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Assessing the Relationship between Psychosocial Learning Environment and Higher Order Thinking Skills

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Abstract: The aim of this study is to investigate the influence of learning environment (psychosocial) on higher order thinking skills ability among higher education students. A total of 164 undergraduate chemistry students in Universiti Teknologi Malaysia (UTM) were selected as sample using disproportionate stratified sampling technique. The study instruments were adapted from College and Classroom Environment Inventory CCEI, and Marzano Higher Order Thinking Dimension of Learning. Multiple linear regression analysis indicates that psychosocial learning environment constructs have a significant direct effect on HOTS; Student-Student Relationship (ß=0.395), Attitudes toward Students (ß=0.344), Class Organization (ß=0.161), Autonomy and Power Sharing (ß=0.076), and Students Interest and Motivation (ß=0.176). Moreover, Tukey's test shows that the perception towards HOTS has a significant difference among different students' achievement (CGPA).

Keywords: Higher order thinking skills, Psychosocial learning environment.

1 Introduction

In Malaysia, the issues of higher order thinking skills improvement are greatly discussed at school level. However, too little attention has been given to how higher education is performing. In contrast, a study revealed that a large number of lectures in universities typically reflected thinking at lower levels of cognition [1]. The above finding was consistent with study conducted by Fisher and Grant who found that regardless of the kind of subject area, course level and institution, teaching and learning process in college were still at the lowest levels of cognition [2]. The data from their study discovered that 98% of the discourse times conducted by lecturers were at lower levels of cognition. Another findings also showed that 94% and 98% of lecturers respectively, conducted their discourse at lower level of cognition [3,4].

Those high percentages phenomena cannot be accepted as normal application because the implications of developing higher order thinking skills in student have been greatly discussed by scholars of educational field. In order to counter this situation, it is recommended that a study focusing on the assessment of intellectual concepts should be implemented [5]. In addition, educators, school and universities need to understand that besides appropriate teaching strategies, quality of learning environments provided can also facilitate improvement in cognitive and psychological characteristics of learner [6]. As observed from prior studies, there has been much discussion in educational circles that quality of learning environment and mastery of higher order thinking skills should be given special attention.

Studies have proven that assessing thinking skills gives a great effect to the students' development in many aspects. Embedding students with higher order thinking skills in order to fulfill the requirement needed by industry also seems to have a huge potential solution to improve the employment rate. Moreover, improving student higher order thinking skills also leads to improvement of student content knowledge. Thus, the study on the factors that influence higher order thinking skills

is very essential. It appears from the aforementioned investigations that the quality of classroom learning environment has given a significant positive effect on students' cognitive and psychological characteristic [7-14]. Moreover, the quality of learning environment is also capable in motivating students to learn [14,15]. Student learning outcomes are also proven to be incremented via a comfortable and enjoyable teaching and learning environment [16-18]. Khine in his study identified the learning environment as a determinant of successful teaching and learning process [19]. As described in published paper, a good quality of learning environment tends to increase students' achievement [20]. Earlier study already demonstrated that students' positive perceptions on quality of learning environment revealed a consistent relationship with student outcomes [21]. On a much later research, one study demonstrated the positive influences of social constructivism in skill development and employability of the students [22]. It may be noted that most of the studies revealed that students seem to learn better in high quality of learning environment.

2 Review of Literature

Psychosocial Learning Environment

Another segment of learning environment construct is psychosocial learning environment. Psychosocial environment plays a paramount role in attracting students and allowing them to be successful within the classroom. Previous study suggested that psychosocial environment in classroom should be taken care and given attention [23]. It is important to notice the atmosphere created by the educators in class that can either encourage or discourage students to be successful. During teaching and learning process, the classroom is composed of different types of communication and interaction that lead to overall characterization of the learning environment [24]. The psychosocial learning environment includes social factors, such as relationship between the students, health and ability to perform in the class [25]. The psychosocial environment also provides good exploratory information of how student perceives the quality of learning environments.

The studies on the psychosocial environment have been conducted in various ways. For example, to measure the psychosocial learning environment, Trigwell and Prosser employed ten items namely clear objectives, clear explanations, well prepared, helped understanding, creates interest, relevance of the subject, chance for questions, time for consultations, clear assessment criteria, and the adequateness [26]. In addition, Church, Elliot and Gabel organized a study to examine the predictor role of perception toward the psychosocial environment for goal and outcomes achievement of learning. In their study, the perception toward the psychosocial environment included lecture engagement, evaluation focus, and harsh evaluation [27]. Since the present study involves degree level students as sample, College and Classroom Environment Inventory (CCEI) is deemed as a suitable instrument to measure psychosocial learning environment construct. There are five dimensions involved in CCEI; 1) attitude toward students, 2) autonomy-power sharing, 3) student-student relationship, 4) student interest-motivation, and 5) class organization.

