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5.0 INTRODUCTION

The internet and related technologies have ignited the information age, in which the teaching-learning process and communication have been increasing exponentially and allow wide and quick dissemination of knowledge. Learning is a social process and it prepares an individual for any adjustment and adaptation that is necessary for life. Today's learners immersed in technology throughout their lives are eager to acquire knowledge through offline and online technology- supported learning tools in a virtual environment. They are very keen to use interactive and collaborative learning tools that best suit their learning styles. In this context, Learning Management System (LMS) - a web based technology, is taking the learning experience to the next level by providing anytime solution for content delivery, learner participation and assessment. In the present study, the investigator has made an attempt to study the usage of LMS among engineering students in their learning environment.

5.1 NEED AND SIGNIFICANCE OF THE STUDY

Individual student plays a pivotal role in technology enhanced learning. Each student has individual needs and characteristics such as diverse prior knowledge, cognitive ability and learning styles. Incorporating students' learning styles in the learning environment makes learning easier for them and increases their learning efficacy. Today's students are more self-directed, better prepared to grasp information, more reliant on feedback from peers and more inclined to collaborate, but still they need much more to quench their digital thirst. They want to be the active users of modern technological tools in their learning situation. Therefore, the importance of this research becomes more evident by taking into consideration the fact that there is a virtual platform called LMS, which caters to the needs of students with different learning styles in the digital environment.

5.2 STATEMENT OF THE PROBLEM

The present study focuses on the usage of usability and accessibility features of LMS and its relation to the learning styles of the engineering students. In addition, the study finds out the influence of personal variables on the usage of LMS features and also its relationship with the learning styles of the students. Based on the above aspects, the present study was entitled as, **"Usability and Accessibility features of Learning Management System and its relation to Learning Styles".**

5.3 OBJECTIVES OF THE STUDY

5.3.1 General objectives of the study

1. To study the relationship between the usage of LMS features and learning styles.

2. To study the intervention of personal variables on the usage of LMS features and learning styles.

5.3.2 Specific objectives of the study

1. To construct and validate a survey tool to evaluate the usage of usability and accessibility features of LMS among the engineering students.

2. To identify the specific learning styles of the engineering students.

3. To make a descriptive analysis on the usage of usability and accessibility features of LMS and the learning styles among the engineering students.

4. To ascertain the relationship between the usage of usability and accessibility features of LMS and learning styles among the engineering students.

5. To find out the intervention of personal variables on the usage of usability and accessibility features of LMS among the engineering students.

6. To find out the intervention of personal variables on learning styles among the engineering students.

5.4 HYPOTHESES OF THE STUDY

1. a) There is no significant relationship between the usage of usability & accessibility features of LMS and visual learning style.

   b) There is no significant relationship between the usage of usability & accessibility features of LMS and auditory learning style.

   c) There is no significant relationship between the usage of usability & accessibility features of LMS and kinesthetic learning style.

2. a) There is no significant mean score difference between male and female students in using the usability features of LMS.

   b) There is no significant mean score difference between male and female students in using the accessibility features of LMS.

3. a) There is no significant mean score difference between UG and PG course students in using the usability features of LMS.

   b) There is no significant mean score difference between UG and PG course students in using the accessibility features of LMS.

4. a) There is no significant mean score difference between the students of different branches of study in using the usability features of LMS.

   b) There is no significant mean score difference between the students of different branches of study in using the accessibility features of LMS.

5. a) There is no significant mean score difference between $1^{st}/2^{nd}/3^{rd}/4^{th}$ year UG students in using the usability features of LMS.

   b) There is no significant mean score difference between $1^{st}/2^{nd}/3^{rd}/4^{th}$ year UG students in using the accessibility features of LMS.

6. a) There is no significant mean score difference between first and second year PG students in using the usability features of LMS.

   b) There is no significant mean score difference between first and second year PG students in using the accessibility features of LMS.

7. a) There is no significant mean score difference between students with different years of experience in using computers in using the usability features of LMS.

   b) There is no significant mean score difference between students with different years of experience in using computers in using the accessibility features of LMS.

8. a) There is no significant mean score difference between students with different years of experience in using internet in using the usability features of LMS.

   b) There is no significant mean score difference between students with different years of experience in using internet in using the accessibility features of LMS.

9. a) There is no significant mean score difference between daily, frequent and rare users of computers in using the usability features of LMS.

   b) There is no significant mean score difference between daily, frequent and rare users of computers in using the accessibility features of LMS.

10. a) There is no significant mean score difference between daily, frequent and rare users of internet in using the usability features of LMS.

b) There is no significant mean score difference between daily, frequent and rare users of internet in using the accessibility features of LMS.

11. a) There is no significant mean score difference between male and female students in visual learning style.

b) There is no significant mean score difference between male and female students in auditory learning style.

c) There is no significant mean score difference between male and female students in kinesthetic learning style.

