Pedagogical quality enrichment in OER-based courseware: Guiding principles

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Abstract

This is a critical phase for Open Educational Resources (OER) movement: on one side the number of OER is increasing rapidly, and on other side debates about quality of OER-based courseware are heating up. These debates emanate from the fact that OER-based courseware are supposed to help users to follow a logical learning path and get an engaging, interactive, and enjoyable learning experience. There are two aspects of quality assurance in OER-based courseware: content and pedagogy. The content aspect primarily rests with subject experts, and pedagogical quality of courseware mainly lies in the hands of developers. Present trends reveal that mainly enthusiasts, working with some support from the institution management are designing and developing OER-based courseware. There seems a possibility that these enthusiasts are developing courseware without undergoing any specific courseware development training, and in the absence of proper knowledge and training about pedagogy, one can not be sure that the produced courseware will be of superior quality. In this backdrop, present paper discusses and details about a number of guiding principles for enrichment of pedagogical quality in OER-based courseware.

Keywords: Open Educational Resources; OER-based courseware; Pedagogical quality enrichment; Principles for OER development; Quality assurance

Introduction

Now-a-days organizations (UNESCO, OECD, European Union, COL, etc.), institutions (Universities, Colleges, etc.), and individuals are engaged in promotion, dissemination, and use of Open Educational Resources (OER). The term OER was officially introduced first time in 2002 at a forum on the impact of open courseware for higher education in developing countries (UNESCO, 2002). Since then, OER have been recognized as educational materials and resources that are shared openly and freely for all to use. OER was perceived as a means of sharing unique and interesting resources potentially of value to others who would not otherwise have access to them (Johnstone, 2005). OER apply the principles of openness-particularly the freedoms of use, modification and redistribution of digital materials for teaching, learning, and research. Generally, OER refers to accumulated digital assets that can be adjusted and provide benefits without restricting the possibilities for others to enjoy them (OECD, 2007). Examples of OER include: full courses, course modules, syllabi, lectures, homework assignments, quizzes, lab and classroom activities, pedagogical materials, games, simulations, and many more resources contained in digital media collections from around the world.

The OER movement is based on the philosophy that creation of content must be primarily aimed for welfare and use of people without any commercial restrictions. Clarifying about the intention of OER movement, OECD (2007, p. 4) points out, "Until recently, much of the learning materials were locked up behind passwords within proprietary systems, unreachable for outsiders. The open educational resource (OER) movement aims to break down such barriers and to encourage and enable freely sharing content." Regarding OER movement, a report of William and Flora Hewlett Foundation underlines,

At the heart of the movement toward Open Educational Resources is the simple and powerful idea that the world's knowledge is a public good and that technology in general and the Worldwide Web in particular provide an extraordinary opportunity for everyone to share, use, and re-use knowledge. OER are the parts of that knowledge that comprise the fundamental components of education- content and tools for teaching, learning and research (Atkins, Seely and Hammond, 2007, p. 5).

On other side, debates about definition, range and diversity of the OER are still going on in different parts of the world and at different forums. For example, in an internet discussion forum about Open Educational Resources, it was observed that resources are not limited to content but comprise, "Three major areas of activity: the creation of open source software and development tools, the creation and provision of open course content, and the development of standards and licensing tools" (UNESCO, IIEP and Albright, 2005, p. 1). Elaborating further, Atkins, Seely and Hammond (2007, p. 4) suggest,

OER are 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 or 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.

According to Geser (2012, p. 12), "OER are understood to comprise content for teaching and learning, software-based tools and services, and licenses that allow for open development and re-use of content, tools and services." Whereas, 2012 Paris OER declaration defines OER as, "Teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions" (UNESCO, 2012, p.1). While, Clements and Pawlowski (2012) see OER as resources for the purpose of learning, education, and training that are freely accessible. This includes literature and scientific resources (open access for education), technologies, and systems (open source for education), and open content (actual learning materials/contents) as well as related artefacts (such as didactical materials or lesson plans). In backdrop of these observations and discussions, one can say that OER are materials used to support education that may be freely accessed, reused, modified and shared by users.

