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THE FUTURE OF E-LEARNING SYSTEMS



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The eLearning space has evolved. It is moving towards further inclusive and collaboration approaches and nowadays it is very challenging to keep up with the most recent trend. Presently, digital education trends have evolved in using enhanced engaging format similar as AR / VR and gamification to grasp learners' attention and to draw on their interest in an innovative way by offering a variety of experiences through interactivity and simulation.

This thesis aims to research and explain the future trends of eLearning process and how technology can improve and make it easy to use for all primary users such as teachers, system administrators, and students.

A survey was conducted with the objective of discovering the need for eLearning in the education sector and how to avoid issues related to online learning. Other important subjects within the thesis include eLearning technologies, eLearning system, eLearning pros and cons and lastly eLearning design process. In the practical implementation of the thesis, Lectora software was used to demonstrate VR scenario and how to make engaging eLearning.

The thesis concludes that eLearning is not one thing. It can evolve a variety of different technologies such as Virtual Reality (VR), Augmented Reality (AR), Artificial Intelligence (AI), Adaptive learning systems and gamification.

Keywords: Lectora, eLearning, Learners, AR, VR.

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List of abbreviations (or) symbols

Abbreviation	Explanation of abbreviation (Source)
AI	Artificial Intelligence
AR	Augmented Reality
ASP.NET	Active Server Pages Network Enabled Technologies
CSS	Cascading Style Sheets
eLearning	Electronic Learning
HTML	Hypertext Markup Language
IQ	Intelligence Quotient
LMS	Learning Management System
LE	Learning Environment
ML	Machine Learning
PLA	Prescient Learning Analytics
ROI	Return on Investment
ROL	Revision Cycle and Return on Learning
SCORM	Shareable Content Object Reference Model
VR	Virtual Reality
WYSIWIG	What You See Is What You

1 Introduction

Ten years ago, the concepts Computer Based Training, Computer Based Assessment, Computer Assisted Instruction, etc. were introduced and the idea about internet-based instruction was hardly mentioned.

Presently e-Learning is one of the most up-to-date expressions. There are relatively different delineations of the conception eLearning. Let us dissect some of them.

- eLearning is a combination of methods, structures and networked electronic tools orchestrated into systems that bring about, or are intended to bring about, learning.
- Learning conducted via electronic media, typically on the internet.
- My understanding of eLearning is about using any information and communication technologies to expand access to education and to enhance and transform teaching and learning.

Considering these definitions, it can be summarized that all of them comprise the combination and interaction of the following basic components: learning activities and teaching via different electronic media. That is why it becomes very important to be apprehensive of some didactical and technological aspects during the development process of any eLearning course. The expectations that high level technological tools will increase any e-learning course quality often rely to an underestimation of the educational objectives being set. According to our experience the crucial question is not “What technological tools are to be used during the development process of e-learning courses?” The core problem is “How to design and plan an e-learning course that ensures the achievement of the educational objectives [1]?”

The goal of the thesis is to investigate the need for eLearning in the education sector and to investigate different technologies involved in eLearning development.

First part of the thesis (chapters 1-3) defines the eLearning concept and different technologies, methodologies involved in the eLearning development process and its stages. In chap 4, a survey was conducted with the objective to discover the need of eLearning in the education sector. Chapter 5 explains the process to design and publish an eLearning using Lectora software, and the thesis ends with a conclusion in chap 6.

The thesis uses diverse sources from software's official documentation, reputable website articles, and research conducted by large companies. In addition to the outside sources, the author has also used his over 2 years of work experience in the field.

2 E-Learning

The term 'e-learning' was independently invented several times in the mid-1990s [2]: Twenty years on, the term is beginning to sound like a quaint anachronism. Before it dies out altogether, we will provide a definition: eLearning is a combination of methods, structures and networked electronic tools orchestrated into systems that bring about, or are intended to bring about, learning.

Inherent in this definition is that part of the orchestrated assembly must include methods of teaching or, more concisely, pedagogies. From this perspective, pedagogies are technologies [3]. Like all technologies, no one part exists in isolation. All are mutually constitutive and dependent on one another parts of a single orchestration and so all must fit together [4]. With its original name in English eLearning has become ubiquitous "brand", the trademark for an innovative approach of teaching new generation of students. Its subset, online learning, is the focus of attention, both because of its increased use at all educational levels and numerous analyses of positive and negative aspects of this teaching method [5].

eLearning generally takes the form of online courses. Element of the course is learning object. Contents of the course are attained through collecting and association of learning objects. The conception of objects is formalized in a rigorous form of established procedures of how these pieces of content are collected and organized into courses and packages for delivery on the Internet. Learning Management System is the dominant technology that is now used to organize and deliver online courses. This software has come an ineluctable part of the learning environment.

2.1 E-Learning technologies

Advanced technology is changing the business scene at a quick speed. To flourish in the present consistently advancing businesses, current associations should change the way they configure, convey, and assess learning. Innovation is playing a steadily expanding role in the improvement of eLearning. All things considered, innovation is redoing the way people live, impart knowledge, lead businesses, and learn and instruct. The methods involved in creating and conveying learning programs have also changed significantly [6].

Let us take a look at these arising technologies, and how they are taking eLearning to the next level.

2.1.1 Artificial Intelligence

Artificial Intelligence is referred to the intelligence displayed by machines, as opposed to natural intelligence displayed by humans and animals. It is revolutionizing the whole eLearning experience due to the many advantages it has to offer. AI can help highlight areas that require improvement and assist students in focusing on areas where they are lagging. Advanced AI models can solve many problems for the users in a more comprehensive way as compared to the typical classroom curriculum. Furthermore, the technology can also create more realistic experiences compared to traditional linear pre-programmed lessons and eLearning courses.

In order to use AI for training, the company should have access to an eLearning AI engine, and have programmers who can code the learning interactions/experiences [7].

2.1.2 Prescient Learning Analytics

Prescient learning analytics (PLA) endeavour to anticipate future results and decrease useless preparation content, otherwise called "piece learning." By investigating LMS learning information for patterns and examples, associations can refine their projects to content more likely to interest members, to actually be used, and to increment completion rates. Purdue University is utilizing prescient examination to furnish students with ongoing input to inform them of the extent to which they are on target for their goals. Different associations utilize the information to dissect the viability of their courses in light of interest and achievement measurements and identify areas for development [8].

2.1.3 Augmented Reality (AR)

Augmented Reality is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. This, also, includes real-world sensory input like video, graphics, or sound [9].

When it comes to eLearning, Augmented Reality can make the learning process more interesting and easier to grasp. For instance, if you were an online instructor and your target subject was astronomy, you could offer your students a virtual tour of Mars without asking anyone to leave their home. The concept would also be excellent for research. Experts predict that the AR market could be worth \$200 billion by 2024, showing real potential for the future.

Similarly, to VR to start building learning experiences for Augmented Reality, the company needs to have the capability to work with 3D modelling software and have access to AR headsets for the learners.

2.1.4 Virtual Reality

Virtual Reality (VR) is a computer technology that utilizes Virtual Reality headsets or multi-projected environments, sometimes in conjunction with props or physical environments, in order to create realistic sounds, images, and other sensations that promote a user's physical presence in an imaginary or virtual environment.

The functional applicability of Virtual Reality has made it an incredibly popular tech in eLearning. For now, potential applications in the fields of medical training and physics show the most promise. What benefits can this exciting technology bring? First, VR can transmit students to the farthest corners of the universe in just a blink of an eye and surround them with an engaging and deeply educational environment. An improved motivation to learn is another key benefit. Students will no longer be stuck with pages upon pages of boring text, bullet points, and illustrations, but they will have a chance to go through the experience and get the most out of it instead. Virtual Reality holds great potential and is expected to go further beyond gaming, to include areas such as training and education, as well as VR films, sports, and music.

