

Teaching the slow learner students with and without e-learning environment

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Abstract: *The applications of the data mining in the recent years have been improved in order to classify and mine the characteristics and the records of the learners in the environment of E-learning. The main aim of this study is to help the learners and predicting the results of their studying; which can be simply achieved by finding the effects of e-learning systems as well as the effect of traditional on the student by using classification techniques of data mining. Another goal in this paper is to discover the difference between E-learning and traditional learning by developing an online learning system and apply it to the student and exclude the best pattern with the results. Furthermore, to discover the result of the traditional learning many teachers have been asked about the student patterns and then these patterns have been collected and analyzed using the Weka program. After that the traditional learning results have been compared with the E-learning patterns to discover if the data mining techniques are effective in predicting the results of learners studying.*

Keywords: Data mining; classification; clustering; education; application of data mining; traditional learning; E-learning.

1. INTRODUCTION

A. Background

Education is a comprehensive concept that contains methods of learning. A method of learning is a process that includes the procedures used by the teacher to achieve particular targets for the students. Some of the traditional methods of learning include distance learning, discussion, lecturing, teamwork, workable demonstrations, lab, programmed instruction solving problems, discovery, Inquiry and others as mentioned in [1]. Advances in communication and computer technology have altered classic methods for learning. Since 1960's much potentials and money have been placed on developing computer-based education systems. Currently, there is focus to use the computer and communications technologies in education, recently, distance learning classes can be self paced learning materials and threaded argumentations transferred over the web to concurrent classes where students can learn through audio, text, or video on the web system. On the other hand, distance E-learning provides fewer chances to measure the reactions of students as clear in a traditional classroom as mentioned in [1]. The evolution of computer technology has opened up new potentials for training and education. Currently,

Computer-based learning techniques provide an environment to create interactive interfaces, due to the improvement of communications and computer technologies. The usage of E-learning is not limited to the place and time. The student can learn any place and at any time as they desire, according to authors in [1]. Distance E-education is a mode of transferring education and materials to students who do not physically exist in a classic setting such as a schoolroom. The main advantage of Distance learning is that the students and the source of information exist in separated areas by distance and time or both. In other words the students and the source of information are geographically distant as mentioned in [2].

B. Research Significance

The current study will design a system that can be very useful in defining the patterns of better achievement to help slow learners in enhancing their academic achievements; this can be signed in the following fields:

- Find out if the data mining techniques are good in E-learning and traditional learning.
- Schools of slow learners: where they can guide slow learners to achieve higher education and academic achievements
- Slow learners: by developing their skills and educational levels.
- Teachers of slow learners: where their efforts could be saved by this system.
- Materials of slow learners: these materials could be designed in suitable patterns that help slow learners in their education speed.

2. Literature Review

The development and improvement of the clever e-learning systems is a result of the development in the machine learning which are used in the educational field. The main source of databases is then heaped up in educational materials. Finding out the appropriate methods after assorting those databases to restoring information from them form the requirements for new paths. In this goal, to produce and extract a worthy analysis, the data mining supplies a strong methodology for it. To understand the student's activities, the techniques of data mining can resolve the related information, results and make various points of views. In the paper, the main aim of it is to use the data mining as a main stage in the process of building a modern generation of clever e-learning systems in a

