**International Academy of Science,
Engineering and Technology**
Connecting Researchers; Nurturing Innovations
IASET

CONSTRUCTION OF MATURITY EVALUATION FRAMEWORK FOR SKILL BASED TRAINING PROGRAM E-LEARNING ENVIRONMENT: LEARNER'S PERSPECTIVE

M I JAWID NAZIR[1] & RAMACHANDRA V PUJERI[2]

[1]Research Scholar, Karpagam University, Coimbatore, Tamil Nadu, India

[2]Vice Principal, KGISL-College of Engineering, Technology, Coimbatore, Tamil Nadu, India

ABSTRACT

Skill-based training programs are more focused and are designed for a level of expertise at the end of the course or certifications[1]. In the current educational scenario, colleges, and training centers are developing a culture of a computer-based learning under two environments, as in-person and remote approach. Exponential growth of eLearning in recent age witnessed high rate of success in e learning market. Many learning environments are established and delivered with the instructors' point of view. If the learning environment is designed and developed more from the learner's perspective, it could result in a higher level of learning and better skill development. Better results are produced by a system when it follows matured practices in its operations. Maturity of a system is achieved at the advanced level when processes are not only being managed well, but staffs are involved in continuous process improvement on a daily basis. This paper discusses the research work conducted in constructing a framework to measure the maturity of the skill based training program learning environment.

KEYWORDS: E-Learning, Maturity Framework, Skill Based Learning, Training Programs

INTRODUCTION

Many IT industries recruiting skilled parsons as an employee, and they've almost made it mandatory nowadays. Findings indicate that good basics for skill-based training and learning are teaching, assessing, planning, group work, creativity, enquiry, evaluation and self-confidence. Listening to a lecture calls on listening and maybe note-making, but skill-based learning environment must train and evaluate one's independency, thinking skills, collaboration and the knowledge [2]. Skill based training programs require clear instruction to make a learner understand the theoretical concepts and the practical aspects of the study. The environment must be designed in such a way to give chance to apply the theoretical concepts through hands-on or opportunity to apply them on a problem and test its functions [3]. Computer based learning and an e-learning environment provide such facilities to do the practice and know their outcome immediately.

The SBTP-eLE Model was constructed through a careful literature study for finding the Indicators, followed by a Pilot study, with the aid of confirmed indicators data was collected from students who are doing the skill based training programs. The data was analyzed using the SPSS-16 statistical tool to group in to factors. Expert study for maturity level acceptance, and application of statistical method Analytical Hierarchy Process (AHP) to quantify the maturity stages and to calculate the overall maturity of the SBTP-eLE environment were adapted in construction of this framework. In this paper the construction of the SBTP-eLE model has been discussed with the practical evidence and with the statistical analysis result and discussion.

PROBLEM STATEMENT

Industries are looking for more focused and skilled people to achieve their goals, and global expansion of their business. Standardizing the procedures and practices will help a company to grow enormously. IT equipment's' and software development industries are promoting and encouraging a structured learning practice to support their product and global market acceptance. Creating knowledgeable hands of their products by providing a structured education system makes them manage and maintain the products and software better. So a high need of training environment which could contribute in easy, better and acceptable learning environment by learners and an evaluative framework to evaluate the maturity of this learning environment.

RESEARCH METHODOLOGY

Research Methodology refers to the style to a problem which could be put into practice in a research process, from the theoretical foundations to the gathering and analysis of data[4]. The selection of a proper methodology helps to achieve valid and reliable results. An effective literature review was used to continuously support this research throughout its process. Literature Review was used to explore the fields such as e learning environment, skill based training environment, effective learning environment, learning maturity models and this review would help identify the variables needed to construct the Primary Data Collection Questionnaire Instrument[5]. The Literature review [6] helped to identify the variables needed to construct the Pilot Study Data Collection Instrument.

- **Research Approach**

Research in common parlance refers to a search for knowledge. One can also define research as a scientific and systematic search for pertinent information on a specific topic. Research is an art of scientific investigation. Many people have defined research. Some people consider research as a movement, a movement from the known to the unknown. It is actually a voyage of discovery [7]. The research approach normally begins with an investigation of theory that summarizes and organizes knowledge by proposing a general relation between events [4].

The research approach consists of four components, which are Purpose of Research, Process of Research, Logic of Research, and Outcome of Research Purpose of Research could be Exploratory, Explanatory or Descriptive. Process of Research could either be Quantitative or Qualitative. Logic of Research could either be Deductive or Inductive, and Outcome of Research could either be Applied or Basic Research. Figure 1 shows the Research Approach followed for this PhD Research.

The initial part of this research followed a deductive pattern — indicators were identified after Literature Review, framework was created using Pilot Study and data collection, and then the framework was refined by Expert Opinion Study. The remaining part of the Research was Inductive — the Refined Framework was applied to existing SBTP-MSeLE institutions or academies. This research is a Basic Research, as the aim of the research is to contribute to existing theory and knowledge in the field.
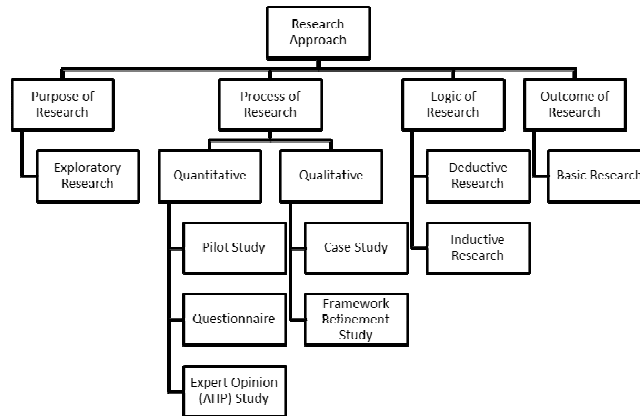
Construction of Maturity Evaluation Framework for Skill Based Training Program
E-Learning Environment : Learner's Perspective

127

Figure 1: Research Approach [5]

After a successful pilot study and analysis 33 variables [8] has been fixed in the main study and used for collecting the primary data of this research

- **Pilot Study Results**

This study was divided into two parts; the first part is reviewing the factors in existing skill based learning environment. The mentioned secondary data analysis of 220 research papers was instrumental in identifying 33 final indicators after doing many comparisons and regress study and it is shown in table 1

Table 1: Indicators from the Pilot Study [8]

