

## Re-engineering Adult Education Programme- an Online Learning Curricular Perspective

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### ABSTRACT

The Web based multimedia programmes/courses are becoming widely available in recent years. Most of these courses focus on Behaviorist way of learning, which does not promote deep learning in any way. For Adults this approach further incapacitated, as it does not satisfy Andragogical needs. The search for Constructivist way of learning through the web applied to Indian conditions led to need for developing a curriculum development approach that would promote construction of knowledge through web based collaboration. This paper attempts to reengineer existing curriculum development processes and lays out a framework of 'Problem Based Online Learning (PBOL)' curriculum design. In this context, entire curriculum development life cycle is evolved and explained. This is a part of doctoral work (Ph.D), which is in progress and being undertaken by K.James Mathai, and guided of Dr.D.S.Karaulia.

**Key words:** Re-engineering, Behaviorist, Constructivist Epistemology, Pedagogy, Andragogy, Problem Based Learning, Well-Structured Problems, Ill-Structured Problems, mental models, Computer Supported Collaborative Learning, Problem Based Online Learning, Problem Based Educational Project, Problem Based Educational Concept Map, distributed technology, collaborative technology, Zone of Proximal Development, Portfolio Assessment

### 1. INTRODUCTION

In view of the recent technological advancement and increased availability of web based interactive features, the mode of online learning is all set to undergo a change in its design. This shift will be in favour of using the web for constructing knowledge individually and through social interactions with community of learners and instructor. The tools available in an internet or intranet based learning environment are email, chat, audio and video conferencing, multimedia presentation, discussion board, tools to transfer files program/desktop sharing and other shared spaces for online collaborations.

Now, the key to design best training/educational environment for a situation, depends upon the way we analyze, design, and implement curriculum/instruction according to the target learner (children/adolescent or adult) epistemology. Research

carried out on adult education show that adults being mature, autonomous, experienced, self-directed, intrinsically motivated and goal oriented learners, like to take responsibility for their own learning process/decisions[1]. Their style of learning is by drawing on past/present experiences, *constructing knowledge individually, working and learning in-groups (collaborative learning)* rather than to be taught pedagogically (like children and adolescent in most of the contemporary online learning). About adult learning, *Bruner (1950) go to the extent recommending that adult education should take place in groups exclusively and Moore concludes that "educational theory which did not provide a place for such learning and teaching was incomplete"*[(2),p73].

To translate these findings into practice for adult learners, collaborative technology that supports online group learning should be used in an intelligent way imbibing the principles of 'Constructivist' epistemology, and 'Problem Based Learning (PBL)' andragogy must be used for designing a suitable model for PBOL curriculum. This PBOL

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model can also be called as CSCL curriculum model.

This paper attempts to establish a foundation grounded into the sound principles of learning theory, Andragogy and emerging models of instruction, and thereby create/evolve a suitable 'Problem Based Online Learning (PBOL) Curriculum Development Model' for adult education. This model is based on primarily conventional classroom oriented "Problem Based Learning. While developing Problem Based Online Learning(PBOL) Curriculum Development Model", four process-models have been evolved. These process-models are: 'Model for Occupation Analysis & Identifying Problem Based Educational Project', Problem Based Educational Project Concept Map', 'PBOL Curriculum Design Model', 'Design cum Learners Team Centered Communication Model' and 'Design Principles of PBOL Environment'.

## 2. REENGINEERING ADULT EDUCATION PROGRAMME IN CONTEXT OF MODEL DEVELOPMENT

Through research study, it has been observed that the existing models of most of the contemporary online curriculum, based on Behaviorist Learning Theories, promote surface or rote learning[3] as compared to the need of nurturing deep or meaningful learning[4]. Surface learning designs are found to be highly planned, prescriptive, structured and algorithmic, often rigorous and based on tasks that promote individual reflection and problem solving using pedagogical philosophy. These planned courses have their learning 'Objectives', 'Methods', 'Materials' and 'Evaluation Scheme' defined by the Instructor himself. The deep learning or meaningful learning design, on the other hand, emphasizes on Constructivist philosophy, of which the driving idea is that the knowledge cannot be transmitted but has to be constructed through individual and social collaborative experiences. This shift alone calls for reengi-

neering of curriculum processes as it involves fundamental rethinking and radical redesign (Herman (1987) as cited in [5]).

