Adaptive Social Learning Management System to Develop University Students Achievement

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Abstract

Course Management Systems (CMS) tools, e.g. MOODLE, have no longer effective for eLearning. Most CMS are one system fits all. Learning styles Visual-Auditory-Read and Write – Kinesthetic (VARK) would be used to improve students' cognitive achievements. This thesis presents the results of delivering a course using VARK. This course named Database 2. It has been delivered to third level of management information system department (Arabic Section) at Thebes Academy since 2010. A design criterion list, for the selected course, was prepared taking into consideration the VARK learning styles. Students' achievements were measured before applying the proposed framework in the first semester 2019.

The experimental group consists of 150 students from the selected research society. The experimental group where divided into four groups according to the electronic VARK learning style. A questionnaire was an experimental tool designed. Course contents were developed by applying the design criterion. The Edmodo was used to manage and deliver the contents. A pre-questionnaire was provided to each student in the experiment group. The answers of each student to that questionnaire determines his/her learning style. The research results demonstrated the impact applying proposed framework. The final results of applying the proposed framework showed improvement of students' cognitive achievements.

Keywords: *Adaptive E-Learning, Learning Style, Learning Management System, social learning*

1. Introduction

The technology is one of the most important factors that affects the educational fields in which it changed the way of learning for both learners and instructors in which the process of learning has changed the way of thinking from "it is not what to learn? To it is how to learn?". In the 21st. century the way of living our life's is been changed many times than it was before especially in the fields of educations and this is because of a lot of variables that is been discovered (appeared) these days, the most main variables that caused this effect and change beside the other variables can be considered in the following three arrangement as their level of priority which are the technology which played a very important role in the fields of education, the information that is gathered, assembled, collected to be used (designed) in the learning material and delivered to the students(learners), finally the way of communication that is done during the process of learning which can happen between the students with each other's or the students with their contents or the students with their teachers(tutors) [1].

The variables that has been discussed is known as the Information Communication Technology (ICT) and these variables have got the attention of all the researchers who are searching in the field of educations to make the educational process better that it was in the traditional education, beginning from the planning of how to build a learning material that considers and puts in mind some considerations like the learning objectives and the students difference passing through the designing of the learning material until finally delivering the material learning contents at anytime, anywhere and by a way that suits each student [2]. Abdelhafez etal focused on different aspects of eLearning in higher education in Egypt and to discuss the quality assurance issues, challenges, and opportunities in eLearning/distance education [3]. Radwan etal presented a better understanding of the differences between the multivalued logic models in managing uncertainty in expert systems. They discussed the uncertainty models adds value to select the appropriate model for a problem and get the desirable results [4].

The technologies changed a lot of things in the fields of education than it was before where the teacher had to communicate with the student face-to-face at a certain place and time where the students had to know everything directly from their instructor who was the only source of the information needed at that moment. This means that the traditional educational didn't put in their consideration or in mind or even took care of the student behaviors or attitudes or differences in the educational process and the only thing that was taken care of was the content only and nothing else except the content. The technology is one of the most reasons that makes the learning and educational process be developed by discovering some new tools and terminologies that make the learning and educational process work more efficiency and effectiveness [5].

These tools and terminologies that are related in the learning and educational fields must be focused on to develop the learning and educational fields to improve the level of our learners and students. From the tools and terminologies that need to be focused on are (electronic learning-learning management system – learning styles – Artificial Intelligence – Adaptive Learning –Social media.)

 Adaptive learning which is responsible of selecting the suitable way that the content can be delivered to all the learners depending on their learning styles.

Social Media tool makes the way of communication between the learners and teachers closer and easier between each other online using for example the mobile devices or any other devices supported by the internet and from the online websites that is related to social media tools are Facebook, Twitter and Google plus. These social media tools can help in knowing the learning styles of the learners by tracking their clicking and knowing which type of style for each learner by tracking their interactions with the content presented in these social media.

The Learning Management System (LMS) is a "one system fits all", this means that one system would be presented in the same manner (behavior) to all students. The nature of understanding to each student various among other students when a certain information is presented to them, so each students receives the information that is been sent to him and understands it depending on his-her way of learning styles consequently there are students who like to understand by reading text, other students prefer visual pictures and graphs in the content, some other students prefer discussion groups some other students prefer video clips.