12. a) There is no significant mean score difference between UG and PG course students in visual learning style.

b) There is no significant mean score difference between UG and PG course students in auditory learning style.

c) There is no significant mean score difference between UG and PG course students in kinesthetic learning style.

13. a) There is no significant mean score difference between students of different branches of study in visual learning style.

b) There is no significant mean score difference between students of different branches of study in auditory learning style.

c) There is no significant mean score difference between students of different branches of study in kinesthetic learning style.

14. a) There is no significant mean score difference between $1^{st}/2^{nd}/3^{rd}/4^{th}$ year UG students in visual learning style.

b) There is no significant mean score difference between $1^{st}/2^{nd}/3^{rd}/4^{th}$ year UG students in auditory learning style.

c) There is no significant mean score difference between $1^{st}/2^{nd}/3^{rd}/4^{th}$ year UG students in kinesthetic learning style.

15. a) There is no significant mean score difference between first and second year PG students in visual learning style.

   b) There is no significant mean score difference between first and second year PG students in auditory learning style.

   c) There is no significant mean score difference between first and second year PG students in kinesthetic learning style.

16. a) There is no significant mean score difference between different years of experience in using computers in visual learning style.

   b) There is no significant mean score difference between different years of experience in using computers in auditory learning style.

   c) There is no significant mean score difference between different years of experience in using computers in kinesthetic learning style.

17. a) There is no significant mean score difference between different years of experience in using internet in visual learning style.

   b) There is no significant mean score difference between different years of experience in using internet in auditory learning style.

   c) There is no significant mean score difference between different years of experience in using internet in kinesthetic learning style.

18. a) There is no significant mean score difference between daily, frequent and rare users of computers in visual learning style.

   b) There is no significant mean score difference between daily, frequent and rare users of computers in auditory learning style.

   c) There is no significant mean score difference between daily, frequent and rare users of computers in kinesthetic learning style.

19. a) There is no significant mean score difference between daily, frequent and rare users of internet in visual learning style.

   b) There is no significant mean score difference between daily, frequent and rare users of internet in auditory learning style.

   c) There is no significant mean score difference between daily, frequent and rare users of internet in kinesthetic learning style.

5.5 POPULATION AND SAMPLE OF THE STUDY

Population of the present study includes students from engineering colleges in Coimbatore district who use LMS. Adopting the purposive sampling technique, a sample of 1374 students from six engineering colleges was selected for the present study.

5.6 VARIABLES CONSIDERED FOR THE STUDY

A variable means any characteristic or quantity that can take two or more values. Depending on the nature of research design adopted, variables may be controlled or manipulated. In the present study, three types of variables viz. independent, dependent and intervening variables are used.

5.6.1 Independent variables

Independent variables are the conditions or characteristics that can be manipulated by the researcher to establish their relationship to an observed phenomenon. The independent variable is the variable where the responses are measured and it is the assumed cause. The independent variable considered for the present study is learning styles i.e., visual, auditory and kinesthetic learning styles of the selected students.

5.6.2 Dependent variables

Dependent variables are the variables that are varied in accordance with the independent variable, and it is usually distinguished as assumed effect. The dependent variables considered in the present study are the usage of usability features and the usage of accessibility features of LMS among the selected students.

5.6.3 Intervening variables

Intervening variables connect the independent and dependent variables. The intervening variables used in the present study are the personal variables viz., Gender, Course, Branch of study, Year of study, Experience in using computers, Experience in using internet, Frequency of using computers and Frequency of using internet.

Table 5.1: List of variables selected for the study.

Independent Variables	Visual, Auditory and Kinesthetic learning styles
Dependent Variables	Usage of Usability and Accessibility features of LMS
Intervening Variables	Gender
	Course
	Branch of study
	Year of study
	Experience in using computers
	Experience in using internet
	Frequency of using computers
	Frequency of using internet

5.7 TOOLS USED FOR THE STUDY

Table 5.2: Tools used for the study

S. No.	Tools selected for the study	Type of tool	No. of items	Tool Standardization
1	Barsch Learning Style Index (1991)	Questionnaire with scale	24	Adopted
2	Usability and Accessibility features of Learning Management System (UALMS) tool	Questionnaire with scale	60	1. Pilot study 2. Experts' opinion 3. Reliability estimate by Cronbach's α analysis.
3	Personal Proforma	Schedule	08	Experts' opinion

5.8 DEVELOPMENT AND STANDARDIZATION OF UALMS TOOL

The Usability and Accessibility features of Learning Management System (UALMS) tool was constructed after a careful perusal of literature and LMS tools. 51 items under usability of LMS and 9 items under accessibility of LMS were prepared. Each item in the tool was scored on a five point Likert Scale with the alternatives as 5- always, 4- often, 3- sometimes, 2- rarely, and 1- never.

