

Excel Intelligent Tutoring System

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Abstract: *The invention of technology and its entry into many fields facilitated many things. For example, there were smart systems that were based on diagnosing diseases, organizing traffic, and teaching students in schools.*

These days, relying on traditional education (classroom lectures, texts, and individual assignments) at schools is no longer the only and best solution for educating students, increasing their culture and keeping them up to date in life.

E-learning was an ideal solution, based on Lifelong learning implies lifelong education, artificial intelligence has an imprint in this by developing systems depend on one or more teacher for each student.

In this paper, Intelligent Tutoring System Builder explains in terms of the meaning, key components and the integration between them. In order to implement this system, we had a smart Excel education system called Excel Intelligent Tutoring System, which aimed at novice students as users, and teachers as an exhibitor of educational material, with a simple explanation of how to use and benefit from the system.

At the end, a system evaluation presentation was accepted as the basis for a long-term education project.

Keywords: Excel, intelligent tutoring system, learning, ITS, e-learning, Intelligent Tutoring, Knowledge Module, Teaching Strategy, Tutor Module, Student's Learning Style

1. INTRODUCTION

Knowledge development for teaching does not depend only on traditional teaching. It has merged with advanced technology to create a new science called **Intelligent Tutoring Systems (ITS)**. These systems are based on *Artificial Intelligence in education* as main concept such it displays differential tutorials as an expert teachers, for students with different education levels.

One of these tutoring systems are **Intelligent Tutoring System Builder (ITSB) tool** which is an authoring tool collecting three components: *AI, Cognitive science* and the *internet* to be designed and developed to aid teachers in constructing intelligent tutoring systems in multidisciplinary fields^[1].

ITS delivers different exiting or traditional systems, adapting teaching methods from previous human-teachers knowledge, to produce an effective tutorials(text, sound and video materials) with examples, questions(certain answers or article questions) and tests at each level from beginner to advanced one. In addition, it gives hints and corrects the false answers. One person or a collaborative team can use it so that it considers as one-to-one or many-teachers experience to one student from teaching side and one-to-many students from students side.

2. LITERAL REVIEW

There is no determined domain or relative type for ITS. The earliest system was Pascal's Calculator as mechanical intelligent systems created at 17th century by Blaise Pascal, which was capable of doing calculations using mathematical functions. At that time, Gottfried Leibniz was trying to apply

rules and logic on the computer that facilitated the rapid evolution of computers.

Through the work of Leibniz and other philosophers and developers, private tutoring systems have now expanded to include multiple types, and have entered many fields as SHERLOCK in industry to train Air force technicians, and CODES as a Web-based environment for music prototyping and at trade discipline Pascal was a strong system with continuous development until now. The inventions and innovations in this open field have also extended to medicine with CARDIAC tutor to support students, and medicine trainers at cardiac arrest problems using variety of treatment steps.

Despite all this, the share of the field of education was the largest, as it included the education of illiterate people, students of all levels of school, university students and even post-university practitioners as mentioned in the CARDIAC system. Some of them: ANIMAL WATCH to teach student from 10 to 12 years-old, how to deal with mathematical problems according with text questions about endanger animals. PAT (PUMP Algebra Tutor or Practical Algebra Tutor) was developed by the Pittsburgh Advanced Cognitive Tutor (PACT) Center to help students at 12-15 years old successfully use algebra to solve problems and to see its relevance in both academics and the workplace where it represents the information in various ways (text, tables, and graphs). As the previous tutors, there are ACTIVEMATH and MATHEMATICS TUTOR related to mathematical problems but at various study levels. In another field, such as the difficulties in reading texts for children, the tutoring may not interrupt him while reading using a microphone until the end of sentence and then it

correct the pronunciation [1] . While enhancing the student's perusing and reading comprehension, REALP was prepared to give them a series of exercises based on purposed vocabulary after reading lessons [57] .

On the other hand, university students have some of these useful tutors for example: SQL-Tutor to retrieve data from databases using SELECT statement, COLLECT-UML is paired student tutor to work collaboratively on UML class diagrams and provides feedback at domain level [57] .

The integration of physics with technology was evident in ANDES TUTOR that intended for use in universities, high schools and courses to help the user to solve physics problems instead of using papers [3]. In addition at geometric GEOMETRY EXPLANATION or GEOMETRY COGNITIVE TUTOR is one of the top existing tutors for solving geometry problems and providing support as hints and feedback to land at more precise mathematical explanations [56] . There are many tutors available in different fields such as programming languages, Mathematics, education, health, and security[44-53].