The Learning Management System (LMS) takes care of the content only and denies the learning styles of the students which is supposed to differentiate between every student and another. The Learning Styles are very important in the learning process because it determines

which kind or type of content would be suitable for every student. The Learning Style will help in delivering to the student the appropriate type of content they would like to get to accomplish their learning studies.

The ability of the system or the learning environment to be flexible in changing and diversifying what it offers, whether content, processes, methods, or learning strategies. It can be characterized by certain features that classify the learner whether individual learner or group abilities to distinguish a particular group from other learning groups.

In this case, learning environments take into account the great diversity that providers observe in learners. Providers take into account the distinctive features of each learner when designing the structure of this environment. The development of e-learning and artificial intelligence systems have helped to emerge these environments Adaptive, and made it possible to provide learning that depends not only on space and time, but also on each individual according to his needs, characteristics, trends and preparations, which are measured and determined accurately before entering that environment for learning, and then provide what is necessary and appropriate for each learner according to this specification.

"In this era of rapid change, cognitive conflict is a constant challenge to be faced. James Nottingham's Learning Challenge offers learners of all ages a place to be and a process to recognize and engage with. Offering young learners the opportunity to contend with the tension that goes with being ′in the Pit′ and think and talk about their own learning is immensely valuable. My experience, working with this concept is that it works!" commented by Simon Feasey (School Principle).

In this paper there will be one of the pedagogical learning styles that is known by the VARK learning styles as a way to fill in the gap that didn't do it the learning management system (LMS) which will divide the students into four groups as there learning styles, so that the visual student can get the suitable content which is provided with the picture, graphs, also the Auditory student can get the suitable content which suits them which is provided by the narration and auditory sounds, also the Read and Write student can get the suitable material that suits them, also the kinesthetic student can get the suitable content that suits them.

2. Research Organization

2 .1 Research Problem

In this research there is a weakness in the levels of student's achievements of the third level of management information system department (Arabic Section) for the database (2) course in the first semester at Thebes Academy.

The weakness of the levels of the student's achievements are due to the following:

• Electronic Learning Source (ELS) is a one system fits all which deliver the contents to the students without taking care of their learning differences.

• Success Rate (SR) of the year before showed that the majority of the students occurs in the fair and fail which indicates a big drop in the student's achievements.

• Students opinions that were taken from the quality assurance unit resulted that the average of the instructor was very positive when teaching the database 2 course to the students from the student's point of view who had taken the course.

• Studies and Previous studies discussed the characteristics of the 21-century education, the importance of the learning management System, the importance of using the social media

in the fields of education and the role of determining the learning styles at the beginning of the educational process.

2.2 Questions of the Research

The researcher has formulated the basic research question as follows:

How to design an adaptive social learning management system environment according to the learning styles to develop the student's achievement of the third level in the management information department at Thebes Academy?

From the basic research question there are several sub-questions which are as the following:

1. What are the levels of knowledge in the database 2 syllabus required for the development of student's achievement?
2. What are the criteria for designing an adaptive social learning management system environment according to the learning styles of the database 2 course?
3. How to design an adaptive social learning management system environment according to the learning styles for database 2 course?
4. What are the criteria for designing the database 2 course material according to the VARK learning styles?
5. What is the impact of the adaptive social learning management system environment according to the visual learning styles on developing the knowledge aspect of the database 2 course?
6. What is the impact of the adaptive social learning management system environment according to the Auditory learning styles on developing the knowledge aspect of the database 2 course?
7. What is the impact of the adaptive social learning management system environment according to the Read & Write learning styles on developing the knowledge aspect of the database 2 course?
8. What is the impact of the adaptive social learning management system environment according to the Kinesthetic learning styles on developing the knowledge aspect of the database 2 course?

2.3 Research Objectives

The present research seeks to achieve the following objectives:

- Identify the levels of knowledge in the database 2 syllabus which required for the development of student's achievement.
- Determining the criteria for designing an adaptive social learning management system environment according to the learning styles of the database 2 course.
- Designing an adaptive social learning management system environment according to the learning styles for database 2 course.
- Determining the criteria for designing the database 2 course material according to the VARK learning styles.
- Illustrate the impact of the adaptive social learning management system environment according to the visual learning styles on developing the knowledge aspect of the database 2 course.