All the items were placed before the experts in the field of Educational Technology, Educational Research and Computer Science for checking the coverage of content, language and scoring of each item.   The experts judged the content of the tool to ascertain how well each item actually measures the content. The experts also determined whether the tool appears to measure what it intends to measure and confirmed the face validity of the tool. The personal opinion of academicians, research experts and language experts about the items were seriously considered and according to their suggestions, the tool was well constructed and found to be valid.

A pilot study was conducted to establish the reliability of the tool. A total of 150 students from two engineering colleges in Coimbatore district who use LMS in their educational institutions were taken up for the pilot study. The first draft of the tool, finally approved by the experts, was distributed to the students. Clear instructions were given to enable the students to give their responses meaningfully. After the data were collected, a thorough scrutiny was done and the incomplete and stereo type responses were removed. Out of 150 responses, only 117 responses were considered as appropriate and scored for further analyses. Reliability of the tool was established by finding Cronbach's alpha reliability coefficient, and the value was found to be 0.895.

5.9 DATA COLLECTION

Normative survey method was used to administer the tools for data collection. A total sample of 1416 students who use LMS in their educational institutions was taken up for the final study. Purposive sampling technique is used for the selection of sample and students from six engineering colleges in Coimbatore district took part in this survey.

The tools were distributed to the students, and the researcher assured that their responses would be kept confidential and used for research purpose only. Clear instructions were given in order to enable them to give their responses meaningfully.

5.10 DATA ANALYSES

After the data collection was completed, the data were carefully scrutinized and analyzed to evaluate the usage of usability and accessibility features of LMS. Totally 42 responses were eliminated for various reasons, and finally 1374 responses were considered for further analyses. The following statistical analyses were employed on the scrutinized data.

- Descriptive Analysis

- t-test

- Analysis of variance (ANOVA)

- Correlation

Descriptive Analysis provides simple summaries about the sample and the observations that have been made. In this study, percentage of students having visual, auditory and kinesthetic learning styles has been calculated using this analysis. Percentage of students using the Usability and Accessibility features of LMS with different frequencies has also been calculated in this study. Furthermore, correlation analysis is carried out to find the relationship between the usage of LMS features and learning styles of the selected students. The t-test and ANOVA are the statistical methods used to identify the significant differences in the mean scores of two groups and more than two groups respectively. In this study, the t-test and ANOVA were employed to find out the influence of personal variables on usage of usability and accessibility features of LMS and the Learning styles.

5.11 FINDINGS AND DISCUSSIONS OF THE STUDY

5.11.1 Descriptive Analysis

The percentage analysis of learning styles reveals that 53.4% of the students are visual, 24.5% of the students are auditory and 22.1% of the students are kinesthetic in

their learning. Apart from these three learning styles, students also prefer a combination of two or three learning styles. The results showed that 8.9% of the students preferred bimodal way of learning (visual-auditory 4.6%, visual-kinesthetic 2.3% and auditory-kinesthetic 2.0%). Trimodal way of learning was preferred by 0.01% of the students. It was found that among the three major learning styles, the most preferable one is visual and the least is kinesthetic. This was supported by the results of Erton (2010), Sizemore & Schultz (2005) and Amran, Bahry, Yusop, & Abdullah (2011) who found that visual learning is the most preferred learning style among their student respondents.

The findings of the descriptive analysis of usage of usability and accessibility features of LMS are discussed as follows:

a) The feature **Learning Materials** is used 'always' by 27.19% of the students and 'never' used by 8.61% of the students.

b) The feature **Assignments** is used 'always' by 28.13% of the students and 'never' by 12.13% of the students. Proper and regular submission of assignments brings credits and grades to the students. Therefore, students are motivated to use this feature regularly.

c) Similarly, the feature **Quizzes** is used 'always' by 28.91% of the students and 'never' by 10.27% of the students. As the usage of this feature brings credit and the key expectation of getting immediate feedback from the teachers is being fulfilled, majority of the students are very keen to use this feature.

d) The powerful communication feature in the LMS i.e. **Discussion Forums**, is used 'always' by 14.30% of the students; 'sometimes' by 24.50% of the students and 'never' by 20.57% of the students. This result is supported by Venter, Rensburg, & Davis (2012) who argues that most of the students use LMS only for downloading course materials and submitting assignments. He further comments that most of the students behave as passive observers, just reading the postings from other students or lecturers and not contributing ideas or views to discussions. A study of Petrovic & Kennedy (2005) also showed that many students prefer to read the discussions rather than to contribute; only one- third of the students actively participate in the discussions.

e) Though **Chats & E-mail** are the main features of LMS, only 15.62 % of the students use this feature 'always', but 26.72% of the students 'Never' use this feature. This may be due to the lack of peer students' academic communication through LMS, and usage of private e-mail services for a long period of time from the past.

f) The synchronous communication tool, **Instant Messaging** is used 'always' by 22.46% of the students; whereas, the maximum of 23.06% of the students use this feature 'never'. This result is in line with the result of Petrovic & Kennedy (2005) in which nearly half of the students never use LMS to send messages or post discussions. The important reason might be that students may use mobile phones to share their views and ideas.