Picture 1. VR demo of CivilCity floor plan



To get started with VR in eLearning, a company needs to have a professional developer who can work with software like Unity 3D. In addition, VR headsets are required for the learning populations, which by itself can become a cost-prohibitive factor [10] (Picture 1).

2.1.5 Big Data

Big Data allows eLearning experts to understand how the users are digesting the information and which learning aspects appeal the most to them. In addition to that, it allows them to pinpoint learning interactions that should be fine-tuned within the eLearning module or course. Based on the learning patterns, eLearning experts can predict where learners may excel or struggle. This way, they can improve their eLearning courses so that the learners get a fair opportunity to accomplish the best possible outcome [11]. Starting with Big Data can be confusing. The company should figure out a way to collect meaningful data, and, once enough data is collected, find ways to process and analyse it to find helpful insights.

2.1.6 Adaptive learning systems

Adaptive learning systems is a field of computer science that gives computers the capacity to learn without being directly programmed [12]. There is a range of benefits that Adaptive learning systems can offer to online learners, as well as organizations that invest in LMS platforms. First of all, Adaptive learning systems has the ability to offer more custom eLearning solutions based on the learner's past performance and learning goals. Secondly, it enables efficient resource allocation since online learners receive the exact eLearning resources, they require in order to fill knowledge gaps and accomplish their learning goals. For a company wishing to start using Adaptive learning systems in eLearning, the main goal should be assembling a team of developers capable to write scripts for Adaptive learning systems.

2.2 E-Learning system

What is an eLearning system?

An electronic learning system is a cohesive online platform or software that gives teachers, managers, trainers, and learners alike a set of interactive features to help with the management, delivery, and receipt of learning content. Because of its accessibility and versatility, this eLearning system is highly compatible with the learning and training approaches of different work industries [13]. It is consisting of:

- **Microlearning:** Is where you teach and learn using easy-to-remember, bite-sized chunks of information. Only some people can absorb a torrent of information in a single course or lesson but breaking it down into smaller parts is clinically proven to make it absorbed more efficiently. This makes microlearning much more effective than traditional training [13].
- **Mobile-First Learning:** Just about everybody in the developed world has a smartphone nowadays especially those in a business environment. By allowing learners to use their own smartphones, they can perform lessons and training courses at their own convenience, wherever they are in the world [13]!
- **Cloud-based:** Few places in the world have a broadband infrastructure that allows an organization to send large courseware files to scores of individuals. Doing so would also mean that updating information and version control becomes very hard to manage. However, if your electronic learning platform is based in the cloud, you can quickly and easily update courses or lessons whenever you want, and all of your learners will instantly have access to the new information [13].
- **Electronic Learning System Templates:** Despite the conveniences of eLearning, it is still easy to get bogged down in answering myriad multiple-choice or true-or-false questions.

Excellent educational platforms will have a variety of templates for you to choose from. That way you can have learners answering the same style of questions in completely different ways [13].

- **Gamification and Prizes:** Even the best learners can become cynical and apathetic when it comes to doing the latest training. So why not add some incentives and a level of competition? A great electronic learning system will have the option to award points for correct answers and also be able to time answers. This way, you can offer prizes to the best performers. The level of competition makes learning almost subliminal and not the chore it is frequently been regarded as [13].
- **E-Learning Authoring Tools:** These allow you to quickly design course content even without coding or design expertise by using drag-and-drop and other user-friendly interfaces, making content creation easier for you and your team. Learning materials can then be distributed to your learners from an LMS [13].
- **Real-Time Interactivity:** With this feature, you can be sure that any updates you make to your training content will be reflected in real-time. It also means that learner engagement can be tracked automatically so you will be able to get a clear picture of your learners' current performance levels [13].
- **LMS Integrations:** Perhaps your company or educational organization already has an electronic learning system. It is working fine, but it has not kept up with the latest eLearning features and abilities. Rather than replace it, you can integrate your legacy online learning system with other platforms that offer the newer features you are looking for [13].
- **Analytics and Reports:** With analytics and reporting features, you are able to see each learner's unique course history. This will give you better insight into how learners are progressing in each course, their scores, and if there are any roadblocks in their learning pathways [13].

- Protocol-Compliant options: Content standards such as SCORM, API, LTI support you in making sure that your learning materials are compatible and interoperable with other learning platforms. As an L&D professional, it is crucial for you to choose one that supports your training courses and is perfectly compatible with your LMS. SCORM is one example of this. The acronym SCORM stands for Shareable Content Object Reference Model. SCORM is a set of technical, programming standards. Its purpose is to create compatibility between different eLearning platforms. In other words, SCORM standards guide programming code so that eLearning apps can “talk to” each other and work together. If an eLearning system is SCORM-compliant, you know that it has been created according to current best practices of the industry and will be fully communicative with other SCORM-compliant software [13].

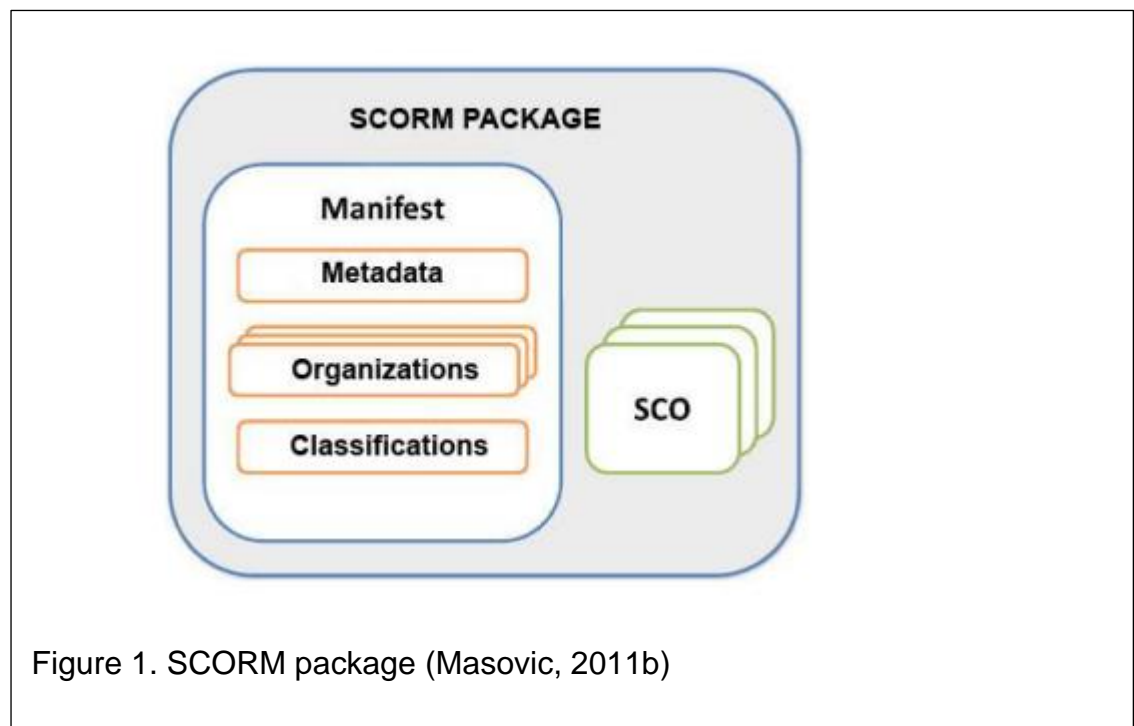


Figure 1. SCORM package (Masovic, 2011b)

2.3 E-Learning Pros and Cons

As e-learning is becoming popular, teaching methods are switched to distance learning using equipment such as computers and tablets. The aim of this chapter is to provide a clear detailed analysis of the major factors contributing to the success and failure of eLearning.