OER-based courseware: Quality issues

A course is defined as a package of educational materials starting at a particular point in the knowledge spectrum, designed to lead to a greater understanding of the issue or topic (Valkenburg, 2011). Whereas, courseware is intended as kits for teachers or trainers or as tutorials for students and mainly include: material for instructor-led classes, material for self-directed learning/training, web sites that offer interactive tutorials, material that is coordinated with distance learning, such as live classes conducted over the Internet, and videos for use individually or as part of classes (Jing, 2005). Like any other courseware, OER-based courseware also includes different type of contents and activities as part of larger learning modules or complete courses, depending on different educational needs. The main difference between traditional courseware and OER-based courseware is that former uses licensed and copyrighted material while later uses different type of open digital publication of high quality educational materials. These materials are organized as courses, and often include course planning materials and evaluation tools as well as thematic content (Open Course Ware Consortium, 2012).

OER-based coursewares are slowly becoming an important part of academic world and there are many reasons behind it. White (2008, p. 7) clarifies,

The influence of the open source movement continues to make an impact on education because of the reduced costs of installation and maintenance of a compendium of office productivity applications and access to free content and services specifically dedicated to education.

OER initiatives, particularly those based in institutions, encourage transparency and can stimulate more quality control and competition to benefit individual learners as well as taxpayers generally. Furthermore, the movement seems to grow both top-down and bottom-up; new projects are started at institutional level and individual teachers and researchers use and produce OER on their own initiative (OECD, 2007, p. 118). The importance of OER stems from the fact that these resources are seen as fundamental to the knowledge society and economy. Therefore it is essential that teachers and students become proficient with digital tools and services and make them aware about various content licenses (Geser, 2012).

OER projects can expand access to learning for everyone, but most of all for non-traditional groups of students, and thus widen participation in higher education. They can be an efficient way of promoting lifelong learning, both for individuals and for government, and can bridge the gap between non-formal, informal and formal learning (OECD, 2007, pp. 9–10). Without the constraints of time or geography, education has the potential to combat economic, social and cultural obstacles. Through independent, self-determined learning and open academic content, the individual is able to grow intellectually beyond previous personal, institutional or local boundaries. Other benefits range from developing valuable work skills to engaging in life-enriching, lifelong learning (D'Antoni & Savage, 2009, p. 61). In other side, some experts have concerns about the applicability of OER, as suggested by Hudson and Moyle (2004) that although open source software, services and content have matured there remains unfounded uncertainty about the robustness and reliability of these applications in education as a viable option.

Instead of these apprehensions, the number of OER-based courseware is increasing rapidly as noted by OECD (2007, p. 12), "With thousands of (open courseware) courses from internationally reputed higher education institutions available for free, teachers will need to consider that students compare their curriculum with others." In the last 10 years, the number of OER-based courseware, as well as their availability and distribution via learning object repositories (LORs), has rapidly increased. There has been a general awakening in the e-learning community regarding OER (Downes, 2007). Tzikopoulos, Manouselis and Vuorikari (2007) pint-out that more OER repositories are built, and metadata of existing repositories are harvested by federated repositories to improve access to high numbers of OER. There are literally millions of open education resources currently available on the Internet. But what differentiates them from one another? How can educators determine whether the resources are high quality? As educators look for ways to help students learn and improve achievement, they need to know which tools may fit their specific needs (Achieve, 2012). These questions more or less raise an increasing need for quality assurance in OER-based courseware.

Question of quality is more or less associated with developers of OER-based courseware. The irony is that much is not known about who is actually producing and developing OER, as observed by Hylén (2009, p. 131),

> Of course, institution-based initiatives, like the OCW programmes at different universities, use their own staff to produce their material; and some of them, such as MIT, try to continuously evaluate who their users are. But, as a whole, very little is known about the users and producers.

Currently, the majority of OER development is undertaken on a project basis, and often with donor support (D'Antoni and Savage, 2009). Present trends reveal that mainly enthusiasts, working with some support from the institution management are designing and developing OER-based course-ware (Hylén, 2009). There seems a possibility that these enthusiasts are developing courseware

without undergoing any specific courseware development training, and in the absence of proper knowledge and training about pedagogy, one cannot be sure that the produced courseware will be of superior quality. In other words, one of the most important concerns for OER-based courseware is their quality.

