DEVELOPING PROBLEM SOLVING SKILLS FOR LIFELONG LEARNING THROUGH WORK-BASED LEARNING AMONG COMMUNITY COLLEGE STUDENTS

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ABSTRACT

Many training providers are working to improve their curricula to meet the demand of today's industries. The Malaysian College Communities, one of the major providers for lifelong learning program, had introduced the Work-Based Learning (WBL) concept since 2007 to ensure that their graduates met these demands. One of the key skills required by industry is problem solving skill. The ability to solve a complex or an ill-structured work problem in the workplace is the kind of skill demanded at a high-level performance organization. This study investigates how the students rate their problem solving skills after undergoing WBL training. The Problem Solving Rating Scale for Employee (PSRS-E) questionnaire was used as the instrument for this study. Study shows that work-based learning may facilitate in developing the problem solving skills in students. Thus, the strengthening cooperation between industries and training institutions is essential in order to benefit students, the future workers of tomorrow.

Key words: *problem solving skills, work-based learning, industrial collaboration, lifelong learning.*

INTRODUCTION

Lifelong learning is all learning activities undertaken throughout life, whether formal or informal. Learning is not confined to childhood or classroom, but extends throughout life and in ranges of situation. Lawson, Askell-Williams, and Murray-Harvey (2006), have categorized attributes of the lifelong learners into four categories: (1) attributes that focus on literacy required for different parts of life, such as the multiple literacy and communication; (2) attributes that describe processes that can be applied to many tasks in different domains, such as problem solving or planning; (3) personal qualities that contribute to the development of agency in the learner, such as self-efficacy, initiative and enterprise; and (4) interpersonal skills that can enable the learner to gain value from, and contribute value to, interaction with others engaged in the same or related tasks. The development of these attributes will enable individuals to make an effective contribution to their own personal development and to the sustainable and moral development of society and of the world, they lived.

Globalization of the marketplace, democratization of workplace decision-making, synchronous production, new technologies, and multiple roles on most jobs have change the nature of most workplaces (Mikulecky & Kirkley, 1998). This change has triggered the demand for adaptable and superior quality workforce. This workforce not only requires possessing multiple skills such as skills and knowledge in technology but also possessing good work ethics and values. Employability skills are necessary, as this will help them in relation to day-to-day job. On top of that, most employers expect and demand a 'cut and ready' type of workers who have all these prerequisite skills.

One of the key skills required by industry is problem-solving skill. Problem solving skill is a basic skill that is required by today's learners. This is especially true, as changes in the economic, organizational, and technological forces have changed the nature of most workplaces. The ability to solve a complex or an ill-structured work problem in the workplace is the kind of skill demanded at a high-level performance organization. The problem is usually not clearly defined or fully known, multiple and often-conflicting opinions exist, and there is no single, correct solution in a complex or ill-structured work problems (Lohman, 2002). Thus, the ability to solve ill-structured problems has become a critical competency for the workforce (Jonassen, 1997). Consequently, many training institutions are working to improve their curricula to meet the demand of today's industries.

One such institute is the Malaysian Community Colleges. Community colleges in Malaysia were established to provide vocational and technical skills for community school leavers before they enter the workforce, especially in rural communities. Their aim is to provide opportunity to all level of the community to upgrade their knowledge, skills and social economic status through lifelong learning programme, which is flexible and easy to access. At the moment, most community colleges award qualifications up to Level 3 in the Malaysian Qualification Framework (Certificate) in both the skills sector (Malaysian Skills Certificate) as well as the vocational and training sector. However, the

numbers of community colleges that are starting to award Level 4 qualifications (Diploma) are also increasing.

The pilot project for the establishment of these community colleges started in 2001 with 12 colleges. Currently, there are 32 college communities that offer two types of courses: short courses and full-time courses for certificate and diploma level .The courses emphasize on 75% practical skills and 25 % theory. To enhance these competitive courses, community colleges have embarked on collaboration with industries, to train students through work-based learning, starting in 2007.

In work-based learning, student will be involved in the training, through a government link company and private sectors, such as Proton Holdings, Malaysia Airlines Systems, Guthrie, Golden Hope, Telekom Malaysia Berhad, DRB-Hicom Berhad, Mesin Niaga, and Media Prima, to name a few, for a period of two semesters. Close collaboration with these companies will give community colleges the opportunity to add value to their program and enable their students to achieve a range of learning outcomes. The collaboration will also involve companies providing input to help develop course syllabus, so that the curriculum offered meet current market requirement.

Work-based learning can be defined as learning at higher educational level derived from undertaking paid or unpaid work, whereby there is a difference between "learning for work (e.g. work placements), learning at work (e.g. company in-house training programs) and learning through work, linked to formally-accredited further or higher education programmers." It represents the means through which a discipline is delivered, not the discipline to be studied (Gray, 2001). Work-based learning experiences can help a student make career decisions, network with potential employers, select courses of study, and develop job skills relevant to future employment. Through the interaction of work and study experiences, students can enhance their academic knowledge, personal development, and professional preparation (DO-IT, 2008).

PURPOSE OF STUDY

The purpose of this study is to measure students rating on their problem-solving skills after experiencing a year of work-based learning in the industry related to their programme of study. Problem-solving skills are measured by using a self-assessment and rater-based assessment developed by Lohman M.C. (2004). Specifically, the objectives for this study are:
1) to measure the level of students problem- solving skills.
2) to compare the level of the students problem-solving skills between male and female students.
3) to compare the level of problem-solving skills between the course of study.

METHODOLOGY

This is an exploratory study using the Problem Solving Rating Scale Employees (PSRS-E) questionnaire designed by Lohman (2004) to measure the students' problem-solving

skills following their work-based learning experience. The target population for this study was college community students that have undergone work-based learning experience in the industry of related field of study. In this study, a sample of 99 seventh semester students from four college communities from various field of study such as Diploma of Electrical Technology, Diploma of Hotel Catering, Diploma of Fashion and Apparel, and Diploma of Information Technology were chosen. They are the first intake students for the Diploma courses in the four College Communities who just participated work-based learning in the industries for two semesters (1 year) all over Malaysia, in related field of study.

PSRS-E is both a self-assessment and a rater-based assessment designed to measure employee-problem solving skills. Problem-solving skills are measured through the self-assessment instrument in which students rated the degree to which they engage in twenty-eight problem-solving activities. As shown in Table 1, the PSRS-E is a twenty-eight-item self-assessment that assessed employees' perceptions of the frequency with which they engage in twenty-eight activities within seven problem-solving stages when dealing with challenging work problems. The seven problem-solving stages are: (A) problem identification, (B) goal selection, (C) generation of alternative solutions, (D) consideration of consequences associated with alternative solutions, (E) approach to decision-making, (F) implementation of solutions, and (G) evaluation of solutions.

Respondents were asked to rate the degree that they are engaged to the seven stages of effective problem-solving on a five-point Liker scales, ranging from 1 to 5 (never to always), were used for all twenty-eight items. A possible score for each of the seven stages ranged from 4 to 20 points. From the possible total score, the mean score and standard deviation were calculated for each of the problem-solving stages to measure the level of skills developed, and interpreted as low when the mean score is 1.00-2.33, medium when the mean score is 2.34 – 3.66 and high when the mean score is 3.67 – 5.00. Frequency of their engagement with the activities of problem-solving stages is the measure of the level of problem-solving skills.

Table 1: Items in the Problem-Solving Rating Scale for Employees

A. Problem Identification
    1. I readily focus on important problems at work.
    2. I consider relevant factors when analyzing problems at work.
    3. *I have difficulty setting priorities about which work problems I should address.*
    4. I am able to accurately describe work problems to others.

B. Goal Selection
    1. I obtain information from others to help set goals for resolving challenging work problems.
    2. I establish appropriate goals for resolving work problems.
    3. I prioritize the goals that I have set for resolving work problems.
    4. *I do not consider how others will be affected if the goals that I set are achieved.*

C. Generation of Alternative Solutions
    1. I generate two or more possible solutions when dealing with a work problem.
    2. The possible solutions that I identify address the real causes of work problems.

3. The possible solutions that I identify reflect an understanding of underlying concepts and issues related to work problems.
4. *I tend to generate idealistic rather than realistic solutions to work problems.*

D. Consideration of Consequences Associated with Alternative Solutions
    1. I recognize positive consequences associated with possible solutions to work problems.
    2. *I tend to overlook negative consequences associated with possible solutions to work problems.*
    3. *I am not concerned about the short-term consequences associated with implementing possible solutions.*
    4. I consider the long-term consequences associated with implementing possible solutions.

E. Approach to Decision Making
    1. I select a solution only after considering all possible consequences associated with possible solutions.
    2. *I procrastinate when making decisions regarding the selection and implementation of solutions.*
    3. I take responsibility for the decisions that I make.
    4. The decisions that I make are in the best interests of those I serve and work with.

F. Implementation of Solutions
    1. *I tend to misjudge the resources that are required to implement solutions.*
    2. I implement solutions in a timely manner.
    3. I implement solutions in an effective manner.
    4. *I overlook unanticipated situations that arise during the implementation of my solutions.*

G. Evaluation of Solutions
    1. *I seldom follow up after solutions have been implemented to determine their effectiveness.*
    2. If goals were not achieved, I reflect on whether the problems were identified correctly.
    3. I accept responsibility for my contributions to successfully solving work problems.
    4. *Someone else is generally responsible when solutions to problems are not successful.*

Note: Reverse items are italicized.   Source: Lohman 2004, pg 313.

RESULTS AND DISCUSSIONS

The findings from this study show that problem-solving skills that developed during work-based learning are still at medium level. This is evidenced from Table 2 where the total mean score of students engaged in the problem-solving activity is at a medium level. When comparing the stages of problem-solving skill, the findings indicate that goal setting and approach to decision making when selecting solution were rated as high, while problem identification, generation of alternative solutions, consideration of consequences associated with alternative solutions, implementation of solution were rated as medium.

Table 2: Level of students engage in the problem-solving activities

No.	Problem-solving Skill	*Mean*	*SD*	Skill level
1.	Identify problem	3.56	0.54	Medium
2.	Select goal	3.71	0.57	High
3.	Generate solutions	3.42	0.51	Medium
4.	Consider consequences	3.47	0.50	Medium
5.	Select Solutions	3.91	0.51	High
6.	Implement Solutions	3.48	0.57	Medium
7.	Evaluate Solutions	3.46	0.53	Medium
	Total Mean Score	3.59	0.36	Medium

When comparing male and female students on the level of problem-solving skills on the different stages of the problem solving skills, it is found the problem skills level for female is relatively higher compared to male students. However using the independent t-test at α = 0.05, it was found that there is no statistical difference in the level of problem-solving skills in the various problem-solving skills between male and female students. Table 3 shows the comparison between male and female students on the level of problem-solving skills on the problem solving activity. Hence, there is no significant difference among gender in problem solving skills, at least among the study respondents, in these community colleges. Thus, for employer seeking out these community college graduates, there is also no significant difference in the problem solving attributes among gender.

Table 3: Comparisons between male and female students on the level of problem-solving skills on the problem solving activity

No.	Problem solving skills	Mean (female)	SD	Mean (male)	SD	t
1.	Identify problem	3.52	0.58	3.60	0.51	-0.75
2.	Select goal	3.63	0.58	3.82	0.54	-1.58
3.	Generate solutions	3.39	0.50	3.45	0.50	-0.51
4.	Consider consequences	3.49	0.50	3.45	0.50	-0.34
5.	Select Solutions	3.92	0.54	3.90	0.49	0.23
6.	Implement Solutions	3.41	0.58	3.56	0.57	-1.26
7.	Evaluate Solutions	3.51	0.57	3.61	0.49	-0.91
	Total Mean Score	3.56	0.37	3.63	0.35	-0.95

When comparing the students in the various program of study it was found that there is no statistical difference in the level of problem-solving skills in the various problem-solving activities between the four programs of studies. Table 4 shows the results of the one-way ANOVA conducted on the level of problem-solving skills in the various problem-solving activities and the program of study. This study thus suggests that there is no significant difference in the field of study, as far as problem-solving skills are concerned. This is hardly surprising, since all field of discipline has its own set of problems and challenges, and thus problem-solving skills is an important aspect in any organization.

Table 4: Results of the one-way ANOVA conducted on the level of problem-solving skills in the various problem-solving activities and the program of study

Program of Study	n	Mean	SD	F	p
Diploma of Hotel Catering	21	3.61	0.40		
Diploma of Fashion and Apparel	19	3.57	0.41	0.16	0.92
Diploma of Electrical Technology	34	356	0.31		
Diploma of Information Technology	25	3.62	0.38		

College Community, a provider for lifelong learning program is good platform to help the local community to develop their technical & vocational skills, and other skills. Through work-based learning, problem-solving skills and other employability can be developed among college community students. Thus, a win-win collaboration between industries and institutions must be carefully planned.

In order to strengthen the work-based learning program in the college communities, both parties must be committed in designing the work-based learning activity so that future generation of good workers can be developed. The industrial experience must be a value-added experience for the students, and helps in complementing the classroom learning they experience in their training institutions. Thus, a well planned and thought of assessment must be planned to make work-based learning experience more meaningful. This will also further enhance the student's lifelong learning experience to help them cope with demands of the workplace.

It is a known fact that it is difficult to replicate real work experience and problem in training institution. Thus, by involving students in work-based learning, they have the opportunity to experience working in their own field first hand, and be able to relate theories that has been learnt in the classrooms. Students should also take the opportunity to make use of their time in the industry to learn 'aspects' of what is required to be an excellent worker in the industry. This includes technical skills and knowledge, adaptive skills, and good work ethics and values (Wan Mohamed, Omar, & Khan, 2008). However, a well-match placement is important as it can provide students with quality work-based learning experience that provide benefit beyond and above what students get in excellent classrooms (Bailey, Hughes, & Moore,2003).

CONCLUSION

Work-based learning can be used in helping students developing their problem-solving skills, an important skill for lifelong learner. This is evidenced from the frequency they spent on the all the stages of problem-solving skills for both male and female students from various course of study during their work-based learning experience. As quality work-based learning experience may benefit students beyond excellent classrooms, collaboration with industries is crucial for the development of future workers of tomorrow.

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