- Explain the impact of the adaptive social learning management system environment according to the Auditory learning styles on developing the knowledge aspect of the database 2 course?
- Demonstrate the impact of the adaptive social learning management system environment according to the Read & Write learning styles on developing the knowledge aspect of the database 2 course?
- Explain the impact of the of the adaptive social learning management system environment according to the Kinesthetic learning styles on developing the knowledge aspect of the database 2 course?

2.4 Research Methodology

The current research is based on the following:

- **The Descriptive Analytical Method:**
  - To prepare a list of criteria for designing an adaptive social learning management system environment according to VARK (Visual – Auditory – Read & Write – Kinesthetic) learning styles.
  - To prepare a list of criteria for designing an electronic database 2 course material according to VARK (Visual – Auditory – Read & Write – Kinesthetic) learning styles.
  - To prepare the VARK learning style questionnaire which will determine each student learning style.

- **The Quasi-Experimental Method**
  To know the effect of the independent variables (the adaptive social learning management system environment designed according to the VARK (Visual – Auditory – Read & Write – Kinesthetic) learning styles on the dependent variable (the student's achievement in the (database 2) course for the third year of management information system department).

2.5 Limitations of the Research
The presented study is limited to the following areas:
- The VARK (Visual – Auditory – Read & Write – Kinesthetic) learning styles.
- The Database 2 course
- The Structured Query Language (SQL)
- The research experiment has been applied to the students who are in the first term semester for the third level in management information system department (Arabic Section) at Thebes Academy.

2.6 Research Variables
The research variables are as follows:

- **Independent Variables (IV):**
  An Adaptive Social Learning Management System Environment designed according to the VARK (Visual – Auditory – Read & Write – Kinesthetic) learning styles.

- **Dependent Variables (DV):**
  University student achievement.

2.7 Research Group
A selected group of 150 student was taken.

The participants had to be willing to take part in the research, to have the requirements of the experiment (any device (Mobile, Tablet, Laptop, PC) - internet connection – computer skills, internet skills and interactive participation skills), and also to accomplish the learning tasks through the proposed adaptive social learning management system environment designed according to the learning styles.

The selected group was divided into 4 sub-groups determined according to the electronic VARK learning style questionnaire.

2.8 Experimental Design of the Research

The Experimental design of the research consists of four experimental groups that have been divided and classified according to the electronic VARK questionnaire as shown

Table 1 Experimental Design of the Research

Groups	VARK Questionnaire Cognitive pre-achievement test	Experimental treatment	Cognitive post-achievement test
Visual	✓	An adaptive content according to the visual learning style	✓
Auditory	✓	An adaptive content according to the Auditory learning style	✓
Read & Write	✓	An adaptive content according to the Read and Write learning style	✓
Kinesthetic	✓	An adaptive content according to the Kinesthetic learning style	✓

2.9 Research Procedures

The following steps were taken to perform the research:

- Extracting and presenting the studies, researches, conferences, results and recommendations related to the topic or to the variables of the research to establish the theoretical framework of the research as related to the following key areas: adaptive social learning management system environment, learning style, instructional design.

- Designing an initial VARK learning style questionnaire and translating it into Arabic language so that it could be understandable and easy for the students to be able to determine their own learning styles.

- Presenting the VARK learning style questionnaire to the experts to express their opinions on some terms inside the questionnaire.

- Designing the structure of the VARK questionnaire in its final edition after taking the expert notifications in the consideration.

- Designing the final edition VARK questionnaire in an electronic way to deliver it to the students.

- Writing inside the electronic VARK questionnaire some pseudo code and adding a certain plugin (add-on) so that each student receives an automated response showing the results of the VARK questionnaire after clicking the summit button.

The automated responses are classified according to the following learning styles:

• Visual learning style:

The students in this classification will be delivered to them a visual content where they can visual pictures and graphs

- Auditory learning style:

  The students in this classification will be delivered to them an auditory content where they can hear and listen to the presented content.

- Read & Write learning style:

  The students in this classification will be delivered to them a readable content where they can read and write to the presented content.

- Kinesthetic learning style:

  The students in this classification will be delivered to them an activity content where they can interact and try by doing.