The Concept of Higher Order Thinking Skills

The present study found that the scope of higher order thinking definition given by Brookhart is more holistic as compared to the others [28]. According to Brookhart, illustration of higher order thinking skills fall into three categories; 1) higher order thinking defined in terms of transfer, 2) higher order thinking as a critical thinking and 3) higher order thinking as problem solving.

Generally, educational goals emphasize on promoting retention and transfer. Retention demands learner to remember what they have learned while transfer expects students to put what they have learned into practice [29]. The general approaches to obtain higher order thinking skill is by dividing learning into two categories; 1) learning for recall; and 2) learning for transfer. Learning for recall obviously needs a type of thinking, and learning for transfer is regarded as meaningful learning. Learning for transfer is about employing thinking skills independently to any subject [30]. For many educators, higher-order thinking is described as "top end" of Bloom's taxonomy: Analysis, Synthesis, and Evaluation. Educators need to remember that the teaching goal of the cognitive perspective is preparing students with transfer skills. Teaching and learning process should produce a student who is able to think and apply the knowledge or skills they have previously established to new contexts. New

context means applying the knowledge into new situation. This area of higher order thinking skill definition as students' cognitive skills to associate their learning to other elements [28].

Higher order thinking skill also refers to critical thinking skill [28]. In past study, Norris and Ennis discussed critical thinking as one of the categories in higher order thinking. According to them, critical thinking trains student to be reasonable on electing what to do or believe [31]. The goal of teaching in this area is equipping students with reasoning, reflecting, and making sound decisions. In a more recent study, critical thinking is described as artful thinking because critical thinking includes comparing and connecting, observing and describing, reasoning, questioning and investigating, exploring and finding complexity [32]. By this understanding, the aim of education should be more likely to produce students who are able to think, and have a wise judgment and critique against something reasonably. An educated citizen should be someone who has wisdom in deciding what to do. Above all, people who can reason, reflect, and make sound decisions on their own fulfill some of the requirements to be categorized as educated person.

Another higher order thinking category is problem solving thinking. In learning process, the usual situation for a student is they do not recognize the proper way of solution to solve the desired outcome automatically [33]. Usually, many problems cannot be handled just by memorizing the solution. Most of the time, to achieve the outcome, an individual requires one or more higher order thinking processes because of its complexity and relatedness. This type of thinking process is called problem solving. Problem solving is defined as non-automatic strategies needed to reach a goal [33]. Basically, problems can be solved in many different ways [34]. In education point of view, every academic discipline has problems including mathematics, statistics and science. General situation is student will face either a closed or open-ended problem. In university level, assessment with a set of statistic problems which is designed to elicit repeated practice with a particular algorithm is no longer relevant. But they should be tested with an open ended problem which has multiple correct solutions or multiple ways to achieve the solution. Economists, mathematicians, scientists, historians, engineers, statisticians, educators and other professions are always looking for efficient and beneficial solutions to problem. Most of the life problems are also open-ended [29]. Therefore, students should be trained to face open-ended problem in class before letting them go into real life situation. The goal of teaching and learning process when defining higher order thinking as problem solving is equipping students that can identify and solve problems not only in academic work but also in real life problems. Students should be able to solve academic related problem and solve new problems that they define themselves. To do so, students need to create something new as the solution. Due to the fact of tremendous benefits of teaching higher order thinking, this study attempts to take an initiative by studying it.

A Theoretical framework

Psychosocial learning environment is represented by five independent variables; Student-Student Relationship (SSR), Attitudes toward Students (ATS), Class Organization (CO), Autonomy Power Sharing (APS), and Students Interest and Motivation (SIM). On the other hand, higher order thinking skills (HOTS) is the dependent variable. The study hypotheses are formulated as in Table 1.

Table 1: Study hypotheses

Hypotheses		
H1	ATS-→HOTS	Attitudes toward student has a direct effect on higher order thinking skill ability.
H2	APS-→HOTS	Autonomy power sharing has a direct effect on higher order thinking skill ability.
H3	SSR-→HOTS	Student with student relationship has a direct effect on higher order thinking skill ability.
H4	SIM-→HOTS	Student interest and motivation has a direct effect on higher order thinking skill ability.
H5	CO-→HOTS	Class organization has a direct effect on higher order thinking skill ability.