S. No	Variable Name	References
1.	Study Material Availability	[9], [10], [11], [12], [13].
2.	Varied Study Material	[14], [15], [16][17],[18], [19].
3.	Repeatable Instruction Delivery	[20], [21],[22].
4.	Compatibility of Platforms	[23], [24], [25].
5.	Multimedia Based Learning	[14], [26], [12], [27],
6.	Structured Learning Content	[28][29],
7.	Skill Supportive Material	[28], [2], [30], [31].
8.	Reference Material	[32], [33], [34], [35], [11].
9.	Face-To-Face Course Delivery	[36],[37],[38],[28], [39].
10.	Simulation Based Learning	[40],[41], [33], [42], [43],[10].
11.	Demonstration Based Learning	[33], [28],[10],[44], [39].
12.	Problem Solving	[45], [46], [30].
13.	Non-Interactive Remote Class	[28], [47],[48], [49],[41]
14.	Collaborative Learning	[50], [51], [52], [53], [54],[54].
15.	Customized Learning Environment	[55], [56], [13], [2], [57], [58].
16.	Conference Learning	[11], [59],[28], [60].
17.	Peer Interactivity	[61],[62], [63], [34], [28].
18.	Expert Counseling	[64],[38], [65], [64]
19.	Student-Faculty Communication	[66],[67],[68], [69].
20.	Online Submissions	[70],[71],[72].
21.	Practice Assessments	[73], [74], [75].
22.	Skill Based Assessments	[76], [77], [78].
23.	Descriptive/Objective Type Assessments	[79], [80], [70], [26]
24.	On Field Assignment	[81], [82], [83].
25.	Prior Intimation About Exam	[1], [84], [72].
26.	Results With Description	[78], [85], [86].
27.	Course Progress Status	[87], [88], [89], [90].
28.	Performance Report/Grade Book	[91], [78], [72], [2].

Table 1: Contd.,		
29.	Course Feed Back	[92], [93], [67].
30.	Award/Appreciation On Completion	[94], [95].
31.	Intimation About Opportunities	[2], [96], [97].
32.	Provision of Internship	[98], [99], [100].
33.	Intimation Of Course Updates	[101], [2], [102].

RESEARCH DEVELOPMENT PHASE

The next phase consisted of the Questionnaire Survey and Data Analysis.

- **Questionnaire Survey**

A Questionnaire is a set of prepared questions used to record opinions of the participants. A Questionnaire is a form containing a series of questions and providing space for their responses to be filled in by the respondent himself. A good questionnaire requires that it be designed in a way to evoke accurate response. Due to the relatively easy availability and accessibility of Internet, nowadays web-based surveys are also used to gather responses from participants. Attitudes stimulated by questionnaire items are frequently measured on a 9-point, 7-point or 5-point scale. In this research a 5- point scale has been planted in the questionnaire. Purpose of this survey was to determine the opinions of SBTP-eLE users (learners, Instructors) about various SBTP-eLE indicators. The objective of the Questionnaire survey was to create the research maturity framework.

- **Methods for Questionnaire Survey**

Designing Questionnaire Instrument: The item generation for the Questionnaire Survey Instrument was done based on the Pilot study from the predecessor phase. Questions were phrased to collect quantitative data using a 5-Point Likert Rating Scale. The types of question used in the questionnaire were mainly of the closed question type, which enables the respondents to give answers that fit into categories that have been established in advance by the researcher. The 5-point Likert scale was employed to enable the respondents rank the importance of each indicator from a minimum of "Disagree Strongly" to a maximum of "Agree Strongly". In this questionnaire, the open question design was only dedicated to get information on respondents[4].

- **Sampling Methods and Type of Survey Used in the Research**

Type of Survey Method

Two survey methods were used in the Research: 1) Web Survey, 2) Traditional Survey in Controlled Environment.

Web Survey: For this research, a web survey was created using Online Survey providers Free Online Surveys (http://www.surveyexpression.com/). Precautions were taken to secure the data collected from the participants. Hence, this Web-Survey service was selected to launch the web questionnaire for data collection.

Traditional Survey in Controlled Environment: The researcher first assembled the respondents in a classroom and then explained the objectives of the research. The respondents were briefed on the expectations from them and the importance of their data, ethical consents in context to this research. Then the questionnaire sheets were handed over to the respondents and allotted a time of 30 minutes to complete the survey.

- **Type of Sampling**

Two types of sampling methods were used in this research: 1) Self - Selected Closed Sampling using Web Survey, 2) Non Probability based Convenience Sampling.

Self-Selected Closed Sampling Using Web Survey: In the case of Web survey, participant's recruitment involves some degree of self-selection. Web surveys represent a cost-effective alternative when one has some confidence that the matching variables are sufficient to eliminate most of the potential bias. Sampling from a closed Population is seen as crucial to successful sampling because every member of the list is a member of the target audience, and knows what is that survey is all about, and they also have some kind of preexisting knowledge before they answer to the questions. Unrestricted, self-selected surveys are based on a form of convenience sampling.

Non-Probability based Convenience Sampling: Non-probability samples are sometimes called Convenience samples. The researchers selected respondents based on the self-experience (judgement sampling), then participants were found based on the referrals (snowball sampling). Web surveys were posted to academy user accounts, students user ID of the universities, Communities who are doing the skill based programs and their participants. Programming, CAD Design, CISCO, Juniper, EMC, MCSE, Oracle, CIW and ICDL students groups were identified and the survey message sent. These posting were done only after taking formal approvals from the program In-Charge/Academy Manager/Coordinator/Instructor. Hence, in case of such web surveys, the respondents were self-selected. In case of traditional survey, postgraduate students and under-graduate students studying at University were selected on basis of prior experiences on using Skill based Training Program on eLearning environment. Filled survey sheets were collected for the tabulation and analysis.

- **Data Analysis Methods Used in the Research**

Data Analysis for this research consisted of tabulating and testing the qualitative and quantitative data collected through the two types of questionnaire Surveys. The aim here was to recombine the evidence to address the initial propositions of this research. Statistical Analysis Software — Statistical Package for the Social Sciences (SPSS-16) was used to aid the analytic process in this research following statistical methods were used for the analysis of the data collected from the above mentioned electronic and traditional surveys.

Descriptive Statistics: was used to describe the main features of the collected data in quantitative form, which gives an overall sense of data being analyzed. Descriptive Statistics are used to present quantitative descriptions in a manageable form. Descriptive statistics help us to simplify large amounts of data in a sensible way through use of tools such as frequency distribution, central tendency, dispersion etc. Such descriptive statistical methods were used to treat the data and give some relational parameters such as percentage of male and female respondents, distribution of respondent experience learning in a SBTP-MSeLE.