Before delving further on this issue, it will be beneficial to understand the meaning of quality in context of OER-based courseware. Quality can be defined as "[. . .] appropriately meeting the stakeholders' objectives and needs which is the result of a transparent, participatory negotiation process within an organization" (Pawlowski, 2007). Quality is not an objective measure but in particular a perceived value for stakeholders and their context. It is difficult to specify precisely what "quality" means in the context of OER, where accessibility and availability are at least as important as the production values they embody. Quality can be applied in both a technical and pedagogical sense—and both are relevant. However, the issue remains that the quality of learning resources is usually determined by using the lenses of: accuracy, reputation of author/institution, standard of technical production, accessibility, and fitness for purpose (McGill, 2011). The issue of quality in OER-based courseware development process relates to two aspects-content and pedagogy. The content aspect primarily rests with subject experts, and pedagogical quality of OER-based courseware mainly lies in the hands of developers.

Pedagogical quality enrichment in OER-based courseware: Guiding principles

OER-based courseware usually employ a range of media like words, pictures, audio, video, graphics, animation, etc. and need to be very carefully structured so that the users can follow a logical learning path and get an engaging, interactive, and enjoyable learning experience. In fact meaningful learning requires that the learner engage in substantial cognitive processing during learning, and considering this the central challenge before designers is to minimize the cognitive overload of learners (Mayer & Moreno, 2003). Therefore, it is obvious that beside technical expertise, developers must have sufficient knowledge about useful pedagogic principles. Pedagogic principles talk about those actions which shape the learning experiences ranging from technical infrastructure to course design to teaching (Anderson & McCormick, 2005). There are number of principles that can be employed by developers to enrich pedagogical quality in OER-based course-ware. These principles can be of immense help to developers for designing and developing highly interactive, engaging, and effective courseware. Keeping this in view, need of the hour is that principles for pedagogical quality enrichment in OER-based courseware should be identified and made public. There are five stages of development of OER-based courseware: planning, preparation, design, development, and presentation. The guiding principles that are helpful in all these stages are discussed one by one.

(A)   Principles for planning stage

Planning is one of the most important stages of development of OER-based courseware. Planning helps developers to visualize that what kind of resources they would like to produce and for what purpose and effect. The developers are required to plan well and in advance to develop effective and useful OER-based courseware that accommodates human learning processes regardless of the media involved (Clark, 2002). Developers must keep in mind that proper planning is essential to carryout courseware development task effectively and efficiently. The following principles can be of great help for developers in this regard:

(i)   Visualize and specify the target users

Before developing the OER-based courseware, developers must visualize the potential users in their mind. They must keep in mind that whatever the scenario, it is the learner, who is at the center of the learning experience (Boettcher, 2007). Therefore, it will be beneficial to think about the potential learners, their profile and intention to use the resource. The developers must understand that visualizing about learners is instrumental to see the issues from the user's point of view and to put appropriate questions and interactions in the courseware. This awareness will help the developers to keep the content relevant to the needs of learners and to build appropriate resource (Brandon, 2005). Most importantly, visualization about learners will be helpful to overcome abstraction as OER-based courseware has limited scope for face to face contact and constructive feedback. The art of pedagogy demands that developers must clearly and specifically declare that their courseware is targeted to which type of learners. This declaration will help the learners to identify and access the required courseware in easiest possible way.

(ii)   Customize the learning needs of targeted users

The ability of the developers to customize learner needs is very important for developing useful OER-based courseware. Keeping this in view, developers are required to assume about learners previous knowledge, understanding about topic, and their learning needs. According to Phillips, Ahmed and Kaur (2005), it will be beneficial for developers to stipulate what changes students taking the course will experience, inform students what is expected of them as well as indicate what will be important in assessing the course. The useful practice for developers in this regard will be to get some experience as a user before producing OER-based courseware. Past experiences of undergoing e-courses, e-sessions and e-instruction will be handy for developers to develop courseware from a learner's perspective. This practice will further help developers to know about learners' likings and disliking. The simple principle in this context will be that while developing OER-based courseware, developer must think that he/she is a learner and this package is mainly designed to satisfy his/her individual learning needs. This customization of learning needs will help the developers to ensure the pedagogical quality of courseware.

(iii)   Assimilate instructional challenges

It is very important for developers to understand the challenges of OER-based courseware instructional model. These challenges can be in terms of technology, diverse audience profile (experience and motivation levels), cultural diversity, learning complexity, and so on (Brandon, 2005). They must realize that it is not the medium that causes learning; rather it is the design of the lesson itself and the best use of instructional methods that make the difference (Clark, 2002). To overcome these challenges, developers can relate the courseware with a classroom situation, and think about best possible way to meet the learners' needs. Developers must also remember that OER-based courseware are learner centered in nature and normally works on the principle of direct interaction between users and courseware. The greater challenge before developers in this context is to hook the learner, sustain the learner, and satisfy the learner. Developers can overcome these types of instructional challenges by understanding the science of instruction. They are advised to have a thorough understanding about how instruction takes place, how it is encoded and consequently decoded by the learner. This understanding will certainly help them to enhance the pedagogical quality of OER-based courseware.