2.3.1 Advantages of eLearning

- Worldwide accessibility: E-Learning is accessible anywhere, at any time through a smart phone, tablet, portable computer and good internet connection is needed to access learning materials.
- Affordable: The biggest eLearning benefit is reduction in costs alike classroom learning. Paying for instructor, travel time and fare, time off work and classroom materials like books can be costly compared to eLearning.
- Easier to update and maintain: E-Learning material is relatively easy to implement changes and to incorporate new technologies or multimedia elements that will benefit learners.
- Encourages students: The use of leader boards, certification can help boost students' motivation and may increase students' satisfaction and better their attitude.
- Knowledge testing: Online quizzes helps students to expand knowledge and increase Students IQ.

2.3.2 Disadvantage of eLearning

- **Software and Hardware issues:** Many external factors hinder the smoothness of a software. To name a few, compatibility issues, not upgrading to a new version, regular system crashes etc... Hardware is the physical device's part. Dust, using the device roughly, overuse are factors that can interrupt distance learning.
- **Misuse:** Most students misuse devices for the wrong cause. Devices are used for gaming purposes which can lead to failure and to not reach their leaning goals.
- **Lack of internet connection or electricity:** In rural areas, the usage of electricity and internet are not yet prevalent. In order to experience distance learning, students must have stable electricity and internet.
- **Inability to concentrate on screen:** Staying focus while learning online can be very challenging. It is imperative for organizations, teachers to make easy to read, engaging, interactive eLearning to help students to stay focused on the lesson.

3 Methodology

In this chapter, we will describe the eLearning development process and its stages.

Stage 1: Program Objectives and Constraints

As with any complex project, the first step in eLearning development is planning. Start with asking these questions:

- What will the outcome of the program be?
- What will be gained?
- And how to measure these gains?
- What is the targeted audience?

Creating a written program to provide stakeholders with statements of expectations to which they can respond [14].

Stage 2: Cultural Fit

Now that you have determined the program objectives and constraints, it is time to think about your company's culture. You want this new curriculum to fit in well with the learning landscape of your organization. Think about your company's vision and values and how the eLearning modules can reinforce these foundational messages. And what about other learning initiatives? Will this curriculum fit in or conflict with them? If there will be opportunities for subsequent learning, what segues need to be established to connect with those? This is also a good time to do some benchmarking, both internally and externally. What has been tried before? What can you learn from previous attempts [14]?

And finally, what kind of resistance to the learning opportunity might you expect? Stage 2 is when you begin to seek buy-in from stakeholders and leadership. Too often learning is rolled out before anyone has bothered to ask coaches or managers their opinions on the learning gaps and resources

needed. The results of even the best eLearning will falter if middle managers are against the program. Good internal communication and marketing start by making sure the curriculum fits within cultural expectations and existing frameworks [14].

Stage 3: Learner Needs

The learner is the shining star of stage 3. Take adequate time to study your learner population. What is their key problem or knowledge gap? How is it measured? What hinders them from learning or applying what they know? Consider their demographics, technical ability, experience with the content, and motivation to learn. And how should content be delivered? Will they make use of just-in-time microlearning segments or prefer an extended learning time away? Departments and teams may appreciate gamification, where they compete against other divisions or individually to top a leader board. Fitting the content to the culture and the learner are two of the best benefits of custom eLearning, so be thorough at these stages. Establish your expectations for the learner experience and decide how you will evaluate the experience in the end [14].

Stage 4: Content and Strategy

You have looked at your organization as a whole, as well as your population of learners. The next stage is to focus on content. What topics and subtopics need to be taught in order to bridge the learning deficit? It is important to ask these questions to the right people, so engage your Subject Matter Experts to brainstorm a list of topics and then sort and consolidate the topics into concise units of study.

Next, write a learning objective for each of these topics and use an action verb. Look for results such as recall, apply, achieve, or value. Using action verbs provides a basis from which to measure results later in the process.

Assessments tie directly to the learning objectives: did they recall the information or were they able to demonstrate a specific skill?

This is also when you begin to uncover any existing resources or content. What has been used before? Even poor resources are a better starting place than working from scratch. Make a folder to house any source information that will be used to create the storyboard and share it with SMEs and developers [14]

Stage 5: Storyboard and Design

All your work analysing, planning and organizing up to this point will influence the Instructional Design of the storyboard. Learners' previous experience with the content will dictate the entry point they need. From that entry point, content follows a logical progression through the topic and sub-topics, peppered with examples, real-life scenarios or interactions to increase learner engagement. Visual graphic elements further enhance learning as do animations and video. How content is delivered is critical to the success of your eLearning module [14].

When you storyboard a module, consider the following key elements:

- An audio script for narration
- Graphics, animations, video, and photos
- Onscreen text
- Sound effects and music
- Learner interactions
- Assessments, feedback, and remediation
- Scoring and next steps

Stage 6: Development

Before your storyboard comes to life at the development stage, think about how the learner will view the module: laptop, mobile device, or both? Then, using your preferred course-writing software, input the onscreen elements, create interactions and assessments and align any animated objects to the audio narration.

At this point, your LMS specialist should be in contact with the developer to discuss publishing preferences and how the course will be set up in the learning management system. For example, will it be published in Tin Can, SCORM or something else? What kind of description of the module should appear in the LMS and instructions to learners about the curriculum? When development is complete, the module is ready for the revision process [14].

Stage 7: Testing and Revision

Depending on the needs of your organization, you may begin with a soft rollout of the curriculum to a focus test group. Before this, stakeholders should review the developed modules and give feedback. Be careful to provide detailed instructions as to what kind of feedback you want. Conflicting personal opinions, which seemingly change with the weather, can keep a module in review for months. If you anticipate this with your stakeholders, appoint one person to review all feedback and then make final revision decisions to keep the project from stalling [14].

Stage 8: Internal Marketing and Launch

Preparing for your launch is a critical stage that is sometimes overlooked. You have worked hard, and it is time for you to share your excitement! Learners and their coaches need the opportunity to form accurate expectations about the curriculum. Incidentally, either false build-up or no build-up can squelch a good program. Through internal marketing, let their anticipation and excitement about

learning new things build over a few days. Enthusiasm is the kind of draw you want, which will propel learning from the start. Treat your people like prospective customers, and woo them into a curious state of mind, eager to learn something new [14].

Stage 9: Revision Cycle and Return on Learning (ROL)

Even before the launch, you will need to establish a revision cycle. How long do you anticipate before some of the content will become obsolete? Will roll out to future learners be cyclical? Providing a channel for learner feedback allows you to make informed decisions about how to improve your eLearning. The results of the assessment checks you determined in the storyboard will guide your next moves.

In addition to an ongoing revision cycle, you will want to evaluate your return on learning. ROL should include both quantitative and qualitative measures, so do not ignore the impact on your organization's culture. For example, learners' promotions and overall satisfaction with their work may not immediately affect profitability, but over time they will keep turnaround to a minimum. Compile both the ROI and qualitative factors to give a complete-picture evaluation of your eLearning program [14].

4 Survey

4.1 Objective

A survey was conducted with the objective to discover the need of eLearning in the education sector.