g) It is remarkable to note that majority of the students (43.80%) 'always' use **Calendar & Announcements** and only 8.72% of the students 'never' use this feature. This result indicates that students may be very keen to note the schedule for the events that are taking place in the institution. Particularly, exam and test timetables are the most viewed part in the LMS.

h) The feature **Wikis & Blogs** is used 'always' by only 9.66% of the students but a maximum of '36.31%' of the students never use this feature. This result is not supported by Amirkhanpour (2011**)** whose findings showed that blogging tools are quite often used by the undergraduate students. The wiki tools and the survey tools were widely used and are considered as popular web collaboration tools.

i) Likewise, only10.60% of the students 'always' use the feature **Glossaries & Surveys** but a maximum of 30.73% of the students 'never' use this feature.

j) It is noteworthy to understand that 38.74% of the students 'always' use the **Accessibility** features and only 6.19% of the students 'never' use the features.

5.11.2 Differential Analysis

1. There is a significant relationship between the usage of usability and accessibility features of LMS and the learning styles. This result implies that there is a positive correlation between the usage of usability and accessibility features of LMS and the learning styles of the selected engineering students. It is also inferred that the

preferred learning styles of the students persuade them to use more visual, auditory and kinesthetic features of LMS. Therefore, it is necessary that usability and accessibility features of LMS should be tailored to reach students in the way they learn best.

To reach visual learners, learning materials should incorporate many visuals like graphics, pictures, video clips, visual themes and colorful backgrounds as they not only read but scan through the materials. LMS features like Blogs, Wikis, Discussion Forums, Learning Materials, particularly, in the form of power point presentations with videos and games are used in the learning process to engage visual learners. Visuals with text on screen, tables, figures, photos and diagrams strengthen the key concepts. To accommodate visual learners, implementation and utilization of plenty of diagrams, flow charts, checklists, and formulas becomes very essential. Well designed visuals motivate the students to learn, and make the complicated information that are difficult to remember as simplified.

To reach auditory learners, learning materials should incorporate auditory features like background sounds, lectures, music and audio-clips as they mainly focus on aural content. LMS features like Discussion Forums, Learning materials, particularly with audio clips, messages with narration are used in the learning process to engage auditory learners. Recorded audio based submission of assignments may be motivated among the students. Particularly, make them use podcasts (audio files listened to via streaming technology or internet download) is very innovative and effective.

To reach kinesthetic learners, learning materials should incorporate move-on features like drag and drop activities, interactive tasks like games and use of simulated interactive multimedia technologies. LMS activities like uploading assignments to a drop box, hyperlinks, periodic self-assessments with the quizzing or survey tool, roll over tables, games, and other interactive elements enable the students to be more active in the course. Furthermore, addition of movable parts like flaps to the concealed words, dial etc., in the visuals, instead of having static visual displays, make learning more interactive. As Kinesthetic Learners are 'doers' rather than 'scanners', Instructional Designers should be very particular to include learning

materials, quizzes, assessments and other features of LMS with simple activities like click the mouse, move things around, flip over icons and, drag and drop answers. Especially, animations and simulations significantly augment the interactivity of the students.

According to the Percentage Analysis shown in Table 4.1, 53.4% of the students are visual learners, 24.5% of the students are auditory learners and 12.7% of the students are kinesthetic learners. So, it is important for the Teachers and Instructional Designers to keep this fact in mind while preparing the lesson plans, assignments, evaluation questions and other activities. Students must be provided with many options like, write an assignment, read and interpret the assignments, draw diagrams, make models or to do practical aspects from the lessons taught, so that diverse learners have the opportunity to choose the assignment or activity according to their learning preferences. Presentations that involve video, vodcast, power point slides may be allowed to encourage the visual learners; podcast, power point slides with audio can be allowed to encourage the auditory learners and interactivity in the presentations like flips and turns on the click of the mouse, interactive displays/icons will encourage the kinesthetic learners. Visually presented pictures, simultaneously narrated explanations will grab the attention of both visual and auditory learners. Even in the assessments, a wide range of diversification is required to accommodate the students with diverse learning styles like visual, auditory and kinesthetic.

Teachers, with help of instructional designers may assign students to complete various activities like responding to posts in the Wikis and Blogs, voting on survey questions, and responding to discussion threads, so that they may show their mastery of the lessons taught or learnt in a way they prefer. Leaving white space in handouts for note-taking; having them draw pictures in the margins; posting flip charts to show what will come and what has been presented are some of the interesting features that enhance visual learning. A catchy phrase, a sudden change in size in the visual or font, a mild background music, a flip or twist on the click of the mouse will easily hold the attention of the learner.

The correlation results further propose that making students aware of their learning styles is very important; providing them with learning materials that incorporates their individual learning styles is much more important. Hence, students can be kept engaged and become more responsible for their own learning. Provision of necessary facilities to access the course is a vital aspect in the usage of LMS. The accessibility features should be in such a way that it should accommodate the needs of visual, auditory and kinesthetic learners. The instructional designers should make use of available technologies to include text for imagery, captioning for audios, narrated slideshows, videos, and simulations to meet the diverse needs of the students.

