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"Integrating Intelligent Tutoring System with Learning Styles of Online Learners in Pakistan"

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KEY WORDS

Intelligent Tutoring System, Learning Styles, Online Learners.

ABSTRACT

The purpose of the study is to investigate the perceptions and preferences of learners who have used adaptive e–learning system. Trial was conducted on computer science and artificial intelligence students at undergraduate level. They were allowed to study on ILMS. Their learning styles were identified through Index of Learning Style questionnaire and automatically categorized into their unique learning style. They were provided with the learning material suited to their learning style, the format of learning material was on text, audio and video aids and hands on activities. Study was conducted on 150 students who had been part of experiment conducted on ILMS. Simple Random sampling technique was implemented. For this study self-developed questionnaire was used. Data was analyzed by using quantitative descriptive methods such as mode, variance, average. The survey result shows that all the participants are willing to use the adaptive Intelligent Learning Management System in their daily studies. The learning effort and time spent on learning the courses were less as compared to traditional Learning Management System they were using in their studies after the onset of Corona virus. The study recommended that more adaptive and navigational techniques should be integrated on LMS. The originality of this study that LMS should be utilized and features of artificial intelligence should be utilized to make LMS more adaptive like students' previous knowledge, behavior of students during course, expectations, etc.

Introduction

The effectiveness and accessibility of learning have both been improved by the swift advances of Information Communication technologies (ICT). The ubiquity of advanced mobile phones, smart watches, capsules and computers has attracted scholars today. These innovations in educational field have opened new doors and created promising improvements in productivity (Mohamed & Lamia, 2018). On January 30th, 2020, COVID-19 was declared as a worldwide public health emergency of global importance and turned into a pandemic on March 11th, 2020 (Cucinotta & Vanelli, 2020). This has led to a terrible impact on educational institutions around the world (Mailizar, et al., 2019). It has brought about the institutions across the globe to discontinue their educational activities so that the students should observe the social distancing measures (Toquero, 2020). As it is unclear when pandemic will fully disappear, the academic experts are compelled to shift to e-learning. Institutions are moving towards flexible learning in education and use the already available technical resources to create online learning material (Kaur, 2020). The faculty provide learning environment for students where e-learning courses are managed and organized. Learning management systems (LMSs) such as WebCT, Blackboard, and Moodle are in many instances and correctly used in e-education for offering a learning environment. LMS is a studying interactive tool where the content material is supplied to college students online. LMS helps instructors to create, administer and manipulate on-line courses. The distance education institutes have seen tremendous advantages from LMS however at the same time there are boundaries connected to the cutting-edge LMS. While they focus on helping instructors in creating and protecting on-line courses, it looks they commonly do not any longer consider the individual differences of learners. However, learners have extraordinary needs and characteristics like prior knowledge, motivation, cognitive traits, and one-of-a-kind mastering styles. Along with all these innovations, the learning material provided to students through new platforms has not seen much improvement over the years. E-learning content material can be customized to suit students' preferences in addition to providing richer and diverse learning experiences (El Sabagh & Hamed, 2020; Yang et al., 2013). Adaptivity is significant in educational system to give and oversee learning course adjusted for every learner, observing and deciphering learning tasks according to their necessities and learning inclinations. Therefore, it is essential that learning material should match with the learning styles of individuals. ITSs are tutoring systems which are used to facilitate directions and are formed with the use of AI methods in computer programs. These structures are supported cognitive mastering concept and this theory is pastime in how statistics organizes in human's memory. Intelligent Tutoring System supports a personalized, interactive, tutor like training through catering and inspecting students' characteristics offering sizeable mastering beneficial properties (Jiménez, et al. 2018).

Literature Review

Educational technology has increased tremendously over the years. Internet and computers have become a necessity for new generation learners. It has permeated the traditional classroom in number of ways. Technology has also improved the remote schooling and education methods (Bedenlier et al. 2020; Castro, 2019). Electronic learning or in other words e-learning is the term used for learning that has electronic dimension. It has made amazing progress since the underlying long periods of electronic guides and transmissions. This type of knowledge is shared and dynamic. It connects the learners, colleagues, professional peers and experts from different backgrounds either inside or outside the organization or institution. With the world engulfed in pandemic, the world in lockdown, education can still take place with the help of e-

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learning. In fact, it is because of these systems, it enabled the Instructional designers to rethink and revise their content in command to deliver more significant practices to their scholars (Pappas & Giannakos, 2021).

