Program designed in Excel for Students' Exam Execution and Correction

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Abstract: In this paper, a simple practical program designed by Excel for exam execution and correction will be presented. The developed computer program is used to execute the exam in the computer lab and then to correct the exams automatically. The system used to support the exam method will be explained. This program has been proved and tested in our faculty and the proved practical examples of exams are approved its correctness, usability and flexibility for doing exams in a simple way.

Keywords: Computer for Education, Exams, Excel Program, and Programming.

1. INTRODUCTION

It is very important to computerize the students' exams, in order to give results of exams (grades) rapidly and automatically by the teacher, and also in order to obtain results without errors. The importance of executing exams on computers and automatically correct them have been discussed during the International Scientific Conference on Challenges for Higher Education *ISCHE2008* "The case of Travel, Tourism, Transportation and Hospitality Studies", which held in 2008 at the Faculty of Tourism & Hospitality, Lebanese University, in Beirut, Lebanon [1][2]. A report of practical exams [3] explained in details all steps of the exams and presented many real executed exams that proved and tested the proposed method in this paper.

There are many works in this field presented on the Internet. Examples and methods of computer and online exams are presented in [4][5][6], but these methods are different and has been designed with other programs. The proposed program is characterized by its small size, its correctness, its fast results, and its friendly usability.

In this paper, a method for execution exams and automatically correct them is presented. The proposed method is based on Excel computer program. It is composed of presenting and correcting methods of the exams. The main advantage lies in the simple programs developed in Excel program for giving questions and correcting the exams.

2. THE PROPOSED METHOD

The proposed method is shown Figure 1. The hardware needed to execute the exam must be: (1) a lab room of computers; (2) an intranet network and (3) network switch. While with respect to the software; the Windows operating system and the Excel program must be installed on all computers. The Lab room must include one computer for each student and one main computer for the teacher. Figure 1

shows a lab for 30 students can do the exam at the same time. For simplification we use the following abbreviations: TC stands for the Teacher Computer PCMain; SC stands for the Student Computer PC_i; where *i* varies between 1 and 30. Note that *i* may be greater than 30 and this depends on the number of computers in Lab room.

The exam will be executed as follows:

- (1) The students will take the questions from the teacher computer TC through the Intranet network at the start time of the exam;
- (2) The students will do their exams each on his computer SC during the required time;
- (3) The students must put back on the teacher computer TC and through the network their answers of exams at the end time of the exam.

Figure 1: The lab with 30 computers.

If we have more students than the number of computer, we have to divide them into groups or we have to use a Lab room with sufficient computers to all students. We can also use the exam through the Internet; in this case, we do not need computer lab and intranet network.

3. TEACHER COMPUTER (TC)

It is the PCMain as shown in Figure 1. The teacher uses only it. The students will take the questions from it through the Intranet network at the start time of the exam. The students also will put back on it their answers of exams at the end time of the exam.

On TC computer we have to:

1. Create a new folder and name it Exam;
2. Put inside the Exam folder and at the start time of the exam the Template Exam Program File, which it contains the questions and it will be explained in this paper (see Figure 2);
3. Share that folder to be seen on SC computers (Right Click on the Exam folder Icon → Click sharing).

The Exam folder sharing properties must be:

1. Read only during the exam to avoid the students from using this folder to copying and cooperating between them during the exam. Read only means the student cannot write and put anything inside the Exam folder but can only read from it.
2. Full Access at the ending time of the exam to give access writes for students to return their exams to the TC computer (see Figure 3).
3. After that a Secret password for read and full access must be typed in order to protect the students' exams from any access through the network.

Figure 2: The exam template file.

Figure 3: The students' exams.

To correct the exams of students (1.xls, 2.xls, 3.xls, 4.xls, ...) on the TC computer, we have to do the following (see Figure 4):

1. The Teacher Corrector Program File must be copied to the exam folder;
2. The Template Exam Program File can be removed;
3. Double click on the Teacher Corrector Program File to start correct exams. Automatically, in few microseconds all exams will be corrected.

Figure 4: The students' exams and the teacher corrector file.

4. STUDENT COMPUTER (SC)

The student computer SC is the PCi computer as shown in Figure 1.

