The Effects of the Mentoring System on the Achievement of Students in Project Management Course

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INTRODUCTION

Professors and teachers naturally are concerned about student learning. They especially are concerned about student learning that is measured by legislatively-mandated (standardized) assessments that affect the public's image of what they do, and the reputation of their universities and colleges. As a result they tend to avoid instructional practices that are not familiar or may be perceived as not achieving the desired outcomes, i.e., higher scores on standardized tests [2]. In an age, however, when it is imperative that people be good thinkers, administrators, the media, legislators, parents, need to encourage teachers to feel comfortable experimenting with practices that challenge students to think at higher levels.

Studies showed that case-based teaching and problem -based learning is more effective in increasing students' academic achievement, as well as allowing them to work in groups and construct their knowledge through social negotiation compared to traditional teaching methods [3]. Problem based learning is highly appropriate for realizing the aims of Accreditation Board for Engineering and Technology (ABET). Problem based learning and case-based teaching might be an effective way of promoting engineering learning, which is highly related to real life and requires students to possess high level of critical thinking skills [4]. In fact, many engineering educators investigated the effects of case-based teaching and problem -based learning in engineering education.

Records of Qassim University for the School Year 2008-2009 shows that the performance of the level ten (10) engineering students in GE 402-Project Management course in the final examination was quite low [5,6]. This prompted the researcher to take steps that would help improve the performance of the students in this course.

Problem solving in case study is almost always a part of any project management lesson. It is observed only those students with the above average ability to attempt to solve problems in case study.

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The mentoring system enables learners to work cooperatively helping each other integrate new knowledge and discover meanings on their own as they explore, discuss, explain, relate and question new ideas and problems that arise in the group. Thus, both the mentor and learner develop strong self- confidence which is believed to result in higher grades. The study aimed to determine the effects of the mentoring system on the achievement of students in project management course. Specifically, it intended to find out the effects of mentoring system in improving the students' attitude and academic performance in problem solving of case studies.

1 MENTORING SYSTEM

1.1 The Project Management students and peer mentoring system

The peer mentoring system in project management course under the College of Engineering at Qassim University worked in collaboration with the senior students with high GPA. This aimed to help students to solve case studies related to their field of specialization. Peer mentors worked in three different contexts with the students in level 10. First, peer mentors attended each class session with the project management students, and were recommended to lead the class for 10-15 min each class period. During this time peer mentors provided academic and interpersonal support via workshop-style presentations and discussion groups, among other methods. Second, students consulted with peer mentors concerning academic project management course and interpersonal (working in groups, and roommate problems, etc.) issues. Third, peer mentors led some of the seminars, which were hour-long interactive presentations concerning project management issues such initiation, planning, execution, controlling and closing projects

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1.2 Effect of peer mentoring

There is a lack of empirical studies examining the effect of peer mentors in engineering students of level 10 on student success, project management course and solving problems in case study {1}. Topping highlights the importance of quantitative research examining the effects of peer mentoring to validate the qualitative research that has praised the effect of peer mentors on their fellow students' academic success. Peer mentor programs have been implemented into many university systems in order to reduce attrition and foster academic success [2]; however, it seems to be more rare that universities implement peer mentor programs to boost social and academic support among engineering students. This study measured the effect of having a peer mentor in project management course on level 10 engineering student change in knowledge of problem solving in case study and first semester GPA scores. Predicted outcomes were that students in project management course with a peer mentor would score higher on a measure of knowledge of campus resources compared to students in project management course without a peer mentor at the conclusion of their first semester at the university as a result of having a peer mentor to ask for guidance. An additional predicted outcome was that students with a peer mentor would have higher GPA scores in their first semester when compared to students in a project management course without a peer mentor.