A similar idea is echoed by Garrison, who states that 21<sup>st</sup> century post-industrial era of online education will be characterized by educational transaction[6] design model where learners will construct their own knowledge based on sustained communication and collaborative learning experiences with the community of learners[7]. It is also appropriate to recall what John Dewey[8] an American philosopher of education said "There is, I think, no point in the philosophy of Progressive Education which is sounder than its emphasis upon the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process, just as there is no defect in traditional education greater than its failure to secure the active cooperation of pupils in construction of the purposes involved in the studying[p63]."

In our search to reengineer the curriculum we have found that with the internet revolution there are new possibilities with PBL[9] based on Constructivist learning theories that can address the requirement of knowledge construction and therefore, a subject of our consideration in developing the requisite curriculum design model.

## 3. 'PBOL' CURRICULUM DEVELOPMENT

The development of online problem based learning curriculum can be divided into five major phases namely planning; designing curriculum and instructional system; developing instructional courseware, its implementation and evaluation. The Curriculum Development Model is shown in fig. 1.

### 3.1. Plan 'PBOL' Environment

To plan the PBOL environment is the first phase of our curriculum development model as shown in fig. 1. It consists of four activities as listed below:

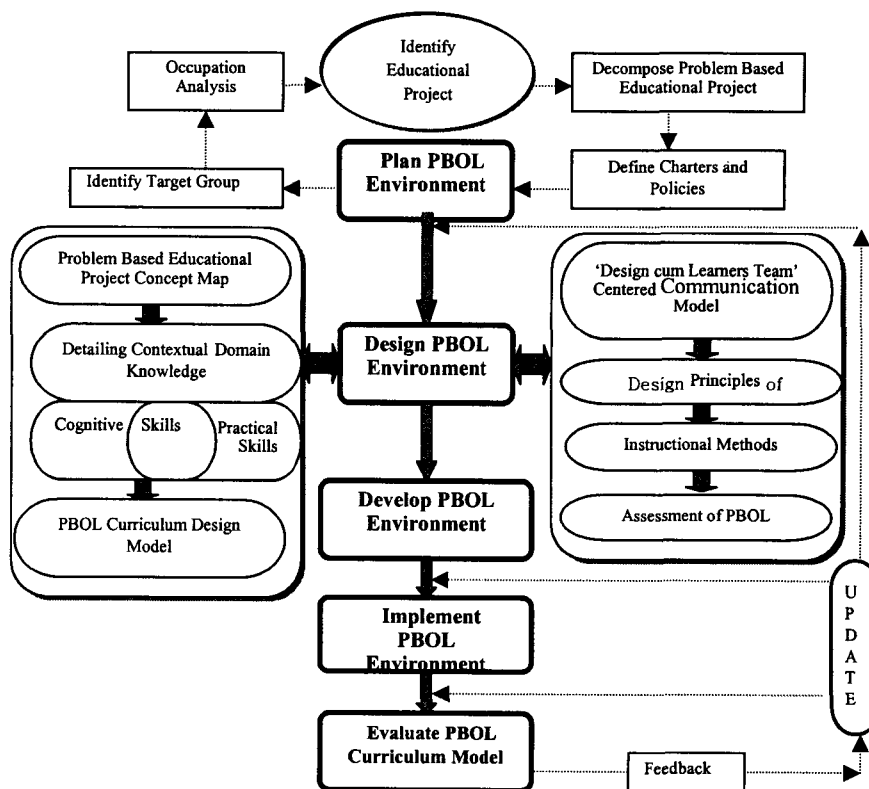


Fig. 1. Problem Based Online Learning Curriculum Development Model

- Target group identification
- Occupation Analysis
- Identify Educational Project
- Decompose Problem Based Educational Project
- Define Charter and Policies

3.1.1. Identify Target Group

Identifying target group of learner and a real-world challenging 'Problem Based Educational Project' emanates from the World Bank Report (no.20417 IN) on scientific and technical manpower of India (2000)[10], where in the absence of life long learning opportunities for technical teachers, has been stated as a source of several weakness of Technical Education System of India. The author feels that training *course in online learning* would help them to undertake demand driven lifelong education on online learning mode for themselves and in turn make them capable teachers to face the future challenges of the

technical manpower of the country.

The attributes of this target group of learners are necessary to finalize the approaches for the design, development and implementation of PBOL curriculum.

