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The Interaction of Students' Perceptions of Classroom Learning Environment and their Academic Achievement

Azani Saleh
Lili Syahani Rusli
Roslinda Rosli
International Education Centre (INTEC),
Universiti Teknologi MARA (UiTM), Malaysia

ABSTRACT

An investigation of the relationships between the students' perceptions of classroom learning environment and their achievement in Biology at the matriculation level is described. Classroom learning environment in Biology classes was measured using a questionnaire on "What Is Happening In This Class?" (WIHIC) which consisted of seven dimensions adapted from Fraser et al. (1996). The questionnaires were administered to Year 12 (AUSMAT 17) and Year 11 (AUSMAT 18) Australian Matriculation Science students at the International Education Centre (INTEC) by the Biology teachers during regular class time. The data collected were analysed using descriptive statistics and Mann-Whitney Test. The results showed that both AUSMAT 17 and AUSMAT 18 students possessed high levels of task orientation, cooperation but low levels of involvement and investigation. The female students perceived their learning environment more favourably than the male. The AUSMAT 12 students' achievement in Biology was significantly related to two dimensions in the WIHIC namely student cohesiveness and equity. Meanwhile, the AUSMAT 18 students showed significant relationships of the achievement in Biology between teacher support and task orientation. The findings of the present study have important implications to the Biology teachers at the matriculation level especially in INTEC to encourage their students to do more investigation and involvement in class discussions besides having good cooperation and task orientation in order to achieve better results in Biology.

Introduction

The classroom environment is recognized as one of the major determinants of students' educational achievement. Numerous studies have clearly demonstrated that the learning environment has a significant impact on student achievement, emotional and social outcomes at all grade levels (Fraser, 1994; McRobbie and Fraser, 1993). In fact, positive classroom environments have been shown to improve the achievement of low-performing students (Pierce, 1994). Most educators and researchers believe that the classroom plays an important role in students' cognitive and affective development (Back and Choi, 2002). Research on classroom environment has identified a number of qualities associated with positive learning outcomes. According to Henningsen and Stein (1997), Huffman et al. (1997), and McRobbie and Fraser (1993), the key areas for improving the learning environment in the mathematics and science classrooms are: supportive relationships among teachers and students, students' participation in creating classroom norms, making decisions and setting goals, clear expectations and responsibilities, opportunities for collaboration, adequate time for completing tasks and for discussions, opportunities to work on open-ended tasks, and interesting and meaningful activities. Baek and Choi (2002) reported that the classroom environment is related to the students' academic achievement in English. For example, teacher control and task orientation are positively related to the level of English achievement in the classroom where teacher support and affiliation are perceived as being very strong. In another study, Yong (2005) found that more student cohesiveness, involvement, task orientation, equity and less co-operation among the students are likely to promote better achievement in Biology in secondary schools.

However, little is known about students' perceptions of their classroom learning environment in INTEC. The present study was carried out in Biology classrooms since Biology is one of the compulsory subjects for students in critical courses such as medicine, dentistry and pharmacy. A high achievement in this subject is necessary for the students to further their studies abroad.

Research Questions

The following research questions were investigated:

1. Are there any differences between AUSMAT 17 and AUSMAT 18 students' perceptions of the Biology classroom learning environment?

2. Are there any relationships between students' perceptions of classroom learning environment and students' achievement in Biology?

Objectives of the Study

The objectives of the study are as follows:

1. Identify the students' perceptions of the Biology classroom learning environment between students from Year 12 (AUSMAT 17) and Year 11 (AUSMAT 18) according to gender, sponsor and courses
2. Determine the relationship between students' perceptions of classroom learning environment and their achievement in Biology.

Research Methodology

Sample of the Study

This study involved 165 students from AUSMAT 17 and 133 students from AUSMAT 18. They were from two different batches and courses such as medicine, dentistry, pharmacy, science and technology, veterinary science, agricultural science, computer science, agricultural science and biotechnology. The subjects taken by the students were Mathematics, English, Biology, Physics and Chemistry.

The Questionnaire

A set of questionnaire on "What Is happening In This Class?" (WIHIC) adapted from Fraser et al. (1996) were administered to the subjects. The questionnaire consisted of 30 statements and seven dimensions of the Biology classroom environment, namely student cohesiveness, teacher support, involvement, investigation, task orientation, co-operation and equity. The statements were arranged in groups based on the seven dimensions. In each statement, the word 'Biology' was added at suitable places to make it clearer to the students. The present version used a five-point Likert response format ranging from almost never, seldom, sometimes, often and almost always. The strength of agreement and disagreement by the respondents for each of the statements were: 1 = almost never; 2 = seldom; 3 = sometimes; 4 = often; 5 = almost always

Achievement in Biology

Achievement in Biology for AUSMAT 17 students was determined by the grades that they obtained in the Senior Secondary Assessment Board of South

Australia (SSABSA) final examinations. The students' achievement in Biology for AUSMAT 18 was based on their end of the semester examination results in INTEC.