different domain and assignments as mentioned in [3]. E-learning is abbreviation of electronic learning, which is acting as a method of technological, educational that aims to improve the process of education via supplying easiest methods and approaches in the learning which is depending on the multimedia technologies [4]; from the e-learning materials a big amount of information is composed. So that, the process of analyzing this data manually, becomes very complicated. Some of the tools help in the process of reporting a useful information which is worthy in analyzing the pattern behavior of the student [5], but such tools do not submit features that needed in the process of evaluating and keeping track of the activities of the students in the class, and recommendation to develop the performance of the students and overcome the lower grades of the students [6]. The "Knowledge Discovery in Database" (KDD) and data mining is the extraction of the interesting and implicit patterns automatically from a big amount of the data [7]. KDD has been used to improve and evaluate e-learning systems not only provide a model for the process of learning [8] or in student modeling [9] through finding out helpful learning information [10]. A different information results can be analyzed using data mining and produce various perspectives to comprehend more about the activities of the students to allocate the course to learn the students. Moreover, using the technique of data mining in the database which is used in the process of education provide a useful and deductive recommendation which used in the academic schema in education academy to improve their process of decision making, in order to develop the academic performance of the students and to depress the failure rate. Also, data mining used to understand the students' behavior in a better way and to help the instructors. Finally, to develop the process of teaching and obtain many other advantages [11]. The definition of the e-learning in relevance to technology [12], in the "e-learning", the letter of 'e' concerning the 'how' the "electronic storage" of the digitized learning subjects [13]. Recently, the definition become includes the mobile and wireless technologies in the process of learning and includes the virtual worlds. As a result, the terminologies of this specific technology are now counted as a subset of the e-learning. The word of 'learning' in the 'e-learning' relevance to 'why' and 'what', "the content and ways to help people learn it, in order to achieve educational goals or to help organizations build skills related to improved job performance" [13]. Willems appended the 'where' of the e-learning, accordingly to the context of this directive or learning and styles of participation. So that, these additions out with this definition; the e-learning is "the use of digital technologies to support the processes of teaching and learning" and "instruction that is delivered on a digital device such as a computer or mobile device that is intended to support learning" [12, 13]. The technique of data mining can find out helpful information that can be utilized informative estimation to aid educators to establish an educational basis for decisions when modifying and designing approach or teaching environment. In the educational

systems, the data mining application is a repeated cycle of testing, refinement and hypothesis formation [14]. The "mind knowledge" must get in the loop of the educational system and guide, enhance and facilitate learning process as a whole. So, it must filter the "mind knowledge" in the decision making, not only conversion that data into mind knowledge. The learning tasks which favor and develop their learning process, propose path shortening and pruning or links to pursue simply, propose perfect learning practices for the students, depending on the tasks which are done by the students and their successes, and on the tasks that done by other students [14].

3. Traditional Learning versus E-Learning

In order to define the process of learning, it can be defined in this way, that person can get the knowledge and learn in various ways from helping others in the learning, questioning, doing, watching and listening. Different knowledge processes available for different learners, priorities of the learning style and the past experiences have been applied in the process of learning. The learning style that deal the learner in an individual way, will impact on the manner of processing information during thinking and learning, and this will be have a major impact on the effectiveness of the learning and the efficiency. There are 3 dimensions for the preferences of learning [15]:

- "Dependent Learners": in this dimension, it prefers an instructor, programs that highly structured with straightforward assignments and estimate by the instructor of the course.
- "Collaborative Learners": in this dimension, it has a discussion oriented and support group projects, social interaction and collaborative assignments.
- "Autonomous Learners": prefer to practice an impact on the structure and content of programs of the learning which is the instructor is the resource of it.

Traditional learning, it is also known as customary education, conventional education or back-to-basics. It refers to the traditional customs which are found for a long time in the schools and the society deemed appropriate traditionally. Some of the education forms repair raises the adoption of advanced learning practices, a more total approach that concentrate on the needs of the individual students' and self-expression of them [15]. What is the definition of the E-Learning? On this side of the definition, it begins from the consideration of the E-learning as the using of network and computer in the process of transferring the knowledge and skills. It refers to ultimate the electronic processes and applications in the process of learning. These applications and processes contain "computer based learning", "Web based learning", digital collaboration and virtual classrooms. The content of the learning is transferred via internet/extranet, CD-ROM, video tape, audio tape, Internet, satellite TV. E-learning includes media in text form, streaming video form, image, animation and audio form, and it can be instructive or self paced [15]. On the side of the activity feature of the learning, in the e-learning systems the students can share their contributors in the debates and express their opinions,

