The Problem-Based Learning Approach towards Developing Soft Skills: A Systematic Review

Sadia Deep
COMSATS University Islamabad (Vehari Campus), sadiadeep@gmail.com

Ali Ahmed
COMSATS University Islamabad(Vehari Campus), Aliahmad@ciitvehari.edu.pk

Nazia Suleman
COMSATS University Islamabad(Vehari Campus), naziasuleman@ciitvehari.edu.pk

Muhammad Zahid Abbas
COMSATS University Islamabad (Vehari Campus), zahidabbas@ciitvehari.edu.pk

Uzma Naza
COMSATS University Islamabad(Vehari Campus), uzma-nazar@ciitvehari.edu.pk

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Abstract

In this paper, we review systematically the role of problem-based learning (PBL) in developing soft skills in Technical and Vocational Education and Training (TVET) and other fields of studies. The Systematic Literature Review (SLR) includes the most recent empirical, review, and conceptual studies from TVET and other multiple fields of studies including medicine, humanities, and engineering between the years of 2001 and 2016 collected from four databases. A qualitative method was used to accomplish the systematic review. After the collection of articles, the selected studies were analyzed through thematic analysis. From this review, we concluded that PBL as an instructional approach has a significant role in the development of soft skills among students of various disciplines including TVET; empirical evidence is predominantly conclusive in identifying the acquisitions of various soft skills including communication skills, conflict resolution skills, leadership skills, and interpersonal skills, and finally, several factors might influence the relationship of PBL and soft skills such as duration and process of PBL instruction, role of facilitator, and awareness and training of learners. Moreover, there are fewer number of empirical studies on the role and effects of PBL approach to developing soft skills in TVET.

Keywords

Problem-Based Learning, Soft Skills, Innovative Approaches; Systematic Literature Review, Skills Development, TVET

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Authors

Sadia Deep, Ali Ahmed, Nazia Suleman, Muhammad Zahid Abbas, Uzma Naza, Hina Shaheen, and Abdul Razzaq

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Sadia Deep, Ali Ahmed, Nazia Suleman, Muhammad Zahid Abbas, Uzma Nazar, and Hina Shaheen Abdul Razzaq
COMSATS University Islamabad (Vehari Campus), Pakistan

In this paper, we review systematically the role of problem-based learning (PBL) in developing soft skills in Technical and Vocational Education and Training (TVET) and other fields of studies. The Systematic Literature Review (SLR) includes the most recent empirical, review, and conceptual studies from TVET and other multiple fields of studies including medicine, humanities, and engineering between the years of 2001 and 2016 collected from four databases. A qualitative method was used to accomplish the systematic review. After the collection of articles, the selected studies were analyzed through thematic analysis. From this review, we concluded that PBL as an instructional approach has a significant role in the development of soft skills among students of various disciplines including TVET; empirical evidence is predominantly conclusive in identifying the acquisitions of various soft skills including communication skills, conflict resolution skills, leadership skills, and interpersonal skills, and finally, several factors might influence the relationship of PBL and soft skills such as duration and process of PBL instruction, role of facilitator, and awareness and training of learners. Moreover, there are fewer number of empirical studies on the role and effects of PBL approach to developing soft skills in TVET. Keywords: Problem-Based Learning, Soft Skills, Innovative Approaches; Systematic Literature Review, Skills Development, TVET

Lecture methods or teacher-centered methods are used especially in universities of smaller cities in Pakistan. The result of this is graduates who are unfit for demands of today's competitive market (Aslam, 2011; Kakepoto et al., 2012). Acknowledging the diverse learning styles of students, it is pertinent to note that transmitting information, fostering the ability to collaborate with others, engaging in active problem-solving, and thinking critically is not ensured by the teacher-centered approaches such as traditional lecture-based approaches (Strobel & Van Barneveld, 2009). According to a study by Holtzhausen (2001), soft skills such as teamwork, communication skills, conflict resolution, and leadership skills were supposed to have more importance than the hard skills gained from a good degree qualification. The question, however, arises about how the key soft skills could be developed or sharpened among the students who will be the prospective employees at the workplace (Holtzhausen, 2001).

This systematic literature review (SLR) was therefore, conducted to learn the outcomes and effects of a student-centered instructional approach on the attainment of soft skills of the students and if the outcomes were found productive and fruitful, then to apply the same student-centered approach on future graduates in Pakistan.

Soft Skills

This introduction of advanced student-centered methods is implemented because employers in Pakistan as well as around the world demand that graduates, especially graduates

of technical education, enter employment already possessing soft skills to effectively work in teams including the ability to solve problems, resolve conflicts, and communicate effectively (Deep et al., 2016a; Deep et al., 2019b; Saeed & Farooqi, 2014; Singh & Singh, 2008). Most employers rank graduates' communication skills highly on their list of required qualifications (Meijer, 1992). There are a number of definitions of the term, skill, however, the general understanding of the concept is that skill is an ability to perform a specific task. A range of personal qualities such as patience, perseverance, empathy, teamwork, and social skills are referred to as soft skills that make someone a compatible co-worker and a good employee (Carter et al., 2014).

In a broad range of jobs, soft skills are transferable across workplaces and are imperative for effective performance. This means that everyone benefits from soft skills in the organization (Adajar et al., 2017). The term used for soft skills has different names in different squares of the world but these skills refer to a number of important competencies for life and work namely communication, entrepreneurship, problem-solving, innovation, and collaboration skills that can be acquired through education and training. Through pathways between education levels and across employment sectors, they can help people better progress (Lin, 2002). In contrast to that, hard skills are usually related to professional tools or techniques and knowledge that allow us to work in a profession.

Current Instructional Approaches

Regarding teaching methods used in the technical and vocational education training, instruction is carried out through the traditional four-step method training approach (i.e., describe, demonstrate, try-out by trainee, and evaluate with feedback). In technical and vocational training, students need to acquire technical skills through hands-on-work that enables them to solve authentic problems from industry. However, students trained with this traditional approach lack some generic skills such as problem-solving, critical thinking, communication, and leadership (Mohamad & de Graaff, 2013). In order to enable solving authentic problems from industry, students need to be equipped with technical skills through practical experience in Technical and Vocational Education Training (TVET). Through this traditional approach, students are trained with technical skills while they lack essential generic skills such as communication, leadership, problem-solving, and critical thinking (Aziz et al., 2014). Efforts are being undertaken to improve the outcomes of TVET programs (Clark & Andrews, 2013), but significant research and application is still needed especially in developing countries such as a research study that was conducted in Bahrain to identify the existing employability skills gap between the industrial requirements and TVET system. Based on the results of this study, an online work-based learning (WBL) module was developed to be delivered with innovative technology. The module aimed to improve the teaching and learning strategies, develop TVET students' competencies, and meet the industrial requirements (Smith et al., 2013). Further, the representatives of the IT industry periodically question the work-readiness of university educated IT graduates. One of the research studies found that industry representatives are in fact less concerned about technical skills than soft skills needed for a team-based, customer-focused business environment. Industry tends to seek base-level technical skills and make recruitment decisions on more personal qualities, leaving detailed training to on-the-job (Cunningham & Duffy, 1996).