1.3 Mentoring and sense of self

Scholars agree that mentoring is associated with a wide range of positive outcomes, such as deterring risky behavior [4] and promoting pro-social and despite mixed reviews of its benefits, support for individual and group mentoring programs remains strong [5]. Based on a meta-analysis conducted by scholars, when a more experienced or senior person takes an interest in a less experienced or disadvantaged individual, that individual experiences attitude, health, relational, motivation, and career benefits. An example of a study on delinquent youth and mentoring shows that a mentoring relationship may be a meaningful component of a program aimed at reducing recidivism. Scholars evaluated a program for juvenile delinquents transitioning from incarceration back to their communities [6]. The program had a strong mentoring component: results showed that about 45% of activities between the youth and the transition coordinator fell under the mentoring category. The study demonstrated how mentoring in combination with other services (including accompaniment to legal meetings) can be effective in getting youth on a less delinquent track. Youth in the program

experienced significantly fewer new criminal contacts during the first 6 months after their release, as compared to youth who were only on probation. Also, these youth were significantly less likely to test positive for drugs and seemed to have less risks and needs than youth in the comparison group [6]. Importantly, researchers credited the success of the re-entry services program in part to the fact that it emphasized mentor-mentee relationships, calling the relationship an active ingredient that significantly improved the youth's participation in the program. However, mentoring has not been consistently or substantially linked to improvements in sense-of-self measurements like self-concept and self-esteem. Meta-analyses have shown that mentoring is associated with a wide range of behavioural benefits, but effect sizes are generally small and more concentrated for academic and workplace mentoring, not youth mentoring [7]. In an evaluation of a school-based mentoring program of 32 tenth graders at-risk for dropping out of high school, researchers found no improvements in self-concept even after evaluating only the students who were effectively mentored, based on ratings of mentor logs [8]. Scholars evaluated an intensive 6- to 12-month program where mentors spent at least 3 hours per week with 34 youths age 10 to 16 at-risk for juvenile delinquency or mental illness [9]. While a slight upward trend in self-concept was reported over time, the difference between pre- and post-intervention measures was not significant [7]. Others have noted slight increases in self-esteem levels as well. In comparing 31 mentored fourth- and fifth-graders to 22 non-mentored children, researchers found only slight improvements in self-concept, where popularity self-concept (as compared to behavior, anxiety, and happiness dimensions) was the only significant dimension changing [10].

1.4 Model of mentor competence

The theoretical work by W. Brad Johnson is especially instructive as contemplate the traits characterizing a competent mentor. Johnson's "Triangular Model of Mentor Competence" proposes three fundamental dimensions that define mentoring proficiency: virtues, abilities, and competencies [11]. Figure 1 illustrates, virtues form the base of the triangle; these are the qualities in an individual typically regarded by society as admirable traits that suggest moral and behavioural uprightness. The model proposes that the mentor should have integrity, i.e., the mentor should act in accordance with ethical principles indicative of an honest and upfront individual. A competent mentor should also be caring, exhibiting genuine concern for the mentee, and prudent, demonstrating sound judgment and wisdom. At the base of the triangle in parentheses, patience is added to the Triangular Model. Guiding young persons as they wind their way through the complexities of the academic life will require mentors to sit back patiently and allow their students to err and learn from their mistakes.

Abilities constitute three categories of assets: cognitive, emotional, and relational. As Johnson describes in his model, these assets are not necessarily trainable; they are capacities individuals may or may not have as part of their psychological disposition [12]. By virtue of attaining faculty status, a mentor is likely to have the intellectual skills necessary to provide a mentee with the instruction necessary to make progress in the laboratory or classroom. It is also likely that a faculty member will embrace the complexity of the problems encountered in the mentor's research and career, which will be useful as the mentor guides mentees through their efforts to attain a diploma. The command of emotional and relational elements may be less certain across prospective mentors. As role models in the position to provide counsel to college students, mentors should be well-balanced emotionally and well-adjusted psychologically. Indeed, given the vicissitudes of life, there may be times when a mentor may decide to take a respite from mentoring to regain perspective and tranquillity in his or her own life. As to relational elements, the capacity to establish intimate relationships and to communicate clearly with mentees is essential for nurturing mentees. The reciprocal nature of a mentoring relationship requires openness to relate in deeply personal as well as professional ways.

According to Johnson, competencies, the third side of the triangular model, essentially comprise the fundamental skill set and knowledge that a mentor brings to the mentorship [13]. As opposed to virtues and abilities, mentoring competencies can be readily modified and enhanced through conscious effort. Indeed, it is this aspect of the model in which the intentional mentor can make significant gains in a mentoring relationship.

