Promoting Prospective Teachers' Constructive Investigation Skill using Activity Based Learning

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Abstract

This study demonstrates the effects of Activity Based Learning (ABL) on the development of constructive investigation skill of 182 prospective teachers' while teaching the "Curriculum Development" course at a Teacher Education Institution in Pakistan. The study shows a real-life activity improves the participants' constructive investigation skill which promotes their deep learning of the course contents and makes the teaching-learning more interactive, effective, rewarding, and enjoyable.

Key words: Constructive Investigation Skill; Learner Centered Teaching; Activity Based Learning; Teacher Education

Introduction

Learning is a social process (Dewey, 1938) in which learners construct their knowledge representations in a form of mental models (Johnson-Laird, 1983). Learning becomes more effective, and meaningful when learners' involvement, participation and interaction are maximized (Fallows & Ahmet, 1999) through various activities (Jonassen & Churchill, 2004) that allow learners to experience procedural, operational, and sensational aspects of learning (Suydam, Marilyn, & Higgins, 1977). Such "hands-on experiences" transform learners' understanding into their personal knowledge that can be applied in other situations (Edward, 2001).

The commentators of constructive learning theory advocate that learning is a participatory process in which learners construct the meaning of learning object (s) /concept (s) using their sensory input and the prior knowledge (Dewey, 1916; Jonassen & Churchill, 2004). However, Piaget (1983) comments that discovery which aims to augment knowledge,

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resolve doubt, or solve a problem is the

Piaget's comments about discovery, constructive investigation involves inquiry, knowledge building, and perseverance. It allows learners to integrate experiential learning with academic learning. It takes into account learners' previous knowledge and socio-cultural context and purposely engages them in a step-by-step exploration of new ideas, understandings, and mental growth through intellectual and real-life activities which promote their deep learning, problem solving, higher-order thinking, and reasoning skills.

Activity based learning (ABL) has emerged as 'Learning by doing' approach among the academic community. In place of teaching concepts, principles and procedures to promote declarative or procedural knowledge, as "constructivist" learning theory suggests (Hein, 1991), the ABL approach urges learners to construct mental models (Norman, 1983 & Mayer, 1989) through active participation. Learners' active, collaborative, and self-directed participation keep them motivated (Hake, 1998) towards contextualizing their learning (Hull, 1999). It makes learning more pragmatic; enabling learners to solve complex, ill-structured and authentic

basis of learning. Taking into account the

problems (Mayer, 1989) and improves learners' power of knowledge retention (McKeachie, 1998).

In the ABL approach, students get involved actively in the learning process (Prince, 2004) and become autonomous learners (Imtiaz & Asif, 2012). They use a variety of learning styles, like learning by doing, learning from mistakes, learning from honest and non-threatening feedback (Solomon, 2003). Teachers become 'delegator' who not only appreciate the students' autonomous and independent learning, but also facilitate them through encouraging, motivating, tutoring, providing resources without dominating the classroom or intimidating the learners (Frank, Lavy & Elata, 2003). These new roles improve students' engagement in teaching-learning process; hence, improve their deep learning and significant outcomes (Yam & Rossini, 2010).

Constructive investigation skill has an important role in an academic environment. It directly influences students' knowledge, skills, beliefs, and attitudes as learning is a social process (Ladd, 2005). Good constructive investigation skill is also critical to promote deep learning. Therefore, the

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development of prospective teachers' constructive investigation skill is very very useful for strengthening students' constructive investigation skill. In Pakistan, teaching of constructive investigation skill has never been a part of teacher education curriculum. This study is aimed to explore the potential of the ABL approach for promoting prospective teachers' constructive investigation skill while teaching the "Curriculum Development" course at a Teacher Education Institution in Pakistan.

Constructive Investigation

Commentators of constructive learning theory advocate that learning is a participatory process in which learners construct the meaning of learning object (s) /concept (s) using their sensory input and the prior knowledge (Dewey, 1916; Dewey, 1938). Whereas, the theory of "social constructivism" (Vygotsky, 1978) places more emphasis on social-cultural context. Knowles, et al. (1998) argue that the learning process becomes more effective when a learner knows that "how learning will be conducted; what learning will occur; and why learning is important" (p. 133). However, Piaget (1983) believes that discovery which aims to augment knowledge, resolve doubt, or solve a

crucial. Activity Based Learning can be

problem is the basis of learning. He has further argued that discovery leads to understanding. Understanding is built up step-by-step through active involvement; learners have to go through stages and discover ideas, build relationships, and construct their mental models (Piaget, 1983). Bruner's discovery learning theory advocates that the learner uses his or her own past experience and existing knowledge to discover new facts and relationships through interacting with the world, exploring and manipulating objects, confronting with questions and controversies, or performing experiments.

Based on Piaget's (1983) ideas of discovery and understanding and Bruner's discovery learning theory, this study has put forward the term "constructive investigation" to represent individual's learning in a collaborative environment through "constructive interaction" (Miyake, 1986)[1]. The study considers that

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[1] Miyake(1986) coined the term "constructive interaction" to describe the way in which people developed their conceptual understanding of a sewing machine through successive iteration of understanding and non-understanding.

the constructive investigation is a process as well as a skill. As a process it follows

defined as "an active process that takes into account learners' previous knowledge and socio-cultural context and purposely engages them in a step-by-step exploration of new ideas, understandings, and mental growth through intellectual and real-life activities which promotes deep learning, problem solving, higher-order thinking, and reasoning skills." As a skill, it follows the theory of constructive interaction and can be defined as learners' ability to construct their mental models through step-by-step exploration (successive iteration of understanding and non-understanding) of new ideas, understandings, and mental growth. The key object of constructive investigation is to make learners more responsible, initiator, thoughtful, collaborative, and capable to integrate experiential learning with academic learning. These objectives can be achieved from various goal-oriented activities suggested in literature, like:

- participating in constructive interaction for share ideas, reflections, and experiences (Baker, 1999);

Piaget's learning theory and can be

- participating in group discussions for collaborative construction of knowledge (Hmelo-Silver, 2003);
- investigating micro and macro factors affecting knowledge creation process (LAM, 2014);
- practicing problem-solving and higher-order thinking skills (Carson, 2007);
- participating in collaborative and cooperative learning sessions to develop the relationship between semantic, episodic and action knowledge (Barkley, Cross, & Major, 2005);
- sharing ideas and asking of questions to develop logical and conceptual meanings of abstract ideas/concepts (Reinhart, 2000);
- constructing conceptual models and reusing in different environments and activities. (Krajcik and Merritt, 2012).

Constructive investigation skill can have an important role in an academic environment. Good constructive investigation skill can promote students' deep learning and influences their knowledge, skills, beliefs, and attitudes as

learning is a social process (Ladd, 2005). Therefore, the development of prospective teachers' constructive investigation skill is a better position to explore and implement creative ideas.

Activity Based Learning

Philosophy of ABL can be traced back to late 20th Century when John Dewey started a university laboratory school at the University of Chicago. In this school, Dewey conducted various experiments to reform ways of teaching in schools for making students active participants and creative. Dewey advocates that human exposures to life must be considered during the educational planning (Dewey, 1938). His initiative inspired many educationists who believed traditional teaching methods make students passive learners, as a result, learners could not associate new concepts with previously acquired learning (Teo & Wong, 2000). Consequently, many non-traditional methods of teaching emerged like Activity Based Learning (Prince, 2004 and Lijanporn & Khlaisang, 2015), Problem-Based Learning (Edens, 2000 and Tana, Van der Molenb and Schmidt, 2016), Project Based Learning (Diehl, et. al., 1999 and Lasauskiene & Rauduvaite, 2015), Collaborative Learning (Bruffee,

very crucial. Teachers with strong constructive investigation skill would be in

1993), Case-Based Learning (Barnes et. al., 1994 and Kantar & Massouh, 2015), Individual and Collaborative Game-based Learning (Ching-Huei Chen, V. L., 2016), Team-based Learning (Tweddell, Clark, & Nelson, 2016), Inquiry Based Learning (Suduc, Bizoi & Gorghiu, 2015).

In literature, a great variety of ABL research activities have been reported from different domains. These studies have demonstrated ABL makes teaching-learning processes more productive, interesting and understandable. For example, a study carried out on 2319 students from six mixed secondary schools in Ekiti State, Borode Bolaji. R. (2014) revealed that ABL used for essay writing appeared to be more effective on the attitude of students than lecture method. Hung, Jonassen and Liu (2008) argued that ABL has enhanced students' abilities to apply basic science knowledge in real-life, professional or personal situations. Similar findings are reported in studies from other domains like, teaching of elementary mathematics (Suydam & Higgins, 1977), teaching of physics class (Hake, 1998), teaching of commerce (Singh & Shilpi, 2012) teaching of medical education

30

(Barrows and Tamblyn, 1980), teaching of physics at Secondary level (Hussain, et al. , 2011), teaching of basic and clinical concepts (Thornton, 2001), teaching of research methods (Fallon, et. al., 2013), ABL in a vocational institution (Choo , 2007), and in higher education (Hmelo-Silver, 2004).

The ABL approach has also been practiced for developing higher order thinking skills (Polanco et al., 2004), improving long-term retention (Norman & Schmidt,1992), enhancing students' information management skills (Kaufman & Mann, 1996), handling complex situations (Martin et al., 1999), developing thinking and problem-solving skills (Gallagher et al.,1992), developing students' habits of reflection keeping (Karuna & Vinita, 2014), enhancing students' confidence and judging alternatives for solving problems (Dean,1999), improving self-directed learning, higher level thinking, and interpersonal skills (Schmidt et al., 2006), and teaching how to learn through different activities and real-life problems (Boud & Feletti, 1999).

Yet, some studies do not ready to accept the claims associated with ABL (Lieux, 2001; Colliver, 2000; Berkson,

sciences (Dochy et. al., 2003), teaching of biomedical (Shelton and Smith, 1998), learning and understanding of scientific 1993; Eisensteadt et al., 1990; Zumbach et al., 2004; and Gallagher & Stepien, 1996). In fact, the effectiveness of ABL depends on many factors. Singh & Shilpi (2012) found a significant relationship between students' learning style and teachers' teaching style. Ladsen-Billings (1994) suggests that culturally relevant activities in teaching empower students socially, emotionally, intellectually, and politically. Thomas (2000) recommends that ABL activities should be interdisciplinary, curriculum based/related, student-centered, multi-stage and make the learners' learning experiences more conceptual, sociable, and rewarding. Edward (2001) suggests that learning activities based on real life experiences allow students to strengthen their personal knowledge base for handling real life scenarios. Chickering & Gamson (1987) have advised that students must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves.

1. **Methodology**

This descriptive study is carried out in two consecutive academic sessions (Fall

2009 & Fall 2010 at a teacher training institution, Lahore, Pakistan to achieve the following objectives:

2. constructive investigation skill of the prospective teachers.

3. To examine the effective of real life activities on strengthening constructive

1. To explore the potential of the ABL approach for promoting the

investigation skill of the prospective teacher.