on the contrary in the traditional learning which a single student in a given period of time can express herself or himself. Furthermore, a lot of discussions can be convened simultaneously and the student can be involved concurrently in various topics and express his/her opinion, but in the traditional learning there is just one topic which can be the student expressing his opinion at a time. When the discussion takes more time, it helps the learner in developing his/her ability of understanding the complex concepts [16]. The process of interaction between the students in the e-learning is higher than the traditional learning, and this interaction is reflected in the amount of the messages which are transferred between the learners in the groups of the study and in the reports of students. The students supposed that communication by using computers is more convenient for expressing the student oneself, but in the traditional learning the interaction between the students is less than e-learning. In the e-learning the students have the capability to control the process of learning and to log in into any course at the convenient times and when they feel that they are able to receive information [16]. When we study the side of learning communities, the community is emanated of the communications between the users of the networks, so the networks are a substantial source of the knowledge of the students that support the society. The community is permanently available and in presence, every student has the prerogative to express himself, and any question that he raises find an answer for it. In the e-learning systems, the students have a freedom of the social restraints of gender, perspiration and the appearance, which occasionally prevent them in the process of the traditional learning [16]. In the e-learning process, one of its features is the non-attendance of the social and physical representation of the sharers, which make the ability of expressing themselves more freely, but in the traditional process of learning the social and physical representation may be caused frustration for expressing themselves. In the e-learning there is no need to vie for the "air time" for the different learners [16]. After comparison between the traditional learning with the e-learning using a conformable course, the learners have expressed contentment from the e-learning, and rated the process of learning as more influential than in the traditional learning process. Also, other studies announce that the e-learning or computer mediated is more interactive and effective [17]. The e-learning systems contains many components which are commonplace to the traditional learning, like; the arguments of transferring information, presentation of notions by the learners and discussion group and accumulating knowledge. The content of the e-learning course's curriculum have been arranged according to topics and in a serial way [17]. There are some of the advantages that exist in the e-learning process and not exist in the traditional learning like; strengthen the process of the communications between the students, the time which is taken for digesting information and responding to it, quality and urgency, information that obtained and transferred between the students themselves, the capability to behave an begin a discussion, where the

learner obtains more of an egalitarian standing than in the discussion of the traditional learning which is face to face, the ability of accessing to discussion and to information, the ability to responses to the discussions around the clock without limitations, involvement in the process of learning from the learners side and higher motivation [17]. It can make comparison between the traditional learning and e-learning from the class discussions side. On this side, in the traditional learning, the teacher commonly talks and speeches more than the learner, but in the e-learning process the learner talks as the teacher or more than him. From the learning process side, the process of learning is done by the participating the whole class, but in the e-learning most of the process of learning happens in group styles or individually. From the teacher's role side, the role of the teacher in the traditional learning is the authority, but in the e-learning the role of him is to direct the learners into the information and the knowledge [17]. When the traditional learning compared to the e-learning of the subject matter, the process of the comparison out with this result, that in the traditional learning, the teacher precedes the lesson in accordance with the curriculum and the study program, but in the e-learning the process of determinate the subjects, the study depends on different sources of information, such as net-experts and data banks which are located by the learner. From the side of the location, the place in the traditional learning in the classroom in the school, but it takes several locations in the e-learning. The lesson structure has been dictated by the teacher and he divides the time of lesson, but the structure influenced by the dynamics of the group [17]. When the traditional learning compared with the e-learning from the emphases in the learning, the process of the comparison out with this result, that in the traditional process of learning the learners not learn "how" but learn "what" just, the learners and teachers are busy with finishing the required topics, the learners are not involved in investigation education and in problems solving, but involved in the tasks which are set by the teacher. From the other side, the learners learn less of "what" and learn "how", the process of learning contains research study that merges searching for and gathering information from the data banks. From the motivation side, the student's motivation in the traditional learning is low, and the issue of the subject is "faraway" from them, but the student's motivation in the e-learning is high because of it involve them on the issues that are nearer to them and because of the technology [17].