Learning Management System

Learning management system is one of the best software which is currently being used to provide e-learning. The number of institutes using the LMS has increased specially during the corona virus. The usage of LMS is not only confined to distance education, formal education has also made use of this technology in delivering learning content and as means of interaction between teacher and students. LMS applications also encourage the use of flipped classroom or blending learning in which both models are combined conventional learning model (face-to-face) and e-learning. Use of LMS in current knowledge has many advantages, it is time efficient, makes use of the technology and it provides unlimited time and space.

According to Aldiab, et al. (2019) LMS platform can automate the administration of learning. Often people associate web-based learning with distance learning, but in fact it is used as a teacher's instrument to support classroom, to keep track of the work and also to track student's record of activity and evaluate them. LMS is a platform which serves all users. It administers and manage the whole learning environment. The instructors manage the individual courses and the learning material associated with them. It also allows students to access all the basic course information and the learning material. In the market there are hundreds of LMS available both proprietary and open source. LMS can easily be integrated with existing web applications. It is because of this property that they are widely used in different institutions. Among the LMS software presently in practice, the most normally utilized in measured object-arranged formative learning climate (Moodle). In 2015 it has more than 53000 sites serving over 69 million users in 230 states. It allows the developers to improve functionality to suit individual requirements. The main purpose of LMS is the development of learning through communication by coordinating various media, dialects, and assets. For cooperation educators depend on specialized gadgets like discussion channels, gatherings, sites, and video streaming. LMS also incorporate the concept of (reusable) learning objects. With the help of LMS teachers can easily create, store, and manage the learning objects. And Learning Management System has the capability to be regularly updated with more advanced functions to cater individual needs. (Aldiab, et al., 2019) Artificial intelligence techniques can be used to enhance LMS by using co-operative intelligent agents or even vigorous instructional agents. Using these techniques result in intelligent learning environments. Intellect permits the mediator to execute responsibilities individually but it requires operator involvement. Automation helps the institutions and instructors in avoiding time consuming and costly manual work and at the same time keeping the content, data and users well-organized (Foreman, 2017; Anderson, 2019).

One of the parameters of adaptive e-learning surroundings is the studying style of an individual. People have various learning styles when they come in contact with the content material given to them. A lot of research has been carried out to discover the relation of e-learning with detection of learning styles of learners. The learning style is motivated by learning situation and is consequently improved with passage of time (Ali, et al. 2019; Alshammari, 2016; Alzain, et al., 2018a, b; Liang, 2012; Mahnane et al., 2013; Nainie, et al., 2010; Velázquez & Assar, 2009). The learning style notion depends on the premise that various learners have various styles of getting information. This assists the pupils with perceiving and integrate data to accomplish better insight and ability (Naqeeb, 2011).

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Learning Styles

Every learner has a distinct learning style and processes information in a variety of ways. Some people learn by repeating it aloud, others by writing it down, and yet others by doing practical work. People are different as far as which sort of guidance or study is best for them, which is alluded to as learning styles (Pashler, et al. 2008, p.105). Styles of learning reveal the diversity of learners' demands (Abidin, et al. 2011, p.143). It refers to how students focus, process, and remembers information. A person's learning style may shift throughout time as a result of their experiences.