Using convenience sampling technique, 182 students, 34 male and 148 female, enrolled in "Curriculum Development" course of M. A. Education degree program was selected for this study. The gender distribution of the participants is shown in Table 1.

Table 1: Gender Distribution of the Prospective Teachers		
Session	Male (34)	Female (148)
Fall-2009-2011 (2 classes)	9	41
	11	39
Fall-2010-2012 (2 classes)	9	43
	5	25
Total	182	

During the study, the researcher taught the "Curriculum Development" course to the participants. The objects of the study were addressed through performing a real life learning activity, "Sowing, Growing and Harvesting Potato Crop", aiming to invoke cognitive processes such as perception, knowledge construction, computational thinking, decision making, and retention. The aim of this real life activity was to make it possible to bring together the ideas, interests and characteristics of the participants with the knowledge, skill, and experience of the researcher in a friendly environment. Detailed instructions were given to the students before the starting of activity. The participants were urged and encouraged to co-relate their field experiences with the contents of Curriculum Development course; further details are given in the Theoretical Framework Section. Duration of the selected activity was one semester, 18

30

weeks including the midterm and final term examinations. All of the sub-activities were monitored and evaluated. A questionnaire was designed to obtain feedback from the participants to characterize their behavior during the execution of the activity and to characterize their attitude towards the development of their constructive investigation skill. The statements designed to characterize the participants' behaviour towards the activity addresses the following five areas:

1. participation in the fieldwork, group discussions, individual and group presentations
2. asking questions if find difficulties in understanding course concepts;
3. getting help of the instructor or peers for co-relating course contents with various stages of the activity
4. attitude towards individual/group assignments;
5. opinion about activities

The statements designed to characterize the participants' attitude towards the development of their constructive investigation skill cover following nine areas:

1. Co-relating field experiences with academic concepts (knowledge).

2. Searching information to understand academic concepts (knowledge).
3. Cognitive load management (differentiating and filtering important information).
4. Understand of concepts across multiple disciplines.
5. Inquiry and computational thinking (understand a vast amount of information and abstract concepts).
6. Social intelligence (sensing and responding to others during social interaction).
7. Sense making and flexible thinking (using experiences to understand the meaning or significance of what is being experienced).
8. Conversation & Collaboration skills.
9. Engagement in activities.

The responses to the questions' statements were collected on five point Likert scale (Oppenheim, 1966): Strongly Agree (SA), Agree (A), Not Sure (NS), Disagree (D), and Strongly Disagree (SD). The collected data was organized, tabulated and analyzed using percentage values.

4. Theoretical Framework

In the light of researcher's previous experiences, the course of "Curriculum Development" remain a 'dry' subject

causing very passive participation of students; causing hindrances to develop their deep learning of the course contents. understandings, and mental growth through intellectual and real-life activities which promotes deep learning, problem solving, higher-order thinking, and reasoning skills. Biggs (1996) has advocated for teaching-learning activities and assessment tasks that directly address the learning outcomes intended in a way not typically achieved in traditional lectures, tutorial classes and examinations. Therefore, it was decided to adopt the ABL approach for making teaching-learning process more interactive, interesting, effective and creative.

The selection of an activity that could make students fully engaged, motivated, imaginative, and creative was an important task. As pure academic presentations, group assignments, and class discussions were found less effective, it was decided to select a real-life activity which (i) matches with students' socio-cultural background, (ii) challenges students' constructive investigation skill, (iii) provides a friendly environment for students' independent learning and socialization, and (iv) must be safe, interesting, relevant, engaging, and provide a sense of belonging.

In parallel, constructive investigation purposely engages students in a step-by-step exploration of new ideas,

As the majority of the students were with an agricultural background, it was decided to engage students in a multistage activity -"Sowing, Growing and Harvesting Potato Crop". The selected multi-stage real life activity was having many sub-activities which could be co-related with the contents of the course. For example, searching for basic information about the potato crop could be correlated with gaining understanding of the basic concepts and definitions of various terms of curriculum development. Similarly, the role of university gardeners would be co-related with the role of curriculum development experts and professionals. Selection and preparation of the land for cultivation can be co-related with the selection of aims, objectives, contents, text books, etc. It is important to point out that the key object of the selected activity was not to teach how to grow potato crop, rather to engage the participants in such a constructive interaction which encourage them to co-relate their learning/fieldwork experiences with the course contents.

To know how well this new approach would be working, the Kirkpatrick evaluation model (Forsyth et

31

al., 1999) was adopted. The model offers four evaluating levels: at Level 1, learners' feelings and opinions about the activity is evaluated; at Level 2, changes in knowledge, attitudes, and skills are evaluated; at Level 3, application of knowledge is measured; and level 4 measures changes in the organization. In addition, the researcher has used her observations as a tool for collecting information (Kawulich, 2005) about prospective teachers' level of participation. These observations also helped the researcher to implement the Kirkpatrick evaluation model for evaluating effectiveness of the activity.

5. Findings

In addition to the researcher's observation, a feedback was obtained through a research questionnaire which was having two question parts. The participants' responses to the statements characterizing their behavior towards the activity are shown in Table 1.

Table 1 The participants' responses to the statements characterizing their behavior towards the activity

S.No	Statement	SA	A	NS	D	SD
1	To participate in the fieldwork, group discussions, individual and group presentations was very useful	11%	67%	2%	13%	7%
2	During the activity, I tried to get help from my instructor whenever I did not understand new information, experiences, and ideas related to the activity.	9%	62%	0%	21%	8%
3	Getting help of the instructor or peers in co-relating the course contents with various stages of the activity was very useful	65%	35%	0%	0%	0%
4	The activity related individual/group assignments were very useful for sharing of information, experiences, ideas, and course related information with peers	23%	48%	2%	18%	9%
5	The activities were very interesting, rewarding,	100	0%	0%	0%	0%

	and a useful experience.	%				

The participants' responses to the statements characterizing their attitude towards the development of constructive investigation skill are shown in Table 2.