Statistical Analysis

The data collected were analysed by using the Statistical Package for Social Science Programmes (SPSS/PC+) version 14.

Descriptive Statistics

Descriptive Statistics was used to summarize the demographic profiles of the respondents. The analysis included a table referring to the percentages of all demographic profiles collected from AUSMAT 17 and AUSMAT 18 students.

Mann-Whitney Test

The Mann-Whitney Test was used to compare the means of two groups. It is one of the best-known non-parametric significant tests. The Mann-Whitney test works by ranking all the values from low to high, and comparing the mean rank in the two groups. If the data is paired or matched, then a Wilcoxon matched pairs test would be chosen instead.

Pearson's Coefficient Correlation

Pearson's correlation was used to find out the degree of linear relationship between two variables. It ranges from $+1$ to -1. A correlation of $+1$ means that there is a perfect positive linear relationship between variables. Positive correlation means the two variables are moving in the same direction and vice-versa for negative correlation. A value close to zero means no correlation, close to ± 0.5 – weak correlation, between ± 0.5 and ± 0.7 – moderate correlation, higher than 0.7 or lower than -0.7, high correlation.

Results and Discussion

Reliability of Questionnaire on "What Is Happening In This Class?" (WIHIC).
According to Oppenheim (1992) a good internal consistency of a questionnaire must have a Cronbach alpha value greater than 0.7. The statistical analysis revealed that this instrument was reliable and valid for the study. The internal consistency indices (alpha reliability) for seven dimensions in WIHIC ranged from a low 0.684 'involvement' to a high of 0.815 for 'task orientation' (Table 1).

Table 1: Internal Consistency Reliability (Cronbach alpha coefficient) for WIHIC

Dimension	Alpha reliability
Students Cohesiveness	0.728
Teacher Support	0.709
Involvement	0.684
Investigation	0.786
Task orientation	0.815
Co-operation	0.811
Equity	0.792

Students' Perceptions of Classroom Learning Environment in the Biology Classes

The results in Table 2 shows that there were similarities in the perceptions of the classroom learning environment in the Biology classes between students of AUSMAT 17 and AUSMAT 18. These students had high levels of task orientation, co-operation, student cohesiveness, equity and teacher support. However, the levels of their involvement and investigation were low. Overall, the results showed that the scale means of seven dimensions of the AUSMAT 17 students were higher than those of the AUSMAT 18 students which ranged from 4.02 to 3.16 and from 4.08 to 2.97 respectively. Among the factors that contributed to these findings could have been the number of lecturers who taught the particular batches, group dynamics and the duration of their studies. For example, at the time the questionnaires were administered, only one Biology lecturer taught the AUSMAT 18 students and they had only spent six months out of the eighteen months in INTEC. Meanwhile, the AUSMAT 17 students had three Biology lecturers and they had almost completed the course duration of eighteen months.

Table 2: Scale Means and Standard Deviations of WIHIC of AUSMAT 17 and AUSMAT 18

	AUSMAT	17	AUSMAT	18
Dimension	Mean	SD	Mean	SD
Student Cohesiveness	3.99	0.60	3.85	0.66
Teacher Support	3.76	0.64	3.30	0.71
Involvement	3.54	0.58	2.99	0.62
Investigation	3.16	0.71	2.97	0.85
Task orientation	4.02	0.57	4.08	0.58
Co-operation	4.00	0.62	4.02	0.65
Equity	3.83	0.65	3.55	0.78

In one previous study, Yong (2005) found similar results. He reported that the secondary school science students' perceptions of their classroom learning environment and teacher interpersonal behaviour from 19 government schools in Brunei were moderately positive. Baek and Choi (2002) also found that high school students in Korea characterized their classroom environment as a very strong task-orientation with warm relationships not only with peers but also with teachers.

In order to determine whether the means of seven dimensions on WIHIC showed significant difference between AUSMAT 17 and AUSMAT 18 students, the Mann-Whitney Test was used. The Mann-Whitney Test showed that there was no significant difference in students' perceptions of three dimensions namely student cohesiveness, task orientation and cooperation at p – values = 0.077, 0.584 and 0.994 respectively. However, there were significant differences in four other dimensions; teacher support, involvement, equity (p-value = 0.000) and investigation (p-value = 0.040).

