Evaluating Moodle As An Open Source E-Learning Software Tools For Teaching In Tertiary Institutions

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Abstract: The continuous and rapid growth in information and communication technology (ICT) has led to a significant change in the learning environment. ICT, for example, have led to the creation of new learning models where traditional learning is mixed with information technology tools to provide learners with an environment that enable them to freely choose their learning material from anywhere around the globe. In addition to these advances in the learning models, learners can also share their comments and questions with their colleagues and teachers as well as assess the knowledge they gained.

In tertiary education, the term Electronic learning (E-learning) is normally used and/or associated with many of the different learning models used. Due to the rapid growth of Internet technologies, E-learning has become an increasingly popular learning approach in many different tertiary institutions. E-learning, in the context of this paper is, thus, defined as the use of ICT to enable people learn or to enhance and facilitate teaching and learning anytime, anywhere around the globe.

For this reason, this paper aims at evaluating Modular Object-Oriented Dynamic Learning Environment (MOODLE) as an open source e-learning software tool for teaching and learning in tertiary institutions. Moodle is a free and open-source e-learning software platform designed to help educators create quality online courses. Sample experimental groups of students were used during the evaluation process. We, therefore, discuss the evaluation process and present our findings in this paper.

Keywords: E-learning, open source e-learning software tools, Moodle, teaching and learning, evaluation process, tertiary education

I. INTRODAUCTION

In recent years, the use of open source software tools in tertiary institutions has become an important force for providing basic education or support for the traditional education system. This is aggravated by the continuous and rapid growth in information and communication technology (ICT), which has also led to a significant change in the learning environment. However, very few institutions take time to evaluate or offer guidance to the suitability of any of the open source software tool they choose to use.

The advances in ICT have also led to the creation of new learning models where traditional learning is mixed with information technology tools to provide learners with an environment that enable them to freely choose their learning material from anywhere around the globe. In addition to these new learning models, learners can also share their comments and questions with their colleagues and teachers as well as assess the knowledge they gained

However, regardless of the specific pedagogical approach used in institutions, the evaluation of any open source software tool adopted is required. This is because the evaluation process can, for example, help in realizing the best performance with least cost especially of the software tool adopted. Besides, certain aspects of open source software tools can have pedagogical benefits to the institution.

This paper, therefore, presents a case for evaluating the use Modular Object-Oriented Dynamic Learning Environment (MOODLE) for teaching and learning in tertiary institutions. The primary objective of the study is to evaluate Moodle as one of the widely used open source E-learning software tool for teaching and learning. We describe our evaluation process and present our findings in this paper

As for the remaining part of this paper, section II introduces the background followed by a detailed description of related work in section III. Section IV presents a discussion of the E-learning concepts followed by the evaluation process in section V. The findings are presented in section VI and finally, conclusions and future work are provided in section VII.

II. BACKGROUND

E-learning system is an educational system that utilizes information technology resources such as the Internet and networking applications to enhance the learning process. The E-learning environment focuses more on the "learner" instead of the material itself. This approach allows the learners to study at their own pace according to their capabilities, communicate with colleagues and lecturers as well [1]. In addition, E-learning offers a number of benefits for tertiary institutions such as anytime, anywhere access, improved motivation, better integration of information and communication technology (ICT) tools, opportunities for independent learning, and increased parental engagement [1, 2, 3].

Because of the continued development in E-learning technologies and the availability of open source software tools, and the necessity to have the benefit of these tools in tertiary institutions for basic education or support the traditional education system, there arises a need to evaluate individual E-learning Platforms so as to help adopt the one that best suit an institution [4].

Many of the Open Source E-learning software tools, such as Moodle, have recently been used in different world Universities. However, the question of how suitable this platform is to our Universities or Organizations as compared to other available Open Source E-learning software tools needs to be addressed. In this paper, therefore, we evaluate the suitability of Moodle as an open source software tool for teaching and learning in tertiary institutions. The next section will however look at the related work first.

III. RELATED WORK

There exists various research works from different researchers which have made valuable contributions towards the study in this paper. In this section, therefore, a summary of some of the most prominent efforts in previous research work is provided.

To begin with, [5] examines the application of e-learning model to explain acceptance of the e-learning technology within the academic settings. Their study goes further to confirm that in order to foster individuals' intention to use e-learning, positive perception on e-learning use is crucial.

In a paper by [6] they discuss how e-learning can be implemented by using open source software especially in developing Learning Management System (LMS). Since there are various types of tools in open source software, they discuss Moodle and eFront in their paper.

In another paper [7] examines a range of issues covering technology, teaching, learning and organizational issues and makes general recommendations for priorities that will promote the successful use of ICT. The objective of their paper is to discuss the different methodologies adopted in e-learning and how to construct Learning objects that can be applied to develop e-learning material in a better way.

In addition [8] present a study to make learning as interactive and interesting as possible for the users with the help of the most useful open-source Learning Management Systems (LMSs) such as MOODLE. In their paper they propose a method to extend Moodle with learn flow capabilities.

In another effort by [9] they present in their paper the development of bilingual e-learning system and reports on its usability on a set of computing courses according to a specific e-content development methodology.

More efforts by [10] however, present an open-source management system of Web-based teaching interventions that can be used in general for science curriculum courses and for computer science courses.

On the other hand, [11] present a framework for introducing e-learning in a traditional course. The framework can be used as a guideline for the development of an instructional model incorporating a pertinent pedagogical setup which federates learning and "learner-centred" factors.

Aydin and Tirkes [12] present findings from evaluating the most widely used open source learning management systems and identify the most suitable open source e-learning platform. In their study, some analyses and comparisons were made about open source learning management systems the outcome of which Moodle was found to be outstanding with many features more than other LMS since it aims to improve the educational quality and include the tools that an e-learning system should have.

There also exist other related works on issues related to e-learning and open source software tool used for teaching and learning, but neither those nor the cited references in this paper have presented an evaluation of Moodle for teaching in tertiary institutions in the way that is introduced in this paper. However, we acknowledge the fact that the previous research works have offered useful insights toward the study in this paper. In the section that follows, we explain in more detail the different open source E-learning platforms used for teaching and learning.

IV. E-LEARNING CONCEPTS

There is no clear and obvious definition of the concept of e-Learning. Definitions in the research literature are partially exclusive and sometimes contradictory, and there are few common terms used consistently [13, 14, 15]. It is difficult to distinguish the term "e-Learning" from terms such as "virtual learning", "network learning", "online learning", "multimedia-based learning", "Web-based learning", "Internet-enabled learning", and similar terms. E-Learning is often seen as learning where the Internet and the Web play an important role. The term is also employed in a broader sense, as learning where any electronic technology is used. [16, 17, 18] and [19] refer to e-learning as "communication and learning activities through computers and networks (or via electronic means)".

To be more specific, [20] defines e-learning as "delivery of training and education via networked interactivity and a range of other knowledge collection and distribution technologies." [21] also had the same definition as Fry's – they defined e-learning as the creation and delivery of knowledge via online services in the form of information, communication, and education and training. On the other hand, [22] stated that e-learning is a self-directed learning that is based on technology, especially web-based technology. He also stressed that e-learning is collaborative learning. Internet and web technology is important in e-learning; [23] defines e-learning as "the use of Internet and digital technologies to create experience that educate fellow human beings."

Apart from web-based technology, e-learning seemed to require multimedia based courseware [24, 25]. Therefore, it is clear that e-learning is centred on Information and Communication Technology (ICT). It is not surprising that [26] and [27] mentioned that e-learning evolved around Information Technology to enhance the learning performance and efficiency. Furthermore, [28] pointed out that technology is indeed needed in e-learning to educate the learner through the usage of two-way video, two-way computer interaction, cable, satellite downlinks and Internet.

An attempt to define e-Learning, from a technological point of view, is to look at the relationships between e-Learning and some closely related concepts: Internet-based learning, Web-based learning, online learning, and computer–based learning:

- The concept of internet-based learning is broader than Web-based learning. Hence, the Web is only one of the Internet services that use HTML, browsers, and URL. Internet offers many other services, not only Web, but also e-mail, file transfer facilities, etc. Learning could be based on the Web, but also as correspondence via e-mail.
- Online learning could be organized through any network. Thus, Internet-based learning is only a subset of online learning.
- Learning may take place via any electronic medium. It is not automatically connected to a network. Learning includes computer-based learning that is not network-based. As a result, e-Learning includes both network-based (online learning, Internet-based learning, and Web-based learning) and non-network-based learning or computer-based learning.

E-learning provides the learners with the flexibility, accessibility and convenience of studying regardless of their location and time zone, because of the great importance of e-learning in modern education and its role in improving the student's performance. Other advantages of e-learning system include cross platform where learners can access the content through window-based computers, low delivery costs once e-content has been developed and uploaded on the server, it is relatively inexpensive to distribute domestically and worldwide, ease of update enables the content to be easily and

regularly updated and instantly available to all learners [29]. It also provides collaborative learning which promotes collaborative learning thus resulting in a more engaging and richer learning experience, Scalability where content can be delivered to a small or large number of learners with little effort [30].

Although there are many advantages of e-learning there are some challenges facing implementation of e-learning system. These are:

Awareness: generally there is still a lack of awareness amongst the population, especially parents, of the effectiveness of e-learning. Many parents feel the traditional learning mode is better, low adoption rate most institutions are not keen to embrace e-learning. Nevertheless, issues like lack of e-content, inadequate infrastructure coupled with the problem of digital divide, has resulted in a relatively low adoption rate. Bandwidth Issue and connectivity engaging content requires a rich combination of multimedia components [31].

Difficulty in Engaging Learners': online engaging of learners actively is one of the key factors in determining the success of an e-learning program. Online learning requires a very high degree of self-motivation which is found to be lacking among our learners. Learners find it difficult to migrate from the traditional learning mode to the new e-learning mode.

Language Barrier: The extensive use of English in e-learning contents is also one of the factors that have hindered the success of e-learning, especially in non- English speaking countries. Many, who like to enrol in e-learning programs, are deterred from doing so as they are not confident with the contents in English [32], [33].

A. Technological Dimensions of E-Learning)

The concept of e-Learning is employed in a broader sense, as learning that takes place via a combination of face-to-face and e-Learning. E-learning is not an easy task for many as it requires a lot of self-discipline. As [34] stated, e-learning provides autonomy or freedom to learn, but the learners should have "initiative and self-discipline to study and complete assignments". However [35] asserted that the e-learning success rate was very dependent on students' abilities to be self-directed and internally motivated. It is therefore reasonable for [36] to comment that learners who are not self-motivated find web-based learning an unsatisfactory experience. Naturally, e-learning students have a higher dropout rate than their conventional counterparts [37]. E-learners need additional encouragement and support, to compensate for the isolation; motivation is the key for them to successfully complete the course Lessons from e-learning.

A mixture of face-to-face and e-Learning is known as hybrid or blended e-Learning [38, 39]. Finally, in addition to the electronic delivery technology, including all form of information and communication technologies, e-Learning incorporates two important dimensions:

- Learning theories, instructional strategies, and pedagogical approaches.
- The subject matter and associated content to be learned.

B. Pedagogical Foundation

Important to the design of e-Learning is a pedagogical foundation built on solid learning theory. Literature suggests that learning theories can be related to three main models:

- Behaviourist learning,
- Constructivist learning
- Collaborative learning

The next section describes the most important characteristics of the learning theories and presents a three-stage model - the learning cycle - that retains the features of each one.

C. Learning Theories

In terms of instruction, the behaviourist learning theory assumes that the goal of learning is to efficiently transmit knowledge from the instructor to the learners [40, 41]. In a behaviourist setting, instructors are clearly central to learning activities. The behaviourist model is therefore criticized for stimulating surface learning and knowledge reproduction. However, behaviourist learning is suitable for beginners, as they need transferable knowledge from the instructor. In contrast to behaviourism, the constructivist learning theory views knowledge as a constructed entity made by each and every learner through a learning process.

Constructivism frames learning less as the product of passive transmission than a process of active construction whereby the learners construct their own knowledge based upon prior knowledge [40, 41, 42, and 43]. Constructivist learning requires learners to demonstrate their skills by constructing their own knowledge when solving practical problems. In a constructivist setting, teachers serve primarily as guides and facilitators of learning, not as transmitters of knowledge. According to the collaborative learning theory, it is through interaction of learners with other people, e.g. instructors and fellow learners [40, 44, and 45].

Learning occurs as learners exercise, test, and improve their knowledge through discussion, dialogue, collaboration, and information sharing. [45] argued that the way learners construct knowledge, think, reason, and reflect is uniquely shaped by their relationships with others. He argued that the guidance given by more capable others, allows the learner to engage in levels of activity that could not be managed alone. This guidance occurs in the Zone of Proximal Development (ZPD), which is the difference between what a learner can do independently and what can be accomplished cognitively with scaffolding from more knowledgeable others.

D. The Pedagogy Derived from the Associative Perspective Instructional Systems Design (ISD)

Much of what is termed e-learning is still based in the training departments of organizations within a training philosophy that is traditional instructional design. The intellectual base for instructional systems design (ISD) consists of principles that are widely accepted within the organizational training culture. This base derives from the behaviourist perspective, but focuses particularly on task analysis.

[46] set out the psychological principles on which ISD is based and essentially developed an instructional approach based on recursive decomposition of knowledge and skill. The basic principle is that competence in advanced and complex tasks is built step by step from simpler units of knowledge or skill, finally adding coordination to the whole structure. Gagne [46] argued that successful instruction depends on placing constraints on the amount of new structure that must be added at any one stage.

ISD consisted of guidelines and procedures for the decomposition of complex tasks into learning hierarchies and detailed prescriptions for the design of instructional programs based on such hierarchies. A theme in this work was the use of taxonomies representing different levels of complexity in learning outcomes. Different levels of intellectual skill were identified: discriminations, concepts, rules and higher order rules.

E. *The Pedagogy Derived from the Cognitive Perspective, Constructivist Learning Environments and Activity Systems*

It is rather too simplistic to argue that constructivism has emerged directly from a cognitive perspective. In fact, in its emphasis on learning-by-doing, and the importance of feedback, it leans partly towards the behaviourist tradition. In its emphasis on authentic tasks it takes much of the situativity position. The emergence of situated cognition was itself partly dependent on the influence on mainstream cognitive theory of [47] socio anthropological work.

[48] distinguish between cognitive constructivism (deriving from the Piagetian tradition), and socio-cultural constructivism (deriving from the[49]). We will consider the latter strand of constructivism in the next section, in the context of activity theory.

[49] constructivist theory of knowledge was based on the assumption that learners do not copy or absorb ideas from the external world, but must construct their concepts through active and personal experimentation and observation. This led Piaget [49] to oppose the direct teaching of disciplinary content – although he was arguing against the behaviourist bottom-up variety, rather than the kind of meaningful learning advocated by [50].

In the constructivist view, which emphasizes general conceptual understanding and thinking ability, the reasons for disillusionment with didactic teaching are mainly empirical. There is very strong evidence that didactic teaching simply does not produce generic understanding. Constructivism can be seen to have developed not so much in the Piagetian sense as a reaction against the small-components-first approach of ISD, but rather as a reaction to the persistence in practice of a transmission-based didactic mode of teaching, for which there is no real theoretical base, but rather a strong folk tradition that compelling explanations will lead to better learning. There is a crucial point here for e-learning: the presentation of subject matter using multimedia is based on a discredited idea – which more vivid and naturalistic representations of knowledge would lead to better learning. This misconception was responsible for much of the disillusionment that resulted from computer-based learning in the 1980s and 90s [51].

Adopting a true learner-centred approach would imply treating each student as an individual case. In a sense this has always been the ultimate goal of educational technology: the achievement of individualized instruction. Taking this to its logical conclusion would imply that Teaching, Learning and Assessments should be designed to match the profile of the individual learner.

F. *The Pedagogy Derived from the Situative Perspective: Communities of Practice*

There are perhaps three levels at which it is useful to think of learning being situated. At the top level is the social-anthropological or cultural perspective, represented by the work of [52], which emphasizes the need to learn to achieve a desired form of participation in a wider community. The essence of a community of practice is that, through joint engagement in some activity, an aggregation of people comes to develop and share practices. This is usually interpreted as a stable and relatively enduring group, scientists for example, whose practices involve the development of a constellation of beliefs, attitudes, values and specific knowledge built up over many years. Yet a community of practice can be built around a common endeavour which has a much shorter time span. [53] gave examples of communities of practice which more closely resemble the groups studied in the social identity literature [54].

Some examples are a garage band, an engineering team, a day care cooperative, a research group or a kindergarten class. These are exactly the kind of groups described as activity systems. One characteristic of these groups is that they allow a greater scope for interplay between the psychological (or personal) and the social in determining practice than do the long-established communities. The influence of individuals, and of individual relationships, is likely to be greater.

For long-term stable communities there are two different ways in which the community will influence learning. First, there is the sense most directly addressed by Wenger [52] someone aspires to become a legitimate participant of a community defined by expertise or competence in some field of application. The learning in this case is the learning of the practice that defines the community. This is the learning involved in becoming an accredited member of a community by reaching a demonstrated level of expertise, and then the learning involved in continuous professional development. This may be formal, as in medicine, or informal, by being accepted as a wine buff or a political activist. The second sense is that of a community of learners, for whom the practice is learning per se. That is, a very broad community identified by a shared high value placed on the process of continuous intellectual development.

At the second level of situations is the learning group. Almost all learning is itself embedded in a social context – the classroom, or the tutorial group, or the virtual Computer-Mediated Communication (CMC) discussion group or even the year group. The learner will usually have a strong sense of identifying with such groups, and a strong need to participate as a full member. Such groups can have the characteristics of a community of practice but here the practice is the learning itself, in a particular educational or training setting. Or rather it is educational practice, which may or may not be centred on learning.

While there have been many studies of learning in informal settings [55], there are comparatively few ethnographic studies of real groups in educational settings to compare with the many studies of group dynamics in work organizations [53]. Yet every student and every teacher knows that there are characteristics of these groups or communities which are powerful determinants of the nature of the learning that actually occurs in educational institutions. Successful students are those who learn how to pass assessments, not necessarily those who have the deepest interest in the subject matter.

There are, of course, many aspects of student behaviour which are determined by social goals which have little or nothing to do with the curriculum, but much to do with peer esteem.

The third level is the level of individual relationships. Most learning that is motivated by the above two levels will actually be mediated through relationships with individual members of the communities or groups in question. The social categorization of these individuals will vary according to the context and nature of particular dialogues. Sometimes their membership of a group will be most salient, in other situations their personal characteristics will be perceived as more important. Such relationships will vary according to the characteristics of the groups involved, the context within which they operate, and the strength of the relationships [56].

G. *Information Technologies Used in E-Learning*

From a pedagogical point of view, learning theories can be implemented to achieve three categories of e-Learning using information technologies:

- The behaviourist learning theory can be applied to e-Learning to support the transmission of knowledge from the instructor to the learners.
- The constructivist learning theory can be applied to e-Learning to support task-based activities rather than the transmission of knowledge from the instructor to the learners.
- The collaborative perspective of learning can be applied to e-Learning to support collaborative learning, dialogue, and discussion with both the instructor and fellow learners.

H. *Learning Outcomes*

In order to set our analysis of e-learning in the context of curriculum design it is first necessary to consider the nature of the learning outcomes that are sought through educational innovation, including e-learning methods.

[57] taxonomy was originally developed to classify the complexity of questions asked in assessment, but has become used as a general system for classifying learning outcomes. The basic cognitive competences to be demonstrated are: knowledge, comprehension, application, analysis, synthesis and evaluation. There are also competences for psychomotor and affective learning. Practitioners are often encouraged to use verbs from Bloom's taxonomy [58] to define the desired outcomes of a course or learning session. This is often carried out as a post-hoc justification for teaching decisions that have already been taken and is quite inadequate as a basis for thinking through fundamental pedagogic issues. The evaluation of Moodle for teaching and learning is explained in the section to follow.

V. EVALUATING MOODLE FOR TEACHING AND LEARNING

There exist different approaches that have been used in the evaluation of open source E-learning tools. According to [58], Most of them do allow quantitative evaluation of a number of criteria based on their assigned weights and thus help to easily compare the results of evaluation when similar pieces of software are evaluated for one particular use. In this paper, though, design science research methodology was used to come up with the specific guidelines for evaluation and iteration within the study

Design Science Research is defined as a research activity that invents or builds new, innovative artifacts for solving problems or achieving improvements. Design Science Research creates new means for achieving some general goal, as its major research contributions. Such new and innovative artifacts create new reality, rather than explaining existing reality or helping to make sense of it.

From a user's perspective, the secret behind any successful software tool is that it should make sense [59].This statement caries even more meaning to the software tool if users were to spend more time learning how to use the software rather than using the software to solve the problem.

One should note, however, that typically the developed artefact aims at addressing a class of problems [60] in a way that it is useful in addressing specific problems of a specific client.

A. *Population of the Study*

The evaluation process in this study was carried out on students at the undergraduate level. A total of 650 students were introduced to Moodle and the authors supplied each student with a questionnaire prepared for the study. The study targeted students enrolled at the school of computer studies. This was also used as the basis for a pilot experiment in this study.

B. *Pilot Experiment*

The authors used an experimental method to obtain the required results. Computer science courses were, however, used to pilot this study. The study included designing the different courses to be delivered with the help of Moodle. The open source software tool called MOODLE was used and the emphasis was on online lessons, online assignments, online discussion and forums.

The rating used in this study weighs the important factors for successful implementation of Moodle for teaching and learning and includes: functionality, quality, performance, support, among other factors as shown in Table 1. These factors were selected as the most important ones for evaluating Moodle as one among other good open source tools for teaching and learning. The analysis of the results shown in Table 1 suggests that this effort has provided as with valuable insights about the use of Moodle for teaching and learning.

VI. FINDINGS

The students' evaluated the learning management system (Moodle) using questionnaires. The results are summarized in Table 1. The results indicate that 70.8% of the students agreed or strongly agreed that learning to use Moodle was easy. 75% of the students also agreed or strongly agreed that it was easy to download lecture hand-outs from Moodle, while 57% of the students found it easy to use Moodle. 60% of the students agreed that it was easy for them to build their skills in Moodle environment. 73% of the students acknowledged that Moodle improves their e-learning skills meanwhile 83% of the students agreed or strongly agreed that it was useful to use Moodle as medium for teaching and learning. 81% of the students agreed that using Moodle makes learning more interesting.

In general the students' experience of using Moodle was an opportunity and their first experience of using e-learning environment. More than 70% of the students agreed to use Moodle for learning computer science courses. The few challenges faced by students included slow Internet speed and high payments for Internet use, however, the overall results are remarkable.

Table 1: Summary of Evaluation Process and Results

| No	Scales for measuring various constructs	Strongly Agree [%]	Agree [%]	Neutral [%]	Disagree [%]	Strongly Disagree [%]
1	Learning to use MOODLE is easy for me	37.5	33.3	14.6	8.3	6.3
2	I find it easy to download lecturer hand-outs from MOODLE	33.3	41.7	14.6	8.3	2.1
3	I find MOODLE easy to use	27.1	31.3	22.9	4.2	14.6
4	I find it easy to do assignment using MOODLE	27.1	41.7	18.8	4.2	8.3
5	It is easy for me to build my skills in using MOODLE	29.2	29.2	25.0	10.4	6.3
6	Using MOODLE would improve my skills in e-learning	39.6	33.3	20.8	4.2	2.1
7	Using MOODLE during my undergraduate studies would enable me to accomplish task quickly	29.2	31.3	33.3	4.2	2.1
8	I find MOODLE useful in my studies	35.4	47.9	14.6	0.0	2.1
9	Using MOODLE increases my effectiveness in the course	25.0	50.0	16.7	2.1	6.3
10	I look forward to those aspects of my course that require me to use MOODLE	37.5	37.5	18.8	4.2	2.1
11	MOODLE makes learning more interesting	31.3	50.0	12.5	2.1	4.2
12	Learning with MOODLE is an innovative approach to learning	29.2	52.1	14.6	0.0	4.2
13	I will use MOODLE in the future	35.4	43.8	12.5	6.3	2.1
14	I will continue to use MOODLE in the other course units	22.9	41.7	22.9	8.3	4.2
15	I plan to use MOODLE in my own classes	22.9	45.8	22.9	4.2	4.2
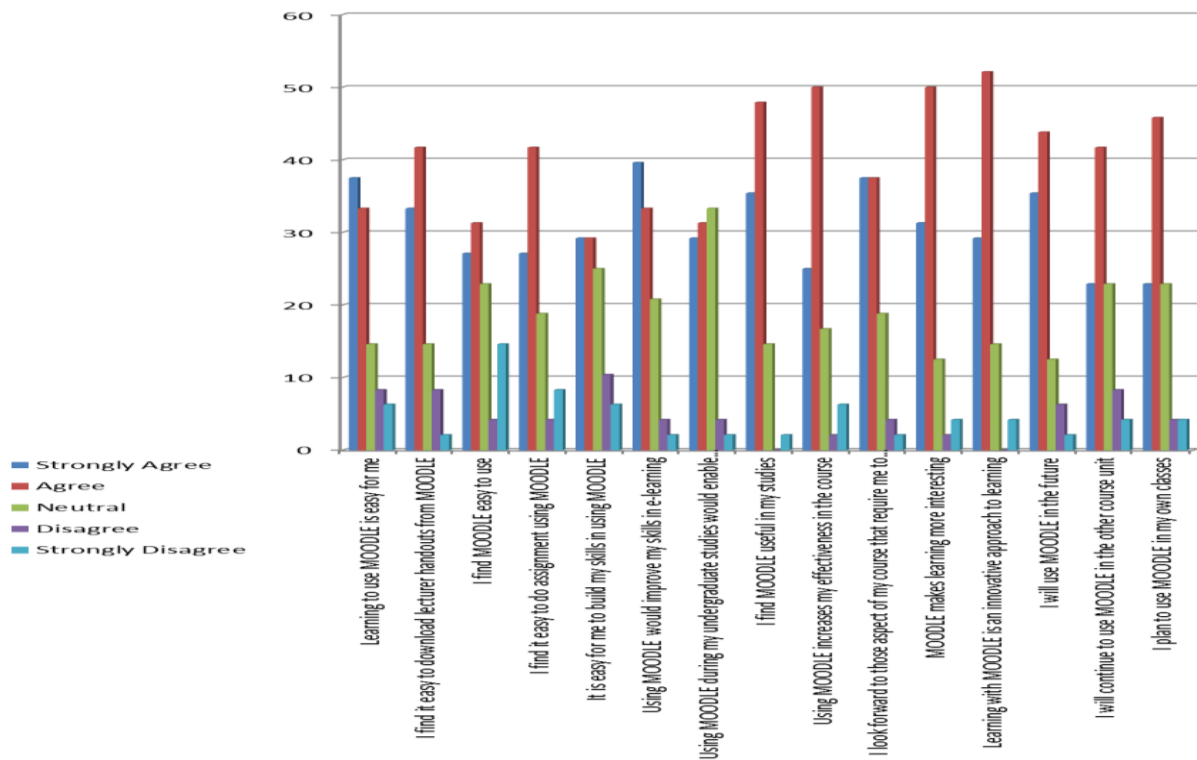
Figure 1: Summary of Evaluation Process and Results

VII. CONCLUSIONS AND FUTURE WORK

Although there are many Open Source E-learning software tools in the world today, in this paper we present the case for evaluating Moodle as an open source software tool for teaching and learning in tertiary institutions. The authors are confident that e-learning is here to stay and will continue to play an important role in education and contributing towards generating knowledge. However, in order to realize the full potentials of using open source software tools in E-learning, institution needs to promote and supporting e-learning initiative such as those presented in this paper.

The future of this paper aims at developing new activities within e-learning (through Moodle), such as the activity of exam exercises. Such an exercise will aid in assessing the knowledge acquired by a student from a module. The implementation of such exercises online will become a vital aspect in the education process. In addition, the practice of online exercises will give students more confidence before taking their final exams.

However, future research will also be done to address some of the possible problems that occur when trying to implement new activities in Moodle. Security issues will also be considered for this system so to improve on the institutions trust in using Moodle.

VIII. ACKNOWLEDGMENT

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