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Promoting open educational resources-based blended learning

Thanuja Chandani Sandanayake

Correspondence: thanujas@uom.lk
Faculty of Information Technology, University of Moratuwa, Moratuwa, Sri Lanka

Abstract

The OER movement has empowered researchers and educators to become more innovative in their teaching and learning, through the openness and flexibility. The use and adaptation of OER have been recommended as a very cost-effective investment in quality teaching-learning. In conventional teaching practices, teachers mostly spend time developing learning materials, reviewing lecture notes, anticipating questions and formulating answers, preparing for examinations. This method is no longer appropriate with the learner's current association with the technology. This research aims on promoting OER-based blended learning for the undergraduate learners. Action research has been conducted in order to identify the learner adaptation to the new culture of OER-based blended learning. This research has evaluated the learner perceptions on OER-based blended learning. The learner performance records were also evaluated as a measure of quality of learning. The study has focused on how the OER materials to be incorporated in the online course development in undergraduate learning. At the same time, research provides feedback on the use of OER- based blended learning methods. The study further elaborates on effective assessment activities which need to be used in OER-based blended learning. Learners were quite positive on these effective assessment activities. Moreover, the study specifies the importance of incorporating OER in undergraduate online learning.

Keywords: OER, Blended learning, Action research, Learning environment

Introduction

Blended learning is one of the most accepted learning modes where the learners get the opportunity to learn using online digital media as well as the traditional classroom methods (Bonk & Graham, 2013). The use of online learning methods in blended learning helps the course designers in using learning materials as their preference. Open Educational Resources (OERs) are the types of educational materials that are used in the public domain or introduced with an open license (UNESCO, 2002). Open Educational Resources (OERs) are becoming popular among such online course designers since OER are the types of educational materials that are in the public domain or introduced with an *open* license (UNESCO, 2014). The Open Educational Resources (OER) movement has empowered educators to become more innovative in their pedagogical practices, through the openness and flexibility in educational resource use permitted by open licensing of materials (Karunanayake, Naidu, & Mohan, 2016). Similar research has been done by many other researches and some can be found in Dhanarajan & Porter, 2013; Jhangiani, Pitt, Hendricks, Key, & Lalonde, 2016; Glenda & Trotter,

2017; Clements & Pawlowski, 2012 and Pete, Mulder, & Neto, 2017. The use and adaptation of OER has been recommended as a very cost-effective investment in curriculum development and quality teaching-learning material development (Dhanarajan & Porter, 2013). 5R Concept of OER (i.e: Retain, Reuse, Revise, Remix and Redistribute) gives the opportunity for the course designers to modify the course as per the course objectives and requirements (Wiley, 2014). The best explanation of 5Rs of openness is applicable in describing all possible ways of how OER being integrated; Retain, Reuse, Revise, Remix and Redistribute (Wiley, 2014).

Enabling user engagement in novel methods of using resources to move beyond more access to them shows the best practices of Open Educational Resources (Karunanayake et al., 2016). Wiley has described the following rights to access materials: retain (the right to make, to own and control copies of content), reuse (in many ways), revise (adaptation, making adjustments, modifications and change), remix (combinations with the original or revised content with other open content, thereby making something innovative such as a mash up), and finally, re-distribute (sharing the new content with others) (Wiley, 2014). In many local universities, the undergraduate degree programmes offer full-time face to face classroom basis learning. This learning environment is conventional since the students are familiar with the existing delivery mechanism (Mason, Shuman, & Cook, 2013). Apart from that, the academics or course developers are reluctant to use novel approaches in the course delivery since both learners and teachers do not like a drastic changes in teaching and learning (Tallvid, 2016).

This research has been carried out at the Faculty of Information Technology of University of Moratuwa, Sri Lanka. The University of Moratuwa offers most of the undergraduate courses face to face while some teachers offer the courses in blended mode with the help of Moodle Learning Management System (LMS) (Moodle reference - https://moodle.itfac.mrt.ac.lk/login/index.php). These teachers or academics use the online platforms only to conduct and upload the assignments. In such courses teaching happens through off line mode. The Faculty of Information Technology uses face to face mode as the main delivery method. The Faculty of IT has been using Moodle LMS for the teaching and learning process. Most of the time, Moodle LMS is used to upload assignments, upload lecture or lesson learning materials which are used during lectures. The learners are given the required training on how to use the official LMS for academic purposes at the beginning of the first year.

The Faculty of Information Technology has been offering blended mode courses to the learners over 10 years. However, OER-based blended learning is new since it has never been used in previous courses or as a delivery mode. This course was the first OER-integrated online course offered by the Faculty of Information Technology. Since this is a new delivery experience, the research team has conducted the study through an Action research. The main aim of the research was to promote OER-based learning for the undergraduates. Therefore this research study was conducted based on the undergraduate learners to promote OER-based blended learning in conventional universities.

Aim and objectives

The aim of the research study is to conduct an action research on promoting OER-based learning in a blended learning approach. Following are the major objectives of the research study:

I. Design an intervention to promote OER-based learning
II. Conduct an intervention with the undergraduate learners in a blended learning model.
III. Evaluate the learner performance in OER-based course
IV. Identify the learner observations on OER-based learning
V. Identify possible ways to promote OER-based learning for undergraduate courses.

Literature review

Conventional teaching and learning method is no longer appropriate for the learner's current association with the technology. Therefore technology-enabled learning (TEL) plays a vital role in contemporary education structures. The literature further says that the basic and fundamental problem of the traditional teaching process is that the faculty members often equate their learning process to their students' (Liyoshi & Vijay-Kumar, 2008). As mentioned in the introduction, OER is teaching and learning materials that are freely available online for everyone to use. Larsen and Vincent-Lancrin (2005) OER has further defined that, "The open sharing of one's educational resources implies that knowledge is made freely available on non-commercial terms,". At the same time, Hylen (2005) defines OER initiatives as "open courseware and content; open software tools (e.g. learning management systems); open material for e-learning capacity building of faculty staff; repositories of learning objects; and free educational courses."

The OER-based online learning is the latest method of learning since the learners and the teachers get the freedom of using the copyright free materials for the academic work (Karunanayaka et al., 2016). OERs help enhance the teaching and learning across the globe immensely. Mostly, OER learning materials are available at "free and open" concept which provides a great advantage for developing countries where many learners may not be able to afford textbooks, where access to classrooms may be limited, and where teacher-training programs may be lacking (UNESCO, 2014).

They are also important in developed and industrialized countries since OER-integrated learning offers significant cost savings. In adult education contexts, most of OER materials are offered free to the learners where the learners get the benefit of accessing the world's best courses and even degree programs. This is cost effective since learners do not have to spend a lot for textbooks and learning materials. Moreover, OER provides free and legal access to some of the world's best courses for teachers which can lead to great innovations. For the students who have financial difficulties in buying textbooks, OER integrated learning is valuable. At the same time, learners are given freedom to learn anytime and anywhere they want. This introduction to OER integrated learning was thus conducted as Action Research study to deeply analyze the area. Open learning approach removes unnecessary barriers to learning especially for adult learning (Marina, 2011). At the same time, it aims to develop and make the learners engage in education and training opportunities which open up doors for different areas of learning. As explained in the book 'A Basic Guide to OER' (Butcher, 2015), OER-integrated learning incorporates and highlights key principles from which many stakeholders will be benefited such as;

– Promotes lifelong learning opportunities and encompasses education and training

- Encourage independent and critical thinking through learner-centered learning process.
- Encourage flexible learning – allow learners to make their own decision on where, when, what and how they learn
- Prior learning, prior experience, and demonstrated competencies
- Learners should be able to gather knowledge from different learning contexts;
- Providers should create the conditions for a fair chance of learner success.

OER-based learning makes the concept of resource-based learning of particular interest. A significant number of researchers have discussed the matter of the quality of OER as a learning resource (Butcher, 2015; Wiley, 2014). In open and distance learning concept, openness and resource-based learning are widely used. Resource-based learning creates a better platform to transform a culture of open learning and teaching across many educational systems to offer a better quality to the significant number of learners (Jarvis, 2012; Marina, 2011).

There are numerous types of resources available in OER offer for online learners (Karunanayake et al., 2016). Such materials are hosted as e-resources, blogs, materials in LMS, software tools, open courseware content, free educational courses, open materials for e-learning, wiki s, online learning repositories. The format of each category differs from each other and different facilities are also available in such resources. As described earlier, OER is valuable and this technological learning will focus on the open provision and use of course elements and learning materials or open content for only courses. At the same time, OER courses explore a very wide variety of projects where it leads to develop and provide complete learning programs, to institutions that publish the materials they use in their own teaching. Such programs publish the syllabi, lecture notes, reading lists, assessments, forums, projects facilitation and much other learning-related useful information (Bang, Dalsgaard, Kjær, & O'Donovan, 2016). OER includes the resources such as lecture notes, publications of staff, online courseware content, different educational programmes hosted internally and externally (OECD, 2014).

Research methodology

As mentioned in the introduction, the aim of the research is to promote OER-based learning among the undergraduate learners. Hence the study has been conducted as an action research study to achieve the main aim of the research. The action research was conducted according to the five-stage model of action research (Mills, 2011) which maps with the research objectives. The methodology adopted in this research study was questionnaire-based evaluation, course peer review and learner performance records in assessment activities. The learners' insights towards OER-based learning were evaluated at the end of the course.

The selected course was offered for the students who follow B.Sc (Hons) in Information Technology and B.Sc (Hons) in Information Technology and Management. The course title is IS 4310 – Business Studies. There were 106 students registered for the course. This course is an elective course module which was offered in the level 4 of both degree programmes. The course was conducted within 14 calendar weeks. Blended teaching and learning method were used. The learner's performance was evaluated through course assignments, quizzes, and discussion forums.

Research design in action research

Action research is a process of systematic inquiry that seeks to improve social issues affecting the daily/ everyday life (Nolen & Putten, 2007; Stringer, 2008). Many educational researchers of educational action research refer to a wide variety of evaluative, investigative, and analytical research methods designed to identify and solve issues of academics, or educational institutes help to develop practical solutions to solve them efficiently (Kemmis & McTaggart, 1988).

Educational action research is applied to educational programs or educational techniques that do not sometimes enounce or experience any problem or an issue, but education researchers simply want to learn new techniques, methods, and phenomena and improve (Ferrance, 2000). Today many educational programmers and educators are involved in education action research in order to build a better learning experience for potential learners and teachers. The action research study was carried out in five phases. Each phase has its unique features which need high attention in order to proceed further. Therefore the research design has aligned the study with the five phases of action research as stated in the below Table 1. Adapting to new learning cultures is difficult for the adult learners (Ruey, 2010). The OER-based learning has made the adult learners' life attuned into a new direction.

The learners may face problems due to the new change but the learners' learning abilities and capabilities will be enhanced. The OER-based intervention course is planned according to the steps of the action research. Each and every step of the process reaches out to its aim and objectives by providing. The target groups of learners are not used to OER environment and the researcher analyzed their learning pattern before developing the intervention course.

The lesson plan should be outlined in a way it reflects the delivery of lesson content with a proper schedule. The time allotted for preparation, presentation and evaluation activities should be appropriate and adequate. The Business Studies course has also

Table 1 Phases of action research (Mills, 2011; Stringer, 2008; Ferrance, 2000; Sagor, 2010)

Description	Proposed action in the intervention
Identify the specific problem. Reflection directed toward identifying a situation	• The new concept of OER -based learning has not been introduced yet for the undergraduate learners. • Defining the research aim, objectives • Identify the suitable research methodology
Develop and implement a new strategy or approach to address your question	• Designing of intervention course for selected student group • Develop the OER-based course addressing the research objectives • Designing of the questionnaire – data collection methods • Making learners aware of the new intervention course
Decide on how, when, what, where the data collection happens	• Decide on the target group • Conduct of sample survey • Redesign the survey based on the outcomes of sample survey • Student notifications on the survey • Conduct the final online surveys • Collect the learner feedback
Analysis of data using a proper statistical method	• Derive the outcomes of a dataset using proper statistical methods • Identifying new patterns, insights, models derived from analysis
Derive the outcomes and identify the differences and new insights	• Identify the differences after introducing OER-based learning. • Discuss the relevant modifications done for the future courses • Derive a plan of actions to integrate OER into online courses

structured its lesson and sub-lessons according to the given semester plan. Each lesson consists of 2 h of teaching hours and 1 h of tutorial sessions which is being identified as direct contact hours of students. The estimated learning time of the course is as follows. Total hours allocated for the course to conduct face to face sessions are 42. This includes 2 h of lectures and 1 h of tutorial sessions run through the 12 weeks of a semester. Apart from this schedule, the research has developed some more learning activities, forums, assessments to be accessed via Moodle LMS. The course has been developed in a way described in Table 1 and the average time a student had to spend on the subject per week is equal to 6 h. This includes face to face session and online sessions. Further, the research has evaluated that the actual average time spent on the lesson is 6 h. The following Table 2, shows the course structure according to time allocated for course activities. Figure 1 shows the screenshot of the Moodle interface.

Questionnaire design of action research

The research methodology of this action research was adopted by considering how to gather information from multiple sources. The most important method was the questionnaire based evaluation. There were two types of questionnaires. One was to get the feedback from the student and the other was to get the feedback from peers. The learners' feedback was collected at the end of the course module but the peer evaluation was conducted in the middle of the course by the course appointed examination moderator.

The student's feedback questionnaire consisted of both structured and unstructured questions which were open-ended. The student's feedback evaluation has used the 5 points Likert scale (Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, Strongly Disagree) structure in getting the feedback. The questions of the questionnaire will be discussed in the data analysis and the results section. The questionnaire was distributed among 106 respondents (students) and all of them responded to the survey. The peer evaluation was conducted by the moderator of the course appointed by the Senate of the university. The moderator has evaluated all the course materials, assignments, quizzes lesson outlines and course guided which was made available for the

Table 2 Course structure of the intervention

Activity	Description
Instructions	Lesson Plans
	Course Outline
	Lesson instructions
	Assessment guidelines
Learning Materials	In-class materials (used in face to face class)
	Reading activities – OER learning materials
	OER-based audio/video clips
	OER-based figures, tables, and graphics
Assessments	Quizzes
	Individual/ group assessments
Collaborative activities	Chat forums
	Discussion forums

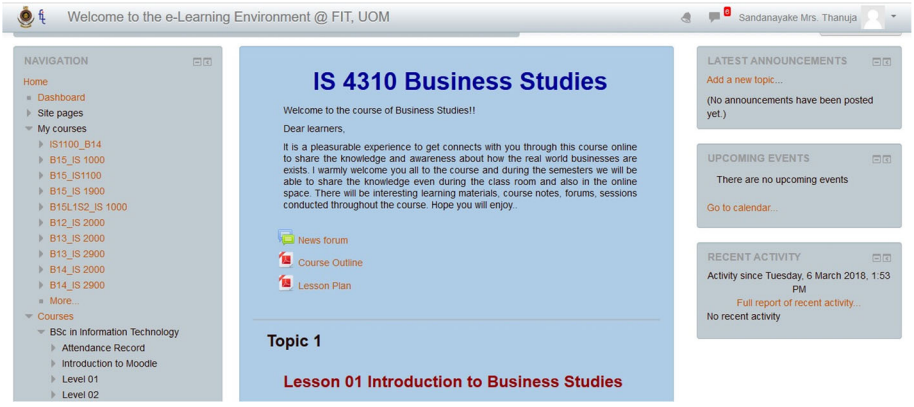

Fig. 1 Moodle interface of the OER-based online course

students. Apart from that, the moderator has observed one face to face session to evaluate the physical conduct of the lecture.

The questionnaire of the research was developed based on three research studies. The first study was conducted by Elango, Gudep, and Selvam (2008) Quality of e-Learning: An Analysis Based on e-Learners' Perception of e-Learning. An attempt has been made to investigate the issues related to the quality dimensions of e-learning. This study aims at analyzing the perception of e-learners on various dimensions of quality such as Relevance of courses, Effectiveness of delivery mode, Course Compliance and Confidence.

The second study which was considered when developing the questionnaire is Students' perceptions on incorporating e-learning into teaching and learning at the University of Ghana done by Michael Tagoe in 2012. This study, which was developed based on the Technology Acceptance Model (TAM), examines students' perceptions on incorporating e-learning into teaching and learning (Tagoe, 2012). Tagoe's study has mainly focused on the categories such as access to computers, prior experience, and perceived ease of use, perceive usefulness, attitude towards e-learning and behavioral intention to use e-learning.

Buzzetto-More has also conducted an analysis on student's perception on Various E-Learning Components in 2008. The research describes the learning perceptions and preferences of students. Buzzetto-More argues that regardless of the delivery method, there are numerous tools and features at the disposal of students and instructors, and it is important for the e-learning community to examine both preferences and usage of these features (Buzzetto-More, 2008). Further the survey was designed to assess students' technology access, skills, and usage; prior experiences with e-learning, course delivery preferences, perceived satisfaction with e-learning, and perceptions of, and preferences towards, various e-learning components (Buzzetto-More, 2008).

The survey was conducted during the course and the learner feedback was collected. Apart from that learners' performance records were monitored too. Both qualitative and qualitative analyses have been conducted. Qualitative data has been reviewed using descriptive statistics with the help of SPSS (SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago, SPSS Inc.) Statistical software and quantitative data has been revised using Nvivo (Nvivo 11 for Windows) software. Results of the action research study are explained in the results section.

Data analysis and results

The data collection was conducted at the end of the course. Questionnaire survey was conducted online for all the learners. Here the learner perceptions and learner performance records were evaluated to observe whether the research objectives were fulfilled.

Learner perception results

According to the methodology, the first evaluation was received by the learners and it was about their familiarity and usage of such courses. The question was "Have you experienced OER-based learning before?". The analysis of the results was given in Fig. 2.

The Fig. 2 shows that nearly 30% of earners have attempted and accessed only OER integrated online course before. A majority of learners, which is 70% of them, have not accessed the OER integrated online course before. This interprets that courses of this nature are new to the majority of the learners. According to JISC study 2012, there are numerous advantages for new users such as: enhanced quality and flexibility of resources, freedom of access (and enhanced opportunities for learning and support for learner-centered, self-directed, peer-to-peer and social/informal learning. Further, the learners are able to develop their skills and they have an opportunity to test course materials before getting enrolled and compare it with other courses. Anyhow this set of IT undergraduates also had new and fresh experience of learning through OER-based blended learning.

According to the results analysis, the next evaluation is about the time spent on learning activities per week. The course was designed in such a way that the learners are given numerous activities to complete within a specific time limit. These time limits vary with the amount of activities to be performed by the learners. According to Table 2 the average time to be spent on the lessons per week is 6 h. Figure 3 shows the students feedback on how they have spent their time on lesson activities per week. The majority of learners, about 41%, have spent 4–5 h per week. There are 34% of learners were spent 3–4 h per week. Therefore average learning time has been calculated as 3.5–4 h per week.

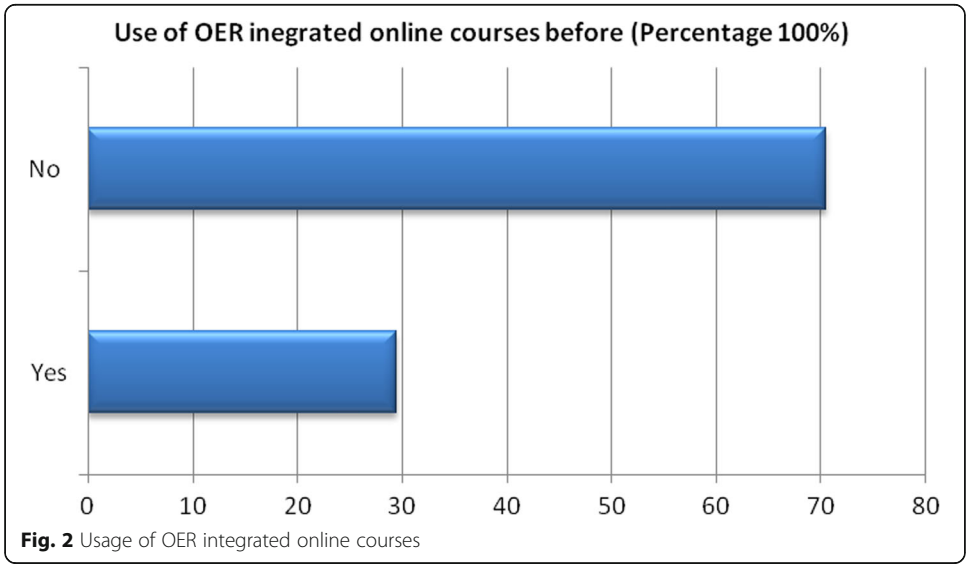

Fig. 2 Usage of OER integrated online courses

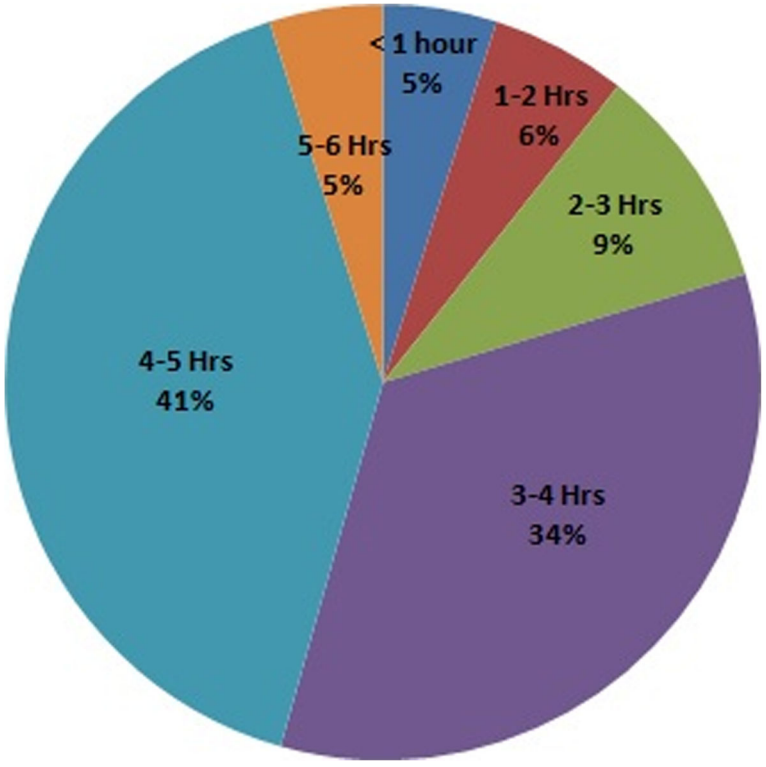

Fig. 3 Time spent on lessons per week

The next analysis is based on the evaluation done on different categories of the course variables as mentioned above. The categories were Course Structure, Lesson format, Assessment Activities, User guide and Overall Performance. The students were evaluated through a questionnaire and each category has been evaluated with the use of two or more questions. Descriptive statistics were used to analyse the questions on the different elements of the course. The elements which were evaluated are course structure, lesson formats, assessment activities, user guide and overall satisfaction. Different questions were used to evaluate the elements and they were measured using five points Likert scale from Strongly Agree to Strongly Disagree format. The following Fig. 4 shows the analysis of average mean values of each category of the questionnaire.

As per the Fig. 4 the average mean values are more than 4 which show that the learners have positive attitude towards each and every activity of the course. Especially the learners have positive feelings and beliefs about the assessments which show 4.5 average mean value as the assessment scores. Overall satisfaction of the course equals to 4.3, which implies that the students are satisfied with the overall course elements.

When critically analyzing the mean values of the questionnaire, the lowest mean values were found for the questions "The course structure is clear and user-friendly" (X = 3.95082) and "I believe the lessons were properly explained and elaborated." (X = 3.557377). This implies that learners have certain negative feelings on the structure and the lesson instructions.

The above results illustrate that the learners show a positive attitude towards incorporating OER elements into other courses of their degree programme. Especially the

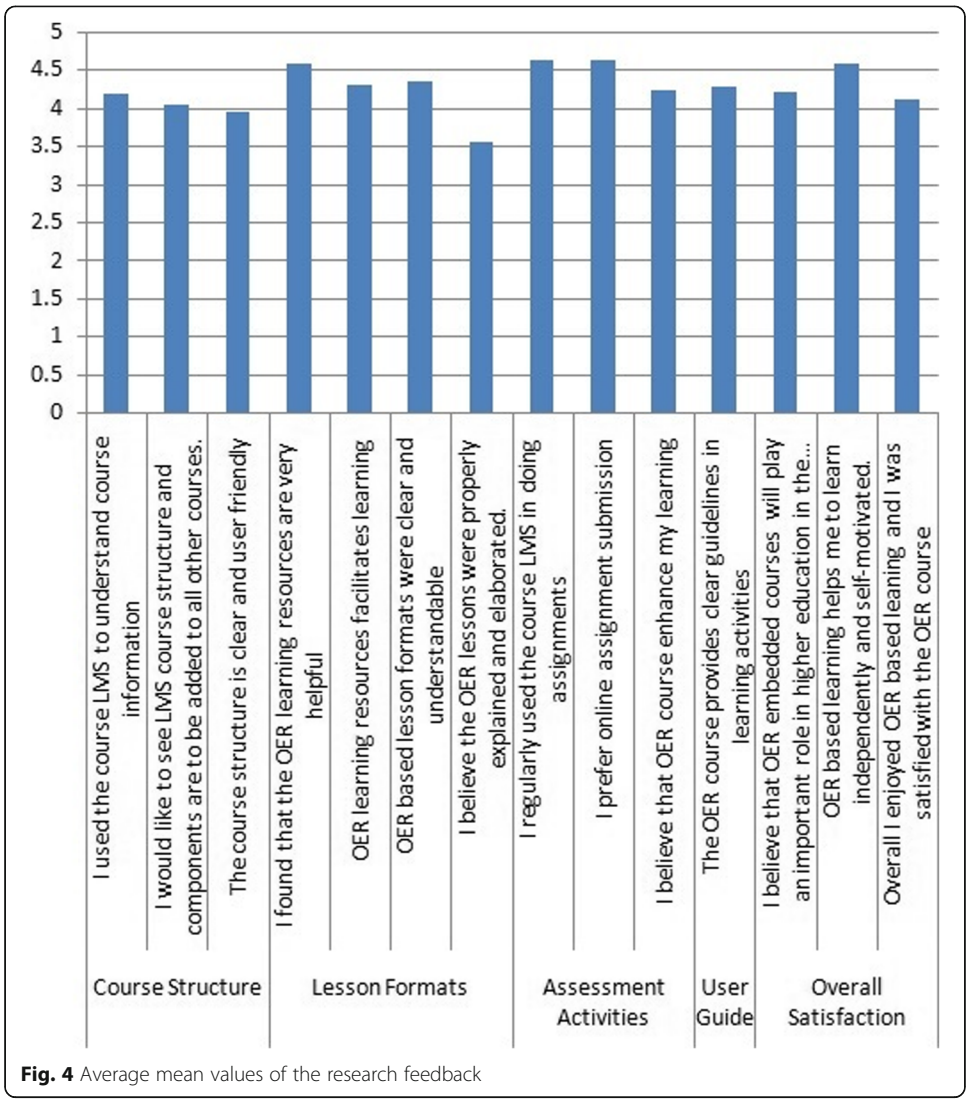

Fig. 4 Average mean values of the research feedback

assessments of the courses can be well guided through clear instructions. The learners have mentioned their views as given below.

The next analysis is based on the leaner's' comments made for the question "What do you think about the structure of OER-based course, presentation of lesson OER materials and lesson formats?". The comments were analyzed and categorized according to its positivity and negativity. The positive comments can be summarized as follows:

- OER materials are clear and understandable
- The course was very user-friendly
- Many of practical examples were given
- Well organized course format
- Clear and readable lessons
- The flow of the OER materials are good
- Easy to understand
- Helpful in developing knowledge
- Enhance the ability of thinking

- New things learned from OER
- Learners can interact each other
- Easy to access and well organized
- The relationship among the lessons was good

Negative feedback was as follows:

- Some materials were a bit lengthy, need to reduce the length
- Please explain the technical terms more, we are not familiar with educational terms
- Prefer the lesson structure, but the lessons should be more interactive.
- Some lessons were difficult to understand, they are more philosophical. Please make them simple as possible

The majority of the students has provided positive feedback for this question. Students believe that OER integrated course was interesting and they had the chance to enhance their knowledge through that. The structure for the lessons was well formed and they have found it easy to access the system. Apart from that, the learners have commented that the lesson structure was helpful for them to understand the course activities in advance clearly.

The next question of the research is "Do you think OER-based online courses are good teaching and learning methods in general? Pleases state your views." This is to review the ideas and views of the students about how important the OER-based online learning courses are. It is impressing to see both positive and negative perceptions towards addressing this question. The positive and negative feedback is listed as follows in Table 3.

The evaluation of the question of "What do you think about the assessment activities used in the OER-based course?" is also interesting since the learners have shown their motivation to get the online assessments in this particular evaluation. According to the feedback received, it is identified that learners enjoy a lot of online assessments/work. The OER course comprises of both formative and summative assessments. The assessments started with individual and gradually moved into group activities. The learners were given proper help using OER. Students have commented that they need more feedback on the assessments offered online. Apart from that, the learners have commented that they need more time in completing the assessments due to their busy schedule. Results were given in Table 4.

The next question that the research has reviewed is related to institutional capability and capacity to conduct OER-based learning. It is important to review the feedback of current learners on the future conducts of such courses in their degree programmes. There were good reviews and proposals made by the current learners listed in Table 5 below.

Further, this research looked at the learner advice and suggestions based on their own experience. It is quite obvious that every education researcher should critically evaluate the learner feedback on the activities which are offered or practiced.

The undergraduate learners, who have attempted and completed the course, have provided very effective ideas on the further development of OER-based blended learning in the technology-oriented faculty. The familiarity and the fluency in technology

Table 3 Feedback of OER-based blended learning methods

Positive feedback	Negative feedback
• OER materials are very helpful for learning • Learners and facilitators can interact virtually which is very comfortable • Can be adopted in many courses with the technology enhancement • Learners enjoy learning using OER • OER is Anytime anywhere learning is easy and interesting. OER is simply best • Learners can learn using modern technological advancements. • Can improve the learner's abilities such as reading, writing and analyze • Less cost for developing physical infrastructure – can improve the quality of lesson learning materials when using OER	• Depends, if only the courses are developed interactively students are able to enjoy the learning • Sometimes it is not motivating because learners do not get the physical connections with the teachers – cant get the actual feeling of learning • Learners can cheat easily • It is very easy for the students to get away from learning and cheat the instructor. • Need more social interactions • Like to sit with the friends in the classroom rather learning through online

will be helpful for them to be in touch with these types of courses in their undergraduate level.

The solutions suggested by the students for the aforementioned question/s are quite interesting. The students have provided the following suggestions:

- Need to add teleconferencing
- Brainstorming sessions
- Warm up sessions for learners
- High interactivity with the learners and teachers
- Cost-effective and sustainable models
- LMS needs to be more interactive
- More live discussion forums where learners can share thoughts
- Provide quick feedback on the assessment activities of the course

Learner performance

This was the first time that the course module was offered to the learners as an OER-integrated online course. In the previous year the course was offered as a traditional face to face lecture mode without the use of OER. Therefore the assessment marks were evaluated in order to evaluate the learner performance. The learner performance records were evaluated based on the marks that the learners have received for the three graded assessments conducted in the course. Apart from that, the

Table 4 Feedback on assessment activities

Positive feedback	Negative feedback
• Better to use formative assessment in these type of OER-based courses • Well structured and organized • Feedbacks are important in assessing • Students do not feel stress in phasing out the assessments • Group assessments are the very effective way of sharing knowledge • Assessments were well connected with lessons • Assessments are connected to each other and well organized	• Time schedules are tight and difficult to spend more time with them • Difficulties of uploading assessments – Technical barriers which affect the deadlines

Table 5 Review on conducting OER-based courses

Positive feedback	Negative feedback
• Better experience for the online learners – can add a lot of learning and non-learning activities help to develop the knowledge • Yes a lot of social learning is required • Prefer for distance learning courses • Open learning platforms are better places Need to add teleconferencing • Appropriate for postgraduate programmes – busy Learners will enjoy this courses	• Need the lot of hands-on practical experience for the IT students – lab work • Keeping students alive all the time – especially if it is fully online and OER-based • Technological barriers will be a problem

self-graded quizzes are also conducted in order to evaluate the learner performance. The learners were given three different formative assessment activities. The very first assessment was an individual activity and the second and third assessments were group activities based on the outcome of the first assignment. The researcher has done a comparison between the average assessment marks between the two courses conducted with and without the use of OER. The average assessment marks comparison between with and without use of OER is given in the Fig. 5.

As displayed in the Fig. 5, marks of the three formative assessments are distributed in a skewed normal curve. The average mark of assignment 1 was 74, assignment 2 is 81 and assignment 3 is 80. The marks of the learners for the three assignments lie between 34 to 96. According to the assessment activities given, the only assessment which was not considered in grading was the discussion forum.

Due to the number of students who attempted the discussion forum, it was difficult to evaluate their level of engagement with the forum based on a specific scenario. Only the feedback was given for the discussion forums. This is one of the biggest problems found in online discussion forums because it is difficult to rationalize the evaluating criteria of the discussion. Therefore the learners were not given marks for the discussion forums of the course.

Discussion and conclusions

This research was conducted to promote OER-based learning among undergraduates. An action research methodology was adopted in this study to achieve the research

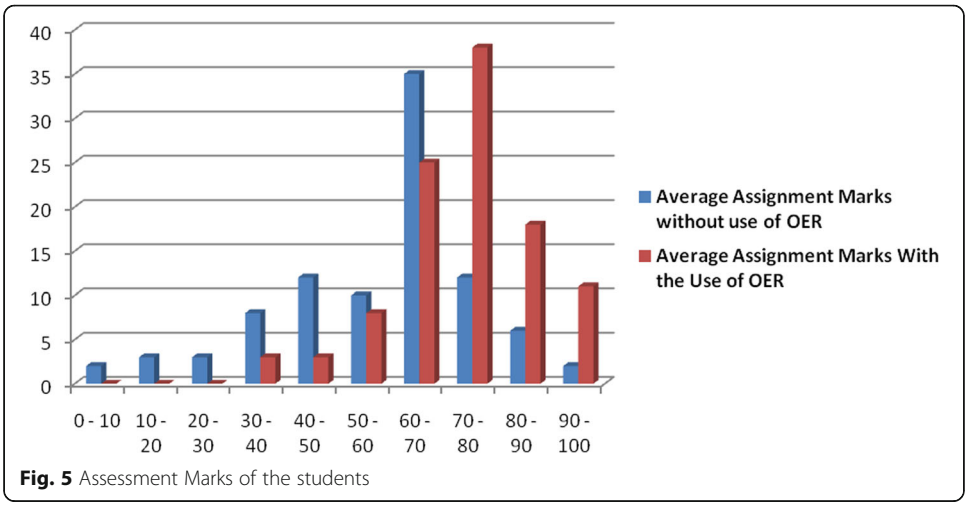

Fig. 5 Assessment Marks of the students

objectives. The major aim was to introduce the OER integrated online learning to the undergraduates and observe differences of their results. The OER integration in the course was done using an intervention course. The intervention course consisted of OER learning materials covering the research objectives. As presented in the results, OER-based blended learning was quite new to the learners. These undergraduates faced challenges in finding relevant free and open materials. OER materials were helpful for them. In the blended learning environment, the course facilitators need to facilitate the learners using multiple learning methods in order to make the learning journey more effective and successful. This study has proven the importance of using novel methods in blended learning mode through an action research study. What is lacking in most of the online course are the social interactions between learners.

The designers of OER-based blended course should create the social interactions though innovative interactions such as peer facilitated discussion forums, video based learning materials to deliver course content, group based assessment activities which lead the learners to apply analytical skills, hands-on practical experience for the learners (specially for IT undergraduates), learning activities to improve the learner's self learning abilities.

The OER-based online courses enhance the quality of learning experience by enabling flexibility of recourses while applying knowledge in a wider context. According to the learner perceptions, the OER-based blended learning concept is highly preferred by them. Moreover the learner-centered, self-directed, peer-to-peer and social/informal learning approaches are promoted in this experiment while the learners get better facilitation, enhance self-learning skills. Further, the researcher observed that learners were sharing their knowledge and skills. The researcher has identified the importance of flexible learning. Hence the 5R feature of OER allows the course designers to 'Retain', 'Reuse', 'Revise', 'Remix', and 'Redistribute' the learning content (Wiley, 2014). One of the main benefits of OER integration is that the materials can be revised and remixed; they can be customized to fit according to the learning requirements or the learning objectives of undergraduates.

The research further highlights the sustainability of OER-based online courses in undergraduate degrees. Hence the teachers are able to use the courses in multiple instances by improving the quality day by day. For example, video materials can accompany text and this is one way of presenting course content in multiple formats which helps the undergraduates to learn more easily. The use of OER materials instead of traditional textbooks can substantially reduce the cost of course materials for both teachers and undergraduate students. Therefore this is a sustainable model for the undergraduate learning and it can improve the quality of teaching and learning process. The next stage of this research study is to identify all the required instructional design features to be incorporated in the OER-integrated online learning and design an intervention to evaluate all the ID features. At the same time though this research study focused only on a limited group of student future the research will be focused on handling a larger set of learners.

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