(B)   Principles for preparation stage

After planning, the next important stage for development of OER-based courseware is preparation. During this stage, the developers are expected to prepare them to undertake the task of development. The stage of preparation mainly encompasses—presentation of contents, under-standing the expectations of learners, and methodology of instruction. Learners have a wide variety of learning styles and needs. Language, experience, interests and ability all determine the ability and approach to learning (Anderson & McCormick, 2005). The developers are expected to specifically prepare about these issues to develop pedagogically sound courseware. The following principles can be of great help for developers during preparation stage:

(i)   Learn about the learning states

People learn in different ways. Developers can not exactly predict that how the users are going to learn but they can consider about the learning states of potential users. The learning state or condition of an individual makes it possible for him or her to engage profitably in a given learning activity. The learning readiness of individual depends on many factors such as -past experiences, cognitive development, affective state, and motivation. It will be beneficial for developers to have knowledge and understanding about these characteristics or circumstances before proceeding on a given course of action. To keep pace with the changing expectations of learners, it will be useful for courseware developers to understand the psychology of learning and update them about evolving researches on human learning and learning states. This understanding will help them in number of ways, as suggested by Mayer and Moreno (2002, p. 117), "The relation between psy-chology and education is a two-way street in which psychological theories can lead to improvements in educational practice and the challenges of realistic learning environments can help cognitive psychology build better theories."

(ii)   Emulate technology of instruction

Technology of instruction plays a pivotal role for designing of OER-based courseware. OER-based courseware needs to be designed for diverse groups of learners and their learning needs. The instructional aspects decide that how learners will perceive the OER-based courseware. In fact, appropriate instructional techniques help developers to engage and entertain learners with course-ware. The designers are expected to make distinctions between cognitive and emotional interest of learners. Cognitive interest stems from materials that promote understanding of the content presented and emotional interest comes from the addition of extraneous materials. The goal should be to promote cognitive interest and avoid emotional interest in situations that require cognitive learning processes (Clark & Mayer, 2003). There are many instructional techniques to promote cognitive interests of learners, like using interesting contexts, novel situations, real-world or authentic environments, problem-solving scenarios, simulations, engaging themes, engaging media, drill and practice and interface elements. The developers must use these and other appropriate instructional technologies with reference to what is to be conveyed and how to provide meaningful experiences and knowledge to the learners.

(iii)   Choose appropriate media

Often developers feel that adding a number of media like words, pictures, audio, video, graphics, animation, etc to the courseware would make an interesting instructional design. While a graphic-intensive instructional design might appeal to the novice learners, but for the serious and focused one, this will not work. It is true that these elements make the courseware glamorous but on the

contrary they also erode the sheen out of the learning activity (Brandon, 2005). Clark (2002) suggests that visuals or text that is not essential to the instructional explanation be avoided and advocates that we need to make a distinction between entertainment and learning. Considering this, developers must understand that excessive use of media elements serve as distracters in the learning process. They must also keep in mind that real essence lies in a balanced use of media elements to enhance learning. The underlying principle is that developers of OER-based courseware must use a design that avoids unnecessary graphic and media elements.

(C) Principles for instructional design stage

The instructional design is another crucial aspect for development of OER-based courseware. Appropriate and need based instructional design is a type of barometer for checking the pedagogical quality of OER-based courseware. The purpose of this phase is to generate the lesson plans and lesson materials. During this phase one develops the instruction, all media that will be used in the instruction, and any supporting documentation. This may also include hardware and software (Middle East Technical University, 2013). Considering this, the developers are expected to take extra care and precaution while choosing the instructional design of OER-based courseware. In this context, developers can take benefit of following principles:

(i) Follow layman approach of instruction

The beauty of any instructional package lies in its ability to help learners to grasp the content in easiest possible way. For this purpose, the developers can go for "layman approach" of instruction. Layman approach works on the principle that one is able to teach a person that does not know anything about the presented topic. Following this approach, developers can try to provide more than one way of learning the content for learners. Further, developers must also understand that line after line of text makes learners grow bored and the instructional message gets lost. Therefore, use of graphics, non-offensive humor, and interaction (questions, drag-and-drop) will help the developers to keep developed courseware interesting even for those learners who are not familiar with the content (Brandon, 2005). The developers must also keep in mind that significant learning is acquired through doing. The best instructional material allows the learner to participate in the learning process and learning is best acquired by doing and practicing the desired task (Middle East Technical University, 2013).