4. Data Analysis and Discussion

A. Participants' Behaviors Patterns

The following figure shows a part of the frequencies for 500 instances of the experiments of the E-learning system and the traditional learning; this figure is generated by the software of Weka. To explain the figure more, the table in the middle of the right side of the figure shows the patterns in the column (Label) and the frequencies out of 500 in the column (Count). The flow chart in the lower right side of the figure shows the frequency distribution graphically.



Figure 1- E-learning and traditional learning Frequency distribution

B. Pattern classification

The following show the run information of the REP classification tree. The next figure shows the E-learning and the traditional learning.

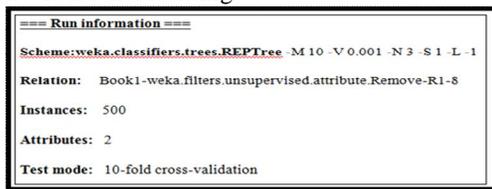


Figure 2 - E-learning and Traditional learning Run Information

It appears from the run information of the E-learning and traditional learning that the REP tree was used as a ready to use functions for the used 500 instances with two attributes (total and activity). The used test model was selected to be the '10-fold cross-validation'. The researcher used the full training set of the classifier's models to build the REP tree. The next figure shows the E-learning and the traditional learning classifier model.

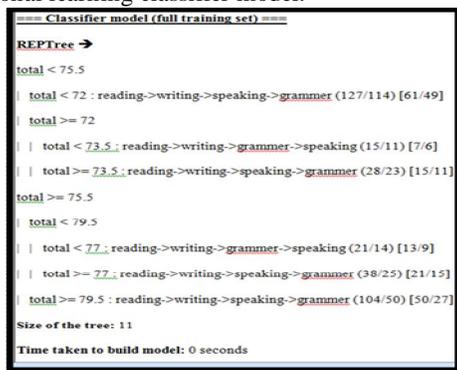


Figure 3-E-learning and Traditional learning classifier model

The size of the resulted REP on the E-learning and traditional learning tree was 11, which took 0 seconds to be built. After that, the weka resulted that the REP tree is stratified cross-validation and then summarized the findings of the tree. While the size of the resulted REP on the E-learning and traditional learningtree was 9, which took 0 seconds to be built. After that, the "Weka" resulted that the REP tree is stratified cross-validation and then

summarized the findings of the tree as the following figures. The next figure belongs to the E-learning and the traditional learning.

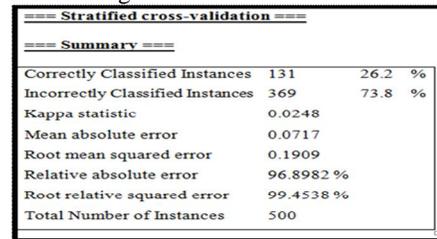


Figure 4- E-learning and traditional learning cross-validation

According to the summarized results in the E-learning and traditional learning, it was clear that the correctly classified instances of the total instances were only 131 out of 500 instances with a percentage of 26.2%. On the other hand the incorrectly classified instances were 369 out of 500 instances with a percentage of 73.8%. In regards to the Kappa statistic, it was 0.0248 and the mean absolute error was 0.0717. The root mean squared error was 0.0717. The percentage of relative absolute error was 96.9% and the percentage of root relative squared error was 99.45%. However, the results in the traditional learning are same as in the e-learning. Finally, the REP tree resulted from Weka software after processing data is shown in the following figure. The next figure belongs to the E-learning and the traditional learning.