The ten competencies highlighted in the model include [11]: 1) developing an awareness of mentees' state of psychological development (e.g., as described above in Chickering's Seven Vector Theory); 2) having an understanding of the status of the mentoring relationship (e.g., whether it is just being established or is ready to progress to an amicable separation); 3) clearly articulating for the mentee the details defining the nature of the mentorship (this competency will be revisited later in this essay); 4) appreciating the three primary mentor functions offered to mentees – career guidance, psychosocial

support, and role-modeling; 5) maintaining a set of boundaries in the relationship that protect the mentee from coercive behavior that may sometimes evolve from power imbalances or from overly personal involvement that may compromise professional judgment; 6) acknowledging when a mentoring relationship has become dysfunctional and implementing strategies to correct the problems or to separate amicably; 7) developing skills in cross-gender relationships, which include developing an awareness for the obstacles and concerns a mentee of the opposite gender may be confronting; 8) developing skills in cross-race or cross-ethnicity mentoring – similar to the cross-gender skill set, this competency involves developing sensitivities to cultural differences that may exist between the mentor and mentee as well as trying to understand the obstacles encountered by mentees who are members of minority groups, particularly those underrepresented in the sciences; 9) respecting mentees as autonomous young adults who are entitled to discover and create their own paths with the mentor's support, rather than simply viewing them as the prospective clones of the mentor; 10) remaining vigilant about the benefits that the mentor can bring to the mentee thereby ensuring that mentees do indeed gain useful knowledge and skills to advance their careers.

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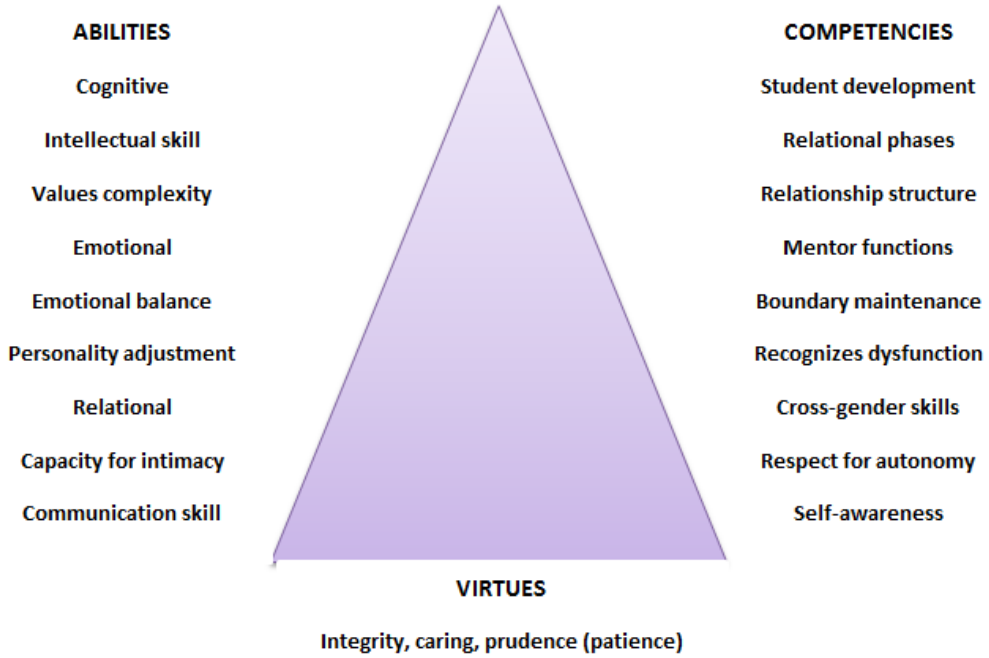

Fig. 1. Model of Mentor Competence

1.5 Five factor model of mentoring

Hudson's five factor model of mentoring provides a framework for analyzing mentors 'personal attributes and mentoring practices [12]. The five factor model identifies five categories of mentoring practices which were derived from the mentoring research literature. The five factors shown in figure 2 are: personal attributes, system requirements, pedagogical knowledge, modeling and feedback. The model suggests that mentors need to exhibit personal attributes that enable them to support mentees by instilling positive attitudes and confidence in them, be encouraging, friendly, take keen interest in the work of the mentee and be able to listen attentively to the problems that the mentee may face during their school based training.

