ASSIGNMENT ONE

A COMPARATIVE REVIEW OF TEAMWORK COMPETENCE AMONGST ENGINEERING STUDENTS

PRESENTED BY

ALBERT WIAFE

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QUESTION:

Write a 3,000 words critical comparative review of the two articles on teamwork competencies amongst engineering students.

First Paper:

Hernandez-Linares, R., Agudo, J. E., Rico, M. and Sanchez, H. (2014). Transversal Competences of University students of engineering, Croatian Journal of Education. Vol. 17; No 2/2015, pages: 383-409.

Second Paper:

Zou, T. X. P. and Ko, E. I. (2012). Teamwork development across the curriculum for chemical engineering students in Hong Kong: Processes, Outcomes and Lessons Learned. Education for Chemical Engineers 7, e105-e117.

ANSWER:

Task 1: Structure and ethical approach of each paper (if any).

Q5	Questions (Paper 1)	Hernandez-Linares, R., Agudo, J. E., Rico, M. and Sanchez, H. (2014). Transversal Competences of University students of engineering, Croatian Journal of Education. Vol. 17; No 2/2015, pages: 383-409.
1	What is the research/telling question or questions?	The main object of this paper is to determine whether or not students of engineering have developed transversal competences, and to what extent, the various dimensions have shaped generic (transversal) competence development. To adequately explore the main objectives, the following sub objectives were set to achieve the purpose of this study. First of all, the study seek to analyze the level of development of the various dimensions that contribute to the shaping of the transversal competences of engineering students and to corroborate whether there is any difference in the level of development of such competences related to gender, study program and year of study. Secondly, the study further seeks to examine the relationships existing between the difference dimensions analysed, in order to determine the quantum of contribution each has on the development of transversal competences. This research work was conducted adhering to high academic and ethical standards. The study relied heavily on previous literature in the subject area to situate its problem statement while duly acknowledging appropriate authorities. The researchers followed scientific approach to the study by employing appropriate models, methodologies and data analysis. Limitations to the study were openly discussed, citing that the sample used was skewed towards male students, also pointing out the effect of decreased participation of students in the post-test assessment and finally admitting to a lack of post-hoc analysis.
2	What are the key concepts?	The study elaborates on following key concepts, transversal competences in higher education emphasizing on its classification into technical/specific competence and generic/transversal competences. DeSeCo Project(Rychen & Salganik, 2001, cited in Hernandez-Linares, R. et al., 2014) also explains that competences can be divided into three categories (the use of tools interactively, interacting in heterogeneous groups, Acting autonomously). The study posit that students are considered to have acquired generic competence (i.e. social skills, leadership, language, management or ICT skills) through their academic qualification. The study also dueled on other key concepts like leadership skills, problem solving skills and teamwork skills.

3	What methods are used?	The paper adopted the mixed method which is a combination of qualitative and quantitative research approaches/techniques. This research was based on an empirical study, analyzing engineering students' perceptions in the University Center of Merida, at the University of Extremadura, Southwest Spain. The data used were mainly from primary sources. Data Collection Instrument used was a questionnaire originally designed and validated by Solanes, Nunez and Rodriquez (2008) where reliability and internal consistency of the instrument was 0.92, distributed in six factors that explained 53.15% of the variance. The instrument was validated in this study with internal consistency measured by Cronbach's alpha of 0.968, distributed in nine factors explaining 74.109% of the total variance. The research questionnaires were administered through a web based system (Moodle learning platform) which expanded the reach of respondent and also open to any engineering student to voluntarily respond to them. A total of 102 respondents responded to the questionnaire of which all were valid. The study utilized the following statistical analytic tools - Descriptive analysis of the variables reporting their means & variances. - Performing Analysis of Variance (ANOVA) to test the significance of differences in scores for gender, study program and year of study. - Adopted the Principal component analysis technique. - Synthesis of full information with the minimum loss criterion of explanatory power. - Conducting the t-test to test the significance from the differences in scores observed for individual variables.
4	What answers are presented?	The study took response from 102 participants of which 52.94% were first-year students and 47.06% were second-year students. It was also observed that 70.59% of the student who participated in the survey were male while 28.41% were female consisting of students of Bachelor of Engineering in Industrial Design and Product Development, Bachelor of Engineering in Telematics, Bachelor of Engineering in IT and Bachelor of Engineering in Geomatics. The study showed that female engineering students at the University Center of Merida have better planning skills and a greater ability to accept and assume new responsibilities than male engineering students suggesting that these skill need to be inculcated in men. The study also reveals that students offering engineering in Industrial design and product development whose program content is individualistic and of artistic nature less likely to

		organize teams and hence, their teamwork skill need to be enhanced by more group work tasks and cooperative learning approaches. Students whose program doesn't exposed them to challenging diverse practical situations should be given tasks with limited resources (i.e. material or time) to aid in developing the competency of maintaining high performance in practical work. It is also revealed that students whose program of study does not involve group work have less ability to manage people and resources thus, should be involved in activities that will compel such students to work in teams. The study identifies management skills, communication and leadership skills, motivation, self-confidence and stress management as less developed in the students. There is therefore the need to provide adequate training for the development of such competencies in student which will prepare them for the labor market.
5	What is the contribution of this work?	This research provide an important contribution to literature on transversal competences in engineering students. It employed a practical approach in evaluating strength and weaknesses of students in different transversal competencies. The study would have been substantially improved by conducting a post-hoc analysis to analyze the differences and similarities between first and second-year students. The study could be extended, in future, to analyze how student are improving their perceptions of the abilities and transferable skills they have acquired by conducting a longitudinal study.