Table 2. The participants' responses to the statements characterizing their attitude towards the development constructive investigation skill

S. No	Statement	SA	A	NS	D	SD
1	Co-relating various tasks of the activity with the course contents was very challenging.	24%	74%	0%	2%	0%
2	Constructive investigation skill has improved my reading habit to look-up further information for understanding the course contents.	12%	75%	0%	11%	2%
3	Constructive investigation skill has improved my cognitive load management ability for differentiating and filtering important information.	8%	70%	2%	12%	8%
4	Constructive investigation skill has improved my ability to understand concepts across multiple disciplines.	6%	64%	7%	13%	10%
5	Constructive investigation skill has developed my inquiry and computational thinking ability to understand a vast amount of information and abstract concepts.	4%	64%	7%	18%	7%
6	Activity based learning has strengthened my social intelligence to sense and respond to others during social interaction.	12%	58%	5%	18%	7%
7	Constructive investigation skill was useful for sense making, flexible thinking and the ability to use my experiences to understand the meaning or significance of what is being experienced.	12%	46%	4%	24%	14%
8	Activity based learning was very useful for improving my conversation & collaboration skills.	10%	73%	0%	13%	4%

9	My engagement in various tasks of the activity increased my interest towards my course commitments.	20%	78%	0%	2%	0%

The study response was significantly encouraging. Between 71% and 100% of students answered positively to the statements characterizing their behavior towards the activity:

1. 78% (11% SA & 67% A) of the participants found it very useful to participate in the activity, group discussions, individual and group presentations;

2. 71% of the participants (with a response rate of 9% SA & 62% A) responded that it was very useful to ask a question to the instructor when they didn't understand new information, experiences, and ideas related to the activity;

3. 100% of the participants (with a response rate of 65% SA & 35% A) said that it was very useful getting help of the instructor or peers in co-relating the course contents with various stages of the activity;

4. 71% of the participants responded (with a response rate of 23% SA & 48% A) that the activity related assignments were very useful for understanding course concepts;

5. 100% the participants ((with a response rate of 100% SA) had the opinion that the activities were interesting, rewarding, and a useful experience.

Similarly, from 58% to 98% of the participants have answered positively to the statements characterizing their attitude towards the development of constructive investigation skill:

1. 98% of the participants (with a response rate of 24% SA & 74% A) find it challenging to co-relate the activity related sub-tasks with course contents.

2. 87% of the participants (with a response rate of 12% SA & 75% A) responded that the constructive investigation skill has improved their reading habit to look-up further information to understand the course contents during the activity.

3. 78% of the participants (with a response rate of 8% SA & 70% A)

34

responded that the constructive investigating skill has improved their cognitive load management ability for differentiating and filtering important information.

5. ability to understand concepts across multiple disciplines.

6. 68% of the participants (with a response rate of 4% SA & 64% A) responded that the constructive investigation skill has developed their inquiry and computational thinking ability to understand a vast amount of information and abstract concepts.

7. 70% of the participants (with a response rate of 12% SA & 58% A) responded that the activity based learning has strengthened their social intelligence to sense and respond to others during social interaction.

8. 58% of the participants (with a response rate of 12% SA & 46% A) responded that the constructive investigation skill was useful for sense making, flexible thinking and the ability to use their experiences to understand the meaning or significance of what is being experienced.

9. 83% of the participants (with a response rate of 10% SA & 73% A) responded that the activity based learning was very useful for improving

4. 70% of the participants (with a response rate of 6% SA & 64% A) responded that the constructive investigation skill has improved their

their conversation & collaboration skills.

10. 98% of the participants (with a response rate of 20% SA & 78% A) responded that their engagement in activities increases their interest towards their course commitments.

6. Discussion and Reflections

The findings of this study are evident from the participants' comments written in their activity journal which they maintained during the activity; for example, one participant commented; "Now I understand how education can act as an element of social change. I wish other teachers should also take this type of initiative to educate us". Another participant commented, "Rote learning not only killed my creativity, but also shattered my confidence. This course has changed my life. I will use activity based learning when joins teaching profession." Another student said, "Madam, now I realized why constructive investigation is so important. If we do not know how to

35

develop a concept we cannot understand what we are reading." Another participant commented, "This course has not only taught me concepts related to curriculum

Although 98% of participants find it challenging to co-relate activities with the course contents, but they felt comfortable with the activity and found various opportunities for:

- Experiencing through observing, comparing, feeling, listening, talking, discussing, imagining, investigating, reporting,
- Memorizing through different modes of perception, finding regularities and patterns, connecting new experiences with previous knowledge,
- Understanding through, planning, predicting, judging, evaluating, interpreting, explaining, and applying knowledge and constructing their own knowledge constructs
- Socializing through developing a happy relationship between participants to participants and the instructor to participants.

These opportunities promoted the participants' constructive investigation skill through building up their habit of

development, but also make me conscious about my constructive investigation skill which will help me in the rest of my life."

exploring new concepts, co-relating learning experiences with academic concepts, sharing information with peers. At the same time, these opportunities made them more curious, more active, more social, more tolerant, more sympathetic, and more caring towards each other. It also made them more serious towards their course assignments.