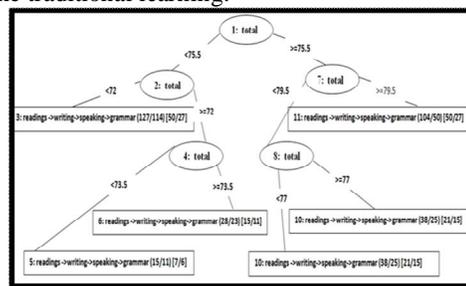


Figure 5-E-learning and Traditional learning REPTree

From the previous study, it's clear that all the results in the e-learning and the traditional learning are same. The best results in students' academic achievement were related to the following pattern in both the E-learning and the traditional learning: Reading- Writing – Speaking – Grammar. Where, the students who followed this pattern achieved the highest academic achievement's rates in both the E-learning and the traditional learning.

5. Conclusion

The benefits of e-learning tools are innumerable since e-learning has developed the learning and teaching methods in an obvious way. There is no doubt in the facilities that have been offered for teachers from e-learning tools; where there are many problems that faced teachers who use traditional teaching methods, in which e-learning have solved those problems effectively. There are huge databases appeared in various computerized systems which require special algorithm to retrieve information. Actually,

retrieving information from databases is not a simple process, especially when these databases include huge amounts of data. Therefore, many efforts have appeared recently in order to find special algorithms to reorder the data and documents within databases with the purpose of facilitating the retrieving process from those databases. A lot technological developments have appeared in different sectors, such as educational sector. In fact, developments in educational sectors have appeared before the appearance of technology where each teacher has developed some educational methods to help him/her in teaching their students such as illustrated graphs, experiments, grouping students, and many more tools. After that, the appearance of technology affects the education positively where many of technological, educational methods have appeared such as e-learning tools. E-learning is considered as a very effective learning method and it affected on students, teachers and many other educational aspects positively. Many types of e-learning tools have appeared recently; therefore, these tools have been divided in accordance with different perspectives such as student's synchronization and the availability of teachers. The idea of this project can be summarized as follows; there is a quiz at the end of each electronic lesson which has been implemented using ASP.net along with #; whereas the main purpose of this quiz is to check the understanding degree of students. Also, at the end of each quiz, there is a final exam, where the main purpose of this exam is to access the best pattern. After finishing each quiz or exam, marks of these quizzes and exams have been stored in the system database taking into account the pattern and the arrangement of these quizzes. In addition, after filling the database with the marks and patterns, all patterns are compared with each other, so that the highest mark pattern is chosen as the best pattern to teach in the future. The system does not force a particular order of parts to follow-up with students who are slow learners in English e-learning classes. Some students start with the listening part, other students start with the reading part and so on. Through focusing on slow learners' students, there are many courses that available for those students who suffer from some problems that make them learn in a slow manner comparable with their equals in normal classes. Across this study, a new English e-learning course for slow learners is designed. The English e-learning course for slow learners is designed in many languages to produce a system that keeps track of each student behavior and grades in each quiz after each lesson. This system contains five different units. Each unit has four parts; (Listen and Chant, Listen and Read, Listen and Match, and Read and choose). Each part contains two levels; material level that explains the idea of the part, and the quiz level that assesses the understanding level of the student for the skills required. There are "24 pattern" can be obtained simply by tracking students' behaviors in the e-learning environment and "9 patterns" in the traditional learning. The relations between the patterns and the academic achievement have been illustrated in order to find the final results that show the relations between the followed patterns and the academic achievements. To find

these results, the function of "REP tree" was used from "Weka software" as a classification method. The best results in students' academic achievement were related to the following pattern in both the E-learning and the traditional learning: Reading- Writing – Speaking – Grammar. Where, the students who followed this pattern achieved the highest academic achievement's rates in both the E-learning and the traditional learning.

6. Recommendations

According to this system, there are some proposed ideas or future works that may be added to the system; in order to be more comprehensive in the future. Firstly, the sample size can be increased to become more than 456 students, until to collect and analysis the data from the largest possible number of students. Secondly, use more than one "classification algorithms" in order to get more results and compare with each other, to reach the best algorithm that can be used in this project. Lastly, this project can be applied on multiple courses in addition to "English course". Also, it can include multiple grades in addition to fourth grade, and reach to academic level for each grade.

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