Q5	Questions (Paper 2)	Zou, T. X. P. and Ko, E. I. (2012). Teamwork development across the curriculum for chemical engineering students in Hong Kong: Processes, Outcomes and Lessons Learned. Education for Chemical Engineers 7, e105-e117.
	What is the research/telling question or questions?	The objective of this paper is to examine how Chinese learners, particularly students of chemical engineering of Hong Kong University of Science and Technology, work and interact. The study answers the following research question towards achieving its purpose; First of all, can the teamwork skills of students be improved by systematic intervention and in what ways? And secondly, what are the special characteristics of Chinese learners in a team environment? This research paper hypothesize that: 1. Systematic intervention enhances students' awareness of teamwork.

		2. Systematic intervention facilitates students to construct more accurate conception of teamwork. The respondents/participants voluntarily consented to partake in both the pre- and post-test of students' knowledge of teamwork which demonstrates high ethical standard in this research. The researchers employed system methods of inquiry and duly acknowledged the works of earlier researchers in their study. They openly reported a high drop-out rate in their study.
	What are the key concepts?	Teamwork Concept was defined in the study as a small number of people committed to a common purpose and approach for which they hold themselves mutually accountable. The study also explored Teamwork models and Framework: The teamwork development initiatives in Chemical and Biomolecular Engineering (CBME) at HKUST as part of a teaching development project. The primary aim of the project is to develop students' teamwork skills systematically trough explicit instruction, opportunities to practice and formative feedback throughout the three-year undergraduate curriculum. The study also delved into concepts such as systematic intervention, teamwork training, teamwork skills and teamwork development.
	What methods are used?	The study utilized a combination of qualitative and quantitative research methods for the collection, collation and analysis of data. To conduct the self-assessment on team and peers, susceptibility test was adopted to explore the possible levels of dysfunctions in the teams. Rating of student teams, on teamwork skill concerned with laboratory tasks on a scale of 1 – 5, were done by Instructors of various courses from the faculty and used as the faculty assessment. Focus group interviews were conducted, using semi-structured list of guiding questions, to get more information otherwise not captured by the pre and post-tests. Pre and post-tests were conducted for all participants to assess their knowledge of effective team. Data for analysis and evaluation were obtained from four primary sources: Pre- and post-tests of students' knowledge of effective teamwork, longitudinal qualitative and quantitative data derived from self-assessment, faculty assessment of student performance, focus group interviews. Population size included all 72 undergraduate students majoring in Chemical engineering, Chemical and Environmental Engineering, and Chemical and Bio-product Engineering.
	What answers are presented?	The result of the study revealed a positive impact on teamwork skills through systematic intervention. Students' awareness of teamwork concepts was considerably improved and their

		misconceptions reduced through a three year well-structured teamwork development project. The study found that a large percentage (over 50%) of the students showed that they would cooperatively and positively address conflicts emanating from their teams contrary to earlier research reports that suggest that Chinese students are indirect in their communication. The choice of conflict resolution strategy adopted by the students depended on the perceived relationship among team members and the level of trust developed. The researchers recognize that the enhanced teamwork awareness does not depict the actual possession of the skill. The instruments used in the study depended on self-reported data, thus, the possession of teamwork skills was not observed directly.
	What is the contribution of this work?	The study adds to literature on Team building across curriculum of Chemical Engineering students by depicting how students perceived and undertook teamwork tasks in Hong Kong Chinese contexts. The study emphasizes on the role of instructors and lecturers in the team building process rather than only the product of the process. This study is an extension of other works (Daniels et al., 2010; Hirsch and McKenna, 2008; Oakley et al., 2007;Tien et al., 2002; Tonso, 2006) in the Chinese context specifically in Hong Kong.

Task Two: Write a comparative, critical review of the two papers which consider research into the competencies required for teamwork amongst students.