Problem-Based Learning

Problem-based learning (PBL) is an instructional approach to teaching used in multiple disciplines for more than 40 years and continues to gain importance due to its diverse learning

outcomes. Conducting research, integration of theory, and proactive application of knowledge and skills to develop a solution to a defined problem are some of the potential benefits which this approach, being an instructional learner-centered approach equips the learners with (Hmelo-Silver & Barrows, 2015). Dissatisfaction with the common and traditional teacher-centered teaching pedagogies actually resulted in the emergence of the problem-based learning (PBL) method in 1969 in medical education in Canada (Barrows, 1998). Although PBL was initially introduced as an alternative pathway to teaching in medical education at McMaster University Medical School, currently it has largely been adopted across the world including most of the Asian countries most notably Malaysia and Thailand in particular in various discipline areas.

Outcomes of Problem-Based Learning

PBL is a student-centered approach to active learning based on authentic and ill-structured problems that serve as a stimulus for learning (Hmelo-Silver & Barrows, 2015). The unique feature of the PBL approach is that it claims the development of essential soft skills in student/learners such as communication skills, teamwork, empathy coordination skills, presentation skills, collaboration, problem-solving skills, and most importantly conflict resolution skills, all of which prepare the learners for workplace dynamics and challenges (Ansari et al., 2015; Deep et al., 2016a; Deep et al., 2016b; Deep et al., 2019a; Deep et al., 2019b; Hande et al., 2015). Moreover, Joanna Dunlap (2005) discussed PBL and the effect of PBL upon students' self-efficacy. In problem-centered learning environments, while working on contextualized problems and authentic projects, there should be opportunities for students to practice applying their workplace skills and content knowledge.

The approach to learning is context sensitive and situated, and the process students follow replicates the commonly used systemic approach to resolving problems or meeting challenges encountered in the workplace and world at large; the problems that students work on reflect the true nature of the world, and are therefore, complex and ill-structured, and without simple, formulaic solutions; students are actively involved in the learning process from problem introduction to solution implementation and process reflection; students set learning goals and create action plans to drive learning activities; students conduct information gathering and research; students reflect on what they have learned and how they have learned; and students work collaboratively with colleagues to pool their knowledge and skills, share the results of their inquiry, engage in peer teaching, and ultimately solve the problem (Dunlap, 2005, p. 65).

Issues in PBL Implementation

It is however argued that educational practice is usually affected by poor implementation of PBL. In many cases, the implementation of PBL is not consistent with the current insights on learning. It is further argued that research should contribute towards a better understanding of why and how the concepts of collaborative, constructive, self-directed, and contextual learning work or do not work and under what circumstances in PBL implementation (Dolmans et al., 2005). A significant role is needed by the facilitator to guide, coach, and ease the struggles and anxiety of students during the early PBL tasks. In terms of time insufficiency, sufficient time is required during discussions, dealing, and completing with the tasks, meeting group members and in understanding PBL tasks itself. In order to accustom with PBL approach, students need time especially, if they are the novice learners in the active learning environment like PBL (Borhan & Yassin, 2013).

Rationale for the Study

We in academia, are trying to introduce problem-based learning as an instructional methodology at COMSATS University Islamabad (Vehari campus) in order to develop soft skills in the undergraduate students as a part of their academic skills. Since, we are in the process of introducing student-centered approaches on our campus, we intend to review the effective use of PBL in various studies including TVET. Results from this review study would help steer our direction of possibly introducing student-centered pedagogies to the higher education authorities for implementation in COMSATS university and as well as its wider implementation in other universities across the country.

Though a PBL approach is being used in TVET and other disciplines in a number of institutions around the globe, it still needs a significant ground for application in the South Asian region in general and in Pakistan in particular. The core purpose and research questions of the study are therefore, to review studies on PBL to ask:

1. What is the role of PBL in developing soft skills of TVET students and non-technical fields of students?
2. What skills might students of different academic disciplines acquire through a PBL approach?
3. What challenges and considerations might be encountered by academicians as they look into employing PBL as a teaching approach?

Context of the Research

The researchers belong to an area in Pakistan where there is much focused on traditional and teacher-centered methodologies. The concept of learning is limited and taken as whatever a teacher delivers in the class. The students have very little say or involvement in the teaching learning process due to teacher dominated methodologies. In such a scenario, we, a group of researchers working in the Humanities and Computer Science Department of COMSATS University Islamabad, Vehari campus, were inspired to bring in student-centered methodologies in the classes in order to develop myriads of soft skills in the undergraduate students apart from academic skills.

Since we are in the process of introducing student-centered approaches, we intended to explore, review, and study the effective use of PBL, a student-centered approach in various studies including TVET. Through this review, we hope to learn whether PBL and other more advanced student-centered pedagogies could be introduced in technical and non-technical fields for its multifarious outcomes, and if the findings were positive then we would be in a position to present our inspiration to the higher education authorities in Pakistan for wider implementation in the universities across the country. For the realization of this objective in mind, we worked as a team and held meetings at times to review the related literature, distributed responsibilities, and finally came up with this SLR article.

Method

A systematic literature review (SLR) is defined as an explicit, rigorous, comprehensive approach to reviewing and summarizing the current body of the published scholarly work on a specific research topic (Ramiro, 2017). This approach is different from the conventional literature review in which a narrative approach to qualitatively reviewing the literature is taken from a specific perspective. SLR features a comprehensive scope of sources, criterion-based

selection, a clear search strategy, rigorous and systematic appraisal, and a content analysis based qualitative summary (Fischer et al., 2017).

Data Collection

The inclusion and exclusion criteria for data collection are unique for each systematic review due to the specified purposes and questions. However, inclusion and exclusion criteria normally belong to one of the following categories: (a) nature of the intervention, (b) cultural and linguistic range, (c) study population, (d) time period, (e) methodological quality, and (f) outcome variables (Meline, 2006). We however, included some of the categories such as cultural and linguistic range, study population, and time period based on our study research questions. Cultural and linguistic range is usually reflected in the culture and language of the research. Meta-analyses, therefore, include studies that are reported in the English language simply because of the practical difficulty of translation of other languages (Lipsey & Wilson, 2001). Accordingly, we opted for the articles written in English language. Regarding timeframe, a longer time frame was chosen as a narrow time frame may severely limit the number of eligible studies (Meline, 2006). Features such as skills, clinical procedure or diagnosis, gender adults or children, grade level, language, disability, geographic region may be included as pertinent characteristics of the study population. Accordingly, we confined our study to intervention and skills.