The success of the online learning process depends on how the digital learning objects fully comply with accessibility requirements. Good accessible features make digital learning elements equal for all users. With good accessibility features, aggregation and sharing of information becomes effortless and enjoyable through LMS features like wikis, blogs and glossaries. Students should be enabled to do simple activities like change in font colour, bold or change the fonts of key points in the content and highlighting make the words easy to see and read; this also helps to emphasize certain information in the given visuals. Through the necessary accessibility features, students must be enabled to upload their work including text files, slideshows, audio, imagery and video files. Facilities to listen to audio files like listening exercises in foreign languages, medical transcription, geology, human physiology, provide a very appreciative learning environment. Teachers must be keen to provide accessibility features to create audio archives of classroom lectures as most students prefer to listen to lecture podcasts at home or on a computer. With the availability of accessibility features, students may be asked to prepare an audio file summarizing the lesson, supplement with background music, and share it with the other students through blogs. Such work may be edited and even submitted to the entire class. Moreover, accessibility features should enable students to readily deploy any work that is originated in digital form on different platforms. Students should be motivated and be given provision to submit their assignments and works based on their learning styles.

2. There is no significant difference in the mean scores of using the usability and accessibility features of LMS among male and female students. It is important to note that regardless of their gender, students are flexible enough to experience different learning technologies like LMS. Moreover, in this technological era, technology-led instructions are more than the teacher-led instruction. Today's students are very comfortable to use individualized learning materials, and they prefer to achieve this flexible way of learning through any educational tool. So, wide range of students uses LMS to cater their educational needs irrespective of their gender. It is so important to note that the teachers are also aware of how discussions, chats, and messaging affect the gender gap. So, they are very careful in selecting the topics for discussion threads and avoid gender variation. Also they are very keen to screen or scrutinize the ideas and responses posted by the students to avoid gender disparity, if any. Group assignments and chat-type assignments provide a welcoming opportunity for both male and female students to create gender equity and excel in academic performance.

3. There is a significant difference in the mean scores of using the usability features of LMS among UG and PG students but not in using the accessibility features. The mean score values indicate that PG students are using the usability features of LMS more than the UG students. The need and urge for getting updated information, learning materials and assignments could be the probable reasons for PG students to use the usability features more than the UG students. New learning environment and limited interactivity could be the reasons for less usage of LMS among UG students.

4. There is a significant difference in the mean scores of using the usability and accessibility features of LMS among the students of different branches of study. Based on the mean score values, it is obvious that ME students use the LMS features to the maximum extent followed by CiE, EE and CE students respectively. BE students are the least in availing LMS features. From the results, it is inferred that these students may have been influenced by the wide usage of computer-based technologies. Furthermore, it is obvious that despite using Learning Materials, they are very keen to use the other features of LMS like Discussion Forum, Wikis & Blogs and Glossaries & Surveys.

Even in using the accessibility features of LMS, BE students are the least users as it is not necessary to access LMS outside the college as most of their work/project is mainly lab-oriented. Other branch students during their internship, field work or out-campus projects, are in need of accessing LMS for communication with teachers, peers and administrative staff. The periodic upload of project reports and other information from the teachers is accessible to them only through LMS. Moreover, LMS is also accessible through Mobile and Tablet devices during their out campus projects. These are all could be the main causes for CiE, EE, ME and CE students to access LMS to the maximum extent.

5. There is a significant difference in the mean scores of using the usability and accessibility features of LMS among the UG students of different years of study. The maximum usage of usability features was found among the fourth year students and was significantly different from second and third year students. The maximum usage may be due to their experience of using LMS over a period of four years. In addition, the complex and advanced nature of curriculum design could have created the necessity to use these features more. Also, they are compelled to use almost all the features of LMS in order to enhance their learning experience and to improve their academic ranking as they are on verge of completing their course. This result is in contrary with Petrovic & Kennedy (2005) views who states that students in the early years of study were heavier users of LMS features like Discussion Forum and Instant Messaging compared to other students, indicating that usage of these features was less important for students in later years.

   The present study also indicates that accessibility features are comfortable to the fourth year students. Due to their experience and accustom to the learning environment, fourth year students are free to administrate and access LMS and get benefitted more than other year students. Interestingly, the mean score for first year students' usage of accessibility features is also very close to that of fourth year students.

6. There is a significant difference in the mean scores of using the usability features of LMS among the first and second year PG students. Second year PG students are using the LMS features more than the first year students. One of the reasons for this result

could be that first year students may be new to the LMS environment. They depend LMS mostly for Learning Materials, Quizzes and Assignments whereas second year students may use LMS for their project work also. Second year students use Assignments feature more, in order to submit their work, related to their project. They use Calendar & Announcements more, to update themselves regarding the college events, campus interviews, placement trainings and exam dates. Instant Messaging and E-mails are used mainly to communicate with the college office administrators, teachers and co-coordinators to know about the campus interview notification and college updates. There is no significant difference in the mean scores of using the accessibility features of LMS among the first and second year PG students.