In this paper, we used Intelligent Tutoring System Builder to set up Intelligent Tutoring System to learn Excel.

3. TUTOR STRUCTURE

ITSB was designed using Delphi Embarcadero XE8 2015. خطأ! لم يتم العثور على مصدر المرجع. with Arabic and English languages presentation. It is used at two ways: Teacher staff for adding the education material, examples, illustrative pictures, videos, and questions, and Student form for studying the lessons at every level, and response by answering the questions.

Tutoring systems are generally shared at some (main) features and different at others as shown in Figure 1. Excel Tutoring System has: student model, domain model, teaching model, and user interface model.

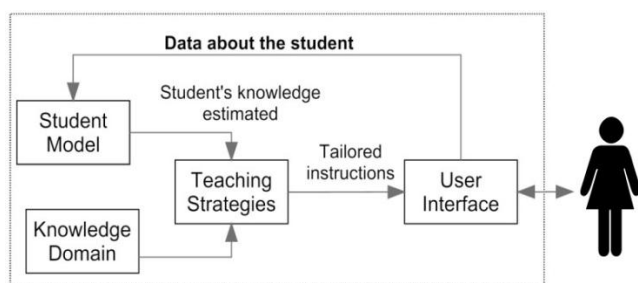


Figure 1: Typical Architecture for Intelligent Tutoring System (ITS)

3.1 Excel Domain Model

The domain has two targets, one for containing, arranging and organizing the lessons (Domain Organization Model),

and the second is a store for the material taught by itself (Repository). خطأ! لم يتم العثور على مصدر المرجع.

The teacher sets the lessons in a specific order in the "lessons" folder in the format of ".rtf". The tutor performs the rest of the tasks in terms of organization and shows them sequentially as appropriate to the user.

The teacher then puts the questions and organizes them with specific difficulty levels and the system helps to link them to its lessons.

Therefore, when the student answers a set of questions related to a specific lesson, and the tutor evaluates him/her, if he/she passes the trajectory (the limit of failure), he passes it to the next lesson. If not, it will force him/her to return to read the lesson again before going to the next lesson.

Excel tutorial covers the following subjects:

- ❖ Introduction to Microsoft Excel 2013.
- ❖ Transporting between Cells.
- ❖ Cleaning Data.
- ❖ Data Types.
- ❖ Auto fill features.
- ❖ Excel Charts and Charts.
- ❖ Pivot Tables and Pivot Charts.

3.2 Excel Student Model

This section is specific to the student but is also related to the domain model. Each student has his or her own profile including the student's name, student's number, specialization (Major), general average (GPA), degree of difficulty, current grade, current lesson, question number, and overall score.

All of this information is kept confidential, and is used to track the student and measure the extent of his progress each time from the previous time. It focuses on the development of educational tutorials, with knowledge of the student's situation in terms of concentration and emotion, to bind to the ability to answer questions with different degrees of difficulty and improve the performance the next time.

3.3 Excel Pedagogical Module

In fact, students do not learn at the touch of a button, so the old teaching theory that depends on feeding, receiving, then memorizing has not worked and does not consolidate information in the minds of students to take advantage of it for the long term.

Therefore, the Excel Tutoring System has never relied on this theory at all, but it uses advanced theories and methods of learning that focus on understanding and absorption the

student of the information and explaining it in different ways and means that make it easier to remember.

The system does not interrupt the student during the stage of understanding or solving the questions, even if the answer is wrong, however it presents the correct answer to him after the end of the solution, and shows help if needed. The structure of student steps in ITS shown in Figure 2.

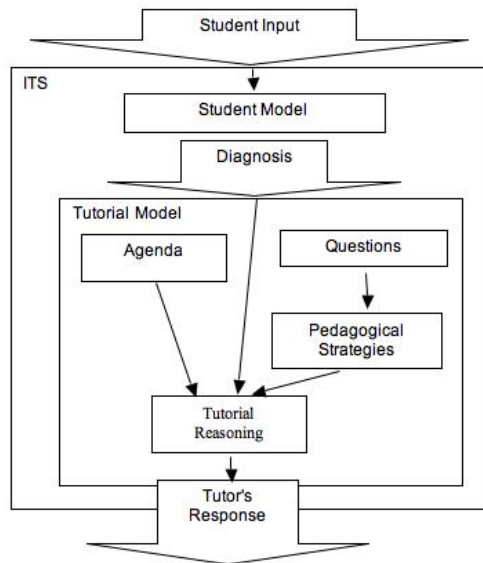


Figure 2: Student steps in ITS

3.4 Excel user Interface

User interfaces are an important and essential part of the Excel learning system. There are two types of user interfaces: teacher interfaces and student interfaces. Each of them sees facades that differ from each other.