Inclusion Criteria

We selected the time period for the articles from the years 2001 to 2016 as we did not find any review study conducted specifically on our inquiry in the mentioned range of time. After setting the timeline, the search was also delimited by the soft skills targeted. Since, the effects of intervention on the soft skills were one of the main targets in the research questions of the study, one of the soft skills like communication skills, critical skills, or conflict resolution skills, was set as the minimum criterion for including the article in the review; there was no limit fixed for the articles having maximum soft skills as a focus. Due to minimum literature existing on the chosen topic and research questions, there was set no criterion for the research design adopted. All types of research were decided to be included within the specified timeframe. Among the gathered articles filtered and selection criteria, we only included those articles in the review which targeted the effects and impact of the PBL approach as an intervention on developing soft skills including communication skills, leadership skills, and/or conflict resolution skills, and were found most relevant to the research questions. We did not include the articles that were focused on the impact of intervention on the acquisition and retention of academic knowledge.

Literature Search

We searched four electronic databases including Google Scholar, Web of Sciences, ERIC, and Science Direct extensively as they were easily accessible to all the research members and they mainly had the relevant literature. Accessibility of databases was the main reason for selecting the mentioned database. After the database selection, the keywords involving PBL, problem-based learning, soft skills, employability skills, generic skills, non-technical skills, and life learning skills were thoroughly searched out. The terms are interchangeably used in the literature for referring to soft skills (Daud, 2013; Othman et al., 2013; Singh & Singh., 2008).

Figure 1
Retrieval Procedure of Articles
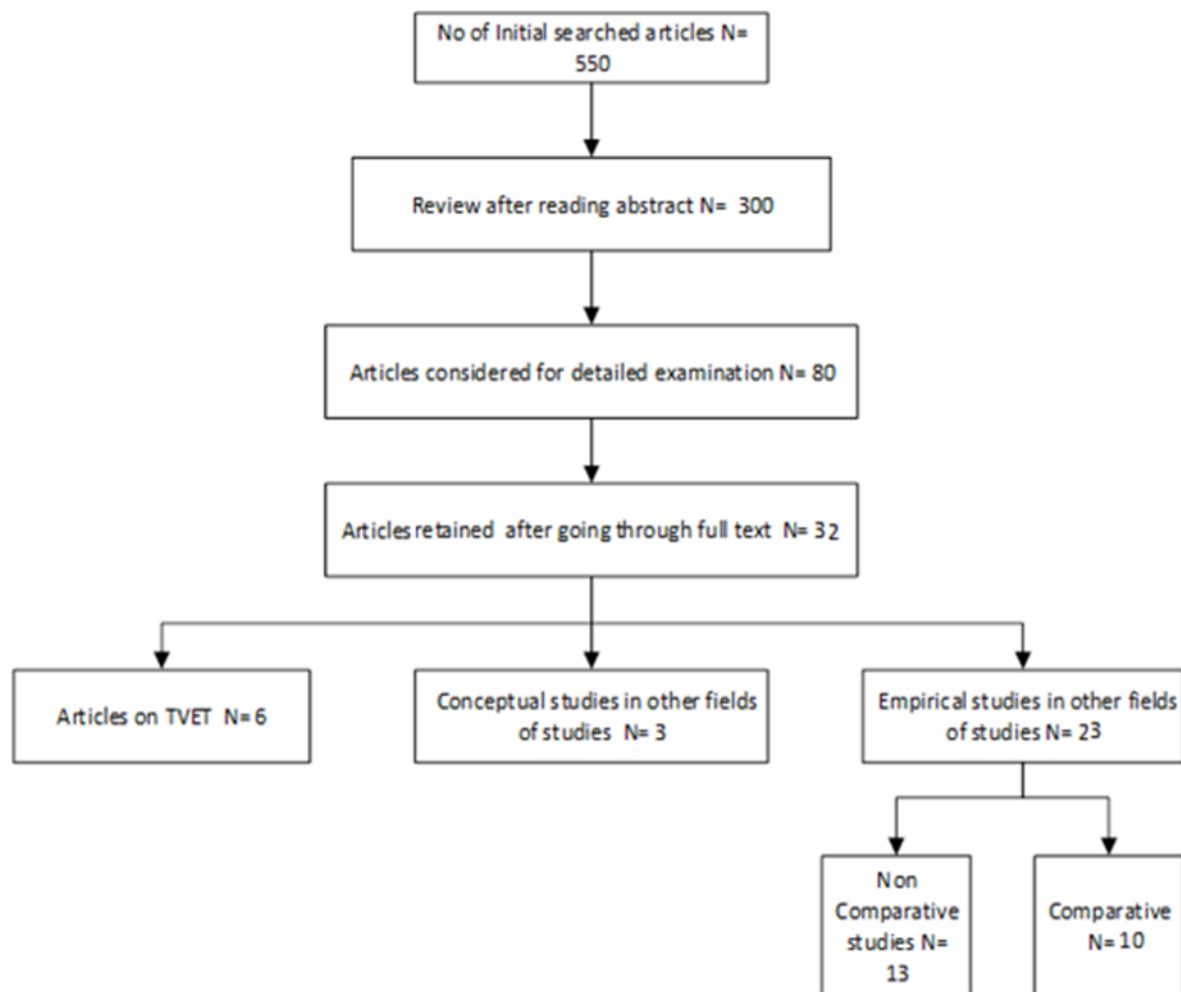
Figure 1 displays our process of conducting the search and the results of the search. To ensure the credibility of the results, we decided that any article showing a negative impact of PBL on the soft skills of students would also be included, but we found no research that had revealed a negative impact of a PBL approach on attaining soft skills of learners.

Table 1:
Description of Source of data

Data Sources	Number of Items	Percentage
Journal Articles	24	74.193
Conference Articles	5	16.129
Books/books sections	1	3.225
Web pages	0	0
Thesis	2	6.451
Total	32	100

Table 1 displays the totally different types of searched material used. Journal articles made up the major portion of the searched and selected materials as compared to fewer inclusions from conference articles, theses, and books. In order to conduct a comprehensive qualitative data synthesis, the full texts of the 32 selected papers were taken as the sample texts.

Data Arrangement

The data were gathered and arranged keeping in view the research design of articles and objectives and research questions of the study according to the types of studies. There were three different types of studies: conceptual, review, and empirical.

Conceptual studies have a focus on the concept or theory that describes the phenomenon being researched. The conceptual researcher usually with pen in hand sits at their desk and tries to solve the problems by thinking about them. There is no experiment involved but some researchers make use of observation to make sense of the data. The review studies included articles that recapitulated the current state of understanding on a topic of interest. Rather than reporting new facts or analysis, a review article reviews and sums up findings from previously published studies (Barnet, 2011; Marshall, 2007). The empirical studies, on the other hand, are based on measured and observed phenomena. The knowledge is drawn from actual experience rather than from theory or belief or deriving findings from already published work (Lauer & Asher, 1988).