A student uses it to do his exam. On SC computer you have to see first the EXAM shared folder on the TC computer. To open and access the Exam folder, you use one of the following two methods:

1. Double Click Network Neighborhood Icon on your desktop → Double Click TC Computer Icon (same workgroup) → Double Click EXAM shared folder to open it.
2. Start → RUN → write inside the RUN dialog Box the path of the Exam folder on the TC computer (\\teacher-computer-name(exam) to open the Exam shared folder.

Inside the Exam folder, you will find the questions of the exam in Template Exam Program File (see Figure 2). To begin the Exam, Double Click the Template Exam file at the start time of the exam. The student must do the exam during the exam period. At the end time of the exam, the student must save the exam by giving filename and file location. Then the student must put his file in the EXAM folder on TC computer.

A number for each student will be assigned in order to use it for his filename. The desktop will be used as the file location. For simplification, the assigned number will be the same number of the student PCi. Where $i=1,2,3,...,N$ (N = the number of computers in Lab Room). The student on PC1 will name the file by number 1, PC2 by 2 and so on (1.xls, 2.xls,...,n.xls,...).

If we have more students than N , we have to divide them into groups or we have to use a Lab room with sufficient computers to all students. In the first case, the student of the second group must take different numbers: on PC1 the Student Exam File is 31, on PC2 is 32, and so on.

5. EXAM PROGRAMS

5.1 Template Exam Program File

It is the file where the student can find the questions. It is a workbook Excel Program that contains the following sheets:

1. The first or the Header sheet;
2. Multiple Choices questions sheet;
3. True-False questions sheet;
4. Matching questions sheet;
5. Others questions on others sheets.

In each sheet a developed program is used to correct the questions and count the grades.

The header sheet is shown in Figure 5. It can also be called Student Name sheet. In this sheet, the general exam information is written in cells B5-L12 and two blank cells where the student can write his name in the first cell (cell E14) and his academic file number in the second one (cell K14).

Figure 5: The first sheet of the exam.

The Multiple Choices Questions Sheet is shown in Figure 6. It is called Question1 sheet. Many questions can be included. Each question has 4 answers and may be more or less than that. The student must type his answer (a,b,c or d) in the appropriate cell K5, K11,...

Figure 6: The multiple choice questions sheet.

We take for example the first question, which is explained as follows: In cell B5, the question number (1,2,3,...or...) is displayed. In cell C5, the question is written. In cells C6,C7,C8 and C9 the answers symbols (a,b,c and d) are displayed. In cells D6, D7, D8 and D9 the proposed answers are written. In cell K5, the student must type the answer (a,b,c or d). In cell L5 (which must be hidden to avoid student from seeing the result), the IF function to correct the answer in cell K5 is typed. In cell Z1 (which must also be hidden), the sum function is used to obtain the total grade of this sheet. We write inside L5 the IF function as follows:

=IF(K5="d",1,0).

Where = is the Excel sign to execute a formula, K5 is the cell where the student types his answer (a,b,c or d) for the first question, "d" is the correct answer in this question, 1 & 0 mean one grade (if the student types d) and zero grade (if the student types a,b or c).

If we take the second question. We type in Cell L11:

=IF(K11="a",1,0)

Where K11 is the cell where the student types his answer (a,b,c or d) for the second question, "a" is the correct answer in the second question. And so on for third, fourth, fifth...Questions.

The cell Z1 must be hidden to avoid student from seeing the grade of this sheet. In cell Z1 we have to add the grades in cell (L5,L11,L17,...). We can use one of the following two methods:

- (1) Use the following formula: =L5+L11+L17+L23+... or
- (2) Use the SUM function: =SUM (L5, L11, L17, L29...).

Figure 7: The true false questions sheet.

The True-False Questions Sheet is shown in Figure7. It is called Question2 sheet. Many questions can be included. Each question has two answers (True or false). The student must type the answer in the appropriate place (L5, L6, L7,...). He must type Yes instead of True and No instead of False because the Excel program considers the blank cell as a false answer, while the blank cell means no answer from student to this question.

We take for example the first question, which is explained as follows: In cell B5, the question number (1,2,3,...or...) is displayed. In cell C5, the question is written. In cell L5, the student must type the answer (Yes or No). In cell M5 (which must be hidden), the IF function is used in order to correct the answer in cell L5. In cell Z1 (which must be hidden), the sum function is used to obtain the grade of this sheet. We write inside M5 the IF function as follows:

=IF(L5="yes",1,0)

Where L5 is the cell where the student types his answer (Yes or No) for the first question, "yes" is the correct answer in the first question.

If we take the second question. We type in Cell L6:

=IF(L6="no",1,0)

Where L6 is the cell where the student types his answer (Yes or No) for the second question, "no" is the correct answer in the second question. And so on for third, fourth, fifth,...questions.

As in the previous sheet, in this one we have to sum the grades. The cell Z1 is also used to sum grades in cells (L5,L6,L7,...). We can use one of the following two methods:

- 1) Use the following formula: =L5+L6+L7+L8+L9+...LX

Where (X-5) is the total number of questions in this sheet. If X=55 means we have 50 questions.

- 2) Use the SUM function: =SUM (L5, L6, L7, L8, L9... LX)
=SUM (L5: LX)

The Matching Question Sheet is shown in Figure8. It is called as Question3 sheet. In this sheet, 15 sentences or questions numbered from 1 to 15 to be matched with their answers are proposed. The questions are placed as follows:

Figure 8: The matching questions sheet.

In cells A5-A19, the answers of questions are typed. In cells B5-B19, the student must type the number of question equivalent to the answers in cells A5-A19 (1,2,3,...13,14,15). In cells D5-D19, the questions numbers are displayed (1,2,3,...13,14,15). In cells E5-E19, the statement questions are written. In cells J5-J19 (which must be hidden), the IF function is used in order to correct the answers in cells B5-B19. In cell J5 we write the IF function as follows:

=IF(B5=12,1,0)

Where B5 is the cell where the student types his answer (1,2,3,...14 or 15), "12" is the correct answer (it means the answer written in cell B5 is for the question of number 12). 1 grade is given if the student types 12 else zero grade if the student types number different than 12. And so on for all other cells (J6,J7,...J19).

As in the previous two sheets, in this one we have to sum the grades. The cell Z1 is also used to sum grades in cells (J5,J6,J7,...). We can use one of the following two methods:

1) Use the following formula: =J5+J6+J7+...+JX

Where (X-5) is the total number of matching questions. If X=19 means we have 15 matching questions.

2) Use the SUM function: =SUM (J5: JX)

Also the proposed exam can be extended to new questions and new sheets. One can introduce questions on a new sheet by using the same manner of the previous three types of questions but the main condition is to have a determined answer for each question. One can propose Fill in the blank questions or English Grammar questions or...

Note the following important security steps, which are required for all sheets:

(1) Columns L & Z in Question1 sheet must be hidden in order to hide the Cells L5, L11, L17, ... and Z1. The same thing for Question2 sheet (columns M and Z must be hidden) and for Question3 sheet (columns J and Z must be hidden).

(2) All cells must be locked – to avoid students to write anywhere or to delete any question or change any question or change the sheet form - expect the cells K5,K11,K17,...in Question1 sheet and L5,L6,L7,... in Question2 sheet and B5,B6,B7,... in Question3 sheet -which must be unlocked in order to give students the permission to write the answer.

(3) The Sheet must be protected (Tools → protection → protect sheet) by a password to obtain and get the above three steps. It means to avoid students from changing the sheet form, writing anywhere, seeing the hidden columns and consequently the results.

5.2 Teacher Corrector Program

The Teacher Corrector Program File is shown in Figure 9. It is like a report, and it consists of columns and rows. Each row represents a record for one student and each column represents sheet grade for each student.

In cells A1-M8, the exam information is written. In Row11, the headings are reported. In Row12, the Record for the first student is presented. In Row13, the Record for the second student is presented. And so on for all other students. In the final row the average are computed.

The columns are explained as follows:

Column A [File Number] contains the filename of the Student Exam File for each student, which is the exam number (1,2,3,4,...).

Column B [Student Number] shows the academic file number for each student. Each cell is equal to the content of the cell

K14 that is a cell inside the first sheet where there is the student academic number.

Column C [Student Name] gives the names of each student. Each cell is equal to the content of the cell E14 that is a cell inside the first sheet where there is the student name.

Column D [Multiple Choice] gives the grade of the Multiple Choice Questions, which is the grade in Z1 cell in Question1 sheet multiplied by a coefficient q1.

Column E [True False] gives the grade of the True False questions, which is the grade in Z1 cell in Question2 sheet multiplied by a coefficient q2.