4.2 Target group

The ultimate purpose of eLearning is to provide distance learning worldwide platform where learners can access courses at anytime, anywhere. Thus, the target group for the survey is professionals working in diverse field and students attending universities. A link was shared to 54 participants via email, WhatsApp and Teams around the world.

4.3 Survey questions

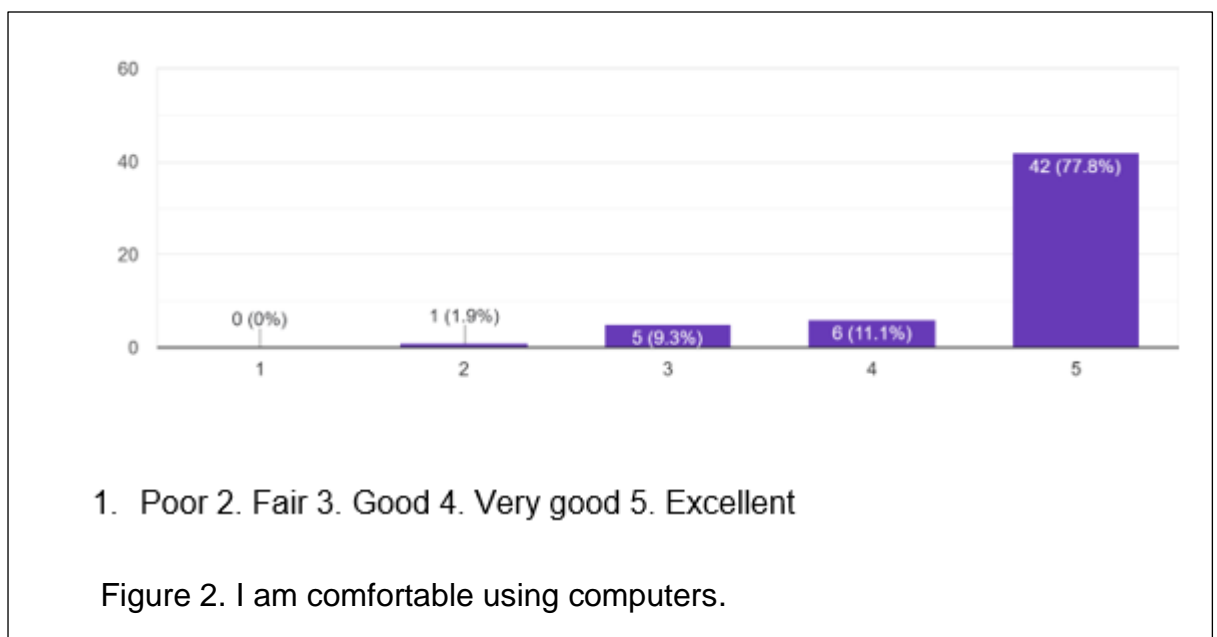
Table 1. Questionnaire Analysis of E-Learning

Question No	Question
1	I am comfortable using computers
2	I am able to access the internet from my computer
3	I enjoy reading and have good reading skills
4	I am familiar with using E-mail and a web browser
5	I believe that high quality learning can take place without face-to-face interaction
6	I like a lot of interaction with my instructors and / or teaching assistants
7	I can ask my teacher questions and receive a quick response during internet activities outside of class
8	I am motivated to learn from online material through internet activity outside of class
9	Learning is the same in class and at home on the internet
10	I could pass a course on the internet without any teacher assistance

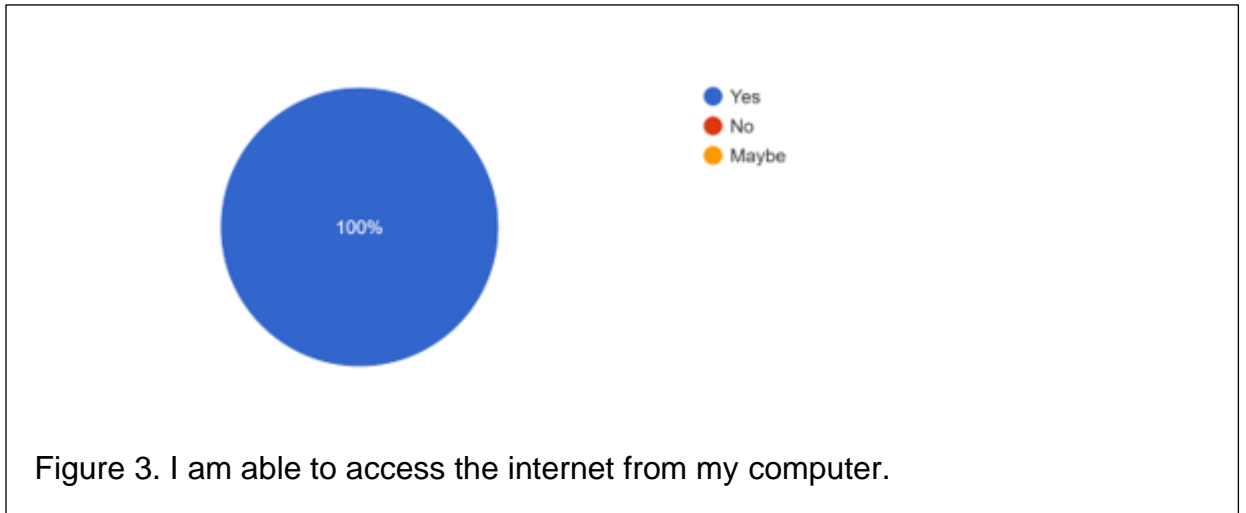
Questions from 1-10 aims to investigate whether learners are able to use a computer, have access to the internet, have good reading skills and are able to learn online without the help of a teacher. Moreover, it is to investigate to understand different experiences between distance and classroom learning.

4.4 Survey Results and Analysis

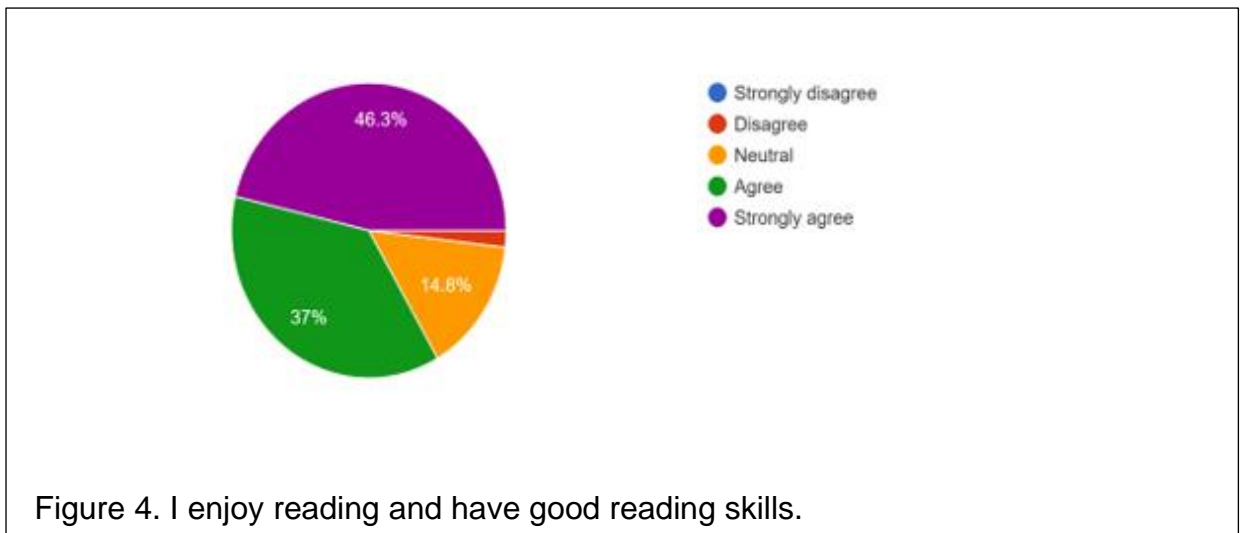
In total, 54 participants took part in the survey. Below are figures from 1-10 explaining the results from students' responses to grasp a better understanding on how eLearning is impacting in their learning process.