According to Kolb (1984), the process of learning is the transformation of experience into knowledge. Researchers employ a range of learning strategy concepts and modify them according to the requirements of their study. Variations in the scope and depth of education, academic accomplishment, and other behaviors anticipated by varied learning pattern categorization create "confusion" (Nel, 2008). It is "compatible with 'cognitive style' for some, while it implies preferred approaches to learning based on modality strengths" for others (Nel, 2008). Lawrence (1984) proposed , The learning style techniques are employed to "incorporate four aspects of the person, which include cognitive style (preferred or habitual patterns of mental functioning), patterns of attitudes and interests that affect an individual's focal point in a learning situation, a tendency to pursue situations attuned to one's own learning patterns, and an inclination to use certain learning strategies." (Bennet, 1979, p. 262) defines learning styles as "a persistent pattern of behavior and accomplishment by which a person approaches educational experience." Teacher must determine how to teach the topic once the course syllabus has been finalized. There are always several methods to explain a topic, and the appropriate way will vary depending on the student. Educators in old-style schoolrooms have continuously had to use a range of teaching styles and adjust them to the needs of many of the students. Large classrooms make it harder to gauge student responses; nevertheless, instructors who deliver the relatively similar content decade after decade can see trends. A strategy may be efficient one year, although with a diverse group of students and the similar topic, this may not be as successful the very next year. There might be several causes of this disparity. A lecturer could be more responsive to a learner 's concerns in one-on-one coaching, as indicated by the student's responses and perceived engagement. There will almost likely be various learning styles among pupils, regardless of the instructor's own preferences. The discrepancies might well be attributable to the nature of the subject matter, the teaching technique of the instructor, and the time of day (i.e., attentiveness or drowsiness), along with many other aspects. However, the majority of students have personality traits that incline them to various learning styles. Different learning styles are thought to be identified by many theories of learning as people approach new ideas, according to various theories of learning (Reid, 1995).

Students have their own learning styles, which might vary depending on the situation. Learners have varied learning styles, distinct motivations for learning, and different levels of confidence and study pace. Learning can be improved by having a better understanding of one's learning style. Learning styles are not set in stone, and a student may favor one over another. Learners may have a variety of learning styles and combine them to create a useful learning combination (Kanninen, 2009, pp.3-12). The learning styles of students have a substantial impact on their information execution. Learning style is a decent indicator of understudies' favored learning conduct, and a match between learning style and instructing style can help students feel more satisfied and achieve more. When researching an educational delivery program, the focus should be on determining its influence on learning. Students may benefit from knowing their learning style and making

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changes to how they absorb information (Cowley, et al., 2002; Manochehr, 2007, p.11).

Most other learning style models partition students into a couple of gatherings; be that as it may, Felder and Silverman carefully describe a student's learning style, isolating inclinations on four aspects. One more critical qualification is that FSLSM depends on propensities, suggesting that students who have serious areas of strength for a for a specific way of behaving may act contrastingly on occasion. FSLSM is regularly used in cutting edge learning innovation concentrates on learning styles. In FSLSM, there are four aspects. Every student has a particular inclination for at least one of these aspects. The primary aspect separates among dynamic and reflecting data handling. Dynamic students learn best by effectively captivating with the learning content, applying it, and endeavoring new things. Besides, they are keener on friendly connection and get a kick out of the chance to learn in bunches where they can discuss the substance they have learnt. Intelligent students, then again, really like to ponder and think about the material. They like to work alone or in a little gathering with one old classmate with regards to correspondence. The subsequent aspect is the distinction among detecting and instinctive learning. Realities and substantial learning material enticement for students who favor a tangible learning approach. They like to deal with hardships utilizing proven strategies and are quieter with minor subtleties. Besides, detecting students are supposed to be more reasonable; they are more functional than natural students and really like to apply what they've realized in the homeroom to genuine circumstances. Natural students, then again, really like to learn dynamic stuff like hypotheses and their hidden implications. They are better at tracking down associations and potential outcomes, and they are more inventive and imaginative than detecting students. The third aspect, visual-verbal, recognizes students who review best and consequently really like to gain from visual portrayals (e.g., drawings, charts, and flowcharts) and students who benefit more from printed portrayals, whether composed or spoken. Students are ordered in the final aspect in view of their appreciation. Successive students advance in unassuming, steady advances, bringing about a straight learning way. They like to tackle issues in a deliberate, bit by bit. Worldwide students, then again, utilize an all-encompassing reasoning methodology and learn in extraordinary leaps. They tend to assimilate data for all intents and purposes indiscriminately, without seeing associations, yet after they have learnt enough, they out of nowhere grasp the entire picture. They can then tackle complex issues, make associations across assorted fields, and set up things in imaginative ways, yet they battle to explain how they got it done. Worldwide students are more keen on outlines and wide data since the 10,000-foot view is vital for them, while consecutive students are more intrigued by subtleties.