(ii) Include interesting exercises

The foremost challenge before developers is to make courseware easy to use, engaging and interactive. One interesting way to make this is to have quizzes and surveys in the courseware. Utilizing little games or activities that user can do will also make the resource more interesting. Developers must also understand that these exercises will bring meaningful experiences and knowledge in the resources. Developers must realize that learners learn more and retain their learning longer if they acquire it in an active rather than a passive manner. Learning activities help learners to monitor their own progress, check their understanding, develop specific skills, apply what they have learned to real-world situations and to reflect on what they have done (Melton, 2002). Employing an exercise or game that requires participants to send individual messages to one another triangulates the learning. Adding games and simulations to resources arouse interest in learners that is quite essential for effectiveness of OER-based courseware. Simulation will particularly help the learners to understand the practical aspects of content and practicing psychomotor skills. To materialize this

in reality, developers can put the web addresses of simulation /hands on exercises from other OER in the courseware.

(iii)   Ensure instructional interactivity

Instructional interactivity is usually defined as interaction that actively stimulates the learner's mind to do those things that improve ability and readiness to perform effectively. The purpose of instructional interactivity is to wrestle intellectual laziness; to reawaken interest in learning; to strengthen ability to learn; and to provide an optimal environment to understand the content (Allen, 2003). Therefore, it will be beneficial for developers to realize that good interactivity helps learners to think, synthesize new information, and integrate their knowledge. They must also remember that instructional interactivity also contributes to self-confidence and tests learner knowledge whenever they might like a progress check. According to Merrill (2002), the most effective learning activities are those that are problem-centered and involve the student in activation of prior experience, demonstration and application of concepts to real-world settings. Therefore, developers are supposed to produce such coursewares that have high level of instructional interactivity. The developers can easily improve the instructional interactivity of courseware by adding games, demonstrations, simulations, and mini quizzes.

(D)   Principles for development stage

The development of OER-based courseware is the most crucial stage for developers. At this stage, the developers are expected to develop the OER-based courseware as per his/her planning and ideology. Development begins with specifying the learning activities that will best assist in the learning process. Although the instructional setting was chosen in the analysis phase, this should be rechecked now to ensure that learning objectives have been fully developed (Middle East Technical University, 2013). During development, developers have to consider a number of permutations and combinations for coming up with expected courseware. There are certain principles that can be of great help for them to develop pedagogically sound OER-based courseware. Some of these principles are discussed below:

(i)   Ensure correct and effective delivery of content

The content and its delivery are crucial to assure the effectiveness of OER-based courseware. The reason is that learning is based on an engagement of the learner with the content of the instruction (Clark, 2002). Therefore, developers must have basic understanding about the content and ensure that content is accurate. Developers can simply do it by taking help of subject matter experts. They must also remember that knowing what they are going to tell, how they are going to tell it, and how much time it will take are fundamentals of effective content delivery. The other important aspect is how to present the content before the learners. Developers are also advised to think about learners' need and accordingly apply the relationship between text, sound, motion and graphics. It will also be beneficial for developers to put brain storming questions or quizzes to break the monotony of content. During development phase, the other useful trick will be to continuously review the courseware to gain perspective and to check that resource is on the right path.

(ii)   Create engaging learning environment

Creation of right environment is instrumental for success of any instructional activity. This is equally true for OER-based courseware. In case of OER-based courseware, developers must try to understand that learner interfaces should be meaningful for learners. In other words, the courseware must

help learners to learn without memorizing symbols, terminology and procedures (Allen, 2003). To make this happen, the developers must use the pedagogy that should engage and motivate learners (Anderson & McCormick, 2005). Developers must also understand that little anxiety and discomfort can actually be helpful for learning but they should come from the user's desire to do their best and not from fear and frustration with the interface (Allen, 2003). Developers can fulfill this demand of learners by providing useful and thought provoking learning experiences. The developers must also remember that right amount of information, delivered in the right way, for the right reason, and aligned with the right deliverables produces good environment for learning from OER-based courseware.