File Number	Student Number	Student Name	Multiple Choice	True False	IE5	Grade	Coefficient
1	102	eman arab	18	24	36	78	q1 1.5
2	71	Suzanne el-Tal	19.5	30	36	85.5	q2 1
3	73	mayssaa nasrallah	18	23	36	77	q3 1.5
4	68	DANA Jaber	18	24	36	78	
5	104	fanous hiba	13.5	24	33	70.5	
6	78	Sara Safa	16.5	23	30	69.5	
26	92	fabienne Asmar	21	29	33	83	
27	96	lydia saab	19.5	26	31.5	77	
28	80	zeina Sukkarieh	21	27	28.5	76.5	
29	98	RABIH BACHA	18	26	31.5	75.5	
30	105	abir moussa	15	26	34.5	75.5	
Average			15.83	25.06	31.17	72.06	

Figure 9: The Teacher Corrector Program File with the results of the exam.

Column F [Matching] gives the grade of the matching questions, which is the grade in Z1 cell in Question3 sheet multiplied by a coefficient q3 (in this case the questions are about the Internet explorer).

Column G [Grade] gives the total grade of each student, which is the sum of the grades in columns D, E, and F.

The coefficients q1, q2, q3 are typed respectively in cells M12, M13, M14.

Note that, if there are more than three sheets of questions, then a column will be inserted for each sheet in the Teacher Corrector Program File. The record of each student in the Teacher Corrector Program File contains the following formulas (we take the first record as example):

Cell	Formula
A12	1
B12	=Path\[1.xls]Your Name'!\$K\$14
C12	=Path\[1.xls]Your Name'!\$E\$14
D12	=Path\[1.xls]Question1'!\$Z\$1*\$M\$12
E12	=Path\[1.xls]Question2'!\$Z\$1*\$M\$13
F12	=Path\[1.xls]Question3'!\$Z\$1*\$M\$14
G12	= D12+E12+F12 (Or) =SUM (D12: F12)

Path means where the file is stored on the hard disk. For example the path in this work is:

C:\WINNT\Profiles\hchible\Personal\EXAM\.

The same for cells A13, B13,and so on.

The Cell G12 represents the grade of the first student as follows:

$$G12 = D12 + E12 + F12 = X*q1+Y*q2+Z*q3$$

Where

X=Path\[1.xls]Question1'!\$Z\$1 (Grade of Question1 sheet);

Y=Path\[1.xls]Question2'!\$Z\$1 (Grade of Question2 sheet);

Z=Path\[1.xls]Question3'!\$Z\$1 (Grade of Question3 sheet).

We call Gmax as the maximum grade of the Exam. It is given by:

$$Gmax = Q1max+Q2max+Q3max.$$

Where Q1max, Q2max and Q3max are respectively the maximum grade of Question1, Question2 and Question3.

They are given as follows:

$$Q1max= Xmax*q1$$

$$Q2max= Ymax*q2$$

$$Q3max= Zmax*q3.$$

Where Xmax, Ymax and Zmax are respectively the maximum grades of X, Y and Z.

6. Practical Results

A real exam of the second part of the third year tourism and travel department - Faculty of tourism and hospitality management - Lebanese university has been tested. The Exam contains in:

- Question1 sheet 10 questions with 1 grade for each (Xmax=10);
- Question2 sheet 25 questions with 1 grade for each (Ymax=25);
- Question3 sheet 15 questions with 1 grade for each (Zmax=15).

The maximum grade is designed to be 100 grades (Gmax=100).

The coefficients are calculated in base of the maximum grade of each sheet.

If we choose the Q1max =30 grades; Q2max=40 grades and Q3=30 grades.

Then the coefficients are: $q1= 30/10=3$; $q2=40/25=1.6$ and $q3=30/15=2$.

The result of this exam is shown in Figure 9. This result is obtained after double clicking the Teacher Corrector Program File, which is teacher.xls file as shown in Figure4.

7. CONCLUSIONS AND FUTURE WORK

I developed this method in the computer Lab of the faculty of tourism and hospitality management at Lebanese University in order to simplify executing the exams at our university. I have tested and proved the method by doing many real exams for the computer course in the first, second, and third years of the travel and tourism & hospitality departments. This method can be used and applied for any course and exam that proposes determined answers for questions such as Multiple Choice, True-False, Matching, Fill in the blank, English Grammar, and so on. The future Work will be focused on: 1) Developing and improving this method in order to enhance more the exam and the type of questions; 2) Developing a method for interactive learning during academic lectures by using computers.

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