Table.1 Felder and Silverman Learning Style Model

Learning styles	Preferred learning
Active	Advance by getting things done or trial and error and work in bunch
Reflect	Advance by thinking and ponder the issue
Sensorial	Advance by reality and given a detail technique
Intuitive	Hypothetical track down probability and relations
Visual	Picture, diagram, video, flowchart
Verbal	Text and sound
Sequential	Rationale bit by bit
Global	Given higher perspective and hopping starting with one point then onto the next in a nonlinear way

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As per the Felder-Silverman learning style model (Felder and Silverman 1988), the Index of Learning Style (ILS) was made as an instrument for distinguishing people's learning styles. It has 44 inquiries, with 11 inquiries for each element of the Felder-Silverman model. The ILS is viewed as a reasonable and reliable instrument for deciding a student's learning style (Felder and Spurlin 2005). Moreover, certain examinations have exhibited that each component of the Felder-Silverman model has adequate proof for freedom, unwavering quality, and develop legitimacy (Felder and Spurlin 2005; Graf et al. 2007; Zywno 2003).The way in which students interact with and process information thus plays a determining role in their approach to learning. As a result, addressing these variables may enable both instructors and platforms that provide additional services to learning in a typical classroom context to create a more meaningful learning experience for students, one that encourages them to grow and develop as they study. LMS platforms, on the whole, are more suited to the demands of teachers (i.e., the ability for the teacher to monitor user activity, uploaded documents, quiz results, and so on). However, there are still significant gaps in terms of student demands and behaviors (i.e., resources and options that are not varied enough). Taking a more student-centered approach would enable the development of digital infrastructures that are more suited to diverse learning styles, resulting in a more personalized LMS experience for the user.

Intelligent Tutoring System

ITSs are PC programs that empower guide like preparation that is incredibly intuitive and individualized. An ITS's motivation is to emulate a singular mentor who intently screens understudies' advancement, knows about their ongoing assets and difficulties, and conveys appropriate criticism as clues and clarifications. ITSs depend on different innovations from the fields of Artificial Intelligence and Cognitive Psychology to do this. ITSs keep various thorough models that address the information (or aptitude) expected for compelling coaching:

1. A space model recognizes a bunch of essential information components (for instance, ideas) that an understudy should dominate;
2. A student model (normally a subset - or overlay - of the space model) helps ITS in monitoring the student's information;
3. A mentoring model formalizes the academic thoughts and practices expected to make informed decisions about how to best deal with the coaching system.
4. A connection point model deals with a student's commitment with an ITS.

Intelligence is described as the ability to adapt to one's surroundings and solve issues. Learning on its own, however, is insufficient. A system must have certain capacities in order to learn, such as sufficient memory capacity, reasoning ability (processor), perception ability (input and output), and so on. These abilities are insufficient if they are not properly integrated or if a suitable learning mechanism is not available. Furthermore, effective learning necessitates some preliminary information, background knowledge inherited by living systems. The system's abilities grow as a result of learning, and as a result, the system's intellect grows as well.

Difference Between Learning Management System And Intelligent Management System

The main difference between the LMS and the ITS is that the latter gives learners with direct tailored feedback depending on their input into the system. It uses Artificial Intelligence (AI), which means it may utilize a number of AI approaches to understand, inform, and direct the user after they've finished the exercises. It aims

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to take on the role of a tutor, skillfully guiding and coaching students through the material. Although the ITS appears to be ideal, it requires a significant amount of professional expertise and resources to construct. If the subject is qualitative rather than quantitative, this increases because qualitative knowledge contains more tacit knowledge. Due to the analysis of content, student, and tutor roles, the timescale for establishing an ITS inside an organization is longer, but if effectively executed, it can provide a rich student experience as well as an accurate barometer of topic understanding. Individual exercises, on the other hand, can be used by the LMS to provide paths across the learning process. The content can be simply modified in a variety of formats. Content is not required to be coupled with logical rules. When each activity is done, the LMS can provide accurate answers to learners, but it cannot provide intelligent feedback like the ITS can. Integrating both types of systems would be possible, but it would require an organization's e-Learning vision to be clear and focused. Within the LMS, functions like student communication and assessment could be regulated, while the ITS could deliver the learning experience. Before providing the degree of integration, detailed technical analysis would be required, but demonstrable strategic benefits would have to be identified first. To fully leverage the potential of the artificial intelligence system, effective semantic analysis of the topic area is required. It's easier to keep adding information to the LMS, but administrators would have to consider context in addition to student and tutor results while adding content to the ITS. Both types of systems are blended learning solutions, with the goal of assisting the instructor both in and out of the classroom and assisting in the delivery of the curriculum. In student testing, ITS would have a clear advantage, as direct tailored feedback is critical in student assessment. It's also worth noting that the majority of LMS courses aren't designed with learning styles in mind. As a result, it is not enough for the system to technically track the necessary information regarding patterns; teachers must also employ the appropriate features in their classes. Perhaps a combination of the two would be the best learning environment.