Hudson also argues that mentors need to articulate System Requirements, that is, school and national policies and curriculum documents, so that pre-service teachers can plan quality lessons and implement curriculum requirements and policies [13]. Furthermore, Hudson appears to suggest that mentors must have good pedagogical knowledge and practices not only for teaching in their own classroom, but also in educating the mentee in both the subject content knowledge as well as the pedagogical practices [12].

Mentoring practices associated with Pedagogical Knowledge can focus on planning, timetabling, preparation, implementation, classroom management strategies, teaching strategies, teaching

knowledge, questioning skills, problem solving strategies and assessment techniques in education context. Effective modeling involves the mentor displaying enthusiasm for teaching the subject. It involves the mentor using effective hands-on activities, good classroom management strategies and having good rapport with students. Feedback is an essential element in the mentoring process. Feedback may involve pedagogical discourse prior to and after the delivery of a lesson. The provision of constructive feedback has the potential to instill confidence in the mentee and requires the mentor to employ the personal attributes and characteristics that support the mentee's emotional and psychological wellbeing.

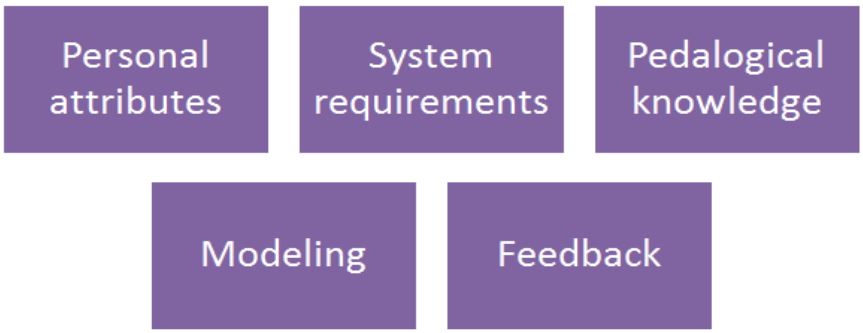

Fig. 2. Five Factor of Model Mentoring

2 RESEARCH METHODOLOGY

The study was designed according to the pre-test and post-test with control group model, which is one of the true experimental models. The study was conducted with level ten (10) engineering students. Two sections with forty (40) students, each comparable in terms of IQ, comprised the experimental and the control groups. These engineering students were picked by the researcher from their sections through random selection. Case-based teaching and problem-based learning was implemented in one class by the researcher and the traditional methods were implemented in another section. An achievement test prepared in accordance with objectives of the topic entitled "Project Management Processes" in the instructional unit "Styles and Strategies in Managing Projects" in the general engineering course was used as testing tools [13,14,15]. These testing tools were administered to the experimental and control groups as pre-test and post-test. The data obtained after an application that lasted 4 weeks were analyzed. For analyzing the data, t-test has been used

2.1 Sample

The sample of this study consisted of two separate level ten (10) engineering students from Bachelor of Civil Engineering, Bachelor of Electrical Engineering and Bachelor of Mechanical Engineering in Qassim University in city of Buraidah which is located in Kingdom of Saudi Arabia. The two classes had similar socioeconomic backgrounds, similar curriculum implemented and same topics covered in both classes. Experimental group consisted of 50 students and control group consisted of 55 students.

2.2 Variables

Independent variable is the instructional methods. Experimental group utilized mentoring system and control group utilized traditional instruction. Dependent variable is the higher order thinking skills.

2.3 Instruments

In order to collect data for the dependent variable which was investigated in the study, an achievement test was developed, pilot tested and administered. The objectives of the lessons related to the topics in "Project Management Processes" which was covered in the "Styles and Strategies in Managing Projects" unit were determined [16,17]. The objectives or each lesson in the topic "Project Management Processes" were identified at a table to ensure content validity of the achievement test items. In accord with this table, 45 questions were prepared to test the higher order thinking skills of the students. The questions were investigated by general engineering teachers and experts in the area of assessment and evaluation and some revisions were made based on their suggestions.