During the activity and assessing the participants' work, it was found that the ABL approach appeared to be very useful for enhancing prospective teachers' knowledge of the course. The researcher also found that the participants showed more responsible, disciplined, and serious attitude towards studying the "Curriculum Development" course. They developed new learning habits, including analytical reading, creative thinking, discriminating and filtering information of importance. They have also realized the importance of active participation, collaborative learning, cooperative learning, and knowledge sharing in a learning environment. They also improved their discipline, project

management, team management, leadership, interpersonal, presentation, and communication skills.

During the activity, the majority of the participants remained excited. Except each other. They left no stone unturned to make their efforts successful. Managing discipline remained a challenge for the researcher during the outdoor activities. Keeping students motivated was another challenging area. Sometimes, stereotype teachers and students pass negative and harsh comments like, "you are growing curriculum; I've never seen doing this silly thing anywhere before". Such comments sometimes made students disappointed. However, these kinds of the participants' comments clearly reflect the effectiveness of the ABL approach: "Similar to Potato cultivation activity, Curriculum Development was a new course for me. From this activity, I have learnt that like potato plants, curriculum is a living thing which requires proper planning, execution strategy, and teachers committed. I have learnt that the students who took proper care of their plants got a lot of potatoes; whereas, the students who were irresponsible got nothing or less potatoes. Similarly, I can say that those teachers

some occasions, they demonstrated patience, tolerance, caring, collaboration, interaction, and sharing attitude towards

who planned and performed every action in time to get the required learning outcome, whereas those teachers who show irresponsible attitude ruin their students' future. 'Inshallah', in my teaching career, I will take care of each student as a farmer takes care of each plant." Another participant commented, "I am surprised; no one has told us about constructive investigation skill. I use to remember notes for reproducing in the examination. This activity has changed my concepts of education. Now I have learnt that constructive investigation skill is very important for developing deep understanding of the course."

This study finding supports the idea that real life activity based learning improves students' active participation which leads to improve their constructive investigation skills. The ABL approach worked on both aspects; constructive investigation as a process, and constructive investigation as a skill. As a process, it takes into account learners' previous

37

knowledge and socio-cultural context and purposely engages them in a step-by-step exploration of new ideas, understandings, and mental growth through a real-life activity which have promoted their deep learning of the course contents. As a skill,

step-by-step. In turn, they co-relate new learning experiences with the academic concepts. They further enhanced their deep learning through sharing information and querying the peers and the teacher. It made them more curious, more active, more social, more tolerant, more sympathetic, and more caring towards each other.

The study also found that the following aspects directly influenced the students' constructive investigation skill:

1. Attitude towards co-relating field experiences with course contents.
2. Reading habit to look up further information to understand the course contents during the activity.
3. Ability of cognitive load management for differentiating and filtering important information.
4. Ability to understand concepts across multiple disciplines.

it encourages the participants' ability to construct their mental models through step-by-step exploration of the multi-stages of the activity. The study has found that the students strengthen their deep learning through exploring new concepts

5. Inquiry and computational thinking ability to understand a vast amount of information and abstract concepts.
6. Social intelligence to sense and respond to others during social interaction.
7. Sense making, flexible thinking and the ability to use of experiences to understand the meaning or significance of what is being experienced.
8. Conversation & collaboration skills.
9. Engagement in the activity.

The ABL approach has also offers very useful learning experiences. As an instructor of the course, the researcher found it challenging to maintain students' motivation and discipline. The negative remarks and discouraging comments of other teachers and fellow students made the participants de-motivated. Sometimes, participants shown a negative attitude when they find difficulty in developing the relationship between activity experiences and course contents. Developing

38

innovative and creative ideas to promote participants' knowledge, skills, and competence were time consuming and difficult. In parallel, lack of encouragement from other colleagues and the administration made the researcher disappointed, de-motivated, and depressed. But, during the activity, the researcher

course execution, the researcher felt more liberal, responsible, and conscientious. The role of facilitator and participant of open discussion sessions promoted the researcher's professional confidence and conceptual understanding of subject knowledge. Towards the end of this section, the study concludes that the encouraging results justify to driving a logical conclusion that the ABL approach is very effective to promote the participants' constructive investigation skill.

In spite of the above mentioned benefits, the ABL approach introduces additional workload on instructors such as additional preparation and assessment, extra time for activity monitoring and evaluation, extra sessions for guidance and counseling. These aspects may discourage teachers to adopt the ABL approach, particularly in situations where the teachers work load is calculated considering the number of courses to be

found three important motivating factors: (i) participants' continuous interaction with the instructor and peers, (ii) an active participation of the instructor in both outdoor and indoor activities, and (iii) a continuous feedback and encouragement from the instructor. Also, during the

taught. To promote the ABL approach, the administration of academic institutions has to reconsider the teachers' workload calculation policy.

7. Recommendations

Real life activities which take into account learners' previous knowledge and socio-cultural context and purposely engage learners in a step-by-step exploration of new ideas, understandings, and mental growth promote their deep learning, problem solving, higher-order thinking, and reasoning skills. Step-by-step exploration of new ideas improves learners' ability to construct mental models; hence promotes their understanding. It also makes them more responsible, initiator, thoughtful and sociable. We believe these aspects are very critical for their professional and social development. In countries like Pakistan, teaching community need to address the

39

teaching of construction investigation skill to build a strong knowledge base for

making teaching-learning process more interactive and rewarding.

References

Baker, M. J.(1999).Argumentation and Constructive Interaction. In G. Rijlaarsdam & E. Espéret (Series

Argumentative Text Processing,179-202. Amsterdam: University of Amsterdam Press. Retrieved from http://ses-perso.telecom-paristech.fr/baker/publications/ArticlesBakerPDF/1999/1999a.pdf

Barnes, L. B., Christensen, C. R. , & Hansen, A. (1994). *Teaching and the Case Method*. (3rd Ed.), Boston: Harvard Business School Press.

