Obtaining the agreement to use as many laboratories as possible in this project will help me create an increasingly comprehensive library of information.

The interface built on the classic application models makes this application easier to understand and use.

It is hoped that the eBIODEX application will be a modern and friendly alternative to having the study materials accessible to the students of the Faculty of Biotechnologies.

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