- Piloting the VARK questionnaire on some other students that have the same characteristics of the research group to measure the reliability.

- The (database 2) course syllabus that is taught in the first term semester for third level of the management information system department (Arabic Section) was analyzed with the aim of locating the cognitive aspects of the course.

- A list of criteria where determined for designing an electronic content into the four VARK learning styles.

- The list of criteria for designing an electronic content into the four VARK learning styles were presented to the experts to express their opinions on some terms inside it.

- Four different electronic contents were prepared according to the list of criteria for designing an electronic content which was presented before to the experts.

- Measurement tools were determined in the cognitive achievement tests that was extracted from a variety of questions that was assembled inside the question bank that had been reviewed before by the educational technology experts in the fields to produce the final version of the measurement tools.

- A list of criteria where determined for designing an adaptive social learning management system environment based on the learning styles

- The list of criteria for designing an adaptive social learning management system environment based on the learning styles where presented to the experts to express their opinion on some terms inside it.

- An adaptive social learning management system environment was designed according to the four learning styles and produced in its final version.

- The research sample was selected from the third level of Management Information System Department (MIS) Arabic Section in Thebes Academy. The sample was divided into groups as detailed in the Experimental Design section above. The grouping was based on the VARK questionnaires sent to the students.

- Pre-achievement test of the research tools was carried out on the 4 groups.

- The basic research experiment was carried out.

- Post-achievement test of the research tools was carried out on the 4 groups.

- The row data obtained were statistically processed.

- Research findings were obtained, discussed.

- Recommendation were made and future research was suggested.

3. Literature Review

The educational institutions and Higher education is changing quickly and rapidly and for over the next ten years will be transformed. These new potentials and possibilities will create many opportunities as well as challenges for the students, educators and librarians. [6]

Today's higher education institutions are encountering many challenging and complicated issues, including increasing student enrollment in their education programs and expanding an infrastructure—such as a Learning Management System (LMS)—in order to accommodate increased enrollment and diversified classes, and to support student learning and faculty teaching [7].

The understanding of the factors that predict the student's intention to adopt e-learning may assist the Egyptian universities in promoting the use information and communication technology in teaching and learning. [8]

There are several e-learning trends give us a view to how e-learning and learning tools will be shaped in the future like blended learning, Social and collaborative learning, Gamification, Micro-learning, Video learning, Rapid e-learning, Personalization and e-learning and Continuous learning.[9]

Edmodo is a free and secure learning platform available at www.edmodo.com. This website looks similar to Facebook, but is much more private and safe for a learning environment. [10]

Edmodo is a tool that marries the benefits of social networking with a safe, controlled environment that educators can allow students to freely operate in. Students can access Edmodo via web browser or iOs and Android Application on their Smartphone or tablet. In this manner, students can get immediate notification from any activities and or announcements posted in Edmodo as long as they are connected to the internet. [11]

The comparison between the main features of two learning management system as shown in table 2. [12]

Table 2 Comparison between Moodle and Edmodo

Moodle	Edmodo
several functions	less functions
hard holding, need install	simple, no install
need server, need support or pay hosting	no server, no hosting
interface less friendly	interface intuitive
monolithic, traditional LMS	social learning platform
less media richness	more media richness

4. Research Results and Discussions

The collected research data were analyzed before the experimental process with the ONE_WAY_ANOVA method using the SPSS version 22 to assess whether the means of the four experimental groups are statistically from each other.

Table 3 Descriptive analysis results of the experimental groups for the pre-achievement test

Descriptive								
Grade of Pre-achievement test								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Visual	30	32.57	2.079	.380	31.79	33.34	29	37
Auditory	35	33.69	2.111	.357	32.96	34.41	30	37
Read & Write	25	34.32	2.340	.468	33.35	35.29	27	37
Kinesthetic	60	34.97	2.350	.303	34.36	35.57	31	39
Total	150	34.08	2.398	.196	33.69	34.47	27	39

The descriptive analysis results of the experimental groups for the pre-achievement test showed that there are no statistically significant differences at significance level 0.05 $\geq \propto$ between the averages of the grades of the four (Visual – Auditory – Read & Write – Kinesthetic) experimental groups in the pre – measurement of the database (2) cognitive achievement test for the students who are in the third level of management information system department (Arabic Section) at Thebes Academy, so it is assumed that participants in the four experimental groups had equivalent prior knowledge.

The collected research data were analyzed after the experimental process with the ONE_WAY_ANOVA method using the SPSS version 22 to assess whether the means of the four experimental groups are statistically from each other.

Table 4 Descriptive analysis results of the experimental groups for the post-achievement test

Descriptives								
Grades of the post achievement test								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Visual	30	42.30	2.120	.387	41.51	43.09	38	46
Auditory	35	44.09	3.033	.513	43.04	45.13	36	49
Read & Write	25	40.64	2.215	.443	39.73	41.55	36	45
Kinesthetic	60	43.13	2.613	.337	42.46	43.81	39	50
Total	150	42.77	2.781	.227	42.32	43.22	36	50

The descriptive analysis results of the experimental groups for the post-achievement test showed that there are a statistically significant differences at significance level 0.05 between the averages of the grades of the four (Visual – Auditory – Read & Write – Kinesthetic) experimental groups in the post-measurement of the database (2) cognitive achievement test for the students who are in the third level of management information system department (Arabic Section) at Thebes Academy.

Table 5 Post hoc for the experimental groups of the post achievement test

Multiple Comparisons						
Dependent Variable: Grades of the post achievement test						
Tukey HSD						
(I) Learning styles experimental group	(J) Learning styles experimental group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Visual	Auditory	-1.786-*	.639	.030	-3.45-	-.12-
	Read & Write	1.660	.696	.084	-.15-	3.47
	kinesthetic	-.833-	.574	.470	-2.33-	.66
Auditory	Visual	1.786*	.639	.030	.12	3.45
	Read & Write	3.446*	.673	.000	1.70	5.19
	kinesthetic	.952	.546	.305	-.47-	2.37
Read & Write	Visual	-1.660-	.696	.084	-3.47-	.15
	Auditory	-3.446-*	.673	.000	-5.19-	-1.70-
	kinesthetic	-2.493-*	.612	.000	-4.08-	-.90-
Kinesthetic	Visual	.833	.574	.470	-.66-	2.33
	Auditory	-.952-	.546	.305	-2.37-	.47
	Read & Write	2.493*	.612	.000	.90	4.08
*. The mean difference is significant at the 0.05 level.						

The post hoc for the experimental groups of the post-achievement test as showed revealed significant differences between the visual learning style experimental group, the auditory learning style experimental group, read & write learning style experimental group and the kinesthetic learning style experimental group in which the auditory learning style experimental group (M= 44.09, SD= 3.03) has higher achievement than the kinesthetic learning style experimental group (M= 43.13, SD= 2.61) which has higher achievement than the visual learning style experimental group (M= 42.30, SD= 2.12) which has higher achievement than the read & write learning style experimental group (M= 40.64, SD= 2.21) when using the adaptive social learning management system environment.
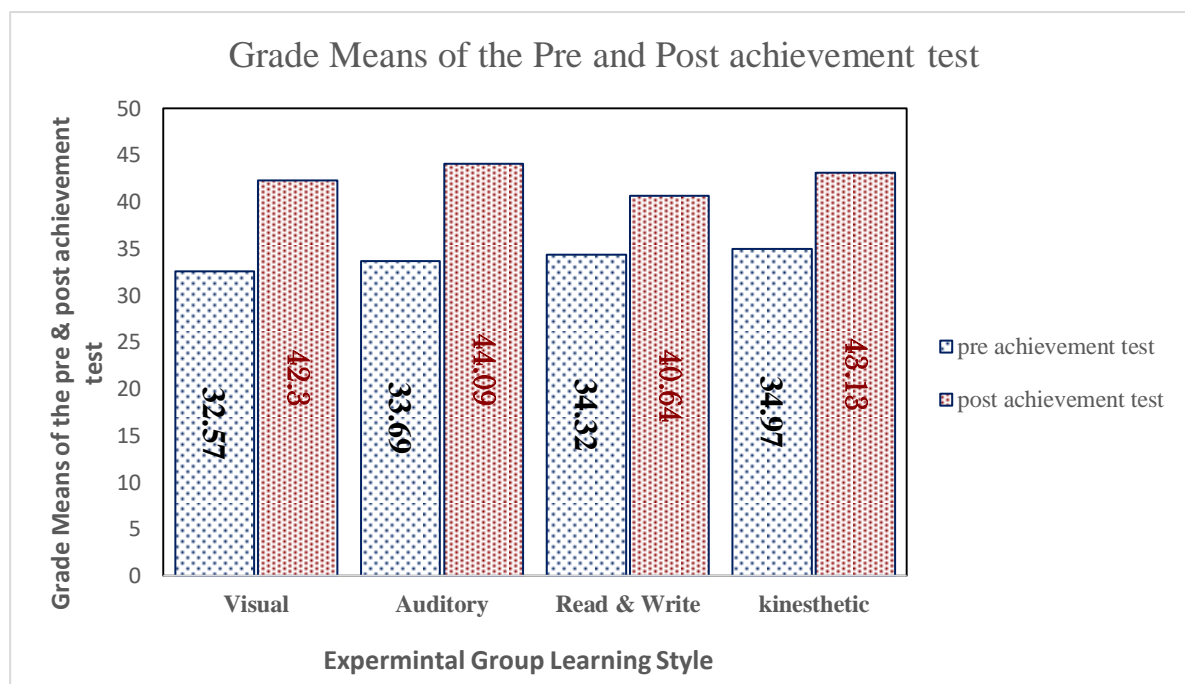
Figure 1 Mean grades for the experimental groups of the pre and post achievement test