The attributes of target learners to be known are:

- Profile - Teachers' location, age group, gender, educational disciplines they belong to, different socio-cultural backgrounds, language/ dialects written and spoken, varied levels of teaching/learning experiences, different learning styles etc.
- Technological proficiencies - Information related to the level of technology access and its orientation, kind of Internet connection teachers' have, computer systems used and probable browsers that will be using.

The above aspects figure prominently in our target group of 'Technical Teachers' of India as

India is a country of many diversities where geographical situations, individual profile, technology proficiency etc. varies every 100 kms.

### 3.1.2. Occupation Analysis

Taking into consideration the profile and proficiency in technologies of the target group, in this case 'technical teachers', the occupation are then analyzed to determine specific educational and training needs (Herman (1987) as cited in [5]) w.r.t the course identified. The occupation analysis is done taking into consideration the present and future needs of the occupation, personal growth needs and advancement in the online learning technology as shown in fig. 2.

Analyzing the job profile of these technical teachers suggests that, after undertaking such a course they are expected to **perform roles of curriculum designer, developer, and implementers of online education programme or courses in different engineering discipline.** As a case to explain the curriculum design model for PBOL environment, **a course on 'Online Education'** offered in Technical Teachers' Training Institute, Bhopal, M.P. India, through classroom contact mode in Masters of Technical Education- degree programme for technical teachers training is considered.

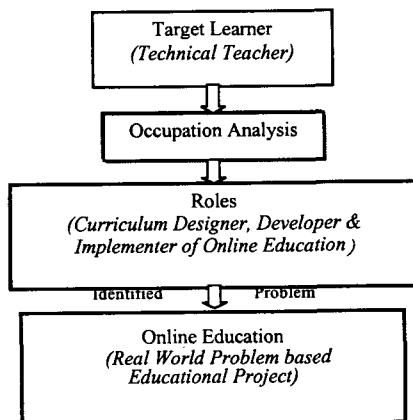


Fig. 2. Model for Occupation Analysis & Identifying Problem Based Educational Project

### ■ Identify Problem Based Educational Project

This course on 'Online Education' is an challenging educational project. It is considered as the real-world ill-structured problem in PBL environment.

The 'Problem Based Educational Project' and its 'Aim' in form of a statement of intended outcome expected from the graduate for solving it can be written as:

• **Problem Based Educational Project:** *To plan, design, develop and implement a sample online learning course through a problem based online learning curricular approach.*

• **Aim:** *The learner comprehends different developmental phases of online learning, then develops and implements a sample online course in their respective area of interest*

### 3.1.3 Decompose Problem Based Educational Project

The problem based educational project identified being an ill-structured problem; it has number of sub-problem(s). It can be decomposed into several sub-problems, which has to be solved by the learners. The sub-problems (i.iv) to be solved or in general terms, goals to be achieved are to:

i) **Sub-Problem-1:** To plan for an online learning environment.

**Goal-1:** The learner comprehends different aspects of planning phase and then plans for an identified online sample course.

ii) **Sub-Problem-2:** To design online learning environment.

**Goal-2:** The learner comprehends different aspects of designing phase and then designs an online learning environment for the planned sample course.

iii) **Sub-Problem -3:** To develop online learning environment.

**Goal-3:** The learner comprehends different aspects of development phase and then develops

the designed online learning environment for the sample course.

**iv) Sub-Problem-4:** To implement online learning environment.

**Goal-4:** The learner comprehends different aspects of implementation phase and then implements the developed online learning sample course.

Sub-problem(s) and their Goal(s) are to be derived by inviting the policy makers, content experts, technology experts etc. and others who have say in the online education and conducting Brain-Storming Session. It can also be derived by preparing instrument, collecting data and analyzing it. The goals of the proposed educational project should be realistic, which the learners can achieve. The competence of the graduates are judged based on measures of the above goals attainment.

#### 3.1.4 Define Charters and Polices

Outlining policies is necessary for long term focus on the quality of the course. These policies should address the issues related to regulation, monitoring and accreditation of online programme. Other polices relevant and necessary for an online programme are concerning, registration, counseling, implementation strategy, assessment system, certification policies, financial aspects, technological feasibility, copyright issues and issues related to infrastructure resources (both physical & Experts).

Lastly, the aim, goals and polices can be combined to form charters of a programme suitable for PBOL.