Data Extraction

In conducting SLRs, data extraction is one of the critical steps. Extracting any type of data from primary studies into any form of standardized tables can be defined as the process of data extraction (Mathes et al., 2017). Further, data extraction always involves extracting much more from reports than simply the findings as without knowing the methodological context, these findings are difficult to interpret (Sandelowski et al., 2007). This practice assures the reviewers about the extraction of all relevant information in a study. The actual data extraction depends on the studies investigated and the research questions (Petticrew & Roberts, 2006).

In order to see the impact of the intervention in the given guidelines (i.e., PBL on the soft skills from our chosen sample of literature), we drew a table in Excel to guide our extraction of information from each selected piece of literature including title, year, research focus, research methods, location, sample, key findings, implications, and limitations (see Appendices 2, 3, and 4). Table 2 below shows an example of our data record keeping to address the research questions.

Table 2 presents the excel sheet drawn to arrange the data. A set of information from each study was retrieved as it could help in answering the queries of our research questions set at the beginning of the research and thus leading towards formulating findings.

The selection of the articles was validated and cross-checked through three qualitative researchers using Critical Appraisal Skills Program (CASP; Burls, 2014) as shown in Appendix 1. The CASP tools are easy to use, simple and freely available on the internet so we opted for it in order to validate the method, design, process, and result of the articles chosen for this systematic study. Three broad issues are considered when gauging a systematic review study through the appraisal tool: Are the results of the study valid? What are the results? Will the results help locally (Burls, 2014)? Some of the articles were excluded due to their study design and unpublished work through the CASP process and retained the most relevant ones Systematic Review Checklist (Akobeng, 2005).

Table 2*:*
Data in Excel Sheet

Title/ Author/ Year	Method	Skills Targeted	Findings	Country
Vocational and Technical Education problem-based learning exercise: Sample scenario (Hatısaru & Küçükturan, 2009)	Empirical research	traits	Students' interactive studies and research efforts even if it was not satisfactory, increased their interest in maths lesson	Turkey
Defining Vocational Education and Training for Tertiary Level Education: Where does Problem Based Learning Fit in? – A Literature Review (Ismail, 2013)	Review	Soft skills	New paradigm in the education system is hoped to produce students that comply with 21st-century skills requirements	UK
Development and Teaching Approaches of Technical and Vocational Education Curricula (Rau, et al., 2006)	Conceptual	Soft skills and traits	This paper proposes two concepts of curriculum design based on problem-based learning: concepts used to design and compile teaching materials, and design concepts of teaching activities. They aim at inspiring students to develop various creative abilities and skills	China
The effect of problem-based learning on enhancing students' workforce competence (Yeh, Chen, Kuo, & Chung, 2011)	Mix method (51)	Teamwork, Self-learning, Self-discipline, Leadership, Work ethics	Through PBL, the researchers identified the influence on students' workforce competence	Taiwan
How effective is the assessment of generic skills gained by technical vocational education and training (TVET) of engineering students engaged in problem-based learning (PBL)?: a literature review(Daud, 2013)	Review	Generic skills	The paper concludes that the aspects in inter TVET disciplines, different cultures, different education system policies, and globalization alongside rapid technology changes need to be given due consideration when designing the generic skills assessment	Aalborg, Denmark
The Effectiveness of Problem-based Learning Approach on Students' Skills in Technical Vocational Education and Training (TVET) Mohamad & de Graaff, 2013)	proposed	technical skills	The expected outcome of the study is to develop a general guideline for educators in Technical and Vocational Education	Malaysia

Data Synthesis and Theme Generation

Qualitative data synthesis can be used to synthesize both qualitative and quantitative studies when studies are not sufficiently similar in a systematic review for which a meta-analysis is found to be appropriate (Mays et al., 2005). In order to synthesize findings from heterogeneous studies, a thematic analysis was performed. We decided to conduct a thematic synthesis due to a range of very different studies included in this systematic review. The findings presented under themes would help us answer the questions set at the beginning of the study as the result would be tallied as themes. Thematic analysis is an approach used in primary qualitative research for identifying, analyzing, and reporting patterns (themes) across data. Thematic synthesis identifies the recurring themes from multiple studies, interprets and explains these themes, and draws conclusions in systematic reviews (Cruzes & Dyba, 2011).

First, we undertook a preliminary synthesis to derive the broad themes inductively involving searching of studies, listing, and presenting results in tabular form. In qualitative research, identifying themes is one of the most fundamental tasks for deriving findings. By themes, we mean constructs which are identified before, during, and after data collection. We outlined various techniques for discovering themes in the data including analysis of words word repetitions, and contextual key words, analysis of larger blocks of information, physical manipulation of texts using cut and sort and pawing procedures (Ryan & Bernard, 2000). After

keeping in view the core words in research questions and going through the whole data set accordingly, the data emerged into three major themes: "Role of PBL in Technical Fields," "Role of PBL in other Disciplines," and "Notable Implications for Academicians."

The broad theme 1 emerged in the data when we tried to see the use and impact of the PBL approach in the skill development under TVET. We found it in the six research studies of heterogeneous study designs. The theme was discovered through word repetition and contextual key words such as TVET, PBL approach/ instructions, effects, and impact. The data under the major theme of "Role of PBL in Technical Fields" led the researchers to code the data as sub-themed further as "Skills Development by PBL in TVET" and "Proposed Research Models into TVET" to present the findings candidly. The sub themes in theme 1 emerged when we look for the use/impact/effect and role of PBL on various soft skills generation and development in TVET and engineering domain. A couple of studies gave proposed models of PBL approach into TVET. The word repetition, hence, gave birth to this other sub-theme in theme 1.

The broad theme 2 emerged in the data when we tried to see the role and impact of PBL approach in the skill development under various other fields of studies except TVET. We discovered it in the 23 research studies of varied research design. The theme was discovered through contextual key words such as PBL approach/ instructions, effects/impact.

The inductively generated theme, "the role of PBL in other disciplines including medical, social sciences, management sciences, and humanities was further codified into sub-themes as "Impact of PBL approach on Soft Skills," "PBL versus Traditional Teaching Approaches," and "Soft Skill Acquisition through PBL" to facilitate the organized presentation of findings. The sub-theme 1 of the major theme 2 came to the fore as an enquiry to research question 1. We identified this theme further through word repetition and text manipulation techniques. The most repeated words in skills included soft skills, generic skills, employability skills, transferable skills, problem solving skills, team work, communication skills, and critical skills; while relating to the impact of PBL approach, effects, satisfaction, improvement, increased scores, and positive response were taken into account as in favor of PBL approach.

Since, many of the selected studies sought to see the outcomes of PBL as compared to the traditional teaching approaches, so it paved the way for generating this sub-theme 2 from theme 2. We identified the theme in comparative studies of "PBL versus Traditional Teaching Approaches" for skills development through word repetition including traditional /PBL/innovative approaches. Further, the words like beneficial, favor, better, more important, more satisfied, and more effective were found for exhibiting the superior method in soft skill development among students.

The sub-theme 3 from theme 2 emerged as we continued to search the data for the kinds of skills students acquired as a result of PBL application. The search was conducted through repetition of words like acquisition, generation, improvement, and development of skills of various types.

Lastly, major theme 3 came into the limelight from the studies through analysis of larger blocks of text and physical manipulation of texts and resultantly we discovered some significant implications in the selected text of studies that are noteworthy for academia. Some notable implications given in these studies are presented under the theme in the findings so that they could be covered by academicians while designing or implementing PBL in future for the effective use in soft skill development.

Validity of SLR

The authenticity of this SLR was ensured through choosing authentic and published articles. The quality of the SRL was controlled through adopting the standards for data

gathering, information extracting, analyzing, and finally reporting the evidence systematically to optimize the internal validity and minimize bias. The complexity of the findings was preserved through presenting all of the findings of one topic together optimizing the descriptive validity (Maxwell, 1992). There is no denying the fact that the whole systematic review process is an inherently judgmental and artificial one. To preserve the scientific integrity of the review, the artifice in systematic review is made as transparent as publication media permits (Sandelowski et al., 2007).

Findings

Theme 1: Role of PBL in Technical Fields

The theme includes the findings of studies revealing the significant role played by the PBL approach in a TVET domain.

Sub-theme: Skills Development by PBL in TVET

This sub-theme reveals the role of the PBL approach in developing soft skills in TVET students. The findings from studies show that a number of skills could be developed as a result of the PBL instructional approach such as problem solving, teamwork, self-learning, self-discipline, leadership, and work ethic (Yeh et al., 2011). The use of the PBL approach can improve employability skills including problem solving, interpersonal skill, life-long learning ability, and communication skill in the TVET environment (Ismail, 2013). Since students acquire the ability to master hands-on skills, and practical skills in TVET approach, there is less concern for them to acquire critical thinking and factual knowledge as compared to academic education (Ismail, 2013). After the tsunami, several policies were implemented by the government of Taiwan in order to lower the unemployment rate to respond to the global economic environment (Yeh et al., 2011). The technological and vocational education system changed significantly in Taiwan after tsunami, so a study eventually concluded that application of the PBL approach can actually enhance workforce competence (e.g., leadership, teamwork, self-discipline) of business and management students (Yeh et al., 2011). PBL instruction increased the motivation of students when used in math lessons. According to students, PBL takes into account real life examples, is a pleasurable group-based learning that encourages students to research, and it increases interest in lessons and gives them permanent knowledge (Hatısaru & Küçükturan, 2009).

Sub-theme: Proposed Research Model into TVET

This sub-theme presents the findings from studies that propose some sort of model for the effective use of the PBL approach for skill development in TVET. One of the research articles proposed an assessment model of generic skills in TVET and concludes that the PBL assessment design has to be more reliable especially in assessing generic skills from an engineering perspective. This research using an inductive approach will culminate into identification and development of measurable and reliable methods for assessing the engineering students' generic skills through a PBL approach that are crucial to the overall success of the respective Technical Vocational Education and Training (TVET) institution (Daud, 2013).

Suggesting an ideal curriculum for TVET, a study proposed that teachers should use problem-based learning as one of their teaching strategies to develop students' creativity and various abilities to meet the needs of businesses, society, and individual career development

(Rau et al., 2006). The application of the PBL approach in Vocational Education and Training environment can improve employability skills; important elements and characteristics of the approach can be used as the main backbone in designing the model with regards to Vocational Education and Training application (Mohamad & de Graaff, 2013). The new paradigm in the education system is hoped to produce students that comply with 21st century skills requirements, which is also the ultimate aim of all learning and teaching methods (Ismail, 2013).

The findings from theme 1 show that although PBL has a significant role in all the spheres of TVET including developing skills, the existing empirical research is quite inadequate. This inadequacy was exposed through searching the number of research studies carried out in the selected databases. There exist some country-specific studies, but they have mainly focused technical skills rather than non-technical in TVET. If considered as a whole, the studies undertaken argue the significant role of PBL in strategic teaching, assessment, and development of soft skill in TVET.

Theme 2: The Role of PBL in Other Disciplines

This theme presents the findings on the role of the PBL approach teaching in various disciplines including medicine, social sciences, management sciences, humanities, and material sciences through sub-themes as follows.

Sub-theme: The Impact of PBL Approach on Soft Skills

This sub-theme sought to see the effects and impact of PBL on the soft skills in various fields of study. The effects of the PBL approach were found to be positive in developing soft skills among graduates in various contexts and fields. The PBL approach enables students to recognize rational features of decision making, confront ethical difficulties, and appreciate multiple perspectives. Further, student reflections exhibit that PBL allowed the students to improve their learning during the PBL process and develop their generic skills through active participation (Agbeh, 2014; Carvalho, 2016; Font & Cebrián, 2013; Hoidn & Kärkkäinen, 2014; Razzaq & Ahsin, 2011; Zhonglei, 2004). The approach allowed them to work in teams and handle authentic problems to come up with effective problem solutions. The written responses of students suggested the acquisition of deep learning and crucial generic skills to better prepare them for future real-world experiences and challenges. It is apparent that teaching and learning through PBL improved student's generic skill which could contribute to the development of their employability skills and increase their marketability locally and abroad (Baharom, 2013; Mgangira, 2003). Focusing on real-world problems helps students appreciate multiple perspectives, recognize non-rational elements of decision making, and confront ethical uncertainties. It teaches them how to execute plans, persuade others, lead teams, resolve conflict, and communicate with multiple constituencies (Brownell & Jameson, 2004). Some of the conceptual studies seemed to be in favor of introducing PBL for skill development. A course aiming at developing generic skills in undergraduate students offered in the context of a Chinese university provided expected benefits in terms of skill development for the learners. The article will be useful in teaching innovatively through PBL in the higher education sector in China as PBL is a student-centered learning that empowers students to conduct active learning skills such as cooperation, communication, and problem solving which are valued by the employers in today's world of competition (Pratminingsih, 2009).

Sub-theme: PBL Versus Traditional Teaching Approaches

This sub-theme presents the findings from the comparative studies of PBL approach effects on skill development with that of traditional teaching approaches. A positive and greater impact of the PBL approach was found on the various skills of students as compared to traditional teaching; some of the research articles targeted one skill for comparison while others focused on multiple skills of assessment for PBL treatment (Abdul Kadir, 2013; Chan, 2013; Choi et al., 2014; Günüşen et al., 2014; Pratminingsih, 2009; Seren & Ustun, 2008; Sungur & Tekkaya, 2006; Tan et al., 2016).

One of the review studies focused on the extent to which problem-based learning could be an effective approach to develop different transferable skills for innovation. This review report aimed to highlight this issue by reviewing the current evidence in higher education teaching in the effectiveness of problem-based learning compared with more traditional approaches. Research showed that problem-based learning appears to be beneficial in fostering certain aspects of skills for innovation. Despite the promising evidence of linking problem-based learning and effective teaching in higher education to certain aspects of skills for innovation, more work is suggested in this area (Hoidn & Kärkkäinen, 2014).

Using a qualitative meta-synthesis approach, one of the review studies compared the assumptions of the meta-analytical research on the effectiveness of PBL in comparison to traditional approaches. The findings found PBL superior where it concerns skill development, long-term retention, and satisfaction of teachers and students, while traditional approaches were found more effective for short-term retention as measured by standardized board exams (Strobel & Van Barneveld, 2009).

The findings from both of these sub-themes answers research question 1 and identifies the significant role of the PBL approach in soft skill development. The result above stated studies that show that the PBL approach has a more significant role than the traditional approaches in developing soft skills of students and is found to be the preferable method of teaching by the students; it should hence, be experimented with in all fields of studies for optimized learning outcomes. The review also exhibits that the PBL approach has played a crucial part in developing a myriad of soft skills that are required for today's undergraduate and graduate learners (Baharom, 2013).

Sub-theme: Soft Skill Acquisition through PBL

A significant number of research studies show that various soft skills could be/have been acquired by the students in diverse academic fields using the PBL instructional approach and hence the findings support the second research question.

A majority of the research studies focused on types of skill acquisition as a result of PBL implementation including interpersonal skills, critical thinking, leadership, conflict resolution skills, and traits, persuasion, communication skills, self-confidence, application of acquired knowledge, ICT Skills, problem-solving, time management, leadership, creativity, motivation, critical thinking, problem-solving, leadership, conflict resolution skills, persuasion, communication skills, oral communication, writing, and team work (Agbeh, 2014; Bahri et al., 2013; Barte & Yeap, 2011; Creswell, 2013; Lasa et al., 2013; Razzaq & Ahsin, 2011; Seren & Ustun, 2008; Tan et al., 2016; Warnock, 2016). The findings from this sub-theme answers research question 2 by revealing the types of skills acquisition as a result of PBL approach implementation.

Theme 3: Notable Implications for Academicians

One of the serious concerns among students and teachers is that PBL is time-consuming with respect to teaching plans, observations in the classroom, interviews, and journals of reflection, but these implications could be covered if teachers enjoy and become satisfied with the students' learning motivation and improved learning outcomes (Hatısaru & Küçükturan, 2009; Yeh et al., 2011), yet, PBL significantly enhances the development of instructional knowledge and capability (Brownell & Jameson 2004). Research reveals an intense need that students should be provided guidance and awareness about conducting PBL. In order to use the PBL method efficiently in professional education, students should be informed about conducting research and reaching various research sources to solve the given problems. All the members of a group should be well-aware of the PBL process involved in solving a problem right from the very beginning; the real fruit of PBL cannot be obtained if this awareness is not focused (Seneviratne et al., 2001). Besides, a crucial issue was feared in a study on interpersonal conflicts within the student group and its impact on their learning (Cooper & Carver, 2012). The "motivation" of students did not change through using PBL approach contributing to insignificant results in a study while the findings showed significant results in developing problem-solving skills (Abdul Kadir, 2013). Despite the promising evidence linking effective teaching and PBL in higher education to certain aspects of skills for innovation, more work is needed to provide additional important insights into the development of skills for innovation especially in medical fields (Hoidn & Kärkkäinen, 2014).

Furthermore, PBL is more challenging for instructors. PBL requires instructors to spend much more effort on problem design/refinement, student coaching, performance evaluation, data gathering, and experience analysis when compared to a traditional instructor-centered learning approach (Brownell & Jameson, 2004; Yu & Adaikkalavan, 2016). Further, a conceptual framework could be developed through the PBL approach having both non-technical employability skills and technical skills integrated into the curriculum, ensuring that teams/groups have the clear rules and expectations and improving interaction with the tutors is found to be essential in tapping PBL's potential in order to develop transferable/soft skills (Brownell & Jameson, 2004; Yu & Adaikkalavan, 2016). Conclusions of a study highlight the importance of effectively managing PBL implementation and highlighting some areas such as improving interaction with the tutors and ensuring teams have clear rules and expectations; these factors appear to be central in tapping PBL's potential to develop transferable skills (Carvalho, 2016). However, despite its difficulties of implementation, PBL is considered to be an effective approach for skill development (Brownell & Jameson, 2004). The research question 3 is answered by the findings of this theme.

Discussion

This SLR was carried out to review the studies looking into the role of PBL approach on the development of soft skills among learners in various fields of study including TVET. Using a systemic review approach to research, the findings and conclusion of the selected 32 studies revealed that PBL approach has shown the potential to develop essential soft skills in learners while some factors and useful implications may influence this effect like the role of facilitator, students lack of awareness of the PBL approach, learning processes, and group dynamics which academia should take into account while implementing the PBL method. Moreover, scarce literature is available on the effects of the PBL approach on the soft skills in TVET. In spite of the limitation of these studies, the overall conclusion goes in favour of adopting the PBL approach as a preferable teaching option to soft skill development in

graduates as compared to other traditional teacher-centered approaches to instruction in TVET and other fields of studies.

The results of this review study contradict some meta-analyses that revealed that PBL had no significant effects on the skills of graduates (Dochy et al., 2003; Rohaeti et al., 2014). On the other hand, it affirms the findings of some of the studies that stress the potential role of PBL in skill development (Kadir et al., 2016; Tiwari et al., 2006). The findings of our study could be generalized across many regions including those in South Asia as the findings of a lot of meta-analytical studies are included.

This study has a number of practical implications for academia and educational policy makers at large who want to bring about wholesome development and diverse competencies in their graduates and not just intend to deliver to them a piece of paper for academic recognition (i.e., the degree/certificate). Firstly, all the challenges and problems associated with PBL must be taken into account when implementing PBL in their respective educational systems in order to have the productive outcomes of this teaching approach. Secondly, the teacher and facilitators and all involved in the implementation phase should be trained systematically on all the aspect or components of PBL so that the outcomes of this approach and method could be optimized. Thirdly and finally, this study triggers the need to devise the need-based educational objectives for graduates' broad outcomes that could help them in acquiring a "place of prestige" in their respective industries in the future.

Certain important limitations and directions for future research are also discussed. Majorly, the results from empirical research papers are published from 2001 to 2016 that specifically concentrated on the PBL approach and attainment of soft skill were included in the review. Secondly, the present study was restricted to only four databases and does not include unpublished work. Thirdly, in order to eliminate the personal bias, future researchers can categorize other possible databases such as the review of further unpublished databases to increase the number of studies. Fourth, this review paper only considered essential soft skills and does not include research articles that entirely focused on the academic achievement of learners instructed through PBL approach. The conclusion materialized from this review is that more systematic empirical research on the use of PBL approach and on development soft skills is necessary to increase the scope of the review and address the mentioned limitations.

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Appendix 1

Administration of CASP TOOL

Section A: Are the results of the review valid?					
S No	**Question**	**Responses**			
		Yes	**No**	**Can't tell**	**Comments**
1	Did the review address a clearly focused questions?	3			
2	Did the authors look for the right type of papers?	3			
3	Do you think all the important, relevant studies were included?	3			Some of the articles should be excluded
4	Did the review's authors do enough to assess quality of the included studies?	2		1	
5	If the results of the review have been combined, was it reasonable to do so?	2		1	research questions requirement
Section B: What are the results?					
6	What are the overall results of the review?	There is an impact of PBL on developing skills			
7	How precise are the results?	N/A			
Section B: What are the results?					
8	Can the results be applied to the local population?	3			
9	Were all important outcomes considered?	3			
10	Are the benefits worth the harms and costs?		2	1	

Appendix 2

Research Studies focusing on TVET through PBL Approach

S #	Title / Publication Author/ Year	Method / Sample	Skills and Traits Targeted	Findings	Country / Institution
1	Vocational and Technical Education problem-based learning exercise: Sample scenario (Hatısaru & Küçükturan, 2009)	Empirical research	None	Students reached the factorial concept by the help of a professional showed that students were still under the influence of teacher based approach. Students' interactive studies and research efforts even if it was not satisfactory, increased their interest in math lessons	Turkey
2	Defining Vocational Education and Training for Tertiary Level Education: Where does Problem Based Learning Fit in? – A Literature Review (Ismail, 2013)	Review	Soft skills	New paradigm in the education system is hoped to produce students that comply with 21st-century skills requirements	UK
3	Development and Teaching Approaches of Technical and Vocational Education Curricula (Rau et al., 2006)	Conceptual	Soft skills and traits	This paper proposes two concepts of curriculum design based on problem-based learning: concepts used to design and compile teaching materials, and design concepts of teaching activities. They aim at inspiring students to develop various creative abilities and skills	China
4	The effect of problem-based learning on enhancing students' workforce competence (Yeh et al., 2011)	Mix method (51)	Teamwork, Self-learning, Self-discipline, Leadership, Work ethics	Through PBL, the researchers identified the influence on students' workforce competence	Taiwan
5	How effective is the assessment of generic skills gained by technical vocational education and training (TVET) of engineering students engaged in problem-based learning (PBL)?: a literature review (Daud, 2013)	Review	Generic skills	The paper concludes that the aspects in inter TVET disciplines, different cultures, different education system policies, and globalization alongside rapid technology changes need to be given due consideration when designing the generic skills assessment	Aalborg, Denmark
6	The Effectiveness of Problem-based Learning Approach on Students' Skills (Mohamad & de Graaff, 2013).	Conceptual	Technical skills	The expected outcome of the study is to develop a general guideline for educators in Technical and Vocational Education	Malaysia

Appendix 3

Conceptual Studies focusing soft skill through PBL Approach

S #	Title / Publication Author / Year	Method / Sample	Skills and Traits Targeted	Findings	Country / Institution
1	Improving generic skills among engineering students through problem-based learning in statistics engineering course (Nopiah et al. 2009).	Assessment Program outcomes by using Problem Based Learning (PBL)	critical thinking and problem-solving	PBL can improve student interests, critical thinking and problem-solving	Malaysia
2	Problem-Based Learning in Graduate Management Education: An Integrative Model and Interdisciplinary Application (Brownell & Jameson, 2004)	Conceptual study (model)	leadership, conflict resolution, persuasion, communication skills	By focusing on real-world problems, PBL helps students appreciate multiple perspectives, recognize no rational elements of decision making, and confront ethical quandaries. Together, cognitive and affective learning underpin the essential third element: behavioural learning about how to implement plans, lead teams, resolve conflict, persuade others, and communicate with multiple constituencies. Specific examples of PBL projects illustrate this interrelationship.	New York.
3	A Problem-based learning course for fostering generic skills (Zhonglei, 2004).	Conceptual model	oral communication; writing, team work;	It will improve the much desired generic skills	University of Sydney

Appendix 4

Research Studies focusing developing soft skills in various discipline through PBL Approach

S#	Title / Publication Author/ Year	Method / Sample	Skills and Traits Targeted	Findings	Country / Institution
1	Conflict resolution skills of nursing students in Problem-based learning compared to conventional curricula (Seren & Ustun, 2008).	Survey/ 255+ 141	Conflict Resolution Skills	Scores of the students educated by PBL were significantly higher than those educated by the conventional method of education	Public universities in Istanbul and Izmir, Turkey.
2	Problem-based learning in mental health nursing: The students' experience (Cooper & Carver, 2012)	Qualitative	Interpersonal skills	The findings show that participants had mainly positive experiences and gained a range of study and interpersonal skills central to mental health nursing	Sheffield Hallam University, UK
3	The student perception of Problem-based learning in medical curriculum of the Faculty of medicine. University of Colombo (Seneviratne et al., 2001). .	Quantitative / survey	Communication skills and problem-solving skills	PBL had helped to improve communication skills and problem-solving skills	Faculty of Medicine, University of Colombo
4	PBL wrap up sessions: an approach to enhance generic skills in medical student (Razzaq & Ahsin 2011).	Survey/100	Soft skills	communication skills, presentation skills, self-confidence, application of acquired knowledge, ICT Skills improved	J Ayub Med Coll Abbottabad.
5	Problem-Based Learning: A Process for the Acquisition of Learning and Generic Skills (Baharom, 2013)	Qualitative (analysis of written responses)	Generic skills	Students reported positively in terms of acquiring various skills such as problem-solving, critical and analytical thinking, communication, teamwork, lifelong learning and self-directed learning	Department of Science and Mathematics, University Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak Malaysia
6	The impact of PBL on transferable skills development in management education (Carvalho, 2016)	Quantitative/270	Transferable skills	Results show the development of transferable skills	The University of Minho, Braga, Portugal
7	Enhancing Students' Problem-Solving Skills Using Problem- Based Learning as an Instructional Communication Approach (Abdul Kadir, 2013)	Quantitative/30	Problem-solving skills	The findings revealed that there were significant differences on students' problem-solving skills in PBL group compared to none-PBL group	University Putra Malaysia
8	Promoting Skills for Innovation in Higher Education: A Literature Review on the Effectiveness of Problem-based Learning and of Teaching Behaviours (Abiodun, 2014)	Review	Problem-solving skills for innovation	Research shows that problem-based learning appears to be beneficial in fostering certain aspects of skills for innovation as compared to traditional approaches	Paris Cedex 16
9	Problem-Based Learning as an Approach to increase students 'soft skills (Pratminingsih, 2009).	A case study	Generic skills	The study found that problem-based learning employed in Auditing class increased the students' communication, problem-solving, teamwork skills.	The University of Bandung, In Indonesia
10	Problem Based Learning Implementation in the Degree of Human Nutrition and Dietetics (Lasa et al., 2013)	Survey	Collaborative skills, ICT learning,	The used indicators show an improvement in the acquisition of specific and generic skills.	The University of the Basque Country, Faculty of Pharmacy Spain

11	The Impact of PBL Training on Legal Professions (Font & Cebrián, 2013)	Qualitative/20(10 students, 5 mentors, and 5 employees)	develop shared leadership, interpersonal and conflict resolution competencies, time management,	PBL contributed to the development of. leadership, interpersonal and conflict resolution competencies	University of Barcelona, Spain
12	From Conventional to Non-conventional Laboratory: Electrical Engineering Students' Perceptions (Bahri et al., 2013)	Qualitative/7(4 m3F students)	Develop generic skills	Communication, reporting writing, and presentation, time management	UTM Malaysia
13	First Year Agriculture Science student perception in students attribute development through Problem-based learning (Tan et al., 2016)	Qualitative Inquiry (41)	Graduates' attributes	teamwork, research, personal attributes, writing abilities, time management, problem-solving, leadership, and multidisciplinary skills	Faculty of Agriculture and Environment, School of Life and Environmental Sciences, The University of Sydney, New South Wales, Australia
14	Integrating the Development of Employability Skills into a Civil Engineering Core Subject through a Problem-based learning (Mgangira, 2003)	Mixed method study	Non-technical skills	problem-solving, communication, information management, group effectiveness and interpersonal skills through integration	UK
15	A Comparison of Problem-based learning and Traditional Education on Nursing Students' Locus of Control and Problem-Solving Skills (Günüşen et al., 2014)	Quantitative /680	Problem-Solving Skills	It was determined that the problem-based learning method was more effective in the development of problem-solving skills and internal locus of control than was the traditional method.	İzmir, Turkey
16	Exploring creativity and critical thinking in traditional and innovative problem-based learning groups (Chan, 2013)	Qualitative/100	Critical thinking, creativity	Both standard and innovative groups agreed that problem-based learning could significantly increase their critical thinking and problem-solving skills.	Hong Kong China
17	Case study: use of problem-based learning to develop students' technical and professional skills (Warnock, 2015)	Qualitative /47	Problem-solving skills, written and oral communication and self-directed learning	The results showed that students made significant improvements in their problem-solving skills, written communication, and self-directed learning. Students also demonstrated an ability to work in teams and communicate orally	Mississippi State, MS, USA
18	Effects of problem-based learning vs. traditional lecture on Korean nursing students' critical thinking, problem-solving, and self-directed learning (Choi et al., 2014)	Quantitative/90	Critical thinking, problem-solving, and self-directed learning abilities	Students in the PBL group improved across all abilities measured including self-directed learning, problem-solving skills, critical thinking	Korea
19	Effects of Problem-Based Learning and Traditional Instruction on Self-Regulated Learning (Sungur & Tekkaya , 2006)	Quantitative/61	Motivation	Results revealed that PBL students had higher levels of use of elaboration learning strategies, critical thinking, peer learning compared with control-group students.	Ankra Turkey
20	The impact of Problem-based learning on problem-solving skills and a sense of communication (Agbeh, 2014)	Qualitative /20	Critical thinking interaction and problem-solving skills	PBL had a strong impact on hospitality student problem-solving skills	USA
21	Approach in enhancing engineering graduates' employability (Barte & Yeap, 2011)	Qualitative/30	Employability skills	communication, team, critical thinking and analytical skills	Malaysia

22	When is PBL More Effective? A Meta-synthesis of Meta-analyses Comparing PBL to Conventional Classrooms (Strobel & Van Barneveld, 2009)	Meta-analysis-Review	Soft skills	Findings indicated that PBL was superior when it comes to long-term retention, skill development, and satisfaction of students and teachers, while traditional approaches were more effective for short-term retention	USA
23	Developing Soft Skills by Applying Problem-Based Learning in Software Engineering Education (Yu & Adaikkalavan, 2016)	Experimental	Soft skills	Studies find that problem-based learning is promising in engaging students and effectively delivering soft skills	USA

Author Note

Sadia Deep works in the capacity of Assistant Professor in COMSATS University Vehari campus. She has done her Ph.D. from University Tun Hussein Onn Malaysia. Her research interest lies in multi-disciplinary areas like Education, educational pedagogies, Educational Leadership, Humanities, Applied linguistics, Social sciences, etc. Correspondence regarding this article can be addressed directly to sadiadeep@gmail.com.

Dr. Ali Ahmed has been serving as an Assistant Professor at COMSATS University Vehari campus for the last ten years. He leads the department of humanities currently in the capacity of the department's head. He completed his Ph.D. from Bahauddin Zakria University Multan, Pakistan in the field of English. His research interest lies in humanities and especially linguistics key areas including lexicography, English language teaching, discourse analysis, and lexicology. Correspondence regarding this article can be addressed directly to draliahmadsaroya@gmail.com.

Nazia Suleman has been serving as an Assistant Professor at COMSATS University Vehari campus for the last ten years. Her Ph.D. is on the verge of completion from Women University Multan. Her research interest lies in multi-disciplinary areas like applied linguistics, feminism, second language learning, terminology, and terminography, etc. Correspondence regarding this article can be addressed directly to Nazia.slmn@gmail.com.

Muhammad Zahid Abbas has done his Ph.D. degree in Computer Science from UTM Malaysia. Currently, he serves as Assistant Professor at COMSATS University Islamabad, Vehari Campus. Apart from his technical research fields, His interest also lies in the issues regarding the integration of PBL into teaching methods in Computer science, etc. Correspondence regarding this article can be addressed directly to zahidmcs@gmail.com.

UZMA Nazar has been serving as a lecturer in COMSATS University Vehari campus for the last 3 years. She desires to opt for Ph.D. studies as soon as she gets a suitable opportunity. Her research interest lies in multi-disciplinary areas like applied linguistics, feminism, second language learning, etc. Correspondence regarding this article can be addressed directly to uzma-nazar@cuivehari.edu.pk.

Hina Shaheen is a lecturer at COMSATS University Vehari campus from the last five years. She holds a master's in Linguistics. She intends to pursue her Ph.D. from an institute of repute in linguistics. His research interests lie in the multidisciplinary fields of key importance like applied linguistics and humanities in general. Correspondence regarding this article can also be addressed directly to hinashaheen@cuivehari.edu.pk.

Dr. Abdul Razzaq has been serving as an Assistant professor at COMSATS University Vehari campus for the last 8 years. He has done his Ph.D. research in Islamic studies from BZU Multan. His interest also lies in the diverse issues including the implementation of advanced teaching methodologies. Correspondence regarding this article can be addressed directly to abdulrazzaq@cuivehari.edu.pk.

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