Berkson, L. (1993). Problem-Based Learning: Have the Expectations Been Met? *Academic Medicine*, 68(Suppl.), 79–88.

Boud, D. and Feletti, G. (1999). *The Challenge of Problem-Based Learning*, (2nd Ed.), London, Kogan Page.

Barkley, E. F., Cross, K. P., & Major, C. H. (2005). *Collaborative learning techniques.* San Francisco, CA: Jossey-Bass.

Eds.) & Pierre Coirier and Jerry Andriessen (Vol. Eds.) *Studies in Writing*: Vol.5. Foundations of

Barrows H.S. & Tamblyn R.M. (1980). *Problem-Based Learning: An Approach to Medical Education*. New York: Springer Publishing Company, p.1 Retrieve from http://apps.fischlerschool.nova.edu/toolbox/instructionalproducts/edd8124/fall11/1980-BarrowsTamblyn-PBL.pdf

Borode B. R. (2014). Effects of Lecture and Activity Based Methods on the Attitudes of Junior Secondary School Students To Essay Writing In French. *European Journal of Educational Studies*, 6(1), 43-49. Retrieved from http://ozelacademy.com/ejes.v6.i1-5.pdf

Biggs, J. 1996. Enhancing Teaching through Constructive Alignment. *Higher Education*, 32, 1-18. Retrieved from http://link.springer.com/article/10.1007/BF00138871#page-1

Bruffee, K. A. (1993). Collaborative Learning: Higher Education, Interdependence & Authority of Knowledge. Baltimore: The Johns Hopkins University Press.

Carson, J. (2007). A Problem with Problem Solving: Teaching Thinking Without Teaching Knowledge. *The Mathematics Educator*, 17(2), 7-14. Retrieved

3-7. Retrieved from http://files.eric.ed.gov/fulltext/ED2 82491.pdf

Ching-Huei Chen, V. L. (2016). Scaffolding individual and collaborative game-based learning in learning performance and intrinsic motivation. *Computers in Human Behavior,* 55(B) 1201-1212. doi:10.1016/j.chb.2015.03.010

Choo, C. B. (2007). Activity based Approach to Authentic Learning in a Vocational Institute. *Educational Media International* , 44(3), 185-205. doi: 10.1080/09523980701491633

Colliver, J. A. (2000). Effectiveness of Problem-Based Learning Curricula: Research and Theory.

from http://files.eric.ed.gov/fulltext/EJ84 1561.pdf

Chickering, A. W. & Gamson, Z. F. (1987). Seven Principles for Good Practice in Undergraduate Education. *AAHE Bulletin*, March,

*Academic Medicine,*75(3) 259–266. PMID: 10724315

Dean, C. D. (1999). Problem-Based Learning in Teacher Education. Paper presented at the Annual Meeting of *American Educational Research Association*, April 19–23, Montreal, Quebec (ERIC Document Reproduction Service No. ED 431 771).

Dochy, F., Segers, M., van den Bossche, P., & Gijbels, D. (2003). Effects of Problem-Based Learning: A Meta-Analysis. *Learn. Instruct*., 13, 533–568. doi: 10.3102/00346543075001027

Dewey, J. (1916). *Democracy and Education*, The Free Press, New York. Retrieved from https://www.gutenberg.org/files/85 2/852-h/852-h.htm

Dewey, J. (1938). *Experience and Education*. Toronto: Collier-MacMillan Canada Ltd. Retrieved from http://ruby.fgcu.edu/courses/ndemers/colloquium/experienceducationdewey.pdf

Dewey, J. (1897) My Pedagogic Creed, Declaration Concerning Education. . *The school journal*, LIV(3) 77-80.

Edens, M.E. (2000). Preparing Problem Solvers for the 21st Century through Problem-Based Learning. *College Teaching*. 48 (2), 55-60. DOI: 10.1080/87567550009595813

Edward, N. S. (2001). Evaluation of a Constructivist Approach to Student Induction in Relation to Students' Learning Style. *European Journal of Engineering Education*, Vol. 26(4) 429-440. DOI: 10.1080/03043790127518

Eisenstaedt, R. S., Barry, W.E. & Glanz, K. (1990). Problem Based Learning: Cognitive Retention and Cohort Traits of Randomly Selected Participants and Decliners. *Academic Medicine*, 65 (Supp): S11. PMID: 2400484

Retrieved from https://pwpresearch.wikispaces.com/file/view/Dewey.pdf

Diehl, W., Grobe, T., Lopez, H., & Cabral, C. (1999). *Project-Based Learning: A Strategy for Teaching and Learning*. Boston, MA: Center for Youth Development and Education, Corporation for Business, Work, and Learning.

Fallows, S., & Ahmet, K. (Eds.) (1999). *Inspiring Students: Case studies in motivating the learner*. Kogan Page/Staff and Education Development Association, London.

Fallon, E., Walsh, S., & Prendergast, T.(2013). An Activity-based Approach to the Learning and Teaching of Research Methods: Measuring Student Engagement and Learning, *Irish Journal of Academic Practice*, 2(1), Article 2. Retrieved from http://arrow.dit.ie/cgi/viewcontent.cgi?article=1019&context=ijap

Forsyth, I., Jolliffe, A., & Stevens D. (1999). *Evaluating a Course – Practical Strategies for Teachers, Lecturers and Trainers*. London: Kogan Page.