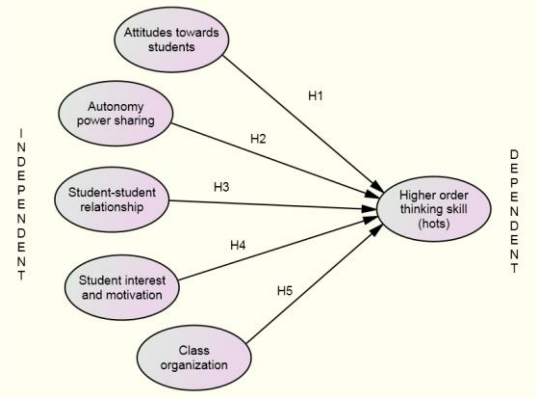

Figure 4: Theoretical framework of the study

3 Methodology

A Participants

The target population is bachelor's degree students of the Department of Chemistry in Faculty of Science, Universiti Teknologi Malaysia (UTM) Skudai. There are two types of program involved; Bachelor of Industrial Science Chemistry (SSI) and Bachelor of Pure Science Chemistry (SSA). The study employed disproportionate stratified sampling technique and the sample result is in Table 2.

Table 2: Sample size

Program	No. of Population	No. of Sample
SSI	130	$n_1 = 75$
SSA	155	$n_2 = 89$
Total	285	164

B Instruments

The questionnaire is divided into 3 sections. The first section asks about demographic questions with five items (gender, age, program, year and current CGPA). The second section is for psychological learning environment variables adopted from College and Classroom Environment Inventory, CCEI [35]. This section contains five sub-sections which represent ATS (6 items), APS (5 items), SSR (5 items), SIM (5 items) and CO (5 items). The third section measures student's perception on HOTS (6 items) adapted from Marzano Higher Order Thinking in Dimension of Learning Framework [36]. Section one and two are measured using Likert scale (1 to 9).

Statistical Analysis

Before the analysis, data screening and cleaning process were performed to avoid bias in analysis. Descriptive statistics, confirmatory factor analysis (CFA) and multiple linear regression analysis (MLR) were gained using SPSS 21.0. CFA was conducted before MLR to ensure the reliability of the items in measuring the variables.

4 Results

Demographic factors

It was found that 31% of the sample was male and the respondent was mostly 23 to 24 years. A total of 74 respondents (45%) obtained CGPA of around 3.01 to 3.66. On the other hand, 41 respondents (25%) obtained CGPA of 2.01 to 3.00 and 49 respondents (30%) obtained CGPA of 3.67 or higher.

Reliability
Reliability test was performed to test the internal consistency of each construct. The higher the Cronbach's Alpha value, the more reliable is the measurement instrument. A rule of thumb for Cronbach's alpha value should exceed 0.6 and above to be considered acceptable. Table 2 shows the summary of Cronbach's alpha values that are acceptable for further analysis.

Table 2: Cronbach's alpha values

	No. Of Items	Cronbach's Alpha
ATS	6	0.943
APS	5	0.832
SSR	5	0.940
SIM	5	0.842
CO	5	0.846
HOTS	6	0.946

ATS=Attitudes toward Students, APS=Autonomy Power Sharing,
SSR=Student Student Relationship, SIM= Students Interest and Motivation,
CO=Class Organization, HOTS=Higher Order Thinking Skills

A Tukey's Test

The multiple comparisons test in Table 3 showed that there was significant difference in perception towards higher order thinking skills between CGPA (2.01 to 3.00) and CGPA (3.01 to 3.66), and CGPA (3.67 and above).

Table 3: Multiple Comparisons (Tukey's Test) Table

Student Achievement (CGPA)	Mean Different	Decision
2.01 to 3.00	$\mu_{2.01 \text{ to } 3.00} \neq \mu_{3.01 \text{ to } 3.66}$	significant
	$\mu_{2.01 \text{ to } 3.00} \neq \mu_{3.67 \text{ and above}}$	significant
3.01 to 3.66	$\mu_{3.01 \text{ to } 3.66} \neq \mu_{2.01 \text{ to } 3.00}$	significant
	$\mu_{3.01 \text{ to } 3.66} = \mu_{3.67 \text{ and above}}$	no significant
3.67 and above	$\mu_{3.67 \text{ and above}} \neq \mu_{2.01 \text{ to } 3.00}$	significant
	$\mu_{3.67 \text{ and above}} = \mu_{3.01 \text{ to } 3.66}$	no significant

B Multiple Linear Regression Analysis

Overall F-test – Test for Significant of Regression Model
Based on Table 4, it shows that the regression model is significant since p-value < 0.05. Therefore, this model can be used to predict students' perception on HOTS.