Reliability Analysis: was used to determine the reliability of the data collected from Questionnaire survey. Reliability analysis was done by the Cronbach's Alpha test. Cronbach's alpha is a measure of internal consistency, which checks how closely related a set of items are as a group. Cronbach's alpha determines the internal consistency or average correlation of items in a survey instrument to gauge its reliability.

Factor Analysis: is a collection of methods used to examine how underlying constructs influence the responses on a number of measured variables. Exploratory Factor Analysis (EFA) attempts to discover the nature of the constructs

influencing a set of responses. Sample Size for Factor Analysis should be decided with respect to the number of items or indicators, and ideally, the ratio should be 5:1 to 10:1 higher the better. The ratio between number of items and sample size i.e. N: P ratio should be minimum 5, and ideally 10 or more. Factor Analysis was used to describe the variability among the indicators initially identified through Literature Review, and refined after Pilot Study and tested using questionnaire survey. This enabled the research in the reduction of the number of indicators and the formation of Seven (7) factor groups.

RESEARCH DEVELOPMENT PHASE OUTCOME

- **Data Tabulation of Research Questionnaire and Analysis**

Purpose of the Questionnaire survey in this doctoral research was to determine the opinions of SBTP-MSeLE experts, curriculum creators, instructors and learners about various SBTP-MSeLE indicators and to construct the research maturity framework. In this research, two types of surveys were conceded, one is web-based online survey and the other one is a traditional survey conducted in a controlled environment. Data Tabulation and Analysis for this research consisted of tabulating and testing the qualitative and quantitative data collected through the two types of questionnaire surveys. The Questionnaire was distributed approximately to 370 participants and 299 participants' data were considered. 20 responses were discarded since they were incomplete. Approximately, 50 participants never responded to online survey (requested through mail to participate). Data collected through traditional survey was tabulated using Microsoft Excel spreadsheet software. The web survey was created and hosted through online survey provider http://www.surveyexpression.com. The data collected through the web survey was exported to the Microsoft Excel format and merged with the tabulated data from traditional survey. A site has been developed for this research and the links are provided for the survey in the survey section http://alsbls.x10.mx. Tabulated data was imported in Statistical Analysis software - Statistical Package for the Social Sciences (SPSS-16) for conducting various analytic processes in this research. Tabulated data, analyzed using statistical research methods, is explained below. Reliability of the all indicator is recorded Assessment Strategies

- **Descriptive Analysis**

Descriptive analysis was done on the tabulated data. The Questionnaire was distributed approximately to 370 participants and 299 participants' data were considered. 20 responses were discarded since they were incomplete. Approximately, 50 participants never responded to online survey (requested through mail to participate). But the number of valid responses was highly optimal at 80.81% this gives credibility to the data collection activity.

The next descriptive statistic revolved round the gender of respondents. The findings of this analysis suggest that 33.4% of respondents were male and the remaining were female. The findings show that a higher number of respondents were female. The next descriptive statistic was related to educational qualifications of the respondents. Findings suggest that 70.6% of the respondents were qualified up to undergraduate level or lesser, whereas the remaining respondents had at least a post graduate qualification. Again these findings suggest more number in respondent educational criterion. The last descriptive statistic is about the employment status of the respondents. The findings suggest that 94.3 of the respondents were students who are doing the skill based training program. The remaining respondents were instructors and experts.

- **Reliability Analysis**

Using reliability analysis, researcher can determine the extent to which the items in the questionnaire are related to

each other. Further, it is possible to get an overall index of the repeatability or internal consistency of the scale as a whole, and to identify problem items that should be excluded from the scale [103]. Internal Consistency of Questionnaire Scale was computed using Cronbach's Alpha method. Further, Alpha (Cronbach's) value checks this model as a model of internal consistency, based on the average inter-item correlation [103]. Alpha was developed by Lee Cronbach's in 1951 to provide a measure of the internal consistency of a test or scale; it is expressed as a number between 0 and 1. The Cronbach's Alpha (α) coefficient for the five (5) scale based questions= 0.819, which can be considered as good value. This value gives weight to the reliability of the questionnaire scale.

- **Factor Analysis**

Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables. Factor Analysis was used to describe the variability among the indicators initially identified through Literature Review, refined after Pilot Study, and tested using questionnaire survey [7]. Factor analysis was conducted on the 33 variables which were mounted on a 5-Point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree).

The following table was generated after subjecting the data to exploratory factor analysis able As seen in the below summary table 5.26, the 7 factors are formed with number of variables per factor ranging from a minimum of 3 variables (Factor 7) per factor to a maximum of 7 variable per factor (Factor 1). The observation also found the respective factor loadings for each variable. The range of the factor loadings is from minimum = 0.422to maximum = 0.744. These are good readings, as factor loading >.40 is considered acceptable. As a result of factor analysis, Indicators are grouped and names are given as per their characteristics. 33 indicators have been grouped in to 7 small factor groups. Figure 4 shows the factors analysis and reliability of groups. After completing the reliability analysis of the factors, proper names have been identified for the factors as per their group indictor's characteristics.

Table 2: Factor Analysis and Reliability Analysis Summary Table

Factor	ID	Indicatores	Factor Loading	Cronbach's α
Factor 1 Interactive Learning	Q15	Customized Learning Environment	0.684	0.839
	Q19	Student-faculty communication	0.670	
	Q17	Peer Interactivity	0.652	
	Q14	Collaborative Learning	0.652	
	Q18	Expert Counseling	0.578	
	Q20	Online submissions	0.563	
	Q16	Conference learning	0.532	
Factor 2 Learning Indicators	Q28	Performance Report/Grade Book	0.716	0.824
	Q27	Course Progress Status	0.697	
	Q26	Results with description	0.689	
	Q25	Prior intimation about exams	0.643	
	Q29	Course Feedback	0.506	
Factor 3 Motivational Learning	Q32	Provision of Internship	0.744	0.786
	Q31	Intimation about Opportunities	0.691	
	Q30	Award/Appreciation on completion	0.644	
	Q33	Intimation of Course updates	0.610	

		Table 2: Contd.,		
Factor 4 Learning Methods	Q11	Demonstration-based learning	0.556	0.769
	Q13	Non-interactive remote class	0.538	
	Q10	Simulation-based learning	0.506	
	Q12	Problem solving	0.473	
	Q9	Face-to-face course delivery	0.430	
Factor 5 Resource-Based Learning	Q2	Varied study material	0.709	0.720
	Q1	Study Material Availability	0.673	
	Q4	Compatibility of platforms	0.668	
	Q3	Repeatable Instruction Delivery	0.638	
	Q5	Multimedia-based learning	0.484	
Factor 6 Assesment Strategies	Q22	Skill-based Assessments	0.664	0.726
	Q24	On-Field Assignments	0.572	
	Q21	Practice Assessments	0.554	
	Q23	Descriptive/Objective type assessments	0.422	
Factor 7 Learning Material	Q7	Skill supportive material	0.733	0.648
	Q8	Reference material	0.629	
	Q6	Structured learning content	0.562	

Factor 1: Interactive Learning in SBTP-eLE

Interactive learning is a more hands-on, real-world process of relaying information in learning environment. Passive learning relies on listening to teachers lecture. However, with interactive learning, students are invited to participate in the conversation through technology, or through role-playing group exercises in class. This type of learning increases the participation in the learning activity, and makes learners feel they are doing something related to the session rather than sitting quiet and listening.

Factor 2: Learning Indicators in SBTP-eLE

Learning Indicators are the provisions on the learning environment to show the day-to-day development of knowledge during the learning period (course of time). They have the ability to identify the fundamental knowledge and skills around which to guide instruction. This is measured by various activities on the learning environment. They are capable of showing their scores, skill level, results information, exam details, and feedback to improve the performance of both learner, and instructors' perspective.

Factor 3: Motivational Learning in SBTP-eLE

Motivational learning is the ability of the eLearning program environment to keep learners interested in learning, and in the particular course, by means of providing different opportunities, new experiences, expertise, certificates and awards for their achievements. Also to recondition for their accomplishments and encouraging them to participate and take part further, by keeping them updated about the program and activities of the e-learning program.

Factor 4: Learning Methods in SBTP-eLE

Learning methods are the way, eLearning environment facilitate the students to learn the particular skill-based program. It is about the different types of teaching methods in other ways, different ways; a learner learns the skill concepts

Construction of Maturity Evaluation Framework for Skill Based Training Program
E-Learning Environment : Learner's Perspective

133

to strengthen their expertise or knowledge. In general, the support provided to the learner by the learning environment to achieve their goals by developing approaches to teaching that influence, motivate and inspire students to learn.

Factor 5: Resource Based Learning in SBTP-eLE

This factor focuses on the course resources and other supportive learning material for main study and additional references. Material availability is one of the most important requirements of a Learner to know what to study, what to refer, and how to revise to understand better. All these requirements could be fulfilled based on the study material of the particular program. A well designed course material helps students to focus better, and learn the desired skill within the stipulated duration.

Factor 6: Assesment Strategies in SBTP-eLE

Assessment strategies are the key element in the learning environment to measure the students' knowledge and their performance. There are different types of assessments conducted in the eLearning environment. This factor focuses on what types of assessment could help the learner improve his or her skill level.

Factor 7: Learning Material in SBTP-eLE

The availability of skill supportive material such as lab manual, step by-step guide to carry out a skill task. Provision for further references when additional clarification or examples are required on a particular topic.

MATURITY FRAMEWORK AND RESULTS

This section shows the results gathered from various activities conducted during the construction of the SBTP-MSeLE Model and Evaluation Framework. The Factor analysis and reliability analysis values are as per the standard so the results are accepted and indicators and factors are acceptable. Figure 2 and 3 shows the results of data analysis and their results

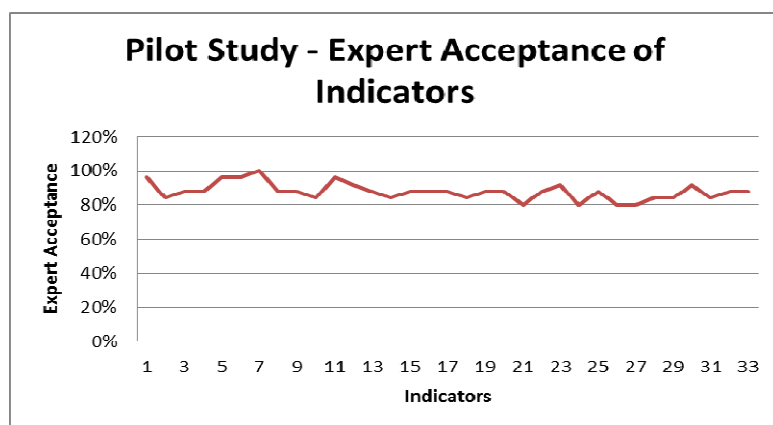- **Pilot Study and Expert Acceptance of Indicators**

Figure 2: Pilot Study – Data Analysis Chart (All Values are above Neutral)
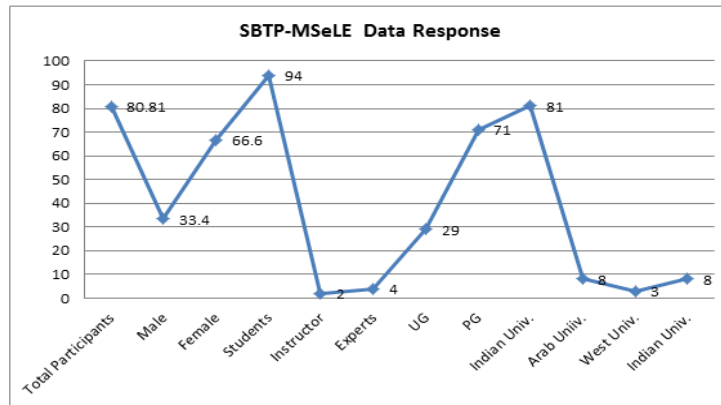
- **Results of Descriptive Statistics**

Figure 3: Pilot Study – Results of Descriptive Statistics

- **Descriptive, and Factor Analysis of SBTP Framework**
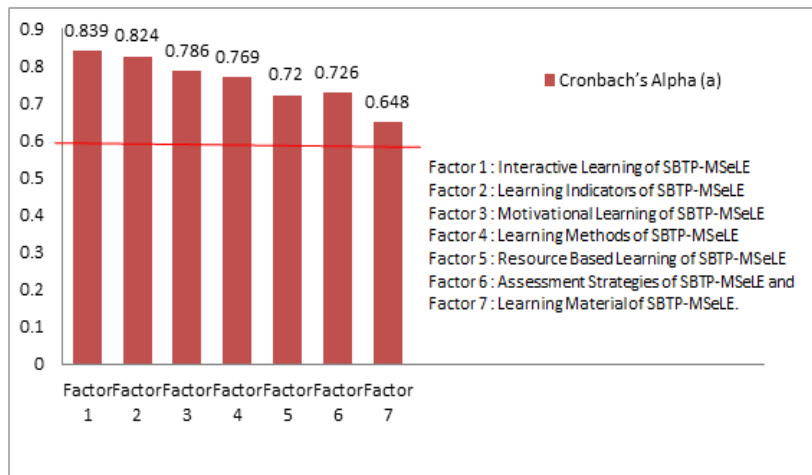

Figure 4: Data Analysis – Factor Analysis

(Cronbach's Alpha value above all 0.6 so acceptable)

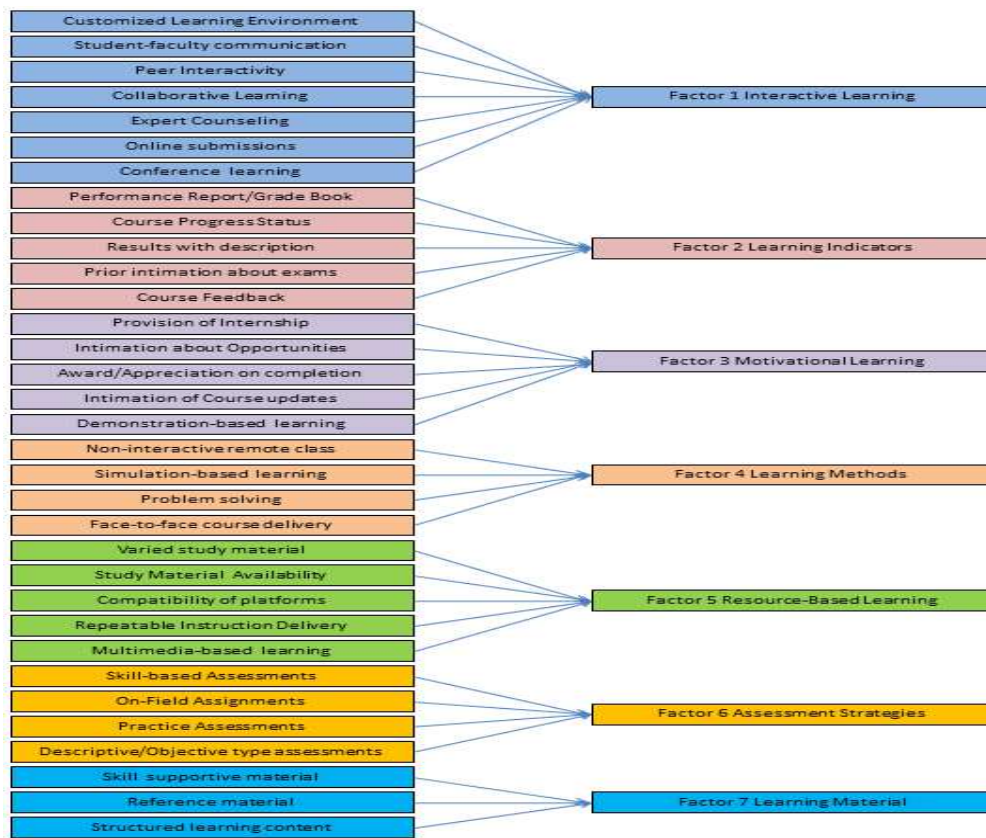- **Maturity Framework Components (Indicators and Factors)**

Figure 5: Factor Grouping of Research Indicators

CONCLUSIONS

This paper presents the results the pilot study conducted during the doctor thesis. From these results the key factors relating to skill based training program environment from the user perspectives and acceptance are identified. These indicators were recognized by means of the common intelligence factor reduction method, which was used on the 180 factors that were initially identified after inclusive phase of literature review. Further this paper presents the results of a pilot study conducted to measure the views of people who involved in the learning environment such as Instructors, Course Administrator, and Infrastructure Consultant for Server & Enterprise applications, Institute- Academy Legal Main Contact, Academy Alliance Partner Contact, and Skill labs Expert on the list of mentioned indicators. The investigation of the data collected in the Pilot Study justified all 33 indicators used for the main study and more than 299 validated responses has been collected and analyzed. The factorizations of variables are show these variables and factors are mathematically justified and used in the framework for evaluation of skill based learning environment.

FURUTE WORK

With the strong literature review and study; maturity level definition will be written for the indicators and factors, which could be used to measure the different maturity level of learning indicators with respect to learner's perspective.

REFERENCES

1. M. I. J. Nazir and R. V Pujeri, "An Evaluative Framework to Measure the Maturity of Skill Based Training Program with Multimedia Support in an E-Learning Environment," in 4th Annual Research Congress (KUARC – 2012), 2012, no. i, pp. 303–305.

2. M. I. J. Nazir, A. H. Rizvi, and R. V Pujeri, "Maturity Level Definitions for the Evaluative Framework to Measure the Maturity of Skill Based Training Program with Multimedia Support in an E- Learning Environment [SBTP-MSeLE]: A Learners Perspective," Int. J. Comput. Inf. Technol., vol. 2, no. 4, pp. 1–8, 2013.

3. M. I. J. Nazir, A. Haider, and R. V Pujeri, "Role and importance of Factors affecting University Students ' Performance in the Multimedia Based Learning Environment," in 2nd Annual Research Congress (KUARC – 2009), 2009, pp. 1–2.

4. V. Akre, "An evaluative framework to measure the maturity of free/open source software (F/OSS) from user perspectives.," University of Salford, 2012.

5. V. Akre, A. H. Rizvi, and M. Arif, "End-User Perspectives on Free/Open Source Software (F/OSS) Adoption: A Pilot Study," in Proceedings of the 10th International Postgraduate Research Conference (IPGRC), 2011, pp. 474–485.

6. M. I. J. Nazir and R. V Pujeri, "Factors Influencing the Skill Development in the Skill based Training Program Learning Environments : A Literature Study," Int. J. Comput. Inf. Technol., vol. 03, no. 03, pp. 579–587, 2014.

7. C. R. Kothari, Research Methodology: Methods and Techniques, Second Edi. New Delhi: NEW AGE INTERNATIONAL (P) LIMITED, 2004, pp. 1–418.

8. M. I. J. Nazir and R. V Pujeri, "LEARNER ' S PERSPECTIVE OF SKILL-BASED TRAINING PROGRAM ' S E-LEARNING ENVIRONMENT : A PILOT STUDY," Glob. J. Adv. Eng. Technol., vol. 3, no. 2, pp. 87–95, 2014.

9. S. Alexander, "e-Learning Developments and Experiences," Educ. Train., vol. 43, no. 4–5, pp. 40–248, 2001.

10. Y. Chen, H. Little, M. Ross, and Q. Zhao, "Factors Motivating the Adoption of e-Learning Technologies," J. e-Learning High. Educ., vol. 2012, pp. 1–17, Sep. 2012.

11. S. Safei, M. Atar, M. Amin, A. Nazari, M. Rose, M. Nordin, and A. Rahman, "Instant e-Teaching Framework Model for Live Online Teaching," IJCSI Int. J. Comput. Sci. Issues, vol. 8, no. 2, pp. 84–91, 2011.

12. S. Asree and D. Dobrzykowski, "The Student Perspective of Online, Multimedia, and Traditional Teaching Methods: An Undergraduate Operations Management Course," in Midwest DSI Annual Conference, 2009, pp. 1–11.

13. M. I. J. Nazir, A. H. Rizvi, and R. V Pujeri, "Skill development in Multimedia Based Learning Environment in Higher Education : An Operational Model," Int. J. Inf. Commun. Technol. Res., vol. 2, no. 11, pp. 820–828, Nov. 2012.

14. T. Vaughan, Multimedia Making It Work, Eighth Edi. McGrawHill, 2010, p. 478.

15. Ismail, R. M. R. Hussain, and S. Jamaluddin, "Assessment of students' learning styles preferences in the faculty of science, Tishreen University, Syria," Procedia - Soc. Behav. Sci., vol. 2, no. 2, pp. 4087–4091, Jan. 2010.

16. N. Manochehr, "The Influence of Learning Styles on Learners in E-Learning Environments : An Empirical Study," CHEER, vol. 18, pp. 10–14, 1999.

17. K. Dunn, L. Styles, T. Dunn, D. Model, P. E. Sound, L. T. Design, E. Motivation, P. Responsibility, and S. M. Rundle., "Learning Styles : Dunn and Dunn Model," Image (Rochester, N.Y.), 2008.

18. M. I. J. Nazir, Mubeen.M, and R. V Pujeri, "What is your Learning Style ? : A theoretical study on various learning style models and assessment techniques to evaluate students learning styles for the multimedia supported e-learning environment," in Second National Conference on Advance Computer Networking, 2012, no. March, pp. 1–5.

19. R. E. Mayer, "Cognitive Theory and the Design of Multimedia Instruction: An Example of the Two-Way Street Between Cognition and Instruction," New Dir. Teach. Learn., no. 89, pp. 55–72, 2002.

20. S. Junaidu, "Effectiveness of Multimedia in Learning & Teaching Data Structures Online," Turkish Online J. Distance Educ., vol. 9, no. 4, pp. 97–107, 2008.

21. J. D. Vermunt and N. Verloop, "Congruence and friction between learning and teaching," Learn. Instr., vol. 9, no. 3, pp. 257–280, Jun. 1999.

22. S. U. Khalid, A. Basharat, A. A. Shahid, and S. Hassan, "An Adaptive E-learning Framework to supporting new ways of Teaching and Learning," IEEE Xplore, vol. 1–7, 2009.

23. V. Akre, A. H. Rizvi, and M. Arif, "Developer perspectives on Free / Open Source Software (F / OSS) Development : A Pilot Study," in Proceedings of the 10th International Postgraduate Research Conference (IPGRC), 2011, pp. 486–491.

24. D. Raymond, V. Baudin, and T. Gayraud, "Distant e-learning Using Synchronous Collaborative Environment 'Platine,'" in Proceedings of the IEEE Sixth International Symposium on Multimedia Software Engineering, 2004, pp. 1–8.

25. M. Nilashi and N. Janahmad, "Assessing and Prioritizing Affecting Factors in E-Learning Websites Using AHP Method and Fuzzy Approach," Inf. Knowl. Manag., vol. 2, no. 1, pp. 46–62, 2012.

26. M. I. J. Nazir, A. H. Rizvi, and R. V Pujeri, "The Impact of Multimedia based Learning among the Children with Special Needs in UAE : A Case Study," in Conference ICL2010, 2010, vol. 1, no. 5, pp. 755–759.

27. W. Burleson, S. Thampuran, and N. Ramaswamy, "Multimedia Systems : Enabling Computer Engineering Education," in 32nd ASEE/IEEE Frontiers in Education Conference, 2002, pp. 1–6.

28. B. Ghirardini, E-learning methodologies. Rome: Food and Agriculture Organization of the United Nations, 2011, pp. 1–141.

29. Paramythis, "Adaptive learning environments and e-learning standards," Electron. J. eLearning, vol. 2, no. 1, pp. 181–194, 2004.

30. E. Hmelo-Silver, R. G. Duncan, and C. a. Chinn, "Scaffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller, and Clark (2006)," Educ. Psychol., vol. 42, no. 2, pp. 99–107, Apr. 2007.

31. M. Y. Yi and F. D. Davis, "Developing and Validating an Observational Learning Model of Computer Software Training and Skill Acquisition," Inf. Syst. Res., vol. 14, no. 2, pp. 146–169, Jun. 2003.

32. N. Miyata, H. Morikawa, and T. Ishida, "Open Smart Classroom: Extensible and Scalable Learning System in Smart Space Using Web Service Technology," IEEE Trans. Knowl. Data Eng., vol. 21, no. 6, pp. 814–828, Jun. 2009.

33. S. K. Lujara, Development of e-Learning Content and Delivery for Self Learning Environment : Case of Selected Rural Secondary Schools in Tanzania, Blekinge I. Sweden: Division of Technoscience Studies,Blekinge Institute o Technology, 2008, pp. 1–126.

34. R. D. Kumar, "The Ambit of Student Support Centre : Case Study of the University of the South Pacific," in Symbiosis InternationalInternational Conference on Open & Distance Learning, 2011, p. 144.

35. M. Glenn, "The future of higher education : How technology will shape learning," Econ. Intell. Unit, 2008.

36. H. Eldeghaidy and a Nouby, "Effectiveness of a blended e-learning cooperative approach in an Egyptian teacher education programme," Comput. Educ., vol. 51, no. 3, pp. 988–1006, Nov. 2008.

37. R. Siaciwena and F. Lubinda, "The Role of Open and Distance Learning in the Implementation of the Right to Education in Zambia," Int. Rev. Res. Open Distance Learn., vol. 9, no. 1, pp. 1–12, 2008.

38. CISCO, "Cisco Validated Design for the Remote Expert," 2013.

39. N. Fleming, "How Do I Learn Best?," VARK -a guide to learning style, 2011. [Online]. Available: http://www.vark-learn.com. [Accessed: 23-Nov-2011].

40. M. Roccetti, P. Salomoni, and M. E. Bonfigli, "A Design for a Simulation-based Multimedia Learning Environment," Simulation, vol. 76, no. 4, pp. 214–221, Apr. 2001.

41. R. E. Mayer and R. Moreno, "Nine Ways to Reduce Cognitive Load in Multimedia Learning," Educ. Psychol., vol. 38, no. 1, pp. 43–52, Mar. 2003.

42. J. S. Lowe, "A Theory of Effective Computer-Based Instruction for Adults," Hum. Resour. Dev. Rev., vol. 4, no. 2, pp. 159–188, Jun. 2005.

43. Chitra, M. I. J. Nazir, and M. Mubeen, "A Study on Virtual Reality : An Application for Psychiatric," in Manipal Conference on Technology Management, 2009, pp. 138–148.

44. R. E. Mayer and R. B. Anderson, "The instructive animation: Helping students build connections between words and pictures in multimedia learning.," J. Educ. Psychol., vol. 84, no. 4, pp. 444–452, 1992.

45. PennState, "Problem-Based Learning," PennState University, 2010. [Online]. Available: http://www.personal.psu.edu/glh10/ist110/topic/topic67/topic67_05.html. [Accessed: 10-Mar-2013].

46. Barrows and Tamblyn, "Problem-Based Learning: An approach to medical education," Springer Publ. Co., p. 18, 1980.

47. S. Jasola and M. Kaushik, "A Low Cost Interactive Webcasting System for Open and Distance Learning Institutions," Commonw. Educ. Media Cent. Asia, vol. 14, no. 2, 2008.

48. J. Bersin, "The Four Stages of E-learning : A maturity model for online corporate training," Bersin Assoc., pp. 1–56, 2005.

49. K. Aoki, "Distance Learning Programs and Schools in Japan: From Correspondence Learning to E-Learning," World Conf. E-Learning Corp. Gov. Heal. High. Educ., vol. 1, 2006.

50. Gokhale, "Collaborative Learning Enhances Critical Thinking," J. Technol. Educ. Vol., vol. 7, no. 1, pp. 22–30, 1995.

51. D. Kimber, "Collaborative Learning in Management Education: Issues, benefits, problems and solutions: A literature review," in Australian and New Zealand Academy of Management, 1994, pp. 1–14.

52. Y. Wang, "Are We Ready ? A Case Study of Technology-enhanced, Collaborative Language Learning," in Proceedings of the World Congress on Engineering and Computer Science 2007, 2007, pp. 1–5.

53. T. S. Roberts, Computer-Supported Collaborative Learning in Higher Education. London: IDEA GROUP PUBLISHING, 2005, p. 339.

54. M. I. J. Nazir, F. Begam, and R. V Pujeri, "Collaborative Learning Technologies : An Effective Learning Environment for the Outcome Based Learning Process," in National Conference on Advanced Computer Networking (NCACN 2011), 2011, p. 35.

55. H. Tarawneh, M. Tarawneh, and F. Alzboun, "Enhancing the Quality of E-learning Systems via Multimedia Learning Tools," IJCSI Int. J. Comput. Sci. Issues, vol. 8, no. 6, pp. 107–111, 2011.

56. D. Tapscott, "Educating the Net Generation.," Educ. Leadersh., vol. 56, no. 5, pp. 6–11, 1999.

57. R. Dunn and N. Missere, "Learning in Vogue : Elements of Style," Dunn and Dunn Learning Styles, 2007.

58. J. McElvaney and Z. Berge, "Weaving a Personal Web: Using online technologies to create customized, connected, and dynamic learning environments," Can. J. Learn. Technol., vol. 35, no. 2, 2009.

59. F. Alonso, G. López, D. Manrique, and J. M. Viñes, "Learning objects, learning objectives and learning design," Innov. Educ. Teach. Int., vol. 45, no. 4, pp. 389–400, Nov. 2008.

60. Doherty and P. Cooper, "Capacity Building for Sustainable eLearning Development," Fourth Int. Conf. eLearning Knowledge-Based Soc., vol. 15, no. SP3, pp. 5.1–5.6, 2007.

61. S. Glogoff, "Instructional blogging: Promoting interactivity, student-centered learning, and peer input," Innov. J. Online Educ., no. 1, pp. 2002–2005, 2005.

62. S. Han, B. Kim, S.-K. Wang, and K. Bhattacharya, "Web-Based Collaborative Learning Environment : Theoretical and Practical Discourse," pp. 138–143, 1999.

63. S. J. H. Yang, J. Zhang, A. Y. S. Su, and J. J. P. Tsai, "A collaborative multimedia annotation tool for enhancing knowledge sharing in CSCL," Interact. Learn. Environ., vol. 19, no. 1, pp. 45–62, Jan. 2011.

64. K. Agariya and D. Singh, "e-Learning quality : Scale development and validation in Indian context," Knowl. Manag. E-Learning An Int. J., vol. 4, no. 4, pp. 500–517, 1999.

65. Álvarez and L. Cuesta, "Designing for online interaction : Scaffolded and collaborative interventions in a graduate-level blended course," in Proceedings of the EUROCALL 2011 Conference, 2011, vol. 20, pp. 5–12.

66. L.. Glenn, C.. Jones, and J. E. Hoyt, "The Effect of Interaction Levels on Student Performance: A Comparative Analysis of Web-Mediated versus Traditional Delivery," J. Interact. Learn. Res., vol. 14, no. 3, pp. 285–299, 2003.

67. E. C. Boling, M. Hough, H. Krinsky, H. Saleem, and M. Stevens, "Cutting the distance in distance education: Perspectives on what promotes positive, online learning experiences," Internet High. Educ., vol. 15, no. 2, pp. 118–126, Mar. 2012.

68. Swan, "Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses," Distance Educ., vol. 22, no. 2, pp. 306–331, Jan. 2001.

69. Swan, Peter Shea, Eric Fredericksen, "Building Knowledge Building Communities: Consistency, Contact and Communication in the Virtual Classroom," J. Educ. Comput. Res., vol. 23, no. 4, pp. 359–383, Feb. 2001.

70. J. Nazir, A. H. Rizvi, and R. V Pujeri, "Does Multimedia Based Instructional and Evaluation Process Improve the Performance of Undergraduate University Students in Skill Based Courses ? : A Case Study," in 10th International Postgraduate Research Conference (IPGRC 2011), 2011, pp. 451–462.

71. S. Palmer, "an Evaluation of on-Line Assignment Submission, Marking, and Return," J. Educ. Technol. Syst., vol. 34, no. 1, pp. 57–67, Feb. 2005.

72. Buzzetto-more, "Student Perceptions of Various E-Learning Components," Interdiscip. J. E-Learning Learn. Objects, vol. 4, pp. 113–135., 2009.

73. V. Mook, J. Bion, C. P. M. Van Der, and L. Schuwirth, "Integrating education, training and assessment : competency-based intensive care medicine training," Netherlands J. Crit. Care, vol. 15, no. 4, pp. 192–198, 2011.

74. P. Santiago, G. Donaldson, A. Looney, and D. Nusche, "OECD Reviews of Evaluation and Assessment in Education: Portugal 2012," OECD Publishing, 2012.

75. IBSA, "VET workforce skills in language, literacy and numeracy," 2010.

76. G. M. J. Fastré, M. R. van der Klink, and J. J. G. van Merriënboer, "The effects of performance-based assessment criteria on student performance and self-assessment skills," Adv Heal. Sci Educ Theory Pr., vol. 15, no. 4, pp. 517–532, 2010.

77. Albanese, G. Mejicano, W. M. Anderson, and L. Gruppen, "Building a competency-based curriculum: the agony and the ecstasy," Adv. Heal. Sci. Educ., vol. 15, no. 3, pp. 439–454, 2010.

78. UTAS, "Guidelines for good assessment practice," Centre for the Advancement of Learning and Teaching, University of Tasmania., Tasmania., 2011.

79. CMU, "Why & Hows of Assesments," Eberly Center for Teaching Excellence, Carnegie Mellon University, 2013. [Online]. Available:

 http://www.cmu.edu/teaching/assessment/howto/basics/objectives.html. [Accessed: 20-Feb-2013].

80. B. S. Bloom, Handbook on Formative and Summative Evaluation of Student Learning. New York: McGraw-Hill Book Company, 1971, pp. 1–3.

81. C. Smith, "Evaluating the quality of work-integrated learning curricula: a comprehensive framework," High. Educ. Res. Dev., vol. 31, no. 2, pp. 247–262, Apr. 2012.

82. Vekkaila, "Doctoral students' key learning experiences in the natural sciences," Int. J. Res. Dev., vol. 3, no. 2, pp. 154–183, 2012.

83. M. Meyers, D. D. Nulty, B. N. Cooke, and J. F. Rigby, "Developing a learning environment that encourages deep learning outcomes," Proc. Aust. Conf. Sci. Math. Educ. (formerly UniServe Sci. Conf., vol. 9, pp. 2–7, 2012.

84. R. Uwameiye, "Effect of Reciprocal Peer Tutoring on the Academic Achievement of Students in Introductory Technology," vol. 3, no. 6, pp. 41–47, 2006.

85. M. R. Weaver, "Do students value feedback? Student perceptions of tutors' written responses," Assess. Eval. High. Educ., vol. 31, no. 3, pp. 379–394, Jun. 2006.

86. D. Wiliam, "What is assessment for learning?," Stud. Educ. Eval., vol. 37, no. 1, pp. 3–14, Mar. 2011.

87. M. Farajollahi, H. Najafi, K. N. Heshi, H. Mansoori, and M. S. Fatemi, "Developing an Evaluation Model for E-Learning in Higher- Education : A Case Study of Payame Noor University," J. Educ. Pract., vol. 4, no. 5, pp. 1–9, 2013.

88. P.-A. J. Hsieh and V. Cho, "Comparing e-Learning tools' success: The case of instructor–student interactive vs. self-paced tools," Comput. Educ., vol. 57, no. 3, pp. 2025–2038, Nov. 2011.

89. F. Elgamal, H. A. Abas, and E.-S. M. Baladoh, "An interactive e-learning system for improving web programming skills," Educ. Inf. Technol., vol. 18, no. 1, pp. 29–46, Sep. 2011.

90. Moodle, "Moodle Tracking," Moodle community, 2013. [Online]. Available: http://tracker.moodle.org/browse/MDL-16466. [Accessed: 20-Mar-2013].

91. M. Puzziferro, "Online Technologies Self-Efficacy and Self-Regulated Learning as Predictors of Final Grade and Satisfaction in College-Level Online Courses," Am. J. Distance Educ., vol. 22, no. 2, pp. 72–89, May 2008.

92. Song, E. S. Singleton, J. R. Hill, and M. H. Koh, "Improving online learning: Student perceptions of useful and challenging characteristics," Internet High. Educ., vol. 7, no. 1, pp. 59–70, Jan. 2004.

93. J. H. Han and A. Finkelstein, "Understanding the effects of professors' pedagogical development with Clicker Assessment and Feedback technologies and the impact on students' engagement and learning in higher education," Comput. Educ., vol. 65, pp. 64–76, Jul. 2013.

94. D. Major, D. Meakin, and D. Perrin, "Building the capacity of higher education to deliver programmes of work-based learning," High. Educ. Ski. Work. Learn., vol. 1, no. 2, pp. 118–127, 2011.

95. N. Jackson, "Recognising a more complete education through a Lifewide Learning Award," High. Educ. Ski. Work. Learn., vol. 1, no. 3, pp. 247–261, 2011.

96. J. Wang, "Opportunity to Learn: The Impacts and Policy Implications," Educ. Eval. Policy Anal., vol. 20, no. 3, pp. 137–156, Jan. 1998.

97. R. J. White and A. E. Green, "Opening up or Closing down Opportunities?: The Role of Social Networks and Attachment to Place in Informing Young Peoples' Attitudes and Access to Training and Employment," Urban Stud., vol. 48, no. 1, pp. 41–60, May 2010.

98. S. Yardley, P. W. Teunissen, and T. Dornan, "Experiential learning: AMEE Guide No. 63.," Med. Teach., vol. 34, no. 2, pp. e102–15, Jan. 2012.

99. B. S. P. Teoh and T.-K. Neo, "Innovative teaching: Using multimedia to engage students in interactive learning in higher education," IEEE Xplore, pp. 329– 337, 2006.

100. Barron, "Learning How to Learn : Carnegie ' s Third Apprenticeship," 2011.

101. CISCO, "Cisco Networking Academy - Cisco Systems Cisco Networking Academy," Cisco Systems, 2013. [Online]. Available: http://www.cisco.com/web/learning/netacad/index.html. [Accessed: 07-Apr-2013].

102. Google, "Use Sites to manage your class," 2013. [Online]. Available: http://edutraining.googleapps.com/Training-Home/module-5-sites/chapter-7/3-1.

103. IBM, "SPSS Document," IBM Corporation, 2011. [Online]. Available:

http://publib.boulder.ibm.com/infocenter/spssstat/v20r0m0/index.jsp?topic=/com.ibm.spss.statistics.help/idh_reli.htm. [Accessed: 20-Feb-2013].