# The Design Journey of a Collaborative Community based Self-Expanding (CCSE) E-Learning Model: A Practical View

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## ABSTRACT

Covid -19 has resulted in school closure all around the globe and over 1.2 billion learners are out of the classroom (Li and Lalani, 2020). As a result, teaching and learning have become more reliant on digital platforms. Learners, teachers, and even government bodies have had to become more adaptable to technology. However, not all teachers and/ or learners have expertise in digital technologies and may not have access to the right equipment. The COVID-19 pandemic has exposed this digital divide (Jaeger & Blaabaek, 2020) but at the same time, it has also made online education the mainstream. And as a result, there is a need for an eLearning environment that fosters inclusivity, socializing abilities, interaction, contributions, peer support, and motivation.

This paper focuses on the development of a collaborative e-Learning Model, which will be used to develop a scalable online learning community. The uniqueness of this model is that it will bring diverse learners together and give them the flexibility to choose their preferred method of learning, based on their level of knowledge, skills, and interests to obtain the desired outcome. In this paper, we perform a short literature review to discuss the need for

collaboration and community based learning. The authors of the paper will map out the design journey of the proposed CCSE learning system and hence the more community-based learning network. Cooperative Neural-Network Ensembles (CNNEs) algorithm proposed by Islam et al. (2003) will be used to build the nodes and path of the learning network. It is envisioned that a community spirit fostered by the CCSE system will add great value to the future of learning during and after the COVID -19 pandemic.

# 1. Introduction

The spread of COVID-19 requires advanced technology and investment in online learning to enable effective learning. Many education providers have become interested in how to best deliver online courses, engage learners and conduct assessments. Hence, COVID-19 while being a threat to the economy, has evolved organizations to invest in online learning. The evolution of social media channels like YouTube, Facebook, Whatsapp, Instagram, etc has rapidly grown the community-based learning culture. The availability of flexible learning resources video, online content, books, journals, and so on has, in turn, led to the increased use of flexible delivery methods. This has raised questions about the effectiveness of these methods, the quality of interaction between the learners, and learner satisfaction. Biasutti (2011) states that learner satisfaction in an e-learning environment increases with collaboration, knowledge sharing, and peer support.

In this paper, we propose a dynamic eLearning model enriched with flexible resources and at its core collaboration, knowledge sharing, and a peer support culture. It is envisioned to provide a learning environment that is developed by the learners themselves and has the potential to foster engagement, social-interactivity, and reflexion. The model will embrace blended learning by encouraging learners to place their newly constructed resources with pre-existing resources within the system to be shared with peers. The system also will have the capacity to trace learner activities which will help the learners to ponder their experiences, review their results, and also reflect the knowledge obtained. Ease of use of the platform, ability to showcase the skills, and obtain feedback are also adopted to enhance the learning experience.

With the increase in the use of online learning systems during COVID-19, it is necessary to assess its effectiveness with regards to generating new knowledge, effective support, and learner satisfaction. This research will empirically examine two coherent subject areas: (a) the effectiveness of the Collaborative Community based Self-Expanding (CCSE) E-Learning Model in enhancing the learning community's abilities to generate new knowledge and resources (b) the enjoyment in learning, contributing, and providing effective peer support and feedback. The findings will help identify the priorities for establishing a  practical and worthwhile eLearning model addressing the needs of the 21st century.

## 2. Online Learning during COVID -19

Covid -19 has resulted in school closure all around the world and over 1.2 billion learners are out of the classroom (Li and Lalani, 2020). As a result teaching and learning have become more reliant on digital platforms. Learners, teachers, and even government bodies have become more adaptable to technology.  Commuting journey time could be saved by learning from home which is attractive and may drive the education market even post-pandemic into a home learning culture. However, not all learners have expertise in, digital technologies and may not have access to the right equipment. The  COVID-19 pandemic has exposed this digital divide (Jaeger & Blaabaek, 2020). In response to significant demand, many online platforms like BYJU an online tutoring firm founded in 2011 have offered free services and attracted over 200% new learners (Li and Lalani, 2020). Media organizations like BBC are also empowering Virtual learning. Some research confirms that the retention rate of eLearning is 25-60% and face-to-face is only 8-10% (Gutierrez, 2016). The time required to learn online is  40-60% less

than learning in a traditional classroom setting  (Li and Lalani, 2020). COVID -19 pandemic has made online education the mainstream.

Despite these benefits, the human values of socializing are missing greatly and now is driving the growth of the depression rate (Offord, 2020).  The pandemic and the lockdowns have affected the mental health of people around the globe.  Social distancing is necessary to reduce the spread of COVID-19, but it also makes us feel lonely and isolated which can increase stress and anxiety(Cao et al., 2020, COVID-19 and Your Health, 2021). Therefore an eLearning environment that fosters socializing abilities, interaction, contributions, peer support, and motivation is in huge demand now. Although learners consider online learning as having viable options there is huge scope for improvements (Chakraborty et al., 2020).  The authors of this paper feel that learner interaction and contributions should be facilitated, and a community-based culture promoted. Learners should be given more autonomy to create an expanding collaborative community-based E-Learning framework and their participation should be recognised.

# 3. The need for Collaboration and Community based Learning

## 3.1 Utilitarian and Hedonic IT systems

Utilitarian IT systems are used in an education or work environment to improve the school or work performance (eg. word processors or online learning systems). Pleasure-oriented 'Hedonic' IT systems (social media, video games) are employed in the home for fun and

relaxation for an overwhelming 80 percent of the time (Wu & Lu, 2013, p. 155, Massey et al., 2007; Heijden, 2004). The prime objective of Utilitarian IT is to improve learners' productivity in school/job-related tasks. It is aimed at primarily generating extrinsic rewards, whereas Hedonic IT is aimed at yielding intrinsic rewards. Studies on the impacts of the use of IT on learners' educational development have implicitly associated the use of Utilitarian IT with positive impacts and the use of Hedonic IT with negative impacts (e.g., Jackson, et al., 2006; Junco, 2012b, 2012c; Willoughby, 2008). In general, Qahri-Saremi & Turel's (2016) findings depict a negative relation between school engagement and the extent of use of Hedonic IT (social media and videogames) and a positive relationship between school engagement and the extent of use of Utilitarian IT. The research also showed that adolescents who are more disengaged from school have a higher usage of social media and videogames, while they typically use Utilitarian IT less often (Qahri-Saremi & Turel, 2016). Specifically, learners in the *Highly Engaged* cluster spent, on average, the largest number of hours using school-oriented Utilitarian IT, while they spent, fewer hours on using Hedonic IT.

The LMS systems widely used nowadays do not seem to have mastered the true benefits of social media (Tasneemet.al, 2017) . The authors of this paper feel that the eLearning system that effectively combines the benefits of  Utilitarian and Hedonic IT is yet to be designed.  In the pre-COVID culture, socialising was possible face to face and Utilitarian IT systems could simply support learning.  However, at present, there is so much emphasis placed on social distancing which urges the need to collaborate at least online to build a peer support culture. The CCSE Model proposed will integrate the use of Hedonic and Utilitarian IT,  to facilitate collaboration and engagement.

## 3.2.  Collaboration Benefits

The aspects that are associated with learner satisfaction are collaborating, comparing ideas, sharing knowledge and skills to support each other, peer learning, analysing and integrating different points of view, and the usability of the platform (Biasutti, 2011). Ellis (2004) and Triacca et al. (2004) believe that some level of interactivity needs to be included in an eLearning environment.  Interactive internet tools like chat, shared text editor, videoconference, whiteboard, and so on have become widespread and allow learners to communicate at low cost. However, they do not provide tools for sharing and receiving peer reviews, despite the importance of such practices in learning (Baker et al., 2003, Soller et al., 1999, Suthers et al., 1997, Raymond et al., 2005, Lonchamp, 2006).  Therefore, it is believed that an eLearning environment fostering collaboration could add huge value for both the learners and the education providers.

The learners' feeling of being part of a learning community and the social aspect promotes their learning (Hudson et al., 2006).  ELearning platforms enabling collaboration can be used to showcase ability among peers. Many contributors may openly share knowledge because they consider their connections with peers and networking as the lifeline to their professional and business development (Wijk, 2010). Collaborative activities empower the learners to become active learners (Anderson and Simpson, 2004)  and high-quality online courses are delivered through collaboration (Chao et al., 2010). Learners who perceived high levels of collaborative learning tended to be more satisfied with their distance course than those who perceived low levels (Hornik and Salas, 2008).   Interestingly, social presence itself is a factor contributing to learners' success ( Johnson et al., 2008).

# 4. Reflexivity and Evaluation

Through reflexivity, learners can exercise control over their cognitive activity and actions, which allows self-assessment and constructive criticism on themselves (O'Mahony et .al, 2007). Individual and collective reflexivity is used to build group awareness, and synchronous collaboration among participants (Farooq et al., 2007). Using the traces of the learner's activity is an effective way to encourage reflection on the learning process. This type of reflection called ''reflective follow-up'', allows the learner to visualize traces of his/her actions and leads to awareness allowing meta-cognitive regulation. Katz (1992), Despres, et .al, (2001), and Plaisant et al., (1999) developed systems using this kind of reflexive incentive that graphically represented the actions performed by the learner using boxes and arrows. Traces allows the tutor to perceive the status of learners' work. The trace allows for the monitoring of the learner through factors such as the number and duration of consultations of the course, and the number of messages posted on a forum to measure collaboration, etc`. Reviewing the visual traces, the learner should be better able to adapt and succeed in the learning process. Indeed, the visualized traces will allow learners to ponder the experiences they lead, the results they produce, and the knowledge they obtained. By this means, the learner can ensure/ judge the relevance of his/her approach or readjust his/her actions.

Individuals are capable of evaluating their behaviour (i.e., self-evaluation, self-reflectiveness) through observation of that behaviour and the associated outcomes (i.e., self-observation). Based on this evaluation, the behaviour is (dis)continued or altered (i.e. self-reactiveness). This evaluation of behaviour occurs based on goal setting which refers to objectives one wishes to attain by performing a certain behaviour. Hence, the outcomes one desires to attain through a particular behaviour serve as a benchmark against judging effectiveness (Bandura, 2001). Peer

review is an equally important contributing factor to the growth of the learners. The CCSE Elearning model aims to afford  reflexivity, self-evaluation, and peer review to enhance learning.

# 5. Reflection on the design journey of the CCSE Model

It is believed that products are more likely to satisfy needs and reduce human errors when users are involved (Interactive Design Foundation, 2021). Many eLearning systems like Blackboard and Moodle are quite popular recently however, they have not been fully utilized to collaborate (Carvalho et. al., 2021). The vast majority of Blackboard learners have never engaged in 'participating in forum discussions' (72.4%), and 74.2% have never 'shared files with other learners (Carvalho et. al., 2021). Moreover, 60.4% of Moodle learners never engage in 'participating in forum discussions and 73.9% have never shared files with peers and over 86.7% have never participated in course chatroom (Carvalho et al., 2021). Interestingly, a recent study (Appavoo et.al., 2021) disclosed that nearly half of the learners were not making regular use of Moodle in their studies.  Many faculties use alternative social media systems like google groups, or yahoo groups although VLEs (Virtual Learning Environments)  like Blackboard are also available to them (Carvalho et al., 2021). Perhaps,  they are not satisfied using rigid VLE platforms and find collaboration easier in other social media sites?

As Kop et al. (2008) highlighted we need to 'move away from using a VLE primarily as space which holds content and re-envisage it as a community; to create a place where dialogue can take place and all interactions and content can be easily seen, accessed, followed and engaged with'.  Therefore, the user-centered design (UCD ) approach  (see Figure 1) is used to design

the CCSE system to ensure that it is extremely accessible and acceptable for the end-users. Moodle and Blackboard platforms are driven by tutors and not learners, therefore learner power is limited. In contrast, the CCSE eLearning model is believed to put learners in the driver's seat. The system delivers courses, assessment, collaboration, and progression. The useful and user-friendly design will also ensure security and privacy.
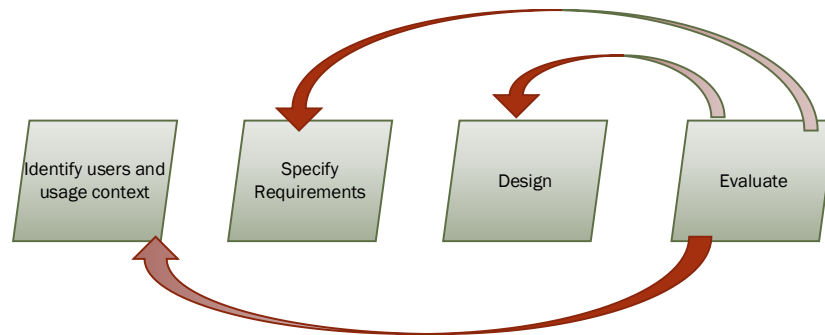


**Figure 1** Phases of UCD

## 5.1 Phase 1: Identify users and usage context

In the first phase of this UCD approach users were identified and the contexts were analysed based on answering four main questions What are the users' tasks? Which tools can support users' goals? Where will the system be used? Are there any technical constraints? The main users identified were Learners, Learner Advocate and Admin. Each target group's tasks and goals were also defined via a use case diagram (see Figure 2).
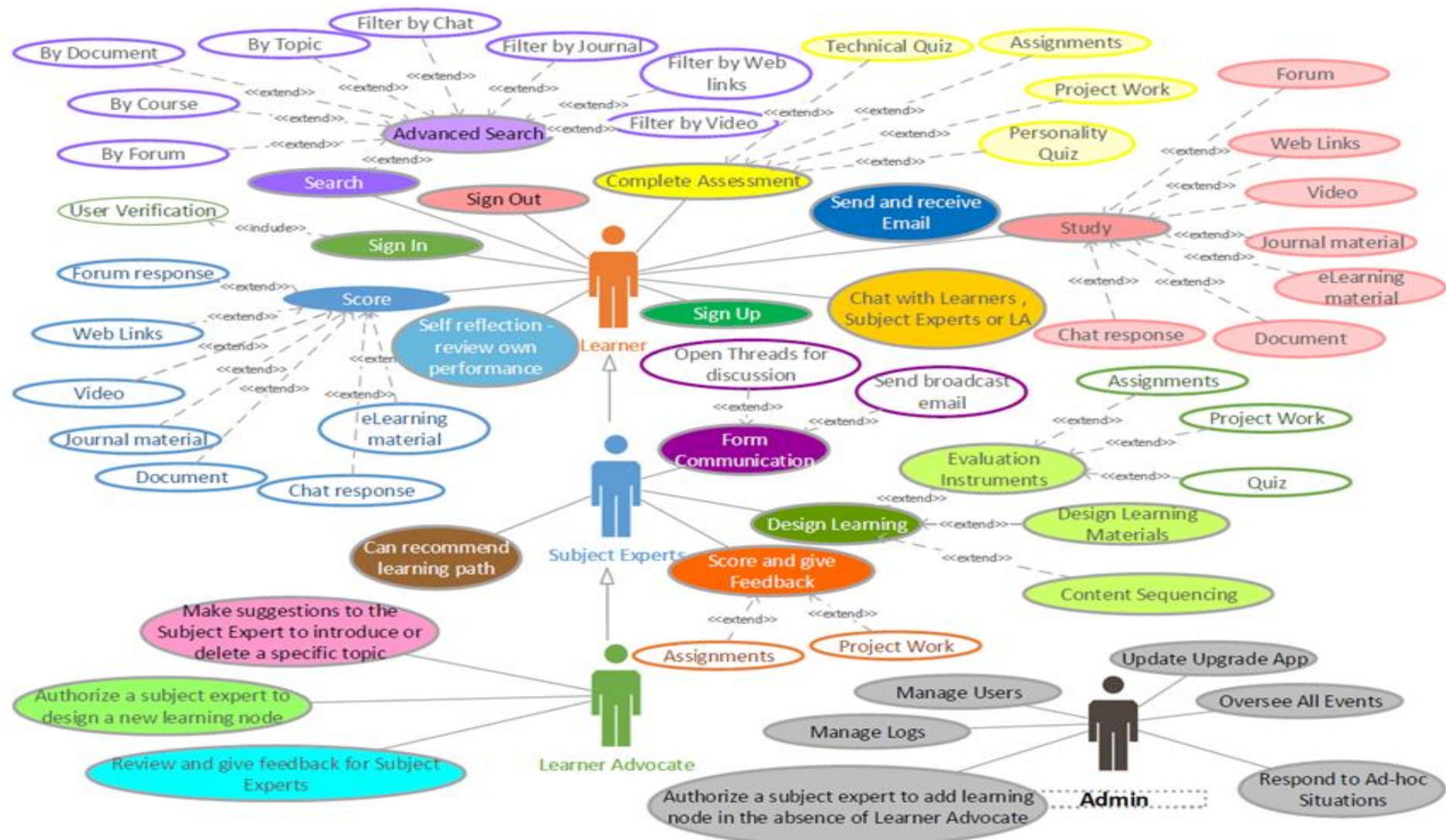
**Figure 2:** Use Case Diagram for CCSE eLearning Model

In detail, a learner can be nominated as Learner Advocate (LA) by the admin or they could gain points based on their knowledge, performance, interaction, collaboration, and achieve the LA status. Therefore, any outperforming learner has the potential to become Learner Advocates and earn more pedagogical responsibilities (see figure 3).
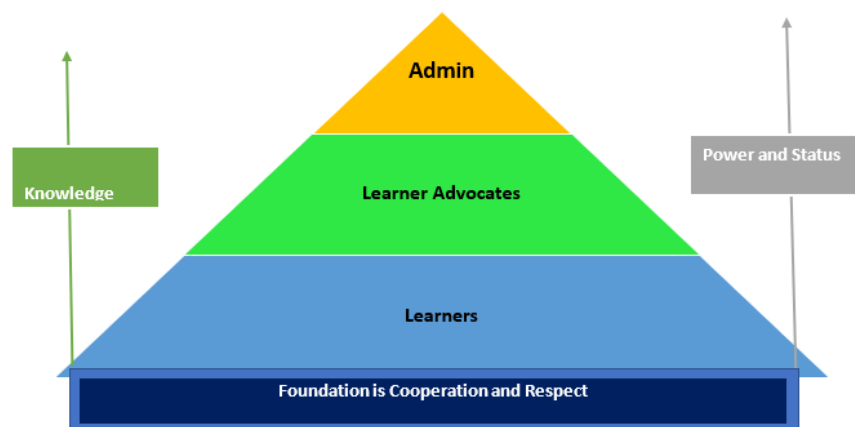


**Figure 3:** Hierarchy of the users of the CCSE E-Learning model

Such distributed leadership principles are the foundation to build a peer support, collaborative environment. Quality of participation will be accessed via review score, rating, evaluations, and likes in this model. The Learner Advocate (LA) status is identified within the system with an intention to "locking-on" people through a deeper sense of commitment, reciprocity, and shared purpose as suggested by Goffee and Jones (2007).

## 5.2.  Phase 2: Specify requirements

The community-based principles of the system originate from the peasant-based society (i.e. a simple architectural community) in Africa where hierarchy is based on precedence and age. People who occupied a land first based on their age gained more power and respect from others (Class Structure and Caste, 2018). The hierarchy of the learning community fostered by the system proposed in this paper will not gain power based on age or precedence, in contrast, it will be based on Knowledge. Some learners gain more influence and become superior because of their wisdom and ability to share and support others in the community. As a foundation, to maintain a peaceful relationship, each member is obliged to acknowledge and respect the other members.

Concept mapping was prepared to understand the CCSE eLearning model requirements and grouping them according to their priority (see figure 4). This categorization is an essential process because the system will not work if the functional requirements are not met (Burak, 2021). This grouping also aids in prioritization.
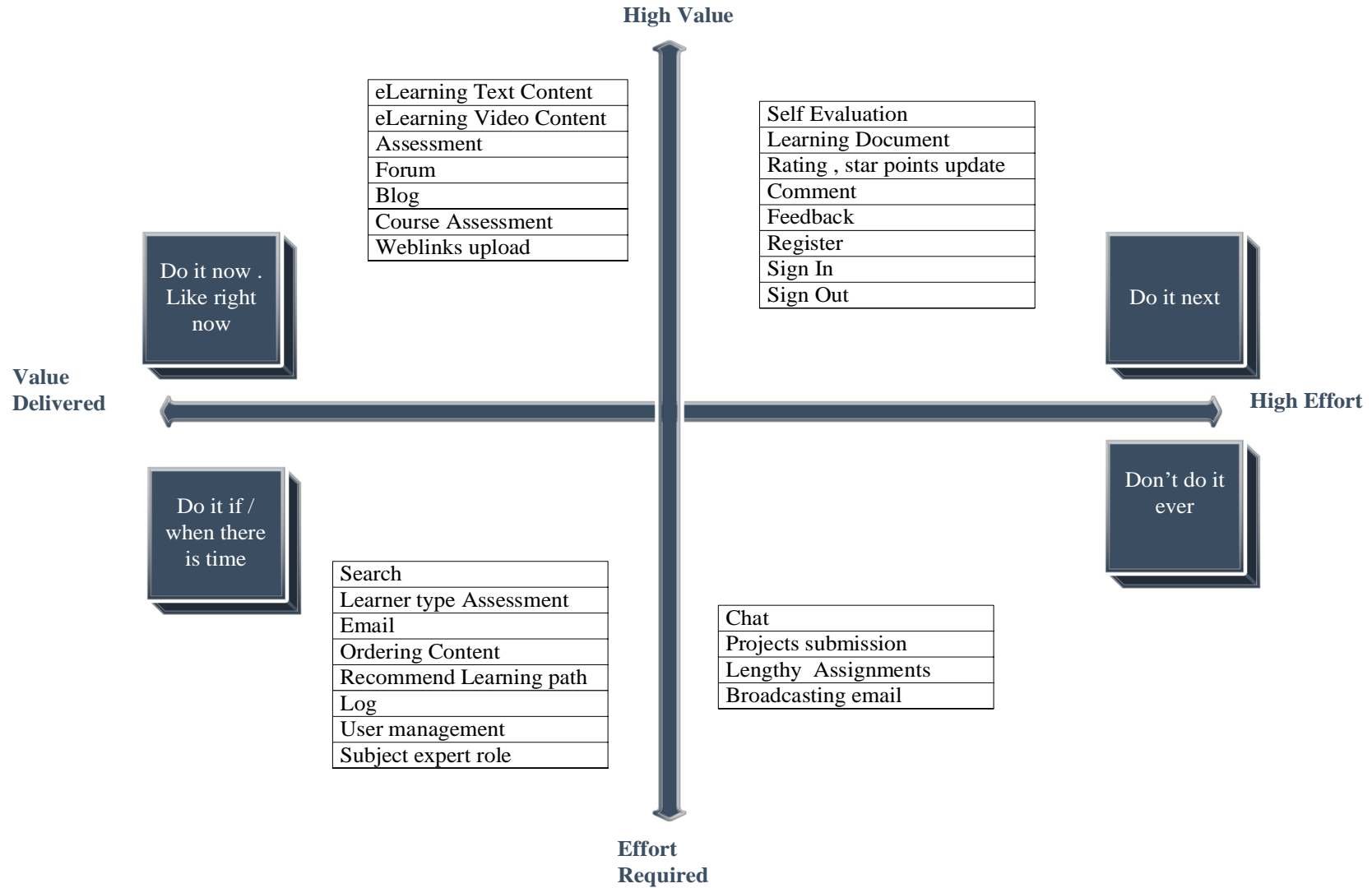
**High Value**

| eLearning Text Content |
|---|
| eLearning Video Content |
| Assessment |
| Forum |
| Blog |
| Course Assessment |
| Weblinks upload |

| Self Evaluation |
|---|
| Learning Document |
| Rating , star points update |
| Comment |
| Feedback |
| Register |
| Sign In |
| Sign Out |

Do it now .
Like right
now

Do it next

**Value
Delivered**

**High Effort**

Do it if /
when there
is time

Don't do it
ever

| Search |
|---|
| Learner type Assessment |
| Email |
| Ordering Content |
| Recommend Learning path |
| Log |
| User management |
| Subject expert role |

| Chat |
|---|
| Projects submission |
| Lengthy  Assignments |
| Broadcasting email |

**Effort
Required**

**Figure 4** Concept Map for CCSE system requirements prioritization

The system requirements were then further refined using user stories (see table 1 for an example of a CCSE user story.

| CCSE user story description: |
| --- |
| As a User, I should be able to register to access the system. |
| **Conditions of Satisfaction:** |
| • A user can register to create an account and access the system <br><br> • The user should be able to enter login details and sign in <br><br> • The user should be able to sign out <br><br> • The user should be able to change his / her registered details |

**Table 1:** An example of a CCSE user story

## 5.3.  Phase 3: Design

This part of the UCD process was done in stages, building from a set of requirements to a functioning design. Rough sketches of the system layout were initially drawn on paper, before further design in Microsoft *Visio* and then the implementation phases. Our design process considered alternative approaches, accommodated changes, ensured quality, and minimized conceptual errors.  An overall system architecture can be seen in Figure 5.
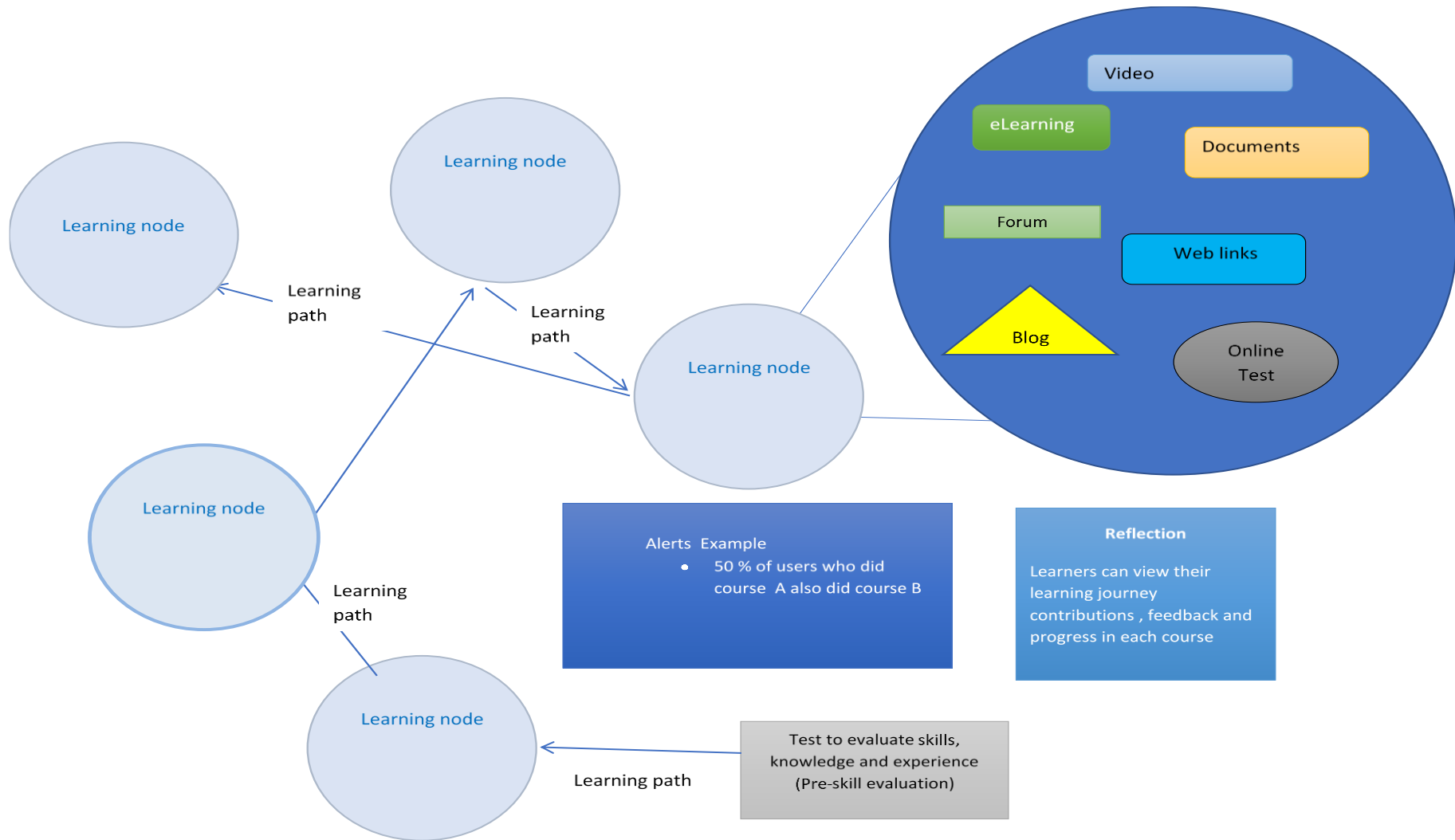
**Figure 5:** Overall System Architecture

In detail, networks or graph theory with the ideas of relations or connectivity is the main backbone of the Collaborative Community based Self-Expanding (CCSE) E-Learning Model's architecture.  To establish the learning network of the model, the authors have adapted the Cooperative Neural-Network Ensembles (CNNEs) algorithm using incremental training (March & Steadman 1971 and Islam et al 2003).  During the incremental training of the dataset, a component network was built by adding new nodes. Similarly, the CCSE eLearning model learning network will be built by adding new nodes based on connectivity and Graph theory. The output of the ensemble is the average of all component outputs scores. The packing of basic units in a hexagonal structure (see Figure 6)  is the geometrical basis of the central place theory (Christaller, 1933 &1966).
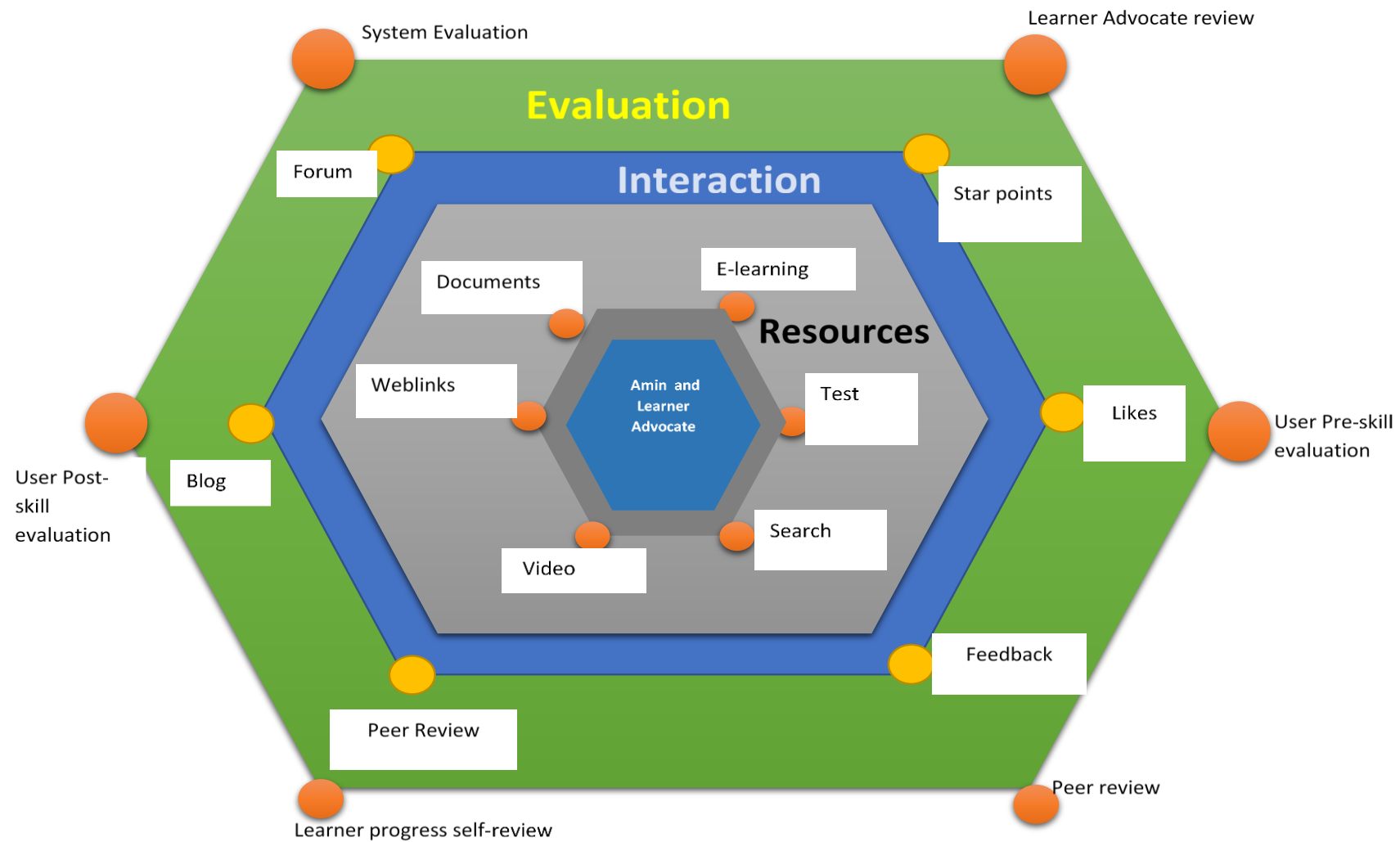
**Figure 6:** Detailed System Architecture of each bubble / Learning node

To summarise, each of the circular connecting learning nodes in Figure 5 has the sub-components evaluation, interaction, and resources as shown in the hexagonal structure (Figure 6). The learning node will be added to the system dynamically and connected via learning paths.

An emphasis will be placed on perceived ease of system use and usefulness because they are known to be valid predictors of attitudes toward system use and user satisfaction (Davis 1989, DeLone et.al, 2003 and  DeLone et. al. 1992). Hence the home page Figure 7 is kept simple with a brief introduction and a basic navigation structure to the key areas of the system.
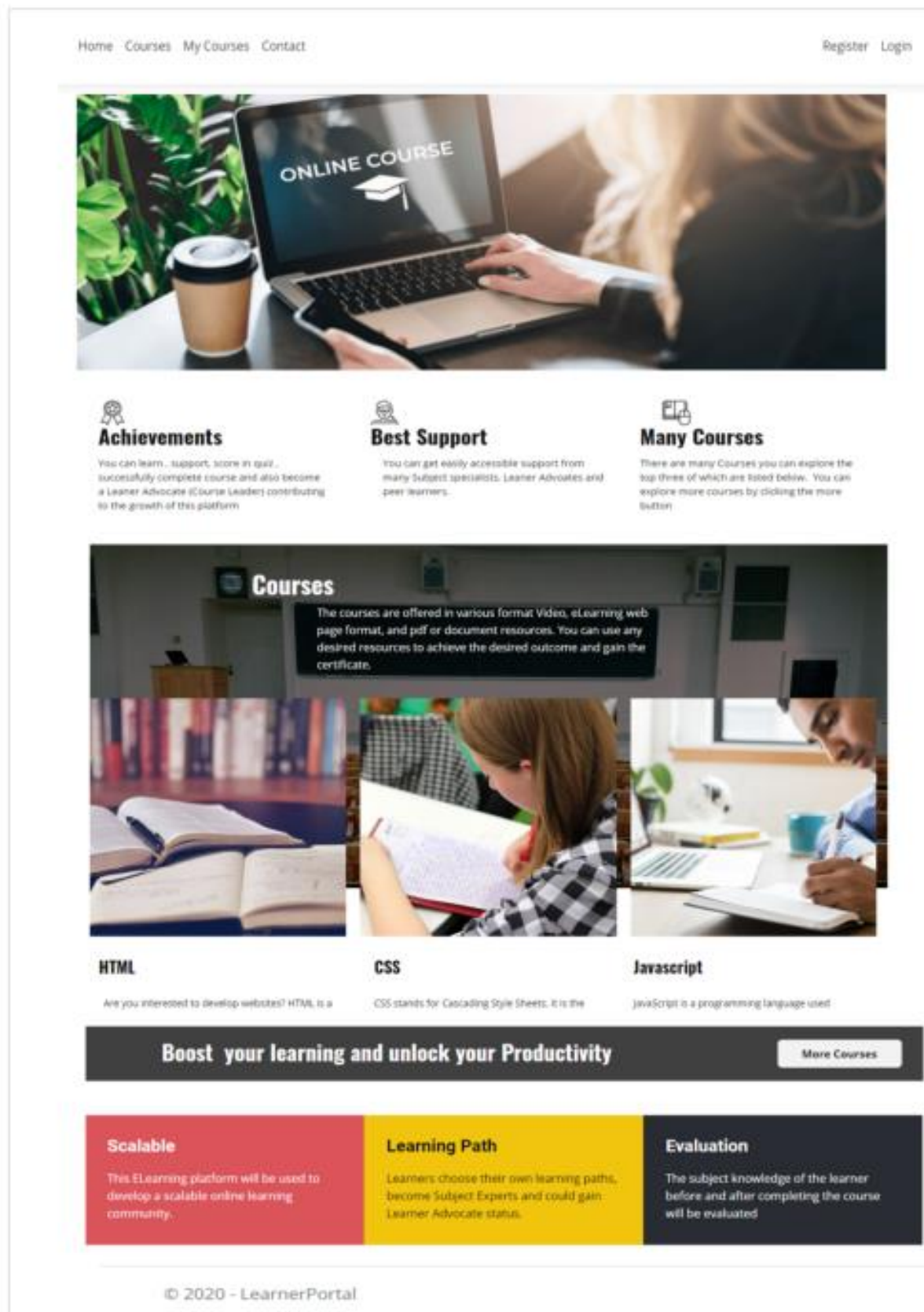
**Figure 7:** Draft Home Page of CCCSE eLearning Model

The designs will further be iterated based on the re-evaluation and user testing. For example, initially, a forum and blog were proposed for the course. It was later realized that topic-specific forum and blog content filtering will not be possible if all the contents are dumped inside the course umbrella. Therefore, the design was amended to allow topic-specific categorizing possibilities as shown in Figure 8.
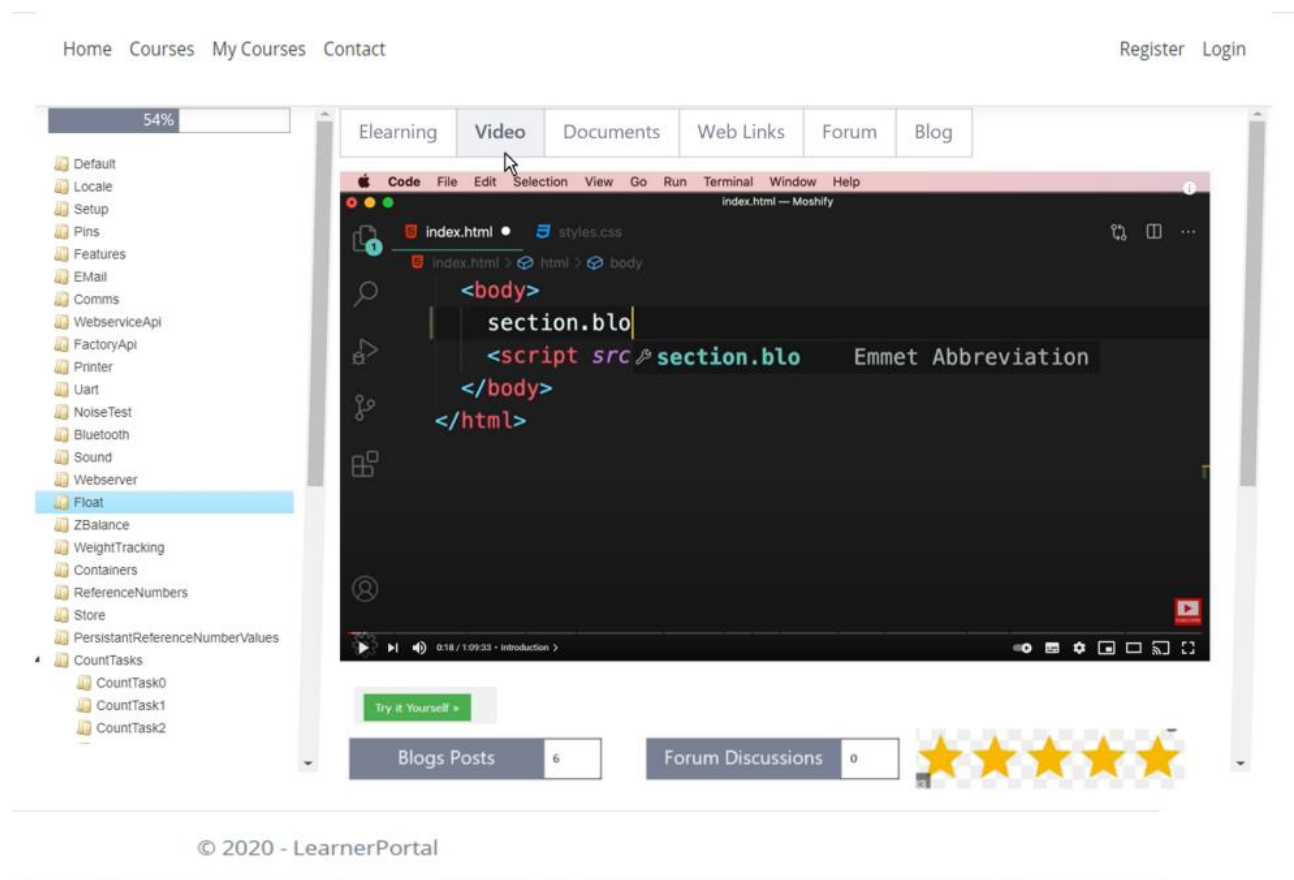


**Figure 8:** Course Content Page of CCCSE eLearning Model

Again, the course content page is simple and easy to navigate and has a status bar showing the progress of the learner in the course. The jsTree is used to display the learning content on the left-hand side and the detailed content (eLearning, Video, Documents, Web Links, Forum, and Blogs) appears on the right-hand side. Each course topic is linked to the relevant Blog and Forum post so learners can learn from the others and also contribute to expanding the learning

network resources. The course contents updated to the system can be reviewed and rated by the readers/learners. Learners can contribute to Web Links, Forum, and Blog sections, and Learner Advocates can create a new course and update the eLearning, Video, and Documents content as well.

## 5.4 Phase 4: Evaluation

When the initial working CCSE prototype is complete, it will be evaluated based on 'Moderated User Testing' and 'Remote Moderated User Testing' approaches (User Experience Researchers, 2021). In moderated user testing, the moderator will sit beside the user and gain deep insight into the users' perception of the system by questioning while simply allowing the users to navigate and use the system. During remote moderated user testing, the moderator will use zoom screen sharing and webcam features to view the actions of the user and simultaneously asking inciting questions to evaluate the user experiences. It is envisioned that the results of this evaluation phase will provide opportunities for further improvements to the design of the CCSE system to ensure that the final working product will afford community-based learning as well as providing a user-friendly and functional experience.

In detail, it will explore/ address four distinctive challenges (1) Enabling collaboration and a peer support culture (2) Giving the learners the ability to progress as Leaner Advocates (3) Facilitating an expanding learning network empowered by the learners (4) Creating an environment where learners can reflect on their journey. To address the first challenge (collaboration), the CCSE system should provide the learners with the facility to comment, rate, review, and contribute to blogs and forums. To meet the second challenge (progression), the CCSE system should allow learners who are performing well to be permitted to progress

as Learner Advocates.  The third challenge (learning network expansion) should be overcome by allowing all users to contribute. The quality of constructs will be rated by peers. Finally, the CCSE system should be designed to translate fragmented existing information into clearly structured information regarding learner journey completed courses, score obtained, star rating obtained resources posted, and so on.

# 6. Discussion

This paper describes the design and initial implementation of the CCSE eLearning system, a system that addresses the need of learners to collaborate, build a peer support culture, and progress. It is envisioned that this CCSE system will be hosted in the Microsoft *Azure* cloud computing environment and will be accessible to all learners at any time. A highly responsive Bootstrap theme will be used in each phase of the design to ensure compatibility, consistency, and responsiveness. The next steps will be a series of detailed user studies. Primarily, the study of the final prototype aims to probe the perceptions by learners and tutors on the effectiveness of the CCSE system to afford a community-based learning experience. It will also evaluate the usability and accessibility of the CCSE system.

Also, further research will be undertaken to involve as many diverse users as possible. Based on these studies and also data collected from the Microsoft Azure Application Insights, database, and logs, the aim is to establish a benchmark for community-based learning standards.

# 7.Conclusion

Online learning is increasingly becoming part of the education system worldwide more rapidly since the origination of the COVID -19.  However, there is still room for improvements to maximize the benefits gathered from using the communication and collaboration tools of the online learning platform (Carvalho, Areal, and Silva, 2021).  Education providers are investing more time and resources in improving the online learning experiences for the learners at present. It is proposed that the Collaborative Community based Self-Expanding E-Learning Model (based on distributed leadership principle fostering collaboration, socialization, peer support, and evaluation ) presented in this paper has the potential to create scalable and engaging online learning community. What makes this research especially relevant and unique is that it can create a self-expanding eLearning model not limited to the knowledge of the tutor with enhanced collaboration and peer support culture.

As this paper highlights, the authors have invested time and effort into understanding and then improving the features of the proposed CCSE eLearning platform designs. They have developed a two-dimensional skeletal outline of the system using Microsoft *Visio* making sure the system is easy to navigate, has organized resources, and features the core principles of the CCSE eLearning model. As we have seen, it is implemented as a .net Core web application and is in ongoing development. Moving forward, it is planned that a selected list of learners from various diverse backgrounds and countries will participate in the user testing of the CCSE system. The focus will be on how effective it is in implementing blended learning, constructivism, collaboration, and distributed leadership eLearning principles to develop engaging learning communities which can then contribute new resources, provide effective peer support and feedback. In doing so, the goal is to create new knowledge around the field

of technology-enhanced learning environments, benefiting learning communities, university decision-makers, academic advisors, faculty, learners, and new business. The authors of this paper feel that this research is indispensable, mainly because the more insight that administrators, learners, faculty, and technical support personnel have about the learning styles and perceptions of eLearning, the greater likelihood that the courses will meet the demands of the learners, thereby enhancing the quality of the educational experience.

In 2005-6, E-Learning was seen as a new paradigm for education and training (Mikic and Anido, 2006; Khan, 2005) and has fostered a wealth of new prospects for the future of education (O'Neill, Singh & O'Donoghue, 2004).  During COVID-19, we witnessed the rise of online education and we are now at a stage where we need to ensure that learners can experience their optimal online learning experience. One of the intended results of this research is to propose new ways to extend the abilities of the learners to generate new knowledge, improve engagement and enhance peer support among learners. The authors feel that this is specifically important when people are isolated in their homes due to the COVID-19 pandemic. The aim is to motivate learners and teachers with a community-based learning experience fostered by the CCSE system and in doing so to add value to the future of learning during and post a COVID -19 pandemic.

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