Frank, M., Lavy, I., & Elata, D. (2003). Implementing the Project-Based Learning Approach in an Academic Engineering Course. *International Journal of Technology and Design Education, 13,* 273-288. Retrieved from http://link.springer.com/article/10.1023%2FA%3A1026192113732#page-1

Gallagher, S. A. & Stepien, W. J. (1996). Content Acquisition in Problem-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses. *American Journal of Physics,* 66, 64-74. Retrieved from http://www.physics.indiana.edu/~sdi/ajpv3i.pdf

Hmelo-Silver, C. E. (2004). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, 16, 235–266. Retrieved from http://link.springer.com/article/10.1023%2FB%3AEDPR.0000034022.16470.f3#page-1

Hein, G. (1991). *Constructivist Learning Theory*. Retrieved from http://www.exploratorium. edu/IFI /resources /constructivistlearning.html.

Based Learning: Depth versus Breadth in American Studies. *J. Educ. Gifted*, 19(3) 257–275. doi: 10.1177/016235329601900302

Gallagher, S. A., Stepien, W. J., and Rosenthal, H. (1992). The Effects of Problem-Based Learning on Problem Solving. *Gifted Child Quarterly*, 36, 195-200. doi: 10.1177/001698629203600405

Hake, H. (1998). Interactive-Engagement vs. Traditional Methods: A Six-

Hmelo-Silver, C. E. (2003). Analyzing collaborative knowledge construction: multiple methods for integrated understanding. Computers & Education 41 (2003) 397–420. Retrieved from https://associatie.kuleuven.be/altus/ seminaries/1011/seminarie7/CORD TRA.pdf

Hussain, S., Anwar, S. & Majoka, M. I. (2011). Effect of Peer Group Activity-Based Learning on Students' Academic Achievement in Physics at Secondary Level. *International Journal of Academic Research*, 3(1) 940-944.

Hung, W., Jonassen, D.H., & Liu, R. (2008). Problem-based Learning. In D.H. Jonassen (Ed.), *Handbook of Research on Educational*

43

Communications and Technology (3rd Ed.). Mahwah,N.J., Lawrence Erlbaum Associates.

Hull, D. (1999). *Teaching Science Contextually*. Retrieved from: http://www.cord.org/uploadedfiles/ Teaching_ Science_ Contextually.pdf.

Imtiaz, S. & Asif, S. I (2012). "I almost learnt to learn": Promoting Learner's Autonomy through Project Based Learning in Access Classrooms, Language in India,

Johnson-Laird, P.N. (1983). *Mental Models: Towards a Cognitive Science of Language, Inference, and Consciousness*. Cambridge: Cambridge University Press.

Karuna, G. & Vinita, D. (2014). Developing Reflection through Activity Based Learning . *Inter. J. Edu. Res. Technol.* 5(2).

Kaufman, D. M. & Mann, K. V. (1996). Students' Perceptions about Their Courses in Problem-Based Learning and Conventional Curricula. *Acad. Med*., 71(1) S52-4. PMID: 8546783

Kantar, L. D. & Massouh, A. (2015). Case-Based Learning: What

Strength for Today and Bright Hope for Tomorrow*, 12(1) 24-45. Retrieved from http://www.languageinindia.com/ja n2012/sanaimtiazpblfinal.pdf

Jonassen, D. H. & Churchill, D. (2004). Is there a Learning Orientation in Learning Objects? *International Journal on E-Learning*, 3(1) 32–41.

Traditional Curricula Fail to Teach, *Nurse Education Today,* 35(8) e8-e14 doi: 10.1016/j.nedt.2015.03.010.

Kawulich, Barbara B. (2005). Participant Observation as a Data Collection Method. *Forum: Qualitative Social Research*, 6(2), Art. 43. Retrieved from http://www.qualitative-research.net/index.php/fqs/article/v iew/466/996

Knowles, M. S, Holton, E. F. and Swanson, R. A. (1998). *The Adult Learner* (5th Ed.) Gulf, Texas.

Krajcik, J. and Merritt, J. (2012). Engaging Students in Scientific Practices: What does constructing and revising models look like in

44

the science classroom? Retrieved from http://www.nsta.org/docs/ngss/201 203_Framework-KrajcikAndMerritt.pdf

Ladd, G.W. (2005). *Children's Peer Relations and Social Competence: A Century of Progress*. New Haven, CT: Yale University Press.

Ladson-Billings, G. (1994). *The Dream Keepers*. San Francisco: Jossey-Bass Publishing Co.

LAM, L. M. C. (2014). *A micro-macro sense-making model for knowledge*

Allen, pp. 223–235. Sterling, VA: Stylus Publishing.

Lijanporn, S. & Khlaisang, J. (2015). The Development of an Activity-based Learning Model Using Educational Mobile Application to Enhance Discipline of Elementary School Students. *Procedia - Social and Behavioral Sciences*, 174, 1707-1712.

Martin, A., Linfoot, K., & Stephenson, J. (1999). How Teachers Respond to Concerns about Misbehaviour in Their Classroom. *Psychology in the Schools*, 36, 347-358. DOI: 10.1002/(SICI)1520-6807(199907)36:4

creation and utilization in healthcare organizations. Ph. D Thesis, Department of Information Studies, The Aberystwyth University, UK. Retrieved from http://cadair.aber.ac.uk/dspace/bitstream/handle/2160/28155/Lam_L_vol1.pdf?sequence=2

Lieux, E. M. (2001). A Skeptic's Look at PBL. In *The Power of Problem-Based Learning: A Practical, How To Teaching Undergraduate Courses in any Discipline*, edited by B. Duch, S. E. Groh, & D. E.

Mayer, R. E. (1989). Models for Understanding. *Review of Educational Research*, 59(1) 43-64. doi: 10.3102/00346543059001043

McKeachie, W.J. (1998). *Teaching Tips: Strategies, Research and Theory for College and University Teachers*. Houghton-Mifflin.