Out of 54 participants, 77.8% is the highest option. These findings substantially enhance the usability of a computer in our everyday life (Figure 2).



All participants were able to access the internet from their computers. Thus, this result is excellent because internet is vital to access eLearning (Figure 3).

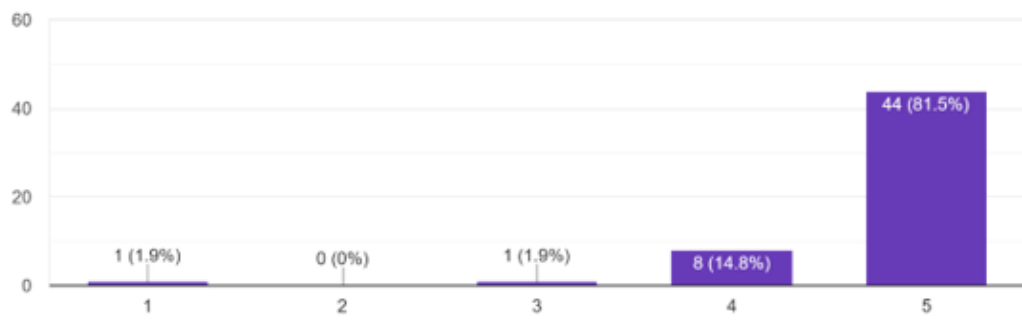


The result shows that 46.3% was the highest option.

Reading is a complex process and understanding what is being read is another.

To read fluently, one needs to instantly recognize and understand words.

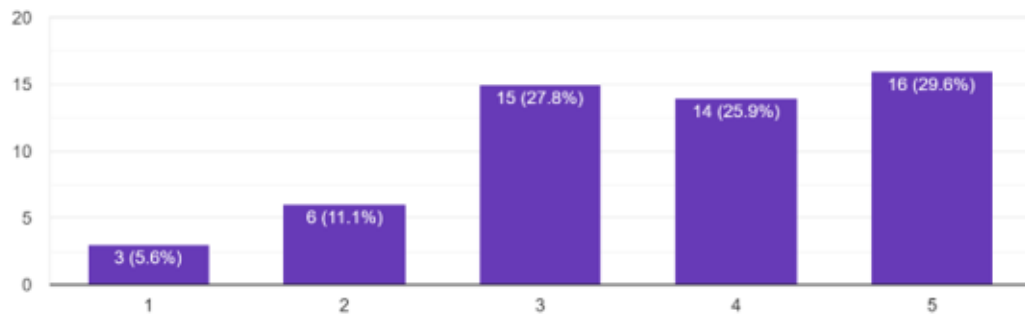
Fluency in reading is very important for good reading comprehension and plays a measure part in eLearning (Figure 4).



1. Poor 2. Fair 3. Good 4. Very good 5. Excellent

Figure 5. I am familiar with using E-mail and web browser.

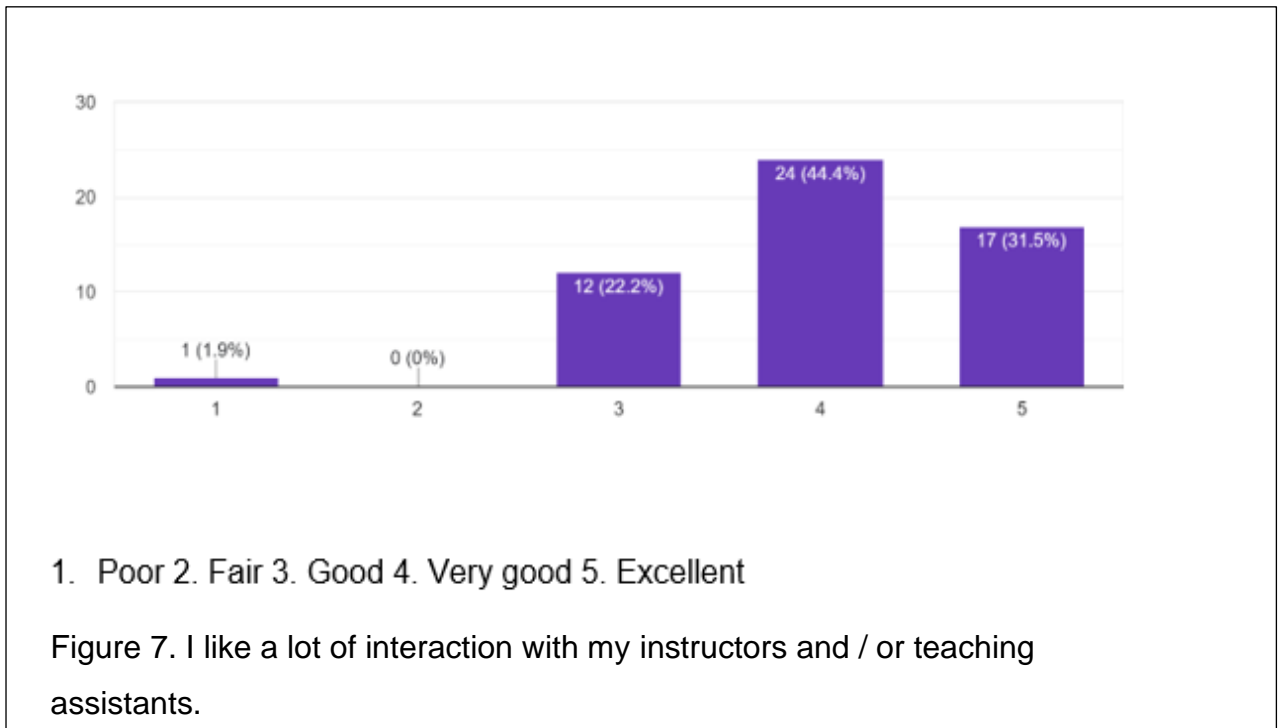
Out of 54 participants, 44 chose the highest option, 8 participants were very good, 1 participant is moderate and 1 participant were poor. Email is an important part to access many online platforms. It can be sent to family members, it also can be sent within an organization, it helps to sign up an account on websites and increase security on the net while web browsers are used by most internet users to surf the internet. A web browser is an interface between us and the information available on the web. It's a software app used to access the world wide web. These two powerful tools are the core platforms to access and navigate through eLearnings (Figure 5).



1. Poor 2. Fair 3. Good 4. Very good 5. Excellent

Figure 6. I believe that high quality learning can take place without face-to-face interaction.

Lack of interactivity definitely does influence students' learning outcomes. Learning tends to take longer online, which limits the total interaction time both on the teacher-student basis and in group sessions. Results show that out of 54 participants, 16 participants were excellent with online learning, 14 participants were very good with online learning, 15 participants are moderate with online learning, 6 participants were not sufficient with online learning and 3 participants were poor with online learning (Figure 6).



Interactivity in eLearning courses can extend from various decision tests, eLearning situations, reproductions, movement recordings, and so on. This assistance develops the comprehension of the substance through a protected experimentation condition. An eLearning course has a few levels of interactivity. These levels are characterized by the degree of intelligence created in the eLearning course [15]. It shows that the majority of participants like interaction while learning (Figure 7).