## 4. DESIGN PROBLEM BASED ONLINE LEARNING (PBOL) ENVIRONMENT

To evolve PBOL curriculum design for the identified 'Problem Based Educational Project' following processes have been considered and found useful for the task in hand. These are:

- 'Problem Based Educational Project Concept Map'
- 'PBOL' Curriculum Design Model'
- 'Design Cum Learner-Team Centered Communication model'
- 'Design Principles of 'PBOL' Environment'

In order to explain the aforesaid conceptual framework it is important to understand some of the underlying concepts, which are briefly stated below for the sake of clarity in subsequent discussions and justifications.

### 4.1 Problem Based Learning Concept

*The author considers ill-structured 'Problem-Based Learning' (PBL) as a curriculum design approach and instructional strategy[11] for designing PBOL environment. This type of learning environment simultaneously develops both problem solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem solvers confronted with an ill-structured problem that mirrors real-world problems. This PBL is implemented through constructivist way of learning.*

Jonassen[12] describes that such "*ill-structured problem* possess multiple *solution, solution paths*, fewer parameters with less manipulability, and contain uncertainty about which concepts, rules, principles that are necessary for the solution or how they are organized and which solution is best. [p65]" In a problem based online learning course, this ill-structured problem is termed as 'Problem-based Educational Project' as it possesses multiple *sub-problems*. The PBOL environment thus designed will encourage collaborative learning and will satisfy andragogical needs of adult learners. On the other hand, well-structured problems in PBOL will be used at different stages of the course schedule like at the time of pre-test, post-test, individual assessment so as to ensure learning. Jonassen(a)[12] defines *well-structured problems* as "constrained problems

with convergent solutions that engage the application of a limited number of concepts, rules and principles within well-defined parameters[65]”.

#### 4.2 Problem Based Educational Project Concept Map

The associated contextual domain knowledge in form of ‘Lessons’ and ‘Processes’ to learn and that will be used to solve each sub-problem(s), can be identified by making a Problem Based Educational Project Concept Map (PBEPCM) as shown in fig. 3. The cognitive map shows inter-relationship and inter-dependencies or linkages of the lessons with the sub-problems and educational project as whole[13].

This contextual knowledge in the form of web-based materials is designed, developed and hosted as a part of larger web-based contextual domain knowledge base/inventory of the course.

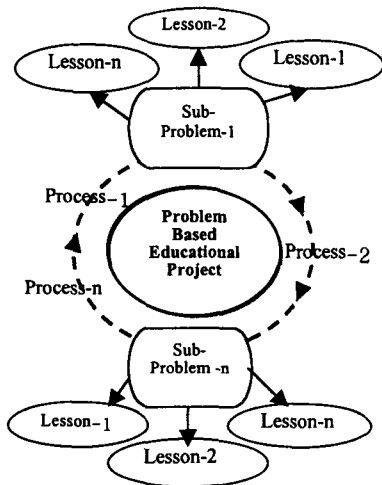


Fig. 3. Problem Based Educational Project Concept Map

##### 4.2.1 Detailing Contextual Domain Knowledge

Broadly the content (declarative & Cognitive Procedural knowledge shown dotted fig. 1) associated to this educational project can be categorized as:

- Philosophy of Online Education, its concepts, pros and Cons.
- Planning, designing, developing and implementing phases of online learning environment etc.

The process skills or activities that has to be performed by learners’, to solve each of the sub-problem(s) are ‘Computer Supported Collaborative Learning Skills’, ‘Technology based Communication Skills’, ‘Interpersonal Skills’, ‘Research’ and the ‘Professional Skills to Solve Educational Project’. The cognitive procedural knowledge related to these process skills also becomes a part of the larger knowledge base/inventory of the course.

The identified problem based educational project, contextual knowledge and processes associated to each sub-problems are then appropriately structured as in the evolved ‘PBOL Curriculum Design Model’.