(iii)   *Engage users to practice and learn new things*

Assessing learners' skills and tailoring the courseware to accommodate the broad range of skills is must to prepare an effective courseware. Developers must realize that designing of courseware from learners' perspective will be quite useful to produce engaging and interesting courseware. Through there courseware, developers must try to create a connected, personalized learning environment that challenges students to practice problem-solving, to work together and to use creativity to construct, share, and present their ideas, thinking and learning (Anderson & McCormick, 2005). They must also keep in mind that instead of static tasks, it will be more beneficial and appropriate to put motion and action in the courseware. They must realize that inclusion of good practices and breaking the material into small learning modules will make the content easy to absorb. Developers must also understand that encouraging learners to find new sources of information is helpful to make them engaged. Mentioning useful resources that are relevant to the content will be another helpful measure to make courseware more useful and pedagogically sound.

(E)   Principles for presentation stage

Presentation is last and final stage for development of OER-based courseware. The good presentation is vital for ensuring the instructional effectiveness as well acceptability and usability of courseware among users. Santally (2011) observes that very often students don not read about course details and expected outcomes thoroughly or they simply do not understand what the course is about. Developers need to take care of this aspect and must also keep in mind that there are already a number of OER about same topics and only those having distinct presentation style will flourish and survive. To make this happen, the developers can take help of following principles:

(i)   *Provide good learning experiences*

The vital aspect of OER-based courseware is to provide good learning experiences for different set of learners. They must realize that thousands of students and their teachers will use them with virtually no training (Anderson & McCormick, 2005). Therefore, coursewares are required to be meaningful, memorable, and transparent in its ease of use. The simple rule in this regard is that if a user does not understand the content, then that user will not gain from the courseware. If users do not see the meaningful implications of learning prescribed tasks, then applicability of such tasks will be of little help to user experience (Allen, 2003).The developers must keep in mind that well designed courseware is expected to be meaningful for every learner. The developers must also try to make resources sensitive to learners demand and appropriate to their needs and levels of readiness. To make this happen, developers must concentrate to select appropriate activities and engage users in experiences that are likely to be meaningful.

(ii)   Design the courseware thoroughly

The designing of the OER-based courseware is most crucial aspect. The developers must pay attention to the fact that OER-based courseware is not a re-format of traditional classroom delivery. The developers must recognize the differences and embrace them. Sketching a good design on paper before committing materials to the learning platform / virtual learning environment will be helpful practices in this regard (Brandon, 2005). The developers must realize that best design is that which allows learners to learn the content in easiest possible way. The developers are also advised to read course scripts to ensure that they sound conversational. Minimizing the amount of text on course pages and where possible, using graphics to summarize and emphasize key points will provide a good design. While developing the courseware, developers must ensure that it is synthesized into an integrated program. It should flow as naturally as possible, with each lesson block building the foundation for the next one (Middle East Technical University, 2013).

(iii)   Keep the courseware conversational and interesting

Learning can be enjoyable by keeping it simple. Developers must take small steps and write in a conversational tone to make it fun, and interesting. The reason is that conversational tone prevents feeling of isolation. Clark (2002) suggests that use of conversational language either directly in the program or via an agent seems to stimulate very ingrained unconscious social conventions that lead to deeper learning. Developers must also realize that OER-based courseware is different from traditional learning and interactivity is must to make it interesting. Relying too heavily on texts and book-based tutorials will leave learners with bad taste. Developers can put added value in OER-based courseware by inculcating resources such as- interactive media and educational games, relevant essays or articles, and quick-reference guides (Brandon, 2005). Developers must also keep in mind that animations and heavy images do not make OER-based courseware of better quality. The useful principle in this regard will be to keep the courseware short, make it easy and deliver small snippets of information.

Conclusion

Phillips, Ahmed and Kaur (2005) observe that content and more importantly its design in prompting cognitive activities among learners should be the core business of any courseware. This observation is equally true for OER-based courseware. A search of available literature on OER reveals that there are only few resources that talks about enhancement of pedagogical quality in OER-based courseware. In absence of any practical guidelines and principles about pedagogical quality assurance, developers often struggle to produce pedagogically sound courseware. Considering this dilemma, present paper outlined and discussed a number of useful principles for design and development of pedagogically sound courseware. Researcher hopes that discussed principles will help the developers to enhance the pedagogical quality of OER-based courseware and make them more useful and meaningful for schooling and learning purposes.

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