7. There is no significant difference in the mean scores of using the usability and accessibility features of LMS among the students with different years of experience in using computers. However, it is noted from the mean values that students who use computers for less than 5 years are using the usability and accessibility features of LMS greater than the students who use computers for more than 5 years. The results indicate that different years of experience in using computers does not influence the usage of usability and accessibility features of LMS among the selected students.

8. There is no significant difference in the mean scores of using the usability features of LMS among the students with different years of experience in using internet but there is a significant difference in using the accessibility features of LMS. This result signifies that irrespective of number of years of using internet, students are using all the features of LMS to gain better learning experiences. This result is in agreement with the findings of the study done by Alzamil (2006) where he concluded that there was no effect on e-learning from previous experience with the usage of internet or computers. Nevertheless, this result was contrary to the views of Abdullah (2008) who stated that students' usage of LMS and interaction with instructors was favorable for those who have previous experience in using internet or e-learning. Hence, the result signifies that irrespective of number of years of using internet, students are using the usability features of LMS to gain better learning experiences. But, students with less than 5 years experience in using internet are found to be more comfortable in using the accessibility features of LMS.

9. There is no significant difference in the mean scores of using the usability and accessibility features of LMS among students with different frequencies (daily, frequent and rare) of using computers. However, it was observed from the mean values that frequent users of computers are using and accessing the LMS features more than the daily and rare users of computers.

10. There is no significant difference in the mean scores of using the usability and accessibility features of LMS among students with different frequencies (daily, frequent and rare) of using internet. However, it was observed from the mean values that frequent users of internet are using and accessing the LMS features more than the daily and rare users of internet.

11. There is a significant difference in the mean scores of male and female students in visual and auditory learning styles and not in kinesthetic learning style. It is to be noted that male and female students have different preferences and requirements in learning. As female students are very particular to complete the visual features of learning like assignments and quizzes on time, that could have enhanced their visual learning. Also, they are fond of taking detailed notes, keen to hear the lectures, get benefitted from illustrations, diagrams, sketches etc., which are the visual and auditory features of learning. So, the female students are more visual and auditory than male students. This result is in contrary with Maria, Navin & Chandrasekhar, 2013), who stated that there is no significant difference between male and female students and most of the students learn by kinesthetic style and then by visual and auditory. It is important to be noted that female students are also equally managing the available resources to get an ideal learning experience and hence there is no difference between male and female students in their kinesthetic style.

12. There is a significant difference in the mean scores of UG and PG students in visual and auditory learning styles and not in kinesthetic learning style. As PG students are able to identify their suitable learning styles and select the learning resources (tools) according to their needs, visual and auditory learning is higher among PG students than UG students (as it was discussed in the percentage analysis, the most preferable learning style is visual followed by auditory). As the importance of kinesthetic

learning is higher among the engineering students and more practical courses are involved in their study, kinesthetic learning is equal among both UG and PG students.

13. There is a significant difference in the mean scores of visual, auditory and kinesthetic learning styles among the students of different branches of study. CE students are found to be highly visual and kinesthetic learners; whereas, EE students are found to be highly auditory learners. In kinesthetic learning, the mean value for CiE students is incredibly high which indicates that they are in favor of activity based or practical oriented learning. BE students are different from other branch students in visual, auditory and kinesthetic learning styles. It is inferred that branch of study influences the visual, auditory and kinesthetic learning styles of the selected students.

From the results, it was also revealed that BE students have the lowest mean score in visual, auditory and kinesthetic learning and are significantly different from students of all other branches. The over packed curricula and the teaching methodology adopted could be the reasons for not having a dominant learning style. The mean values also reveal that EE students are more towards auditory learning followed by ME and CiE students. It is evident that they depend more on lectures, class discussion and demonstrations done in their classrooms.

14. There is a significant difference in the mean scores of visual, auditory and kinesthetic learning styles among the UG students in different years of study. Third and fourth year students were found to be more visual in their learning than the other students. The mean scores of auditory learning style show that the students understand the need for classroom lectures and realize to use the listening abilities and improve their auditory means of learning. The low mean score value of first year students reveal that they need time to know their learning preferences and the available learning facilities in the new environment.

The result also illustrates that first year students are very less in kinesthetic. The vast difference (increase) in the mean score of fourth year students shows the maximum usage of kinesthetic learning which has made the learning environment, a comprehensive one. It is concluded that, in visual, auditory and kinesthetic learning, fourth year students are

more influenced than other year students. Owing to their experience and accustom to the situation, they were free to exhibit their nature of learning.