#### 4.3. PBOL Curriculum Design Model

A hybrid model of both ‘Content Structured Model’ of contemporary online learning and ‘Process Structured Model’ of classroom based Problem Based Learning (PBL) curriculum design. is adapted for arranging or structuring courseware content in PBOL environment as shown in fig. 4 [Adapted from the Models suggested by Conway

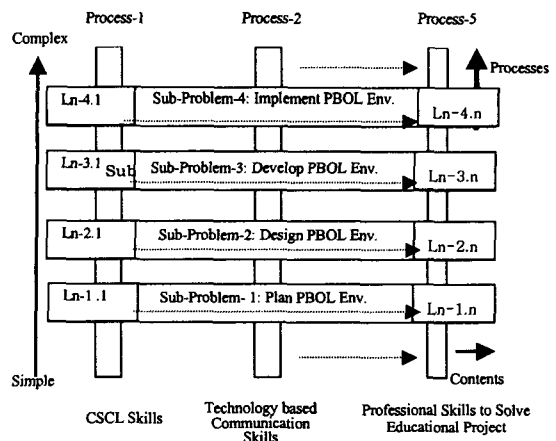


Fig. 4. PBOL Curriculum Design Model

J. and Little .P, 2000(11)]. This new model that has been evolved is named as 'PBOL Curriculum Design Model'.

The problem based educational project, sub-problems, associated processes and contextual knowledge identified in the PBEPKM are structured in a manner that it facilitates web based collaborative learning. In this curriculum design model the learner (or technical teacher) solves the presented sub-problems (i..iv) one after the other in its order, from simple to complex (arranged vertically) through individual and group efforts. The related contextual domain knowledge in form of Subject/lesson (L1-Ln), are arranged across horizontally along each problem space, in order of its prerequisite knowledge (as done in any 'Content Structured Curriculum Model').

The PBOL curriculum design model, places more focus on to development of process skills, encouraging deep learning. Deep meaningful learning occur by making the learner visit/perform the core processes, again and again throughout the learning process till they achieve the desired goals of the stated problem. Deep learning also occurs because they themselves constructs their knowledge.

Apart from problem solving skills, deliberate efforts needs to be made to include learning experiences for developing thinking skills,[14] interpersonal skills, leadership skills while developing the environment. In CSCL environment the learners work in teams/groups and are led by a team tutor. The course Instructor acts only as a facilitator, guide, and coach and as a mentor during the learning process.

#### 4.4 Instructional Design

To the author, the search for an established educational methodology for PBOL "that emphasize real world challenges, higher order thinking skills, multi-disciplinary learning, independent learning, information mining skills, team-

work and communication skills appeared to have a confluence in the holistic approach to Problem-Based Learning"[9]. In this process, the sub-systems of instructional design namely 'Design cum Learners Team' Centered Communication Model', 'Design Principles of PBOL Environment', 'Instructional Methods' and 'Evaluation Scheme' are also evolved for its effective implementation.

##### 4.4.1 'Design cum Learners Team' Centered Communication Model

The 'Design cum Learners Team' Centered communication model shown in fig. 5, depicts the processes through which a peer tutor/instructor or learners team conveys the ideas, information or intentions to the other in order to achieve shared goal/aim, either of gathering information or initiating some action or interacting with the contextual knowledge domain base.

The communications or interactions are carried out using web-based interface and collaborative communication tools. The instructional designer based on this model designs a learning environment taking into consideration the available collaborative technology tools that will encourage 'Design' cum 'Learner team centered' learning experiences. Through 'design centered' learning experiences, the learners can design their own web-

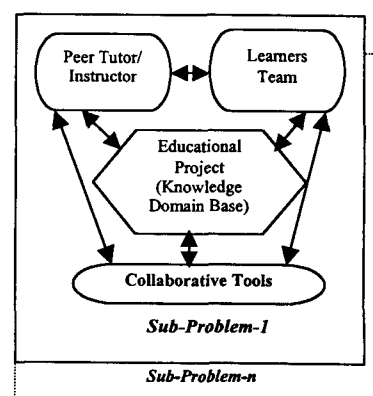


Fig. 5. Design cum Learners Team Centered Communication Model

based learning environment and learning processes.

Whereas a 'Learner team centered' learning experiences, allow learner to interact with the web-based contextual knowledge and communicate with Instructor and community of learners. The learner in PBOL thus establishes multilateral relationship by interacting with the peers, peer tutor, Instructor, contextual domain knowledge and also by interacting with other group members. The communication or interaction can take place in real time using web based synchronous collaborative communication tools (such as chat, audio/video conferencing, whiteboard, shared programs/documents etc.) or by using asynchronous collaborative communication tools (such as email, discussion board, file transfer, www sites etc.) at learners own convenient time. The layering in the figure (5) shows that each problem space identified is build on or related to the other sub-problem(s) as contextual domain knowledge as arranged in 'PBOL Curriculum Design Model'. Designing a PBOL environment as per 'Design' cum 'Learner Team Centered' communication model enables creation of a 'Thinking' course/ programme. In such an environment, the autonomous learner thinks about designing their own learning environment and learning processes by defining objectives, identifying learning material, selecting methods of learning and justifying learning.