Students' Perceptions of Classroom Learning Environment According to Gender

Table 3 shows that the female students had higher levels of all seven dimensions than the male students especially for student cohesiveness, teacher support, co-operation and equity. These findings indicated that female students had more favourable attitudes towards their learning environment. However, the Mann-Whitney test showed that only students' cohesiveness had a significant difference ($\alpha = 0.05$) between male and female students. These results corroborated the findings of other studies such as Riah (1998) who reported that boys and girls had different perceptions of their classroom learning environment and the girls seemed to perceive their learning environment more favourably than the boys.

Table 3: Scale Means and Standard Deviations of WIHIC According to Gender

Dimension	Male		Female	
	Mean	SD	Mean	SD
Student Cohesiveness	3.82	0.66	3.99	0.60
Teacher Support	3.46	0.74	3.60	0.69
Involvement	3.26	0.72	3.32	0.62
Investigation	3.06	0.85	3.08	0.74
Task Orientation	4.02	0.63	4.06	0.54
Co-operation	3.95	0.63	4.05	0.63
Equity	3.59	0.72	3.77	0.72

Students' Perceptions of Classroom Learning Environment According to Courses

In determining the students' perceptions of classroom learning environment according to the courses, students were grouped into two groups that were 'medicine' and 'non medicine'. The 'medicine' group included students taking courses such as medicine, pharmacy, dentistry, veterinary science; while the 'non medicine' group included students taking courses such as biotechnology, science and technology, computer science and agricultural science. Table 4 shows that students from both groups had almost the same perceptions towards their classroom learning environment. The Mann-Whitney test showed that there was a significant difference ($\alpha = 0.05$) in students' perceptions of one dimension, namely task orientation (p-value = 0.042).

Table 4: Scale Means and Standard Deviations of WIHIC According to Courses

Dimension	Medicine		Non Medicine	
	Mean	SD	Mean	SD
Student Cohesiveness	3.91	0.64	3.96	0.61
Teacher Support	3.55	0.73	3.56	0.67
Involvement	3.28	0.70	3.32	0.59
Investigation	3.05	0.78	3.11	0.79
Task Orientation	4.08	0.60	3.99	0.53
Co-operation	3.99	0.66	4.05	0.58
Equity	3.76	0.72	3.63	0.73

Students' Perceptions of Classroom Learning Environment According to Sponsors

Table 5 shows that students from both the JPA and non JPA (MARA, Petronas and Private) sponsors had high levels of task orientation, co-operation and student cohesiveness. The Mann-Whitney test showed there was no significant different at $\alpha = 0.05$ in any of the seven dimensions; student cohesiveness (p-value = 0.243), teacher support (p-value = 0.220), involvement (p-value = 0.313), task orientation (p-value = 0.541), co-operation (p-value = 0.875), equity (p-value = 0.297) and investigation (p-value = 0.908).

Table 5: Scale Means and Standard Deviations of WIHIC According to Sponsors

Dimension	JPA		Non JPA	
	Mean	SD	Mean	SD
Student Cohesiveness	3.95	0.62	3.87	0.64
Teacher Support	3.58	0.73	3.47	0.65
Involvement	3.32	0.68	3.23	0.59
Investigation	3.07	0.76	3.09	0.83
Task Orientation	4.06	0.59	4.02	0.53
Co-operation	4.00	0.65	4.05	0.55
Equity	3.74	0.69	3.62	0.81

Relationships Between Students' Perceptions of Classroom Learning Environment and Achievement in Biology

The main research question was whether classroom learning environments were significantly related to students' achievement as measured by the Biology examination results.

Table 6: Pearson Correlation between Classroom Learning Environment and Achievement in Biology of AUSMAT 17 Students

	BIO	SC	TS	INVLT	INVST	TO	CO	EQ
Pearson correlation	1	.159*	0.099	.112	-0.60	.105	.126	.419**
Sig. (2-tailed)		.043	.209	.154	.445	.181	.108	0.000
N	163	163	163	163	163	163	163	163

* Correlation is significant at the 0.05 level (2-tailed);
** Correlation is significant at the 0.01 level (2 -tailed);
Biology (BIO); student cohesiveness (SC); teacher support (TS); involvement (INVLT); investigation (INVST); task orientation (TO); cooperation (CO), Equity (EQ)

Table 6 shows the relationships between the WIHIC dimensions and the achievement in Biology of AUSMAT 17 students. These students' achