

Open Education Resource (OER)for Advanced C Concepts Course usingLMS – Moodle for Engineering Education

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Abstract: To design any software, students should have the knowledge about the fundamentals of programming language. C - Programming language is important and basic language for all engineering disciplines. It is also prerequisite for other programming languages like C++, Java, C# etc. In present study, we have designed an educational material which is available in the form of Open Educational Resources (OER). OER is teaching, learning and research material that is available freely to reuse, redistribute, remix, retain and revise. Our OER consist of study material like power point presentations, videos, assignments, practice problem statement and quiz in the form of Moodle back up file (.mbz). In the present study, we present how to restore Moodle backup file and how to use this OER at instructor as well as student side. Here OER implementation for Advanced C Concepts, results and feedback are discussed.

Keywords: Open Educational Resource (OER), C programming concepts, MOODLE (Modular Object-Oriented Dynamic Learning Environment), wordpress, Creative Common Licenses, Bloom's Taxonomy, quiz.

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1. Introduction

Educational resources contain course materials such as presentations, videos, notes, animations, e-books, tools, softwares etc. These materials can be designed and made available in the form of OER (Open Education Resources).

“OER are the teaching, learning and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge” (William and Flora Hewlett Foundation's definition of OER)

In the presented OER, the content of the course is designed as per the syllabus of the course and this can be reused for next batches with or without modification. In this paper, we presented the OER designed and used for Advanced C Concepts course for Second Year Engineering students of Information Technology Department. It consists of e-materials, such as power point presentations, video lectures used during teaching a particular topic, assignments for lab sessions, quiz and practice problem statements. From this, students are using course e-materials to revise the concept. Assignments are implemented in the lab session and the doubt based on the particular assignment is asked through the discussion forum. All

these materials are made available through MOODLE, learning management system. All the contents of this course are managed through Admin or teacher account and students are able to access the course material through the user accounts created for individual students. The students attempt a quiz at the end of the lab session. The objective of this OER is to prepare reusable open education resource for basic programming course such as C-Programming and Advanced C Concepts. This is an extension work of OER designed for C-programming course [3].

2. Related Work

Open Educational Resources (OERs) are teaching, learning, and research materials in any medium that reside in the public domain or have been released under an open license that permits their free use and re-purposing by others.

OER include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge.

5Rs of Open Content are reuse, revise, remix, redistribute and retain [4].

- Reuse - to use the content in a wide range of ways (e.g., in a class, in a study group, on a website, in a video)
- Revise - adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language)
- Remix - combine the original or revised content with other OER to create something new (e.g., incorporate the content into a mashup)
- Redistribute - share copies of the original content, your revisions, or your remixes with others (e.g., give a copy of the content to a friend)
- Retain - make, own, and control copies of the content (e.g., download, duplicate, store, and manage) [4]

Nearly a decade an importance of OERs has greatly documented and demonstrated. Stephen Downes discussed about the sustainability of Open Educational Resources (OERs) in terms of the three

models: funding, technical, and content. A different OER projects has been started in years which are originated from governments, from foundations and organizations, and from groups and individuals [1]. Tom Caswell et. al says that the Open Educational Resources (OER) movement is a technology-empowered effort to create and share educational content on a global level [5]. Also they explained how OERs move distance education's role from one of classroom alternative to one of social transformer [5]. Similarly, Deepa created Open Education Resource (OER) at Wordpress to share students' work and to enhance the skills [7]. The presented OER is implemented for C programming language concepts. Indi implemented Flipped classroom strategy for Java programming course in which video lectures shared with students before classroom session and then, based on the concepts explained in the video, quiz and discussion on assignments is held in classroom session [8]. In our presented OER similar concept adopted, here in the course materials we are sharing videos related to that topic which will be useful for students to revise the concepts. As well Indi et. al implemented handout based learning for effective implementation of problem statements during lab session for C programming course [2]. In the handouts, practice problem statements included for the students to complete during lab session.

3. Our OER Components

Our OER consist of following components -

- Faculty webpage using wordpress site for making moodle back up file available online.

In the following video, how to restore themoodle backup file to local moodle server is demonstrated: <https://www.youtube.com/watch?v=bYWZhcuSmK4> or <https://youtu.be/lmkGZAtPA-A>

- LMS Moodle to make course material available for students. Course materials consist of notes comprising PPTs and videos, practise assignment statements, quiz etc.
- Think-Pair-Share activity: this is a well known active learning strategy in which students work on the problem posed by instructor, first individually then in pair and finally share together with the class. This activity is considered during the lab

session for implementing the first problem statement.

- Creative common licenses let others reuse, redistribute and build upon your content [6].
- Blooms taxonomy: Bloom's Taxonomy is used to classify the educational learning objectives into levels of complexity and specificity. There are three main domain
 - o Cognitive: Recall, Understand, Apply, Analyse, Evaluate, Create
 - o Psychomotor: Perception, Set, Guided Response, Mechanism, Complex Overt Response, Adaptation, Origination and
 - o Affective: Receiving, Responding, Valuing, Organizing, Characterising

The cognitive domain list focuses primarily on most traditional education and is frequently used to structure curriculum learning objectives, assessments and activities. [https://en.wikipedia.org/wiki/Bloom%27s_taxonomy]

In our OER, practise problem statements covers the create level of cognitive domain

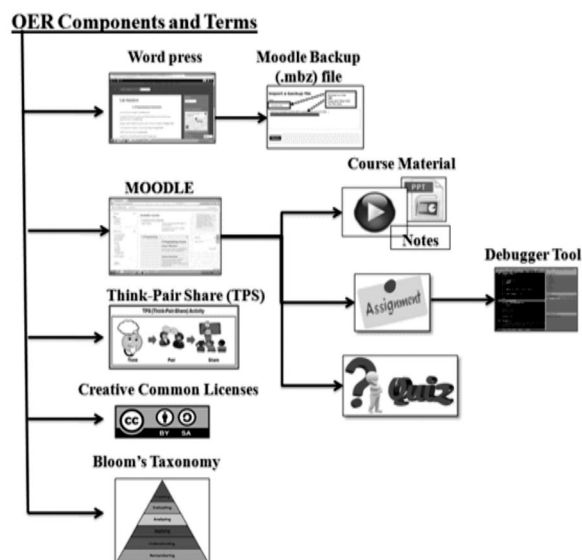


Fig. 1 Our OER Components

Following table shows the list of activity or resource, prepared as part of course, week wise made available to students on through Moodle:

Table-1: Week wise List of contents available to Students through Moodle

Sr No.	Activity or Resource in Moodle
1	Education Material such as videos, power point presentations, notes etc.
2	Assignment display and Submission Link
3	Quiz
4	Practice Problem Statements
5	Discussion Forum (not created for every week)

1. How to Use this OER

This OER is designed for the Advanced C Concepts course of Second Year Computer Science and Allied branches from Solapur University. This OER can be implemented using learning management system, Moodle. An educational material such as presentations, notes, videos lectures can be made available to students using Moodle. The flow of the use of this OER contains – use of OER at instructor level and use of OER at student level [3].

Use of OER at instructor level–

- i) Download moodle backup file of ACC course from <https://truptiindi.wordpress.com/courses/advanced-c-concepts/> or https://drive.google.com/file/d/0B2zPRT7l2_zDUkNIazE2T3NzRWs/view?usp=sharing
- ii) Login to local Moodle server using admin credentials.
- iii) Restore the above downloaded file to the local Moodle server by importing the file.
 - a. Go to site administration-> courses-> restore courses
 - b. Select the file to be restored by clicking on choose a file -(choose file from download folder)->upload this file->restore-> continue
 - c. Select category e.g. miscellaneous -> next -> next-> perform restore-> continue
- ii) Once course is imported then verify the contents and or modify the course contents as per the current course structure.

iii) Enroll all students for this course.

iv) Instructor will check the report generated by moodle before start of next class to check the students' performance.

Use of OER at student level -

i) Student will login to Moodle account

ii) Access the course material and assignments for given week.

iii) Write and execute first practice problem statement using TPS strategy and remaining individually

iv) Submit the given problem statement and the practice problem statement on the Moodle submission link

v) At end of laboratory session, in last 10 minutes, students will attempt quiz available based on that week content.

Students will "Logout" from Moodle account.

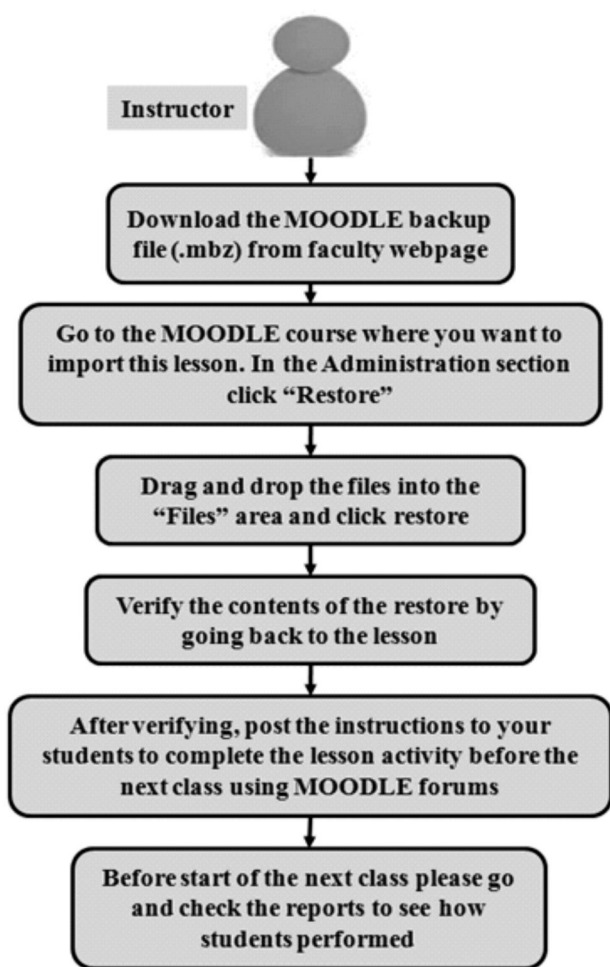


Fig. 2 Use of OER at Instructor Level

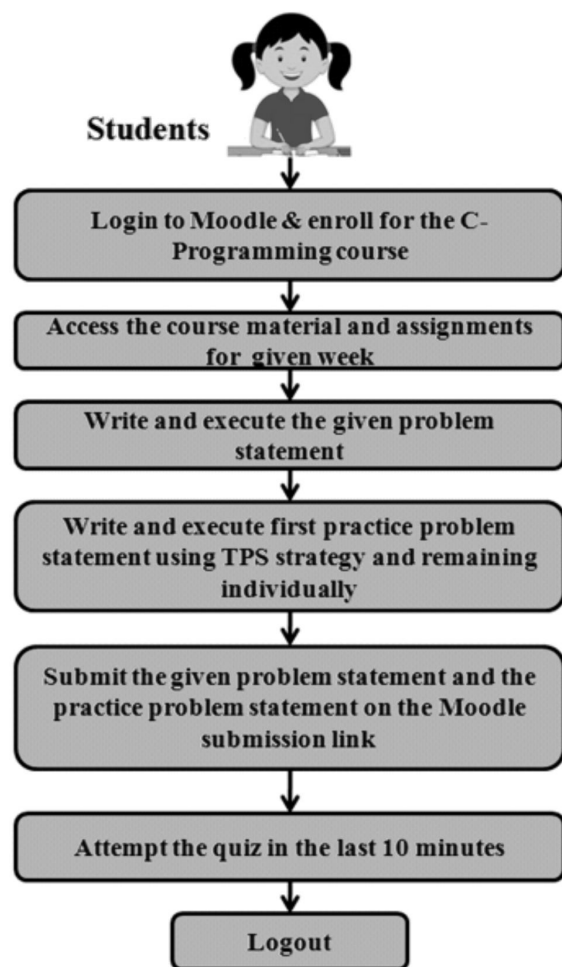


Fig. 3 Use of OER at Student Level

Following are the snapshot of the Advanced C Concept course hosted on local Moodle server. These snapshots are collected from admin login. The snapshot of the course home page is shown in figure-4, the snapshot of the course content material page e.g. for recursion topic, is shown in figure-5, the snapshot

of the assignment submission page is shown in figure-6, the snapshot of student grading report is shown in figure-7, the snapshot of practice problem statements is shown in figure-8 and the snapshot of overall grade report generated through Moodle is shown in figure-9.



Fig. 4 Snapshot of Course Home Page in Moodle



Fig. 5 Snapshot of Content Material Page in Moodle

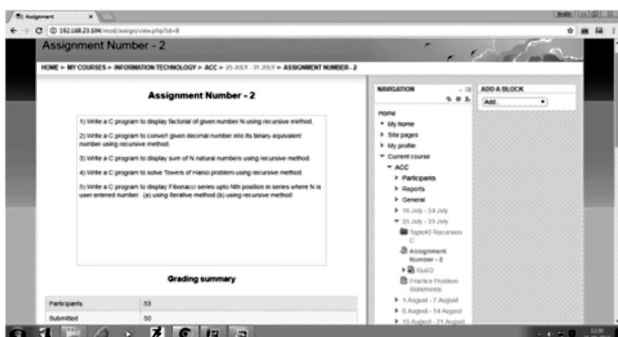


Fig. 6 Snapshot of Assignment submission Page in Moodle

The demonstration of Advanced C Concept course on Local Moodle - <https://youtu.be/mlwn9LkgrGE> or <https://youtu.be/gSddRwrzSLM>

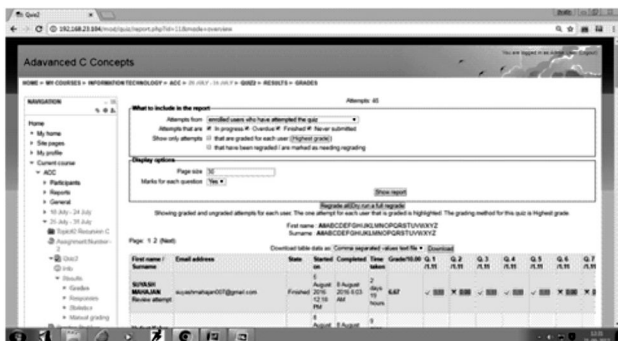


Fig. 7 Snapshot of Student Grading report generated in Moodle

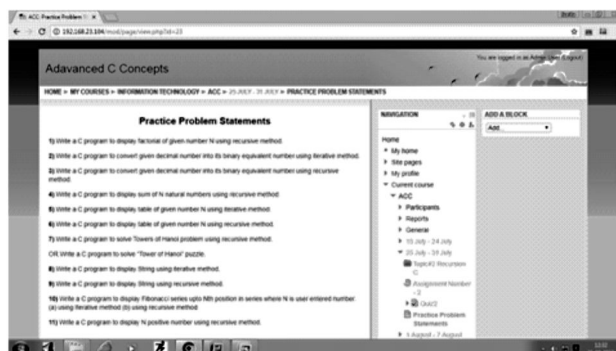


Fig. 8 Snapshot of Practice Problem Statements Page

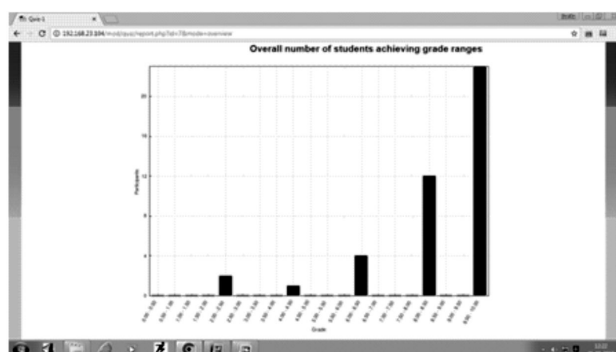


Fig. 9 Snapshot of Overall Grade Report generated

The drawback of the way it's implemented is that the content was available to students within college local server which is not accessible outside college campus. It means Moodle server was not accessible out of college. This is considered as drawback because if contents were accessible beyond college hours then students were able to access course material from home or the place where they wish as well they were able to complete the assignments as per their convenience. Especially for practice problem statement implementation this was required.

5. Results and Feedback

The students' active participation and performance is measured in terms of number of assignments completed by each student and students' individual grade in topic based quiz conducted. We have also used a survey instrument with Likert-scale to collect students' feedback about the way the course education material, assignment submission and quiz conducted for the ACC course during semester, as shown in Table-2.

The result of the quiz conducted through Moodle for ACC course is shown in figure 10. Here, the X-axis represents roll number of the students whereas Y-axis represents maximum marks allocated for that quiz

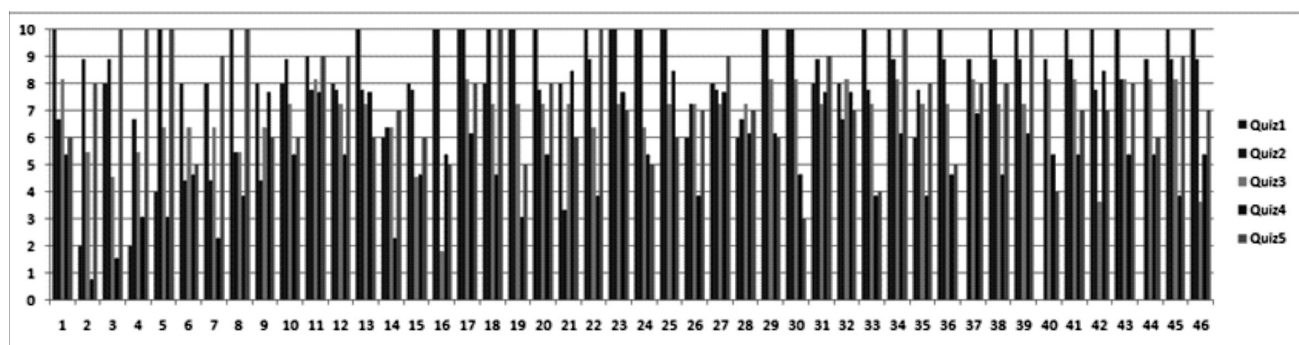


Fig. 10 Quiz Result conducted on Moodle for ACC course

Table 2. Students' Feedback about ACC course on Moodle

Sr. No.	Questions	Agree	Neutral	Disagree
1	Due to material provided in lab session, you are able to implement program completely in the same session.	85%	13%	2%
2	You are able to map concept explained in classroom session and program statements (assignments) given for practice session.	92%	5%	3%
3	Material provided for this course was helpful to accomplish task.	97%	2%	1%
4	Guidelines provided in material guided you to complete task.	96%	3%	1%
5	Fundamentals provided in this material was helpful to implement the program	99%	0%	1%
6	Material was supportive document to encourage for accomplishment of assignments	87%	11%	2%
7	Quiz on the Moodle was helpful to revise the concept	91%	5%	4%
8	Practise problem statements provided in the material was helpful to improve the concept and programming skill	90%	4%	6%
9	Overall material enriched our interest in implementation of Advanced C-Concept Assignments	88%	4%	8%

7. Conclusions

Open Educational Resources (OER) are teaching and learning materials which are freely available online. Open Education Resource (OER) is designed for Advanced C Concepts Course and implemented for Second Year of Engineering students of Computer Science and allied branches. OER implemented for Advanced C Concepts is available for reuse. Even though the syllabus is updated for this course in the curriculum the same OER can be reused by updating the contents as per the requirement of new syllabus. This is main advantage of OERs.

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