15. There is no significant difference in the mean scores of visual, auditory and kinesthetic learning styles among the first and second year PG students. However, second year PG students are found to be more visual, auditory and kinesthetic learners than first year students. This could be because of the reason that they are aware of the learning resources and their usage. There is no requirement for creating any new learning situation even in their first year of study. Moreover, today's technologies available to the teachers allow them to create a multi-faced learning environment to afford the opportunity to meet the learning style needs of all students. (Gülbahar, 2005 & Whiteley, 2007). Therefore, it is concluded that year of study of selected engineering students does not influence the visual, auditory and kinesthetic learning styles at PG level.

16. There is no significant difference in the mean scores of visual and auditory learning styles among the students with different years of experience in using computer. It is noted from the mean values that students who use computers for more than 5 years are more visual and less auditory than students who use computers for less than 5 years. But, students who use computers for more than 5 years are more kinesthetic than students who use computers for less than 5 years. As kinesthetic learning is learning through experience, and mostly online technologies are used in the process of learning, kinesthetic learning increases with the number of years of usage of computers. This indicates that the number of years of using computers does not influence visual and auditory learning styles among engineering students.

17. There is no significant difference in the mean scores of visual, auditory and kinesthetic learning styles among the students with different years of experience in using internet. It is observed that students who use internet for more than 5 years are more visual and kinesthetic, but the students who use internet for less than 5 years are found to be more auditory. From the results, it is confirmed that different experiences in using internet do not influence visual, auditory and kinesthetic learning styles among the selected students of this study.

18. There is a significant difference in the mean scores of visual learning style among the daily, frequent and rare users of computers. Visual learning is strengthened for daily users as they may have been attracted by visual features present in their learning materials. Though there is no significant difference in auditory and kinesthetic learning styles, daily users of computers are found to be more auditory and kinesthetic. It is revealed from the results that the daily and frequent users of computers are more auditory and kinesthetic learners than rare users. Therefore, we can conclude that frequency of using computers of selected students influences the visual learning style but not the auditory and kinesthetic learning styles.

19. There is no significant difference in the mean scores of visual, auditory and kinesthetic learning styles among the daily, frequent and rare users of internet. Nevertheless, frequent users exhibit the maximum extent of visual, auditory and kinesthetic learning styles, whereas rare users show the least mean score in visual, auditory and kinesthetic learning styles. From the results, it can be concluded that due to the interactive nature of internet, its usage is not restricted to one particular learning style.

5.12 LIMITATIONS AND DELIMITATIONS OF THE STUDY

Though this study has been conducted at the best, minimizing the shortcomings, there are some limitations. Among the researches related to LMS, the usage of usability and accessibility features of LMS is the least researched in India. Moreover, inclusion of learning styles with the LMS usage has produced the following limitations and delimitations.

LIMITATIONS OF THE STUDY

o Currently, the LMS is mostly used in engineering colleges only. Therefore, the present study was confined only to engineering students.

o Very limited colleges only are using the LMS. So, the sample selection was restricted only among them.

o Only private institutions have implemented LMS for teaching-learning process. Hence, the present study was carried out only among private institutions.

DELIMITATIONS OF THE STUDY

- o Due to time, transportation and other costs, the research was restricted only within Coimbatore district.

- o The LMS features that commonly exist among various LMS like MOODLE, Desire2Learn are only considered in this study, as different colleges use different LMSs.

5.13 SUGGESTIONS FOR FURTHER RESEARCH

By observing the findings and limitations of the present study, the following suggestions are given which can be considered for the future research.

- o Research shall be conducted on the usage of LMS among students of Arts & Science, Medical and Business institutions.

- o Academic achievements of students after using LMS may be studied.

- o Apart from the mentioned features in this study, usage of the new emerging features of LMS, and the payable plugins shall be included in the study.

- o This study shall be conducted in different geographical area so that the findings of the present study can be compared with other regions.

- o This study shall be conducted by considering more or different intervening variables into account.

- o The study shall be conducted for identifying other learning styles like active, reflective, independent, dependent and collaborative.

- o Study of learning styles can be compared with online and traditional learning methods.

5.14 IMPLICATIONS OF THE STUDY

- o This study creates awareness among students to identify their learning styles.

- o This study enables teachers to think over their teaching strategies whether the learning materials tailored to meet the diverse needs of the students.

- o This study is useful for the instructors and curriculum planners in their consideration regarding the teaching approach to suit the students' preferred learning styles.

- Learning materials, Assignments, Blogs and Wikis can be used in such a way that it satisfies the needs of students of different learning styles.

- This study facilitates the Instructional Designers to prepare the learning contents and other LMS activities according to the diverse needs of the students.

- The results of this study may lead to the usage of suitable LMS features among students and teachers.

- This study facilitates LMS designers to design necessary and suitable accessibility features to cater the needs of students with diverse needs.

- Heavy teaching workloads due to the increase of student enrolment in engineering colleges can be condensed significantly by the use of LMS.