Objectives

The objectives of the study were to.

1. Investigate the perceptions of online learners regarding effectiveness of the Intelligent Learning Management System.
2. Explore preference of online learners about the Intelligent Learning Management System.
3. Investigate the user satisfaction of Intelligent Learning Management System.

Methodology

Research Design

Research methodology required gathering data from a specific group of students who were part of the program which carried out the use of adaptive e learning systems. Students have experienced both the learning management system and Intelligent learning Management System. This type of research methods lies under descriptive survey. A quantitative form of inquiry was used to fulfill the objectives of the research. Learners' perceptions and preferences, satisfaction level and effectiveness of new learning platform were investigated through the questionnaire.

Population and Sampling

Population was the students enrolled in Computer Science department and AI department are enrolled in bachelor level. Total population was 321 students. The sampling technique used was simple random sampling, as it allowed equal possibility to all participants to take part in study. All the college students that have used the ILMS have been part of the sample. Out of 150 college students took part in study about only 115 responded. So, it was once a 77% response rate.

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Research Instrument

The study used self-developed structured questionnaire that contained 8 items in total 6 questions were close ended while 2 was open ended. Question 1 further contained 6 items which was used to obtain information regarding LMS and ILMS constructed on Likert scale. While question 2 was a dichotomous question. Item 3 was a single answer multiple choice question. Question 4, 5 and 6 were also developed on Likert scale. Question 7 and 8 were open ended questions.

Data Collection Procedure and Data Analysis

Questionnaire was administered through Google forms among one hundred fifty students who had studied through Intelligent Tutoring System. Link to the Google forms was sent through e-mail. Researcher ensured ethical issues by using the informed consent and anonymity.

Data was collected and statistically analyzed using statistical software SPSS. More over for further analysis descriptive statistics like Mean, differences, percentages etc. was applied.

Result

According to the responses to Question 1, majority of the respondents learned more when taught with ILMS, 85 respondents replied more while statistics are mode=3, variance=195. When asked about enjoyment, 90 students enjoyed studying through ILMS and statistic values are mode=3, variance=172. Statistic values mode=1 and variance=.202 prove that time taken to study with adaptive system is shorter than they spent on traditional LMS. For part d, students' responses to learning effort spent on ILMS was lower than spent on LMS (mode=1. Variance=.208). Majority of students showed increase in motivation (mode=3, variance=.234) and satisfaction (mode=3. Variance=.251).

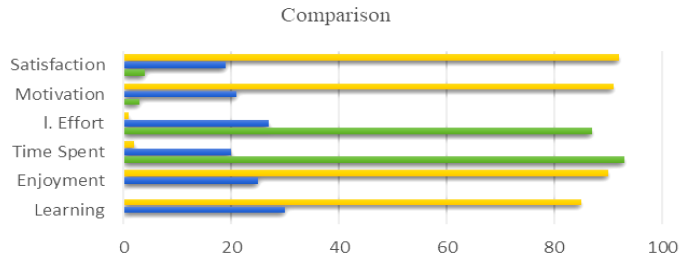

Fig.1

Comparison LMS and ILMS

When learners were asked about awareness of their learning styles, according to responses, most of the respondents (82.6) were unaware of their learning styles. And very few (17.4) knew what their learning styles were.

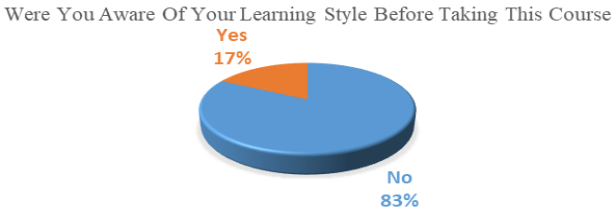

Fig 2 Pie Chart Awareness of Learning Styles

In Q3, respondents were required to answer if they prefer to choose the material themselves or to be provided with material only matching to their learning style. Respondents who want to choose their own material on ILMS were only 4% and the respondents who would like to be only provided with learning material suited to their learning style are 96%.