45-item pilot test was administered to one hundred and twenty seven level ten (10) engineering students. Based on the data, reliability constant (KR-20) of the test and discrimination indices of the each item were computed. The items which have item discrimination index under 0.30 were eliminated from the test. Based on the analyses, final test was consisted of 30 items and the reliability constant was found to be 0.74. The test was consisted of items which were accessing comprehension (10), problem based learning (10), and case management skills (10).

3 RESULTS AND DISCUSSIONS

The statistical techniques used to analyze the data were means, Standard deviations and t-test. The data were analyzed by using statistical software SPSS. The data indicate a significantly higher achievement gain score in the experimental group than the control group. Using a one-tailed t-test at the 0.05 level of significance the difference in the mean gain scores of the two groups is significant as gleaned from table 1.

Table 1. Comparison of Experimental and Control Groups for Difference in Comprehension Level

Groups	N	Mean Score			Difference between gain scores	t-test	Probability
		Pretest	Posttest	Gain			
Experimental	50	0.20	10.00	9.75	8.7	9.88	p≤0.05
Control	55	5.35	6.40	1.00			

As shown in table 2, with regard to problem based learning, no significant difference was found in the students' problem based skills towards Project Management course between those exposed to mentoring system and those who were not.

The non-significant difference in problem based learning change may due to the fact that the students already had initially positive problem based learning towards Project Management course. Having been taught by the same teacher from the start of the school year, it could be that the two groups after the four (4) month experimental treatment no longer showed a significant change in their problem solving skills.

Furthermore, integrating problem based learning in case management process skills present in both groups emphasizes the relevant and usefulness of Project Management course to real life situations and thus may have narrowed down problem based learning differences between the two groups to non-significant levels.

Table 2. Comparison of Experimental and Control Groups for Difference in Problem Based Learning

Groups	N	Mean Score			Difference between gain scores	t-test	Probability
		Pretest	Posttest	Gain			
Experimental	50	3.65	9.30	5.60	0.30	0.11	p≥0.05
Control	55	4.40	9.75	5.30			

Table 3 shows pre-test scores of students on case management skills. Case Management process skill scores for traditional instruction group is 2.5 and for problem based instruction group it is 1.13. The t-test result shows a significant difference at 0.05 levels. Control group students' case management process skills were found to be more improved compared to experimental group students.

Moreover, the post-test shows that the mean score on the case management process skills is 4.43 for control group and 8.19 for experimental groups. The t-test result indicates that the difference is significant at 0.05 levels. The result suggests that mentoring system is more effective than the traditional instruction in improving case management skills.

Table 3. Comparison of Experimental and Control Groups for Difference in Case Management Skills

Groups	N	Mean Score			Difference between gain scores	t-test	Probability
		Pretest	Posttest	Gain			
Experimental	50	1.13	8.19	7.00	5.10	-9.10	$p \geq 0.05$
Control	55	2.50	4.43	1.90			

4 SUMMARY AND ACKNOWLEDGMENTS

Exposure to mentoring system in case based teaching resulted in greater gains and improvement in the achievement test scores of Project Management course. Problem-based learning applications resulted in improvements in all level of learning outcomes namely comprehension, problem solving skills and case management skills. In control group, classifications, definitions and rules directly given to the students and their getting used to traditional instruction could be the reason of the increase in their scores. However, the increase in experimental group's score is higher than the control group's score. Experimental group students learn the lesson by scenarios, made connections with the real life problems, used inquiry and investigative activities, and tried to acquire the objectives of the lesson by using mentoring system. As a result these activities their skills in comprehension, case management skills and problem solving skills have increased more than the traditional group students. During the experimental application, problem based learning group students stated the problems with their own words which made them aware of the lesson objectives. This indicates that teachers who used mentoring system in project management course leads to improved students' thinking and more meaningful context learning. Applying opportunities for brainstorming sessions and using mentoring system more likely improve the cognitive structure as well as the academic performance and the students

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