INTRODUCTION 250 WORDS	Transversal competences refers to a set of competences related to attitudes, values and, procedures. These competences can be transferred from one specific professional field to another. Acquiring transversal competencies provides students with the basic knowledge, abilities and qualities required to translate competences into suitable behavior for organizational purposes. Transversal competences are those competencies related to leadership skills, problem solving skills, and teamwork skills which are extremely valued by the labor market. Teamwork skill has become more significant when educating engineering professional as they will mostly find themselves in multi-disciplinary project team environment. Again, engineering sector employers look out for strong teamwork competence since engineering professionals are expected to work in team-based projects. Organizations no longer require experienced experts, but competent professionals which educational institution should consider for churning out future graduates. In most educational institutions, the focus of the educational models is placed on acquiring technical knowledge in that particular engineering area or aspect whilst the development of transversal competences such as teamwork competences is largely disregarded. There exist numerous research on how the development of teamwork competences could be integrated into institution's curriculum for training students especially engineering students. Some researchers have developed various models for the development of relevant competences in students. It is argued, on one hand, that teamwork skills should be inculcated in engineering students through a systematic training and explicit instruction. On the other hand, some studies emphasize on the development of transversal or generic competences such as leadership skills, problem-solving skills, and management skills along with teamwork skills in engineering students. These propositions put forward among others, makes it relevant to enhance teamwork competences in engineering students. The main focus of this review is to compare and contrast the objectives, research question and hypotheses, theoretical framework, methodology, research results and major findings taking all aspect of arguments into account.
COMPARATIVE REVIEW 1500 WORDS	Hernandez-Linares R. et al., (2014) conducted a study on "*Transversal Competences of University Students of Engineering*". Hernandez-Linares R. et al., (2014) research uses a tool to measure the progress of students in different transversal competences drawing inferences from empirical study conducted on a sample of 102 engineering students from the University Center of Merida. Hernandez-Linares R. et al., (2014) argues that, transversal competences are developed in different subjects throughout the study program making it difficult to be measured. Thus, it is essential to establish mechanisms to measure students' progress in

	competence acquisition and identify areas not addressed before. This forms the basis for their research. This study has broad scope, covering the entire engineering students of the University. Again, the study considered many aspects of transversal competences aside teamwork competence which makes it very broad. On the other hand, Zou, T. X. P. and Ko, E.I. (2012) study was on the topic "*Teamwork development across the curriculum for chemical engineering students in Hong Kong: Processes, outcomes and lessons learned*". The study reported on a three-year project aimed at developing students' teamwork skills systematically through explicit instruction, opportunities to practice, and formative feedback across the curriculum. Zou, T. X. P. and Ko, E.I. (2012) is of the view that current engineering education in China still focuses primarily on the transmission of technical knowledge while the development of professional skills is largely overlooked (Tu, 2006; cited in Zou, T. X. P. and Ko, E.I. (2012). The study also points out that engineering educators worldwide are continually interested in how Chinese engineering students perform in a team due to the fact that China produces about 8 times more graduate engineers than the U.S. (Gereffi et al., 2008; cited in Zou, T. X. P. and Ko, E.I. (2012). This study seems focused on a specific targeted participants/respondents and only one aspect of transversal competences (i.e. teamwork competences). The objective of the Hernandez-Linares R. et al., (2014) study was to determine whether students have acquired transversal competences, and to what extent. The main objective was subdivided into two: firstly, to analyze the level of development of the dimensions that shape the transversal competences of engineering students and to verify whether there is any difference in the level of development of such competences related to gender, study program and year of study. Secondly, to study the relationships between the different dimensions analysed, in order to determine how much they contribute to the development of transversal competences. Conversely, the Zou, T. X. P. and Ko, E.I. (2012) study's objective is to examine how Chinese learners work and interact and sought to answer the following research questions: Can the teamwork skills of students be improved by systematic intervention and in what ways? And What are the special characteristics of Chinese learners in a team environment? The researchers hypothesize that: 1. Systematic intervention enhances students' awareness of teamwork. 2. Systematic intervention facilitates students to construct more accurate conception of teamwork. Whilst Zou, T. X. P. and Ko, E.I. (2012) focused on students' awareness and conception of team developed through systematic intervention, Hernandez-Linares R. et al., (2014) study considered different dimensions of transversal competences and their relationships.

REFLECTIVE SUMMARY 250 WORDS	

Theme

The theme of the research as reported by Hernandez-Linares et al., (2014) focuses on the use of a tool to measure students' performance in different transversal competences.

On the other hand, Zou and Ko (2012) assessed students' performance through the implementation of a three year project aimed at developing students' teamwork skills systematically through explicit instruction, opportunities to practice, and formative feedback across the curriculum.

Objectives

Hernandez-Linares et al., (2014) study was aim at determining whether students have acquired transversal competences and to what extent. This was achieved through the following specific objectives:

- To analyze the level of development of the dimensions that shape the transversal competences of engineering students and to verify whether there is any difference in the level of development of such competences related to gender, study program and year of study.
- To study the relationship between the difference dimensions analyzed, in order to determine how much they contribute to the development of transversal competences.

Zou and Ko (2012) study sought to develop student's teamwork skills systematically through explicit instruction, opportunities to practice, and formative feedback across the curriculum.

Research Questions & Hypothesis

The Zou and Ko (2012) study examine how Chinese learners work and interact. This was elaborated by attempting to answer the following research questions:

- Can the teamwork skills of students be improved by systematic intervention and in what ways?
- What are the special characteristics of Chinese learners in a team environment?

The following hypothesis were established to be tested:

1. Systematic intervention enhances student's awareness of teamwork.
2. Systematic intervention facilitates students to construct more accurate conception of teamwork.

Hernandez-Linares et al., (2014) study

Literature Review

Theoretical framework

Methodology

Result & Discussion