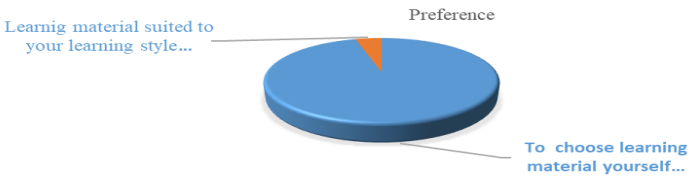

Fig. 3 Pie chart for Learning Material Preferences

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most of the respondents showed very high satisfaction level with adaptive e-learning systems as percentage was 68%. 21 % respondents have high satisfaction level with adaptive e-learning system. And 15% respondents have low satisfaction level with adaptive e-learning system.

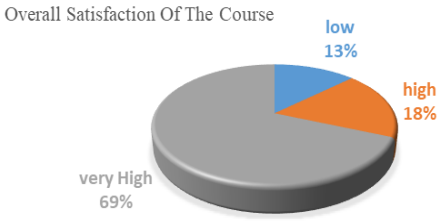

Fig.4 Pie chart for overall satisfaction

out of 115 respondents who have taken part in survey answered definitely when asked if they wanted to use the adaptive systems in their daily basis 71%. While 20% answered probably yes for using Adaptive systems. 13% of the respondents were unsure if they wanted to use it in their daily life.

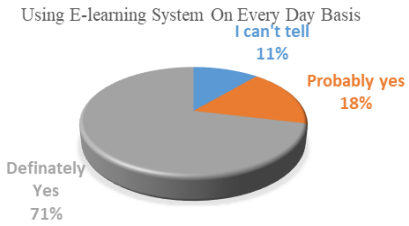

Fig.5 Pie Chart for using adaptive system

when asked how important it is for them to have adaptive learning material according to their learning style 14% of respondents answered very important. On the other hand, most of the respondents (83.5%) have answered it is important to have adapted learning material. Only 1.7% answered moderately important while only one respondent answered little important.

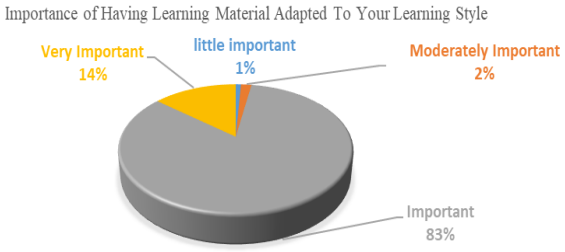

Fig.6 Pie chart for having learning material adapted to your learning style

Question 7 stated that "Did you face any problems?" if the answer would be "yes" respondents were asked to mention the details of the problem they had faced. But if they were faced with no problem they would simply mention "no". Responses of students were;

"The tutorial before the using ILMS was not enough. It should be a bit detailed."

"It took a lot of time to answer the questionnaire as questions were too long. Questions should be less in number."

"Learning material should be more, only few ppts and pdf were provided. There should be links to other material as well."

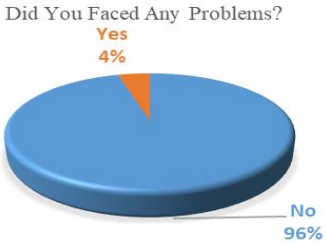

Fig 7 Pie Chart for Problems Faced on adaptive Systems

Question 8 was an open-ended question. Respondents were asked to give suggestions regarding improvement of ILMS. The question was "Do you have any suggests to improve current adaptive e-learning system?" Students responses were recorded. Most students showed their satisfaction with the current adaptive system and showed motivation to use this feature in their future studies. Their responses

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are satisfactory overall. But some students showed eagerness to integrate more features of artificial intelligence into current system to get maximum benefits. While others also complained about inadequate learning material, they would have liked more versatile learning content.

Some responses to the questions are as follows:

"Detailed and effective presentation of topics were very good"

"Other courses should be taught with ILMS."

"Learning analytics is also new technology. Pakistan should also make use of such technology in educational institutions."

"I am satisfied with ILMS as it had provided the learning material the way I wanted."