Miyake, N. (1986). Constructive interaction and the iterative process of understanding. *Cognitive Science*, 10, 151–177. DOI: 10.1207/s15516709cog1002_2

Norman, D. A. (1983). Some Observation on Mental Models. In Gentner, D., & Stevens, A.L. (Eds.), *Mental*

Models, (pp.7-14), Hillsdale, NJ: Lawrence Erlbaum.

Oppenheim, A. N. (1966). *Questionnaire Design and Attitude Measurement*. London: Heinemann.

Piaget, J. (1983). Piaget's Theory in P. Mussen (ed.), *Handbook of Child Psychology*, Vol. 1, 4th ed., New York: Wiley.

Prince, M. (2004). Does Active Learning Work? A Review of the Research, *Journal of Engineering Education*, pp. 223-231. Retrieved from http://www4.ncsu.edu/unity/locker

Reinhart, S. C.(2000). Never Say Anything ; A Kid Can Say. *Mathematics Teaching in The Middle School* , 5(8), 478-481. Retrieved from http://www.eastside.k12.ca.us/pages_inc/Never_say_anything_a_kid_can_say.pdf

Schmidt, H. G., Vermeulen, L., & van der Molen, H. T. (2006). Long-Term Effects of Problem-Based Learning: A Comparison of Competencies Acquired by Graduates of a Problem-Based and a Conventional Medical School. *Med. Educ*., 40(6) 562–567.

Suydam, M. N. & Higgins, J. L. (1977). *Activity-Based Learning in*

s/users/f/felder/public/Papers/Prince_AL.pdf

Polanco, R., Calderon, P., and Delgado, F. (2004). Effects of a problem-based learning program on engineering students' academic achievements in a Mexican university. *Innov. Educ. Teaching Int.*, 41(2), 145–155. **DOI:**10.1080/1470329042000208675

Elementary School Mathematics: Recommendations from Research. Information Reference Center (ERIC/IRC), The Ohio State University, 1200 Chambers Rd., 3rd Floor, Columbus, Ohio 43212.

Singh, A. K. & Shilpi (2012). Activity Based Learning in Commerce Education: An Empirical Analysis of Preferred Learning Styles and Instruction Approach. *Indian Journal of Commerce*, 65(2), pp 225-238. Retrieved from http://poseidon01.ssrn.com/delivery.php?ID=9500720660000310040190130120990640000490820290210280280861251270811020820 97

10400711305210303503902100104610606812511701300710904908309301300010710110600400408508912300901901411101110309002009409712612702008107003006909908300100608808707608310309107100 3&EXT=pdf

Shelton, J. B. & Smith, R. F. (1998). Problem-Based Learning in Analytical Science Undergraduate Teaching. *Research in Science and Technological Education*, 16 (1) 19-29. **DOI:**10.1080/0263514980160102

Solomon, G. (2003). Project-based Learning: A Primer. *Technology and Learning,23* (6) 20-26.

Learning Contribute to Students' Professional Identity, Development? *Teaching and Teacher Education*, 54, 54–64. doi:10.1016/j.tate.2015.11.009

Thomas, J. W. (2000). A Review of Research on Project Based Learning. Retrieved from http://www.bobpearlman.org/BestPractices/PBL_Research.pdf.

Teo, R. & Wong, A. (2000). Does Problem Based Learning Create A Better Student: A Refelection? Paper presented at the *2nd Asia Pacific Conference on Problem –Based*

Retrieved from http://webpages.charter.net/jklock/pbl.htm

Suduc, A., Bizoi, M. & Gorghiu, G. (2015). Inquiry Based Science Learning in Primary Education. *Procedia - Social and Behavioral Sciences,* 205, 474-479. doi:10.1016/j.sbspro.2015.09.044

Tana, C. P., Van der Molenb, H. T. & Schmidt, H. G. (2016). To What Extent Does Problem-Based

Learning: Education Across Disciplines, December 4-7, 2000, Singapore.

Thornton. K. R. (2001). *Teaching Physics Concepts with Activity-based Learning*, University of Wisconsin-Madison. Retrieved from http://www.wcer.wisc.edu/archive/cl1/ilt/extra/download/solution/thorntonr.pdf

Tweddell, S., Clark, D. & Nelson, M. (2016). Team-based learning in pharmacy: The faculty experience,
47

Currents in Pharmacy Teaching and Learning, 8(1) 7-17. Retrieved from https://www.escholar.manchester.ac.uk/api/datastream?publicationPid=uk-ac-man-scw:226812&datastreamId=FULL-TEXT.PDF

Vygotsky, L. S. (1978). *Mind in Society*, Harvard University Press, Cambridge. Retrieved from http://www.cles.mlc.edu.tw/~cerntcu/099-curriculum/Edu_Psy/EP_03_New.pdf

Technology in Childhood Education Annual (2004), 25-37. Retrieved from https://www.sbg.ac.at/mediaresearc

Yam, L. H. S. & Rossini, P. (2010). Implementing a Project-Based Learning Approach in an Introductory Property Course, *16th Pacific Rim Real Estate Society Conference*, Wellington, New Zealand. Retrieved from http://www.prres.net/papers/Yam_Implementing_a_Project-Based_Learning_Approach_in_an_Introductory_Property_Course.pdf

Zumbach, J., Kumpf, D. & Koch, S. (2004). Using Multimedia to Enhance Problem-Based Learning in Elementary School. *Information* h/zumbach/download/1999_2006/journals/Zumbach_Kumpf.pdf on 21 Jan., 2016.