Individual t-test – Test for Significance of Individual Predictor Variables
Based on the t-test, Table 5 shows that all factors are significant independent constructs; Attitudes toward Students (p-value=0.000<0.05), Autonomy and Power Sharing (p-value=0.003<0.05), Student with Student Relationship (p-value<0.05), Students Interest and Motivation (p-value=0.000<0.05) and Class Organization (p-value=0.047<0.05).

Table 4: Overall F-test – Test for Significance of Regression Model

F-statistic	**p-value**
1297.202	0.000

Table 5: Test for Significance of Individual Predictor Variables

Variable	Coefficient Value	t-statistics	p-value
(Constant)	-.307	-3.421	0.001
ATS	.344	11.640	0.000
APS	.076	3.031	0.003
SSR	.395	9.940	0.000
SIM	.176	4.645	0.000
CO	.061	2.003	0.047

ATS=Attitudes toward Students, APS=Autonomy Power Sharing, SSR=Student Student Relationship, SIM= Students Interest and Motivation, CO=Class Organization, HOTS=Higher Order Thinking Skills

Model Adequacy Checking

Scatter plot of residual against predicted value is randomly scattered with no pattern. Therefore, the homoscedasticity assumption of constant error variance is achieved. The normal probability plot shows all values are near to the fitted line. Therefore, the normality assumption is also acceptable. The value of R-square in Table 6 is 0.976 which indicates that 97.6% of total variation in Perception toward Higher Order Thinking Skill is explained by psychosocial learning environment dimension (ATS, APS, SSR, SIM, and CO). The other 2.4% is explained by other factors.

Table 6: R-square Value

R Square
0.976

The Estimated Regression Model

$$\hat{Y} = -0.307 + 0.344(ß_1) + 0.076(ß_2) + 0.395(ß_3) + 0.176(ß_4) + 0.061(ß_5)$$

The results revealed that there were significant direct relationships between psychosocial learning environment and higher order thinking skills ability. The summary of finding is as shown in Table 7.

	Hypothesis	Result
H1	Attitudes toward Students has a significant and direct influence on students' higher order thinking skill.	Supported
H2	Autonomy and Power Sharing has a significant and direct influence on students' higher order thinking skill.	Supported
H3	Student with Student Relationship has a significant and direct influence on students' higher order thinking skill.	Supported
H4	Students Interest and Motivation has a significant and direct influence on students' higher order thinking skill.	Supported
H5	Class Organization has a significant and direct influence on students' higher order thinking skill.	Supported

5 Conclusion

The result of this study indicated that attitude toward students, autonomy and power sharing, student with student relationship, student interest and motivation, and class organization are significant factors to the psychosocial learning environment construct and give a significant influence toward students' perception in their higher order thinking skills ability. This finding is consistent with the result obtained by Budsankom *et al.* [37] and Fleith [38]. In both studies, the authors concluded that quality of psychosocial learning environment is one of the factors that contribute to the development of higher order thinking skills ability. The finding obtained in this study is also consistent with the result of the study done by Pascarella *et al.* [39]. The authors concluded that quality of psychosocial learning environment is an antecedent to development of higher order thinking skills. Furthermore, the finding of this study is also consistent with the result obtained by Chini *et al.* [40]. In their study

on Physics education setting, it was reported that psychosocial learning environment learning environment quality has a strong and positive association with student's higher order thinking skills development. Last but not least, this hypothesis is also in line with Morris and Maisto where they asserted that in psychology point of view, the element of social environment affects the intellectual characteristic [41].

Based on the findings of this study, there are several recommendations to the Department of Chemistry, UTM Administration and future researcher. Since the learning environment affects the student thinking skills, the university should focus on improving the quality of learning environment in every faculty. The university also needs to give a greater attention to the development of the learning environment quality. The result of this study certainly provides useful implications to Universiti Teknologi Malaysia concerning the importance of providing satisfying educational experiences to their undergraduate students.

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