"Other features of Artificial Intelligence should be integrated."

"Content should be richer."

"Teacher's recordings should be available."

"I learn better when I practically do it myself. There should be more activities for active learners."

	Sub-Topics	Frequency	Percentage
1.	None	40	34.7
2.	Satisfaction with the current system	24	20.8
3.	Diversity in learning material	22	19.1
4.	More features of AI should be integrated	18	15.6
5.	Other courses should be taught wit adaptive system	11	9.56

Discussion

Artificial Intelligence like in all other fields around the world have proved to be beneficial in education as well. Machine learning has been used to teach learners at all sectors whether it is banking sector, commercial sector or any other level of education. Although Pakistan has started slow in machine learning but it has all the potential to adopt latest technology. Basic objective of the study was to investigate the effectiveness of ILMS from students' perceptions. First literature was reviewed for selection of learning style model better suited for online platform. Felder and Silverman Model was most widely used learning style model for detection of learning styles of online learners. Therefore, the current study was carried out on participants who used Felder and Silverman's model for identification of learning styles in adaptive systems. The reason to select this model is that it is widely accepted and that a questionnaire has been developed that is very effective and easy to use for adaptive environments (Al-Azawei & Badii, 2014; Kumar et al., 2017; Ozyurt & Ozyurt, 2015; Truong, 2016). In traditional learning environments questionnaires are more useful, where it is difficult to analyze student's preferences (Kumar et. al., 2017). These findings are of this research are consistent with other studies, such as (Alshammari & Qtaish, 2019; Chun-Hui et al., 2017), which have revealed the effectiveness of the adaptive e-learning environment. For distance education, time is an important factor. Another important factor is the distance unlike formal education where instructor deals with students one to one and is able access the learning styles of learners. In distance education, physical presence of student in same environment and at same time is not a requirement and number of students per instructor is more as compared to formal mode. Many courses cannot be adapted due to lack of time according to needs 'of students. Hence the instructor follows "one shoe fits all" approach. Since the development of e-learning systems, personalization of system has attracted many researchers to work on. All these personalized approach towards learning help students to choose content matching to their unique learning requirement (Hussein & Al-Chalabi, 2020). In such circumstances the best option is to know the student's preferences in advance to maximize the time spent on personalized environment. But if a system is adaptive, it should be flexible enough to support student's learning styles (Ennouamani & Mahani, 2017).

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Besides helping students', the use of intelligent features in learning platforms can reduce the instructor's routine workload and help the instructor to utilize his time elsewhere in teaching process. In order to fully understand the effectiveness of ILMS, it is important to investigate the perceptions of the ones who are directly affected by it i.e. learners. Students had been using LMS for their studies but when they were taught with ILMS the differences were clear from the data that has been collected. Students were highly motivated for using ILMS as it had been experienced as time saving and efficient method for learning. Previous studies conducted on adaptive learning technologies prove that these technologies improve the learning knowledge and it can further enhance their engagement with learning material (Ali et al., 2019; Graf & Kinshuk, 2007; Murray & Perez, 2015). But this research differs from other researches as this had been conducted on Pakistani context where artificial intelligence in education is new concept.

Conclusion and Recommendations

This study concludes that respondents were of the view that other features of intelligent Tutoring System should also be included in traditional E-learning systems. Foreign universities are in cooperating artificial intelligence in their teaching learning system. Pakistan should not stay behind. Most of the students even in post graduate level were not aware of their learning styles. Awareness regarding learning styles should be provided in early classes this in return will save time and effort of students. And it can go long way in their studies. Most of the participants were highly motivated to use new adaptive e-learning system than conventional instructional delivery systems in learning. and it is positively endorsed by them.

Teachers at educational institutions using e-learning platform may be trained to prepare content matching with online learner's preferences for better conceptual understanding among the learners. Institutions may add more advance features of Intelligent Tutoring System into present Learning Management System to initiate adaptive learning at M.Phil. and PhD level in education department. For instance; predicting students drop outs… This research was carried out on students, there is a need to conduct research on teachers as well that can provide the developers with suggestions and can support to evaluate these systems. Only one course has been selected for the study. This study may be repeated for the other programs/courses in ODL programs and in the formal education systems as well. In this way, students will be able to use digital learning platforms more often.

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