The teacher is the ground of the system as the interface used is empty shell. The teacher will place basic system data such as the name of the system, the name of the teacher or the author of these lessons, a background image of the system's main interface, the language of the system (Arabic-English) or vice versa , the colors to be used in the system, the font size, questions, buttons, and others. The teacher also registers a new student and puts all of his / her data mentioned above in (Excel Student Model). In addition, the teacher sets lessons and questions with the characteristics and order mentioned in (Excel Domain Model) so that the system will then use his theories of education as mentioned in (Excel Pedagogical Module). Thus, the system becomes an independent field for this teaching material, as shown in Figure [3, 4, 5, 6, 7, 8].

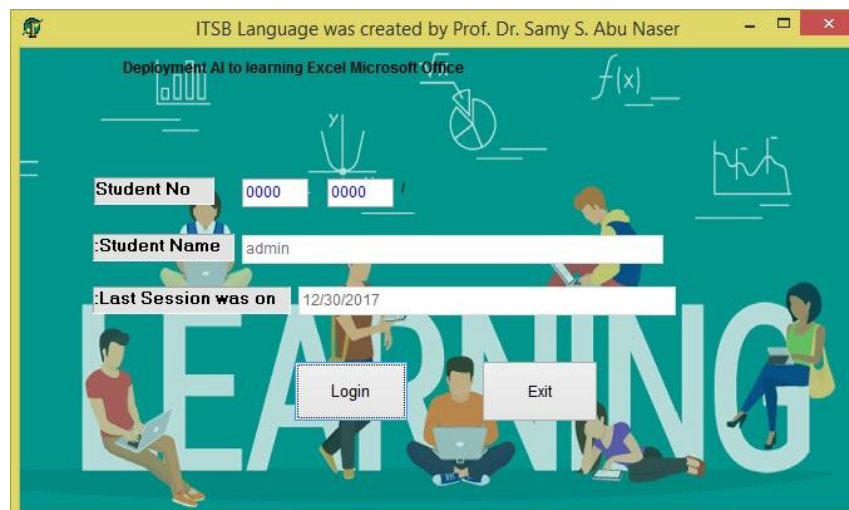


Figure 3: Admin Login Interface

Element	Background Color	Font Name	Font Color	Font Size
Forms	clSkyBlue			
Labels		Arial	clBlack	9
Buttons		Arial	clBlack	9
Page Sheet		Arial	clMaroon	9
Richedit	clWindow	Arial	clBlue	9
List Box	clBtnFace	Arial	clBlue	9
Combo Box	clBtnFace	Arial	clBlue	9
Edit	clWindow	Arial	clBlue	9

Figure 4: Updating features Interface for ITS screens

Enter Title of The ITS System (English) Deployment AI to learning Excel Microsoft Office

Enter Title of The ITS System (Arabic) توظيف الذكاء الاصطناعي في التعلم على برنامج مايكروسوفت إكسل

Enter Name of creator of the ITS (English) Sabreen Qwaider

Enter Name of creator of the ITS(Arabic) صابرين قوايدر

Enter name of Background Image Image C:\Users\itcs6321 - 2017\images\learning1.jpg

Enter the meaning of @ symbol

Figure 5: Updating features for Main Interface

Lesson Details

Type
☒ Lesson ☐ Example

Title of(Lesson/Example): Lesson 3

Lesson/Example List:

- 1stLesson.docx
- 1stLesson.rtf
- 2ndLesson.docx
- 2ndLesson.rtf
- 3rdLesson.docx
- 3rdLesson.rtf

save Close

Figure 6: Inserting Lesson Interface

Form8

Auto ID 12

Name(Lesson/Example) Introduction of Microsoft Excel

Example for Lesson No

Type (Lesson/Example) L

Path of the lesson/example Introduction To Microsoft Excel.rtf

Audio Name (optional)

Close

Confirm

Delete record?

OK Cancel

Figure 7: Updating Lesson Interface

Figure 8: Student Registration Interface

As for the student interface, it displays a screen to display the lessons, and other examples either in the form of illustrations or videos.

There is also a special interface for questions and exercises, followed by a destination to present the result of evaluating student performance, as shown in figure [9, 10, 11, 12, 13].

Figure 9: Student Login Interface

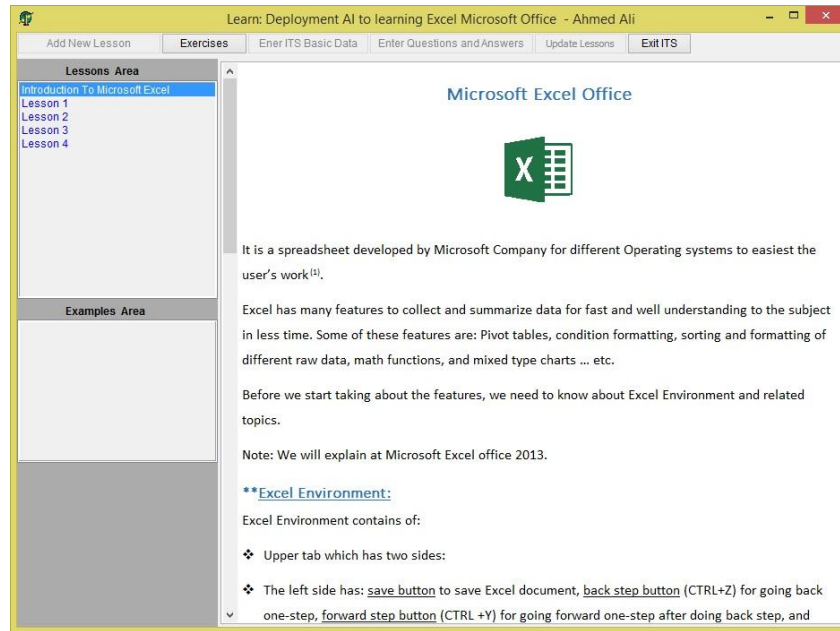


Figure 10: Lessons Interface

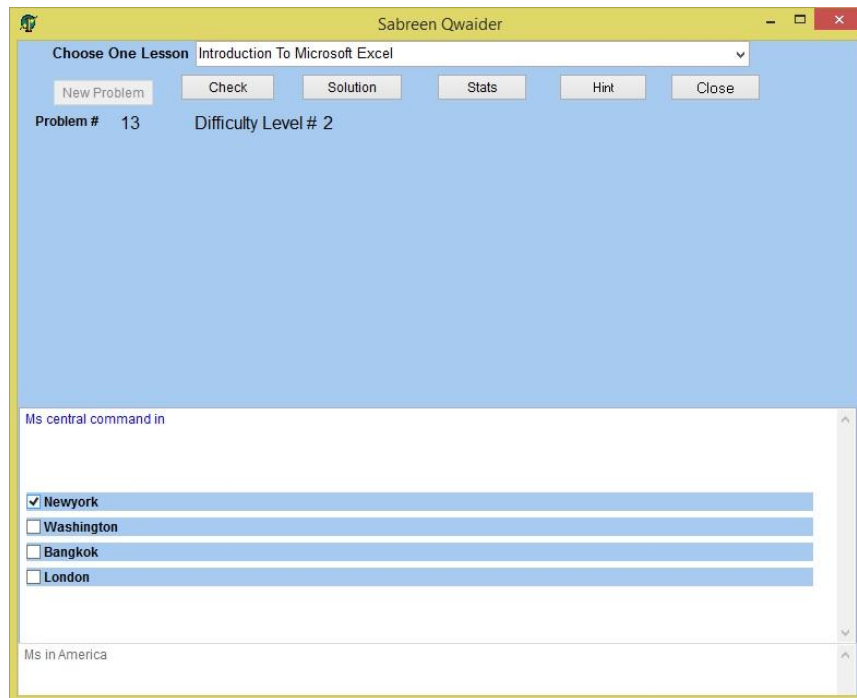


Figure 11: Questions Interface

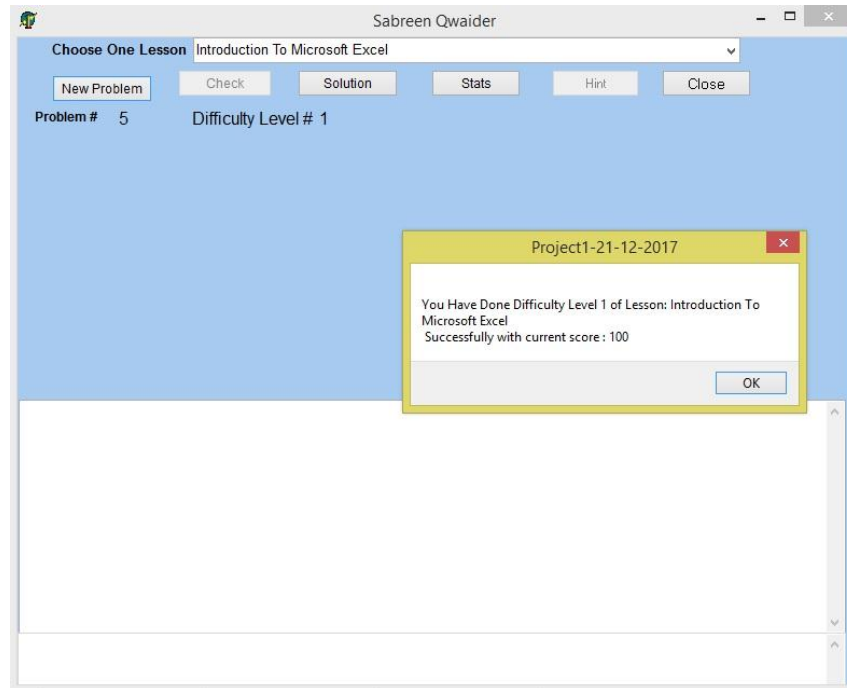


Figure 12: Estimation-Passing Level 1- Interface

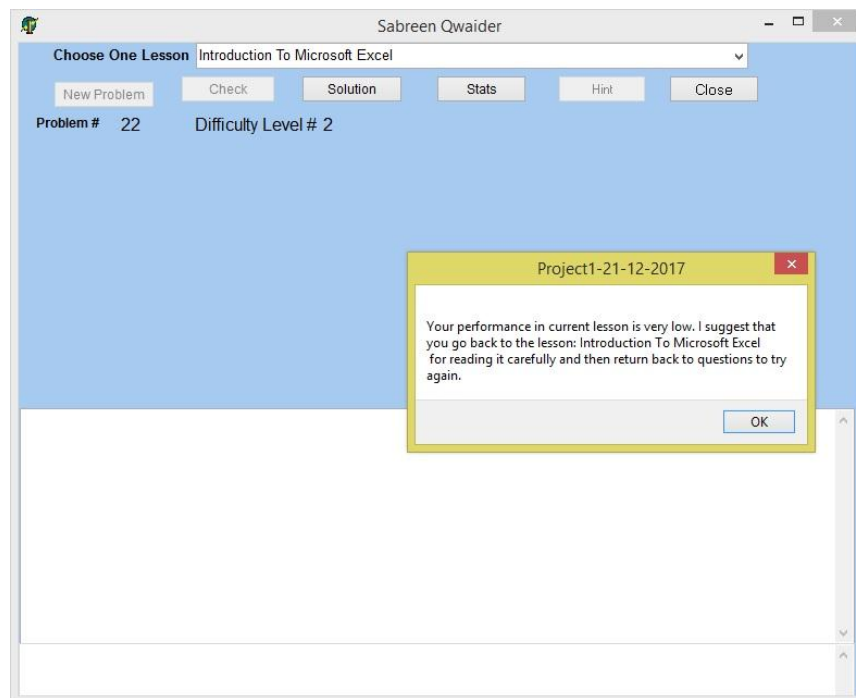


Figure 13: Estimation-Failure at Level 2- Interface

4. EVALUATION OF THE EXCEL ITS

The evaluation of the system was based mainly on the views of both the human teachers of Excel and the students who did not have any previous experience of the Excel. They were asked several questions in terms of ease of dealing with the system, efficiency, and in terms of educational material

used in the explanation if it is clear as required for novice students, the examples used are clear, and if the questions used meet the purpose of establishing the information in mind. Also if there are any suggestions for development of the program.

The answers were as in the following table for both the first students), as shown in Table [1].
class (Excel's teachers) and the second class (junior

Table 1: The result of the evaluation of Excel ITS's user

Category	Excel Teachers	Novice Students
Tutoring System		
Ease of dealing with the system	%96	%95
The system's flexibility	92%	94%
Education materials		
Tutorial is appropriate and clear	90%	90%
Examples are easy to understand and can be applied	93%	92%
Questions ranging in degree of difficulty	88%	89%
Opinions for Development	We strongly support the program but want to have a pretest done before to make the system suitable for students with prior experience moving directly to their level.	We have a greater incentive to learn Excel. The system is interesting and easy to deal with, although we wish there is a panel like Excel in the same program to apply examples instead of moving between the system and the program.

5. CONCLUSION

In this research paper, the intelligent tutoring systems (ITS) were generally clarified and their internal structure, with a clear demonstration of the function of each system's part, for both tutoring users (the teacher and the student).

After that, we have dedicated the system to Excel's intelligent tutoring system, the topics covered in it, and how the user categories of the system can be used, while making use of it effectively. In addition, screenshots of the system were used to illustrate this. Finally, the opinions of teachers and students were presented in detail and their suggestions for development.

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