5.15 CONCLUSION

The purpose of any research is to find solution scientifically for the problem. Researches in the field of education create a great impact in teaching as well as learning. Particularly, internet has taken learning into an innovative, digital era to ease students to gain their knowledge anytime, anywhere and everywhere. They feel that learning with the support of ICT tools is trouble-free, comfortable, trendy and uniquely interactive. At present, knowledge explosion and technological explosion are the two major challenges in education. So, it is imperative for the educators to consider technology integration in teaching as the right solution to meet these challenges. In addition, suitable education provided to the students enables them to be better prepared for the knowledge society.

As students have different learning preferences based on their interests, ability and previous knowledge, it becomes essential to adapt the teaching methodologies and technological innovations according to their interest. For this purpose, a keen knowledge about learning styles of the students becomes an inevitable one. Therefore, the three basic learning styles viz., visual, auditory and kinesthetic were taken into consideration in this study. Students, the so called digital natives expect learning materials personalized to their individual needs rather than 'one-size-fits-all' information. Therefore, teachers should design course materials, assessment tools and other activities that address multiple modes of learning styles with the purpose of improving the possibility of acquiring the necessary learning experience of each student.

Information and Communication Technology tools have been widely accepted by students to facilitate and enhance interactive learning. LMS is the foremost tool in providing such a learning experience and meets the needs of students with different learning styles. Features like Learning Materials, Assignments, Quizzes, Discussion Forum, Chats & E-Mail, Instant Messaging, Blogs, wikis and glossaries present in LMS provide a promising, interactive learning environment. The habitual usage of mobile phones, computers and internet among the students paves way for the easy adoption and usage of LMS among them. Particularly, the ease of access or the navigations encourage them to use LMS effortlessly.

The most fascinating finding of the present study is that there is a positive relationship between the usage of usability and accessibility features of LMS and learning styles. This finding indicates that the kind of interactions to use on content or on learning objectives should meet the needs of all learners. With the help of connected technologies like LMS, it is very simple to cope with or to satisfy the needs and expectations of the students. The finding of the study strongly recommends the higher education institutions to really consider forming a team of people comprising teachers, instructional designers, content developers, learning style experts and technicians. The main function of the team should be to suggest what materials to be provided to address all learning style needs and hence to find the best ways for teachers to teach efficiently. Furthermore, it is much more important that the prepared lessons should be presented in a manner so as to achieve the most effective learning. To achieve this purpose, multiple instructional strategies like lectures, discussion, case studies, lab/studio work, group projects, audio clips, tests and feedback should be utilized while designing online courses. Such strategies will also enable the students to meet the learning objectives, whether simple or complex, effortlessly.

The present study showed that more than 50% of the students are visual in their learning style, and they are positively influenced by the usage of LMS features. This result affirms the necessity of including visual features in the learning materials. Teachers should take special consideration in preparing lessons with animations, simulations and illustrations so that students can be encouraged to make use of the materials effectively.

It is also found that the usability & accessibility features of LMS and the learning styles are influenced by the personal variables like 'branch of study' and 'year of study' of the students. This result indicates that students need learning materials appropriate to their course, branch and learning styles. Knowledge about the students' learning styles will help teachers to develop lesson plans and materials that disseminate suitable information across the spectrum of learning styles. Inclusion of necessary features and proper usage of the available LMS features with the help of digital media will help teachers to catch the attention of the students. Content and assignments should be designed using multiple learning strategies to meet the needs of the different branch students. Especially, while preparing the writing assignments a great effort should be taken to make them explore the course content instead of just asking them to report back the content that has been 'delivered' to them.

Additionally, providing options like chat, e-mail, instant messaging and social media will help the teachers to keep the multitasking students engaged. The inclusion of interesting features like simulations and animations in the learning materials will definitely make learning an irresistible one. Teaching the students in a way in which they learn best is a vital one to gain academic excellence. If the teaching style meets with the learning styles then learning becomes interesting and life-long.

The present study also recommends that the communicative and collaborative tools in the LMS like Discussion Forum, Chats & E-Mail, Instant Messaging and Blogs are rarely used by the students. Hence, this study further suggests that students shall be encouraged by the teachers to use all the features of LMS benefitting them with different learning styles, instead of limiting the students by engaging them with selective features like Learning Materials, Assignments and Quiz.

Blend of LMS in teaching keeps more responsibility on teachers for managing their classes and planning their instruction effectively. The quality of teaching and research in this sphere will play a critical role in the emergence of our country as a global knowledge leader. A knowledge-driven generation will be an asset to the nation (NKC report, 2009). Therefore, teachers must find ways to incorporate the knowledge in a way similar to the way students acquire outside class in their digital lives.

Teachers are using the LMS mainly to communicate to students, distribute materials including the course syllabus, and post grades. Instead, if the LMS is more properly used to attract the students of different learning styles by using right tools and resources for their courses, undoubtedly, students will embrace it unconditionally. And it is assured that proper usage of LMS will enable the students to academically excel in the dot com terrain.