The mean grades for the experimental groups of the pre and post achievement test clarifies that there is an impact of using the adaptive social learning management system environment according to the four learning styles.

5. Research Conclusion and Future Work

The conclusion of this research is to design an adaptive social learning management system according to the learning styles in a database (2) course which is taught in the first semester and its effect on development of the levels of cognitive achievement for the students who are in the third level of management information system department (Arabic Section) at THEBES ACADEMY.

The research problem was addressed as there was a weakness in the levels of cognitive achievement for the students as observed from the last year, according to this problem there was some questions presented which leaded to a survey taken through a previous educational literature reviews which was related to the designing of an adaptive social learning management system environments according to the learning styles.

A list of criteria for designing an adaptive social learning management system environment was presented to the experts in the fields to express their opinion on, a list of criteria for designing an electronic course material depending on the four VARK learning styles of the students in which each learning styles will get a suitable delivered course material, an experiment tool which is the adaptive electronic VARK questionnaire was designed to determine the learning style of each student and send an automated respond message to each student tries to submit the electronic questionnaire with the best learning style that suits the student and a link to the adaptive social learning management system environment where the student will get the delivered suitable content material that suits the

learning style that was determined before, a research tools which is the database (2) cognitive achievement test was designed as a measurement tool to measure the level of cognitive achievement for the students before and after the research experiments.

A selected research group of 150 students from the third level of management information system department (Arabic Section) was taken, the research group was divided in to four subgroups determined according to the electronic VARK learning style questionnaire which was presented to the students in a guided presentation uploaded on an Electronic Learning Source (ELS) related to their academy.

The results of this research where presented by two kinds of data which are the qualitative data from the survey taken through a previous educational literature reviews and the quantitative data that was exported from the ONE_WAY_ANOVA method used by the Statistical Package for the Social Sciences (SPSS) version 22 which was presented in numeric tables and graph charts.

These research results concluded that the adaptive social learning management system environment which was designed according to the VARK learning style developed the levels of the cognitive achievements for the students of the third level of management information system department (Arabic Section) who studied the database (2) course in the first semester at THEBES ACADEMY.

The research recommendation recommended that more care should be given to the use of the adaptive social learning management system environment which determines the individual differences between the students by knowing their learning styles and delivering to them the suitable content material that suits them than the non-adaptive ones which takes care of the content only.

The research recommendation also recommended that more care should be given to the list of criteria's for designing a well electronic course content material when designing the course content materials and putting in consideration some mistakes that shouldn't be inside a course content material when designing a course content material so that the course can be designed and delivered in a good quality form.

The research recommendation also recommended that more care should be given to the list of criteria's for designing an adaptive social learning management system environment according to the learning styles of the students to let the students interact with the interface of the adaptive social learning management system environment easily and friendly without any problems while studying and learning their courses.

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