The 'Design' cum 'Learner Team Centered' communication model of PBOL, makes the learning experience different from earlier distributed technology and interactive technology based distance learning. Due to varying instructional capabilities and degree of interaction or collaboration that these technologies enables, it facilitates designing of different types of learning experiences to the learners who are at a distance as shown in fig. 6.

The distributed technology such as Radio and Television used by distance educators can only transfer information, as it enable creation of in-

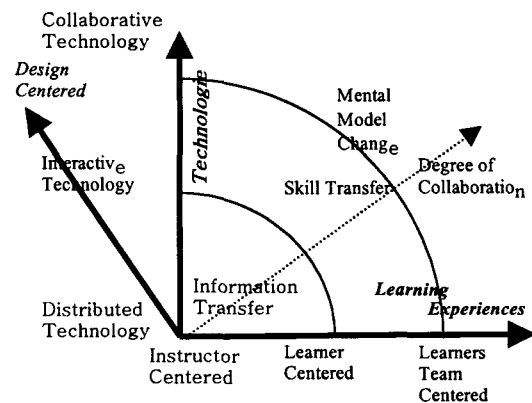


Fig. 6. Design Cum Technology & Learning Experience relationship

structor centered learning experiences. The interactive technology used by most of the contemporary online educators facilitates cognitive skill transfer, as it enables creation of teacher/ learner centered learning experiences. But the use of collaborative technology in team centered PBOL, adds a third dimension 'Design Centered' to the 'Technology and Learning Experience' relationship [15], encouraging deep learning with lasting changes in mental models[16] of the learner.

#### 4.4.2. Design Principles of PBOL Environment

Designing CSCL environment based on 'Constructivist' epistemology and PBOL andragogy, is a challenging task. During the course, the learners' in-group will identify a sample online course of their interest, set its goals, for development and implementation. Based on the past practices and experience of different educators such as Woods, Jonassen, etc of conventional PBL environment; the design principles in web base PBL environment can be stated as below.

- i) Develop appreciation of the innovative concept of CSCL environment among the learner.
- ii) Instructor as Facilitator, guide and mentor create the learning experiences and monitors the progress of learning.
- iii) Set a Web-Based Cooperative learning Environment.



iv) *Create team of learners* with 7 to 8 heterogeneous members each; based on the knowledge level and their experiences. The instructor helps the group either to select their own team leader (peer-tutor) or they themselves nominate a leader who is found more capable (based on pre-test) than others.

v) Present professional real world problem based educational project as challenge.

vi) Create mechanisms for mutual learning

vii) Facilitates contextual domain of knowledge

viii) Empower Learner to design their learning process. Guide them to identify a sample online learning course for its development.

ix) Provide 'Cues' that will trigger the desired search for defining the sub-problem and shared team goals and objectives through brainstorming technique or discussions.

x) *Provide Analogy/Case-Studies* to activate prior-knowledge and experiences.

xi) Focus on developing Thinking skills, Process Skills, the constructions of knowledge, and interpersonal skills.

xii) Create appropriate level of complexity in Learning Process during the learning process.

xiii) Encourage Monitoring and Reflection by providing checklist of questions, to the learners to monitor their process skills development.

xiv) Motivate learners for Collaborative Learning.

xv) Empower learner for their own assessment.

xvi) Build Learner Assessment in particular, the aim and goals identified (refer 3.1.3) that is to be archived are build right from the beginning of the programme. This is to ensure that the programme is guided as per the identified goals.

#### 4.4.3 Instructional Methods

An instructional method is an arrangement of learning events which will facilitate learning to occur. In computer based collaborative learning environment, the instructor facilitates computer based collaborative synchronous and asynchro-

nous communication tools to the learners so that they can plan and design their learning process. It is the freedom of the team members to use these tools as methods to achieve the collaborative-shared goals. Address books and web directories located on the local computer or on the network servers can be used to call instructor or peer for instructional purposes.

The different instructional methods that can be used by the Instructor/learners are 'Case-Study', 'Group Discussions', 'Group tutorials', 'Brainstorming', 'Group Chatting', 'Audio Conferencing', 'Video Conferencing', 'White Board', and 'Program/Desktop Sharing' 'emailing' etc. The learners can also work in a 'Shared Space' and jointly create project related documents and web-based courseware etc. In addition files can be send to one or all members of the team. All these methods provide a social learning situation.

The instructional interaction using the above methods will help the learners to develop content knowledge, higher order complex skills, thinking and process skills, as well as positive interpersonal skills like mutual respect, cooperation, team work, leadership, mutual adjustment through mutual communication and interactions. Thus in PBOL environment the adult teachers not only develops problem solving competencies of real world challenging tasks but also the disciplinary knowledge adragogically in a constructivist learning situation.

## 5. ASSESSMENT OF PBOL

Primarily, in PBOL environment the learners are empowered for their own assessment through 'Portfolio Assessment'[3] method which is based on measurable criteria and on pertinent evidences [17].

The learner collects all evidences/data that is created during individual or collaborative learning to show groups or his/her performance and intellectual growth. They analysis it, interpret it and presents in professional manner as his or her

portfolio. The learner gathers evidences of his learning over a period of time. They are also provided with opportunities to monitor the development of his/her own professional mastery[18] through checklists. Portfolio Assessment encompasses two types of assessments namely 'Self-Assessment' and 'Peer-Assessment'. Apart from the Portfolio assessment, the instructor administers online self-test, timed quizzes, individual-assignments, pre-test and post-test etc. to assess the knowledge constructed by each learner. The judgment can be arrived based on the Portfolio submitted by the learners and Individual Assessment done by the instructor. The final grade awarded to each learner is based on the degree to which the goals of the course are achieved as a learner's outcome.

## 6. DEVELOP PBOL ENVIRONMENT

The steps to be followed for the development of problem based online learning environment are as follows:

- Detailing the content of problem based educational project and developing the storyboard for the 'Online Education' courseware.
- Developing home page and subsequent content pages of the courseware based on the principles of problem based online learning curriculum design (refer 4.4.2), using any web-authoring tool like WebCT, First Class, and Top Class etc.
- Incorporating student support system within the courseware.
- Incorporating Web-based interface as a part of the programme curriculum site so that the learners of 'Online Education' programme can create their sample online courseware.
- Develop and provide option to download Instructor Guide' and 'Learners Guide' from the programme web site.

## 7. IMPLEMENT PBOL ENVIRONMENT

The courseware thus developed for PBOL is

hosted on the web-server. The learners in the team plan, design, develops and implement a sample online courseware their own identified subject area. The learners interacts with the web based contextual knowledge, uses different collaborative tools and methods; communicates and work with his or her team mates. They in group define the objectives for achieving the shared learning goals. The team tutor leads the team, interacts and encourages the members to reach the Zone of Proximal Development (ZPD)[19]. In such an PBOL environment, each learner constructs his or her own meaningful knowledge, thinking skills and process skills with respect to his or her own prior cognitive structures, mental models, experiences and culture[17]. During the academic session each learner collects related documents, web-pages etc that they have created; as an evidences to show his problem solving competencies or intellectual growth in his or her portfolio.

## 8. EVALUATE PBOL CURRICULUM MODEL

The PBL curriculum model can be evaluated by preparing appropriate questionnaire, collecting feedback from both learners and Instructors for further improvement.

## 9. CONCLUSION

The theoretical foundations of Constructivist epistemology and Andragogy when coupled with principles of PBOL and transplanted into a web based online learning environment for adult learners have given rise to radically different approach of curriculum development as has been explained in this paper. It has been found that the PBOL curriculum development approach has a foundation which is well founded and therefore has a potential for reality when put in practice using highly advanced and increasingly available collaborative tools in online learning environments. Using these very facts there is no doubt that the reengineered

curriculum development approach and the PBOL curriculum model will be able to address the distance learning of a mature learner at a distance. As stated earlier this innovation in form of multimedia web based courseware in a collaborative environment will enable training of technical teachers through online collaboration mode. This online learning mode is going to be put in place shortly and we are confident that this will meet the stated goals as laid down above in favour of PBOL.

The further research finding will be reported as and when they become available.

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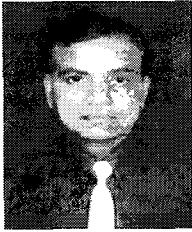
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