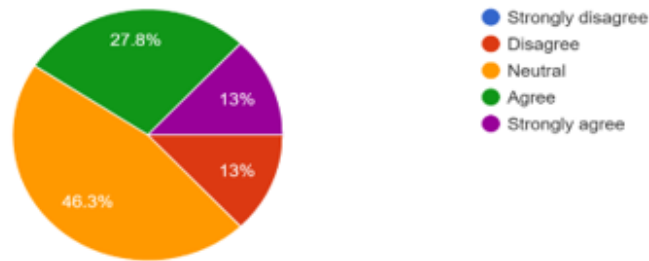
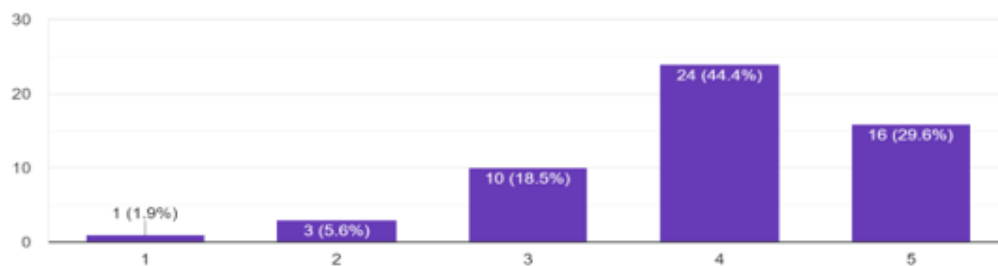


Figure 8. I can ask my teacher questions and receive a quick response during internet activities outside of class.

Learning online requires patience. Instructors must provide time and opportunity for students to ask questions. Most participants were neutral and that shows the importance of a quick response in learning between instructors and students (Figure 8).



1. Poor 2. Fair 3. Good 4. Very good 5. Excellent

Figure 9. I am motivated to learn from online material through internet activity outside of class.

Motivation plays a key role in order to be an effective e-learner. Thus, a lack of motivation can lead to failure or quitting. As described, the rate of

online learning motivation has been high despite many obstacles that may occur during distance learning (Figure 9).

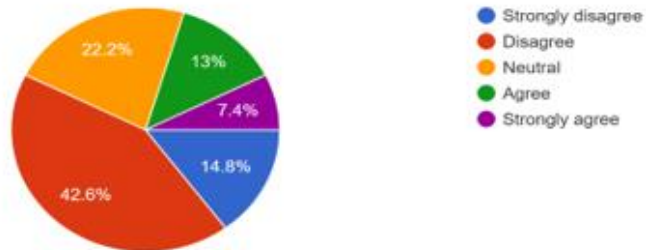


Figure 10. Learning is the same in class and at home on the internet.

Learning online and outside of class differ. Distance learning is ideal for those who want to work and study simultaneously. Adjusting schedule and less burden are needed to learn with ease and to succeed. Learning in class requires discipline and active participation (Figure 10).

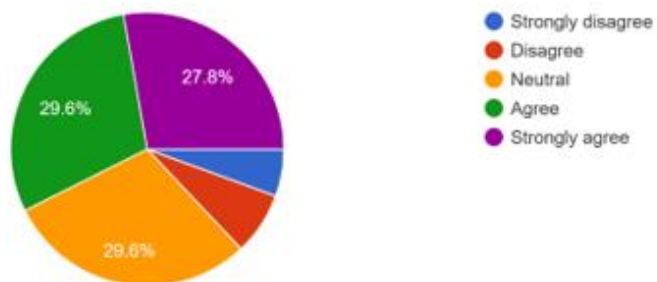


Figure 11. I could pass a course on the internet without any teacher assistance.

Findings show that most participants were able to pass a class without any teacher's assistance (Figure 11).

4.5 Reflection

The survey has helped to gather information and to grasp a clear understanding about several issues that may occur in eLearning sector and how to avoid those issues related to online learning.

Note that, the participants age was between 18- 40 years old. Younger generation is more familiar with computers and internet than elderly people. Overall, participants evaluated themselves familiar with the usage of internet, computer, and eLearning. As eLearning is setting down roots and is here to stay, the usage of blackboards and chalks, notebooks are behind us and designers need to come up with creative ways of making distance learning easy to access, fun to use and to learn by including pictures, videos, sounds and VR. Getting help online variate from time to time as students complain to not get assisted fast enough. The use of AI and ML can be very useful and helpful for students. Designers need to provide digital assistants such as chatbots, voice bots to steer learners self-learning. Furthermore, adding a chatbots to communicate instantly with instructors would be ideal to solve the issue.

Firefox, and Apple Safari. However, there is a possibility to add custom HTML, JavaScript, and CSS code to your Lectora title if needed [16].

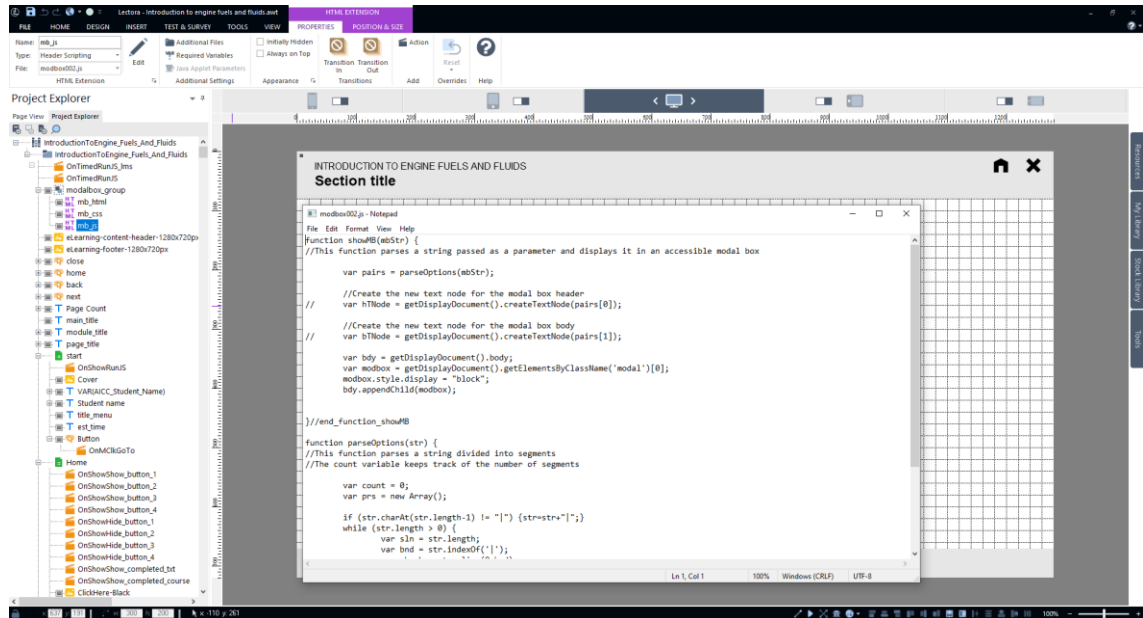


Figure 13. Custom JavaScript code to extend the functionality and contents beyond what the program natively supports.

5.2 System structure

Most e-learning systems can only keep basic learning portfolios [16]. The complete data of learning activities are sparsely scattered in web logs.

Teachers must perform tedious processing to get a clear picture of the learning activities of his or her students [17].

In fact, to perform such analysis requires certain technical capabilities that can pose a difficulty for many teachers.

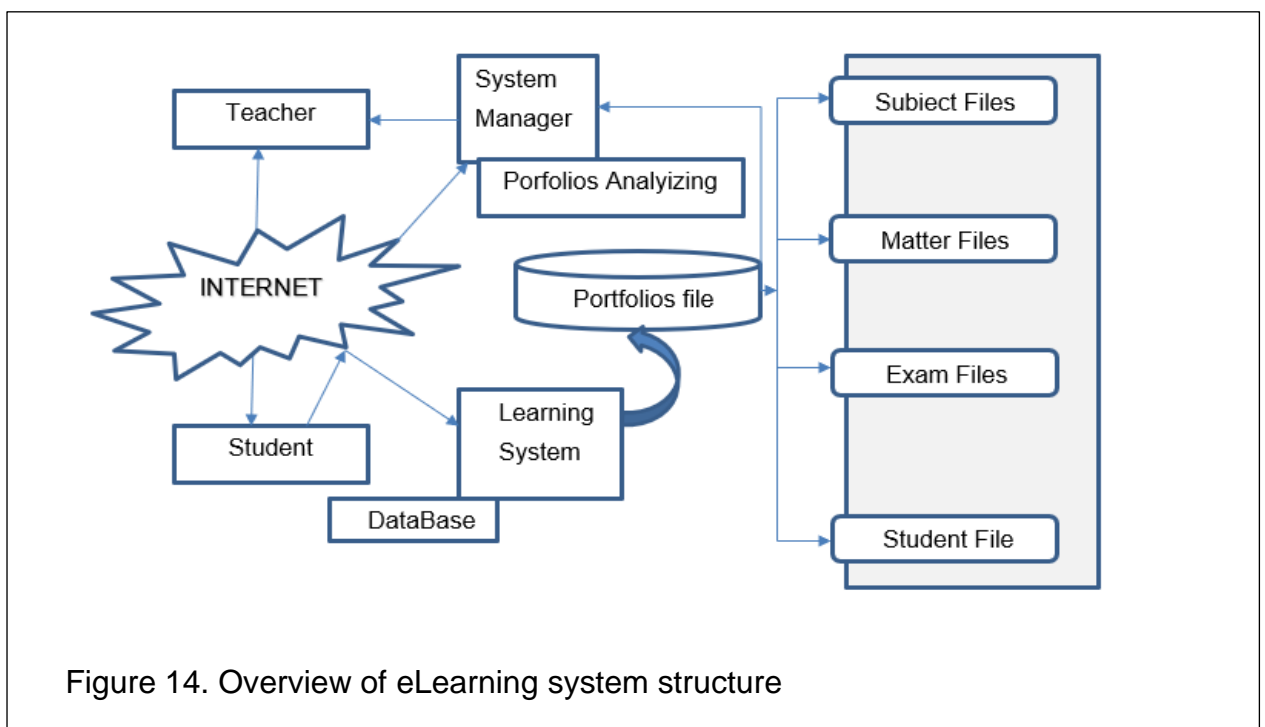


Figure 14. Overview of eLearning system structure

To solve this problem, we integrate the data collection functionality of learning activities with the teaching material managing module in e-learning system to record the learning paths and learning records of all learners simultaneously and automatically.

The system is implemented in ASP.NET. Another tool, the learning path viewer, recalls the learning path and records of any specific student. The learning records include the time spent reading online materials, the number of login times, and the number of online discussions.

5.3 Learning management system

With the rapid advance of the Internet, e-learning systems have become more and more popular [18], [19]. An eLearning system provides the following functions:

1. Delivery of learning content for students via the Internet,
2. Record of learning progress and portfolio,
3. Management of learning content, assessment and course.

The Internet and related web technologies do offer great solutions for presenting, publishing and sharing learning content and information, as is the case in many other areas. Special software called Learning Management System (Fig.13.) is generally used in most institutions providing web-based learning [20]. The most of universities combine form of learning using one of a number of commercial or free LMS.

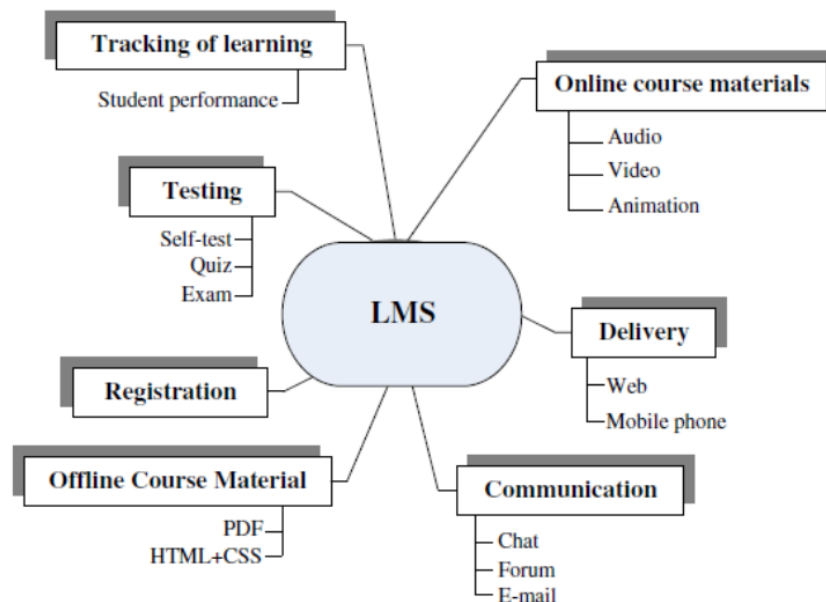


Figure 15. Structure of Learning management system (Balogh and Turčáni, 2011d)

Because of the huge number of e-learning systems, and the availability of a large number of LMSs, one needs a systematic way, or a tool to evaluate the quality, efficiency, and the performance of LMSs and make a choice that will satisfy most or Possibilities of Modelling Web-Based Education 95 all of the requirements [21]. LMS systems usually have large number of features, and it becomes a tedious task to make a manual selection. One possibility is to automate this evaluation process using computer aided techniques [22]. The target function of LMS managing the instruction is the direction of communication as to the student's knowledge and abilities, thus changing the amount and demandingness of the materials submitted to the student. In the theory of management there is an obvious transition from combination procedures to sequence chains and optimized processes (the strategy of continuous assessment of the student instruction reflection, and based on that, adaptation of the following instruction, is comparable with the dual principle of identification and adaptive management). For the description of the communication of a man with a computer it is suitable to use graphic tools [23].

6 Conclusion

Firstly, the thesis aimed to analyze the need of eLearning in the education sector and covered details on trends and options to improve future eLearning. eLearning is a process that involves the development of content, planning for its delivery, and evaluation of learning process. It provides a way to invest in new skills without incurring costs. The process of creating content and planning for its delivery and evaluation of the learning itself is what makes eLearning a feasible and effective system of training.

A survey was conducted, and results showed that most people have access to the internet, are familiar with the eLearning concept and can learn online. However, there are still improvements that can be made to eLearning. The most important that could be implemented would be the use of AI and adaptive learning. These would allow Personalized learning, save time, greater insights, easy to access, improve learners experience.

All the technologies mentioned in chapter 2 can become real game changers for the eLearning industry. They have the capacity to greatly improve the learning experiences for all learners. Companies in the education Tech sector should pay attention to the development of these technologies in order to stay relevant in a rapidly changing market. While getting started with a new technology may be challenging in the beginning, the internet can provide a variety of useful resources ranging from eLearning case studies to how-to guides and tutorials. Any company should strive to utilize all available resources and technologies to improve the learning experiences and learning outcomes within the organization.

References

- [1] Tuparov, G., Tuparova, D., Peneva, J. 2004. Didactical and Technological Issues During the Development Process of E-learning Courses, Proceedings of CompSysTech
[\(PDF\) Didactical and technological issues during the development process of e-learning courses \(researchgate.net\)](#)
[Accessed 26 May 2023].
- [2] Cross, J. 2008. Origins of 'eLearning'. Retrieved from
www.internetttime.com/2008/11/origins-of-elearning
[Accessed 26 May 2023].
- [3] Dron, J. 2006. Any color you like, as long as it's Blackboard. In Reeves, T and Yamashita, S (eds.), Proceedings of E-Learn 2006–World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education. Honolulu, Hawaii, USA: Association for the Advancement of Computing in Education (AACE). pp. 2772–2779. Available at: <https://www.learntechlib.org/primary/p/24125/>.
[Accessed 17 May 2023].
- [4] Arthur, W. B. 2009. The nature of technology: What it is and how it evolves (Kindle edn). New York: Free Press
[\(PDF\) The Nature of Technology: What It Is and How It Evolves, W.B. Arthur. Free Press, New York \(2009\), 246 pp. \(researchgate.net\)](#)
[Accessed 26 May 2023].

- [5] Saracevic, M., Masovic, S., Medjedovic, E. 2011. "Infrastructure for Development and Implementation of E-Learning in the Educational System" YUINFO - XVII International Conference on Computer Science and Information Technology
[MODERN TRENDS IN HIGHER EDUCATION AND THE FUTURE OF E-LEARNING | Request PDF \(researchgate.net\)](#)
[Accessed 17 May 2023]
- [6] Rumzz, B. 2022. 5 Technologies that are Transforming The eLearning Industry.
[5 Technologies That Are Transforming The eLearning Industry](#)
[Accessed 17 May 2023]
- [7] Wikipedia. (2023). *Artificial intelligence*. [online] Available at: https://en.wikipedia.org/wiki/Artificial_intelligence#Other_sources
[Accessed 17 May 2023].
- [8] Jonas, A. (2017). 6 Emerging Technology Trends Changing
[6 Emerging Technology Trends Changing eLearning \(elearningindustry.com\)](#)
[Accessed 17 May 2023]
- [9] Antony, S. (2021). Augmented Reality Apps for Books: Future of Publishing
[Augmented Reality Apps for Books: Bringing Life Into Printing \(itechcraft.com\)](#)
[Accessed 17 May 2023]
- [10] Wikipedia Contributors (2019). *Virtual reality*. [online] Wikipedia. Available at: https://en.wikipedia.org/wiki/Virtual_reality.
[Accessed 17 May 2023].
- [11] Christopher, P. (2014). Big Data in eLearning: The Future of eLearning Industry. Retrieved from
[Big Data in eLearning: The Future of eLearning Industry - eLearning Industry](#)
[Accessed 18 May 2023]

- [12] Ed, B. (2018) Machine Learning. Retrieved from [What Is Machine Learning and Why Is It Important? \(techtarget.com\)](https://www.techtarget.com/whatis/definition/machine-learning)
[Accessed 18 May 2023]
- [13] Hannah, M. Online E-Learning system. Retrieved from [Online E-Learning System | EdApp Learning Management System](https://www.edapp.com/online-e-learning-system/)
[Accessed 26 May 2023]
- [14] Dr. Zandstra, G. (2019). 9 Stages of The Custom eLearning Development Process. Retrieved from [9 Stages Of The Custom eLearning Development Process \(elearningindustry.com\)](https://www.elearningindustry.com/9-stages-of-the-custom-elearning-development-process)
[Accessed 26 May 2023]
- [15] Satyabrota, D. (2020). 4 Levels of interactivity in eLearning and its advantages. Retrieved from [4 Levels of Interactivity In eLearning And Its Advantages \(elearningindustry.com\)](https://www.elearningindustry.com/4-levels-of-interactivity-in-elearning-and-its-advantages)
[4 Levels Of Interactivity In eLearning And Its Advantages - eLearning Industry](https://www.elearningindustry.com/4-levels-of-interactivity-in-elearning-and-its-advantages)
[Accessed 26 May 2023]
- [16] Calahan, C. (2022) *Lectora, eLearning Industry*. Available at: <https://www.elearningindustry.com/directory/elearning-software/lectora>
[Accessed: 18 May 2023]
- [17] Yeh, D., Lee, C.-H. and Sun, P.-C. (2005) "The Analysis of Learning Records and Learning Effect in Blended e-Learning.," *ResearchGate* [Preprint]. Available at : https://www.researchgate.net/publication/220587924_The_Analysis_of_Learning_Records_and_Learning_Effect_in_Blended_e-Learning.
[Accessed: 26 May 2023]

- [18] Sun, P. (2005b) "The Analysis of Learning Records and Learning Effect in Blended e-Learning," *Vermillionmediary* [Preprint]. Available at: https://www.academia.edu/28355818/The_Analysis_of_Learning_Records_and_Learning_Effect_in_Blended_e-Learning. [Accessed: 26 May 2023]
- [19] Gómez-Albarrán, M. (2005) *The Teaching and Learning of Programming: A Survey of Supporting Software Tools*. Available at: <https://www.semanticscholar.org/paper/The-Teaching-and-Learning-of-Programming%3A-A-Survey-G%C3%B3mez-Albarr%C3%A1n/729f96be8d7365bda48c36181e5a2bde4498fce6>. [Accessed: 26 May 2023]
- [20] Su, J.-M. *et al.* (2006) "Constructing SCORM compliant course based on High-Level Petri Nets," *Computer Standards & Interfaces*, 28(3), pp. 336–355. Available at: <https://doi.org/10.1016/j.csi.2005.04.001>. [Accessed: 26 May 2023]
- [21] Cavus, N. and Momani, A.M. (2009) "Computer aided evaluation of learning management systems," *ResearchGate* [Preprint]. Available at: https://www.researchgate.net/publication/286776178_Computer_aided_evaluation_of_learning_management_systems. [Accessed: 26 May 2023]
- [22] Cavus, N. (2010) "The evaluation of Learning Management Systems using an artificial intelligence fuzzy logic algorithm," *Advances in Engineering Software*, 41(2), pp. 248–254. Available at: <https://doi.org/10.1016/j.advengsoft.2009.07.009>. [Accessed: 26 May 2023]

- [23] Markl, J.: HPSim 1.1 – uživatelská příručka, <http://www.cs.vsb.cz/markl/pn/hpsim>], allowing for suitably describing and expressing the interaction. [Possibilities of Modelling Web-Based Education Using IF-THEN Rules and Fuzzy Petri Nets in LMS | SpringerLink](#)
[Accessed: 26 May 2023]
- [24] Balogh, Z.M. and Turčáni, M. (2011) “Possibilities of Modelling Web-Based Education Using IF-THEN Rules and Fuzzy Petri Nets in LMS,” in *Communications in computer and information science*. Springer Science+Business Media, pp. 93–106. Available at: https://doi.org/10.1007/978-3-642-25327-0_9.
[Accessed: 26 May 2023]
- [25] Masovic, S.H. *et al.* (2011) “MODERN TRENDS IN HIGHER EDUCATION AND THE FUTURE OF E-LEARNING,” *ResearchGate* [Preprint]. Available at: https://www.researchgate.net/publication/215725148_MODERN_TRENDS_IN_HIGHER_EDUCATION_AND_THE_FUTURE_OF_E-LEARNING.
[Accessed: 26 May 2023]