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Analysis of the Effect of Problem-Based Learning on Leadership Skills

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ABSTRACT

Educators have developed a model to facilitate the learning of various competencies and the assessment of student understanding. The methods applied include lectures, assignments to be completed at home, and written exams. Meanwhile, to develop non-technical competencies such as leadership skills, a more comprehensive approach is required. This article outlines the findings of a controlled study that implemented Problem-Based Learning (PBL) to teach these skills. The effectiveness of this method was measured using the Competing Value Framework (CVF) developed by Quinn in 2004. The research results indicate a significant statistical improvement in students' ability to set goals and identify and organize activities to achieve these goals. The included literature review also emphasizes the suitability of PBL in teaching both technical and non-technical competencies.

Keyword : Problem Based Learning, Leadership, Competing Value Framework

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1. INTRODUCTION

In today's world of work, there is a trend to build more efficiently, quickly and economically. This success can be achieved by completing tasks quickly using a teamwork approach. This trend requires managers to accomplish tasks with the support of team members, even when faced with time and resource constraints. Faced with this challenge, it is crucial for organizations to recruit staff who are able to work effectively with different types of individuals (Kichuk & Wiesner, 1997). Organizations need to look beyond cognitive abilities and look for characteristics that can enhance team performance. This increases the need for managers to have soft skills, such as communication and stress management, in addition to hard skills such as mastery of construction tools and methods.

One of the challenges faced by organizations today is the need for qualified employees with positive personality characteristics. The importance of personality must be carefully considered in accomplishing various tasks in various work groups and in improving team performance. Kumar & Hsiao (2007) emphasize that "soft skills", such as communication, management, and leadership skills, are non-technical skills that are essential to being a successful professional.

Despite the recognition of communication challenges in the workplace, Thamhain (1992) noted that limited progress has been made. Thamhain highlighted several key factors that demonstrate the importance of interpersonal skills in a manager's success. Respected managers usually possess essential soft skills and use them to make wise decisions under real-world conditions. The existence of a model to evaluate abilities in this area would be very useful, facilitating more effective training for current and future managers. Such an assessment model would also help in validating the learning methods used to prepare future professionals. To quantitatively measure these capabilities, this study used the CVSS, a method that has been recognized to provide competency measurement.

While there are many articles discussing the benefits of problem-based learning, (Prince, 2004) points out that data documenting the effectiveness of this method for undergraduates is limited. Shakir (1997) emphasized the need for further research focusing on the development of critical skills to provide insights and advantages in professional development. While it is argued that providing professional competencies to graduates is a major challenge, Coll & Zegwaard (2006) assert that these competencies are essential.

Recent research has led to the use of hybrid learning methods that combine active learning and Problem Based Learning (PBL) (Prince & Felder, 2006). Prince (2004) suggests that defining active learning universally seems impossible. According to Bonwell and Eison (1991), active learning involves students in activities such as problem solving, discussion, reading, and writing to develop critical thinking skills such as evaluation, investigation, and synthesis. Given that active learning has been recognized as one of the most positive advances in higher education (McKeachie, 2002), this study explores the impact of PBL on the development of specific "soft skills", namely leadership and communication.

Prince and Felder (2004) reviewed key aspects of problem-based learning, highlighting that the method begins with the presentation of an open-ended, unstructured real-world problem to students. In this approach, the instructor acts as a facilitator, while students are responsible for various tasks to create the final product or design. Problem-Based Learning typically emphasizes the development of a final product that utilizes knowledge from previous courses. Throughout this process, students conduct in-depth investigations and independent learning in small groups (Yeo, 2005). The instructor acts as a guide, facilitator, or professional consultant (Ribeiro & Mizukami, 2005). Traditional lecture-style teaching methods are advised to be avoided, as they can inhibit learning styles and the development of critical thinking skills that are essential in the engineering profession (Bernord, 2007).

Referring to this concept, the Leadership course in the Automotive Engineering Education study program at Medan State University can be described as a small group learning experience, where students apply active learning through a combination of Problem-Based Learning. Students work in small groups to address various problems in a setting that resembles a real-world environment. They are directed to investigate independently, access resources, and develop solutions in a multitasking context. This learning method involves processes that require a variety of skills, including communication (both written and oral), decision making, problem solving, time management, planning, and organization. The use of traditional lecture method in delivering materials is minimal and usually only to clarify doubts and limitations.

2. METHOD

While there are various instruments to measure managerial skills such as the Myers-Briggs Type Indicator (MBTI), the California Personality Inventory (CPI), and the Fundamental Interpersonal Relationship Orientation - Behavior Scale (FIRO-B), the Competing Values Framework (CVF) model, specifically the Competing Values Skills Survey (CVSS), was selected as the method to measure the impact of Problem-Based Learning (PBL). The purpose of selecting this method was to explore whether the development of soft skills would contribute to behavior change in students who volunteered for the study.

The Competing Value Framework (CVF) model has gained recognition as a core concept in many Master of Business Administration (MBA) programs around the world (R. Quinn, 2004). The CVF model has been used globally, and researchers have applied the CVF assessment method, the Competing Value Skill Surveys (CVSS) in previous studies. This method, which provides quantitative data on competencies, is in line with Klinger's (1956) recommendation to integrate practice in education. Therefore, this method was selected as a suitable instrument to use in this study.

Quinn and Rohrbaugh (Quin1981) observed that organizational effectiveness has been a fairly dominating subject in the literature, with reference to 13 sources addressing this topic. Despite including these previous studies, they admitted that a common definition of organizational effectiveness has yet to be established and there is no consensus among organizational theorists. The Competing Value Framework (CVF) model, like other successful models, builds on theoretical views of organizations developed over the previous decades.

The CVF is a model that can be applied in a variety of organizational contexts. It enables the examination of management, supervision, leadership roles, and culture, as well as the evaluation of organizational functions and processes, including the identification of gaps. The CVF's name "competing values" comes from combining four different and sometimes conflicting models. For example, while many people want a creative and flexible organization, few want to sacrifice stability and control for these attributes. CVF provides a framework for visualizing various management theories, including internal processes, open systems, rational goals, and human relations. These four conflicting models are integrated in a quadrant when plotted on two axes. Figure 1 illustrates the CVF developed by Quinn in 2004.

Flexibility is located at the top, as opposed to control at the bottom; internal aspects are on the left, while external aspects are on the right. As a further elaboration, the framework consists of four main sections, each with two sub-sections, which are adapted from Quinn's (2004) work as follows:

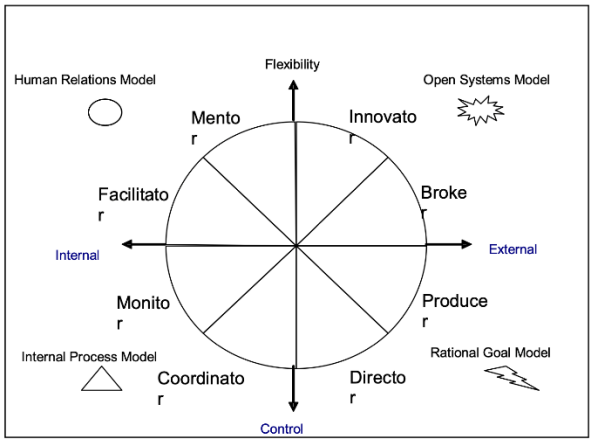

Figure. 1 Competing Values Framework

This shift has had a significant impact on teaching methods, with the curriculum focusing more on theory, usually delivered through lectures. The lack of attention to the development of social, communication and teamwork skills (Roesset & Yao, 2002) has resulted in many graduates being underprepared for the world of work, requiring more in-depth training to work effectively in teams (Davies et al., 1999). Educational opportunities that facilitate open-ended problem solving through experiences of success and failure are fundamental in teaching creative behavior (McGraw, 2004). Previous research by Cohen (1987) showed that appropriate teaching methods can increase the quality of education up to four times. The question is, can active learning like PBL be the solution to this? Can this method be applied to all engineering courses? According to Coll and Zegwaard (2006), developing and measuring behavioral skills is a difficult task.

Based on these reasons, this hypothesis is proposed to evaluate the impact of the PBL method: PBL will improve leadership abilities and communication skills. Although learning leadership in an educational context is difficult (Densten & Gray, 2001) and mastering effective communication is challenging (Yeo, 2005), researchers argue that the PBL method is the best way to teach these skills (Ribeiro & Mizukami, 2005). According to Quinn's (2004) CVF model, individuals who demonstrate capable leadership develop a vision for the team by setting goals and designing strategies to achieve them. However, an effective leader must not only be capable in the leadership aspect, but must also have good communication skills and be sensitive to interpersonal skills. Badger (2007) asserts that leadership is closely related to interpersonal relationships. This view is reinforced by the idea that better leaders tend to excel in teamwork and collaboration (Caudron, 1999).

Given that managers spend more than 70% of their time communicating, it is important not to overlook the human aspects of interacting with people. Qualities expected of leaders, such as the ability to listen, be caring, and give room for growth through delegation, are characteristics that are often encountered. Therefore, to be an effective leader, one must have a balance between the ability to guide and good interpersonal skills.

The participants of this study were undergraduate students who took the Leadership course in the Odd 2023 and Even 2023 semesters. The course, which lasted for one semester, was designed to apply

Problem-Based Learning (PBL) techniques throughout both semesters. This teaching method involves intensive team-based exercises that mimic experiences commonly encountered by professionals in the workforce. The study utilized a pre-experimental pre-test/post-test design (Creswell & Clark, 2011) by applying the Competing Values Skills Survey (CVSS) based on the CVF. The researchers also collected the participants' completed written statements for the qualitative analysis part. Furthermore, as the course was a graduation requirement for all students, the students enrolled in the class were representative of the student population during the F05 and S06 semesters.

The students enrolled in the class were not informed of the opportunity to participate in the study until the first day of class. When they were informed, they were given the option to decline involvement or to sign the necessary consent to voluntarily participate as research subjects. Students who decided to be involved and signed the document were given access to the link and code needed to complete the pre-test. They were also informed that they were free to withdraw from the study at any time as their participation was voluntary. Given that the semester lasted for 16 weeks, and the post-test was scheduled at the end of the semester, the students were asked to complete the pre-test assessment before the end of the first week.

3. RESULTS AND DISCUSSION

In the 2023 Odd Semester (F05), there were 22 students involved. Of these, all 22 students took the pre-test and 21 of them took the post-test, resulting in 21 usable samples. In the Even Semester 2023 (S06), there were 69 students. Of these, 63 students chose to take the pre-test and 65 students took the post-test. Combining the data from these two semesters resulted in a total of 85 students who took the pre-test and 86 students who took the post-test. In the data analysis, only data from students who took both tests, pre-test and post-test, were used. Thus, we obtained 21 samples from the Odd Semester 2023 and 63 samples from the Even Semester 2023.

This hypothesis appears statistically strong ($p<.01$) regarding the summarized correlations. The combined correlations ranged from a low of 0.522 (understanding others) to a high of 1.017 (developing and communicating a vision). For hypothesis testing, a table is provided that lists the mean difference (subtracting the post-test from the pre-test; a negative number indicates an increase), the t value (the value used to determine the probability), and the 2-tail probability figure associated with the t value. Based on the previous analysis, the key definition probability values of $.05<p\leq.10$ indicates suggestive; $.01<p\leq.05$ significant; $.001<p\leq.01$ strong; and $p\leq.001$ convincing; were used. After the analysis of each hypothesis, the final summary section provides a brief overview of the sections and results.

Table 1 presents a summary of the improvements in leadership abilities and communication skills, with a particular focus on the leadership aspect. The participants reported an average improvement in all aspects of leadership ability after the post-test. In the control part of the framework, all three competencies showed statistically significant differences in the paired t-test. For the competency of designing and organizing, there was significant evidence in F05 (t(19), -4.646, $p<.01$), additional strong evidence for S06 (t(64), -6.672, $p\leq.001$), and very convincing evidence for the combined F05/S06 (t(85), -8.135, $p\leq.001$). Competency in setting goals and objectives also showed statistically significant differences in F05 (t(19), -4.041, $p<.05$) and S06 (t(64), -3.174, $p<.05$), with statistically significant differences for F05/S06 (t(85), -4.587, $p<.01$). For the competency of developing and communicating a vision, a statistically significant difference was obtained at F05 (t(19), -3.494, $p<.05$), strong evidence at S06 (t(64), -4.068, $p=.01$), and convincing evidence for F05/S06 (t(85), -5.159, $p=.001$).

Table 1. Leading Ability based on Leadership

Leadership: Director		F05 N = 21 Mean Diff.*	*T*	2-Tail	S06 N = 63 Mean Diff.*	*T*	2-Tail	F05 and S06 combination N = 84 Mean Diff.*	*T*	2-Tail
Pair 1	Designing and Organizing	-0.986	-4.646	0.012	-0.839	-6.672	0.000	-0.875	-8.135	0.000
Pair 9	Set Goals and Objectives	-0.794	-4.041	0.027	-0.423	-3.174	0.060	-0.512	-4.587	0.005
Pair 17	Developing and Communicating the Vision	-0.450	-3.494	0.056	-0.383	-4.068	0.015	-0.399	-5.159	0.002

4. CONCLUSION

This study aims to explore the impact of Problem-Based Learning (PBL) on various soft skills of managers. The results showed that PBL contributed positively to the improvement of soft skills among the studied population. The findings also indicated that self-confidence and stress coping, leadership and communication, and adaptability and management skills were improved. This process also showed that students received more holistic benefits through the practical applications provided by PBL. As more benefits of PBL are revealed, educators now have more opportunities to harness the potential of PBL and contribute to the growing research in this area. Through cooperation between all relevant parties, significant progress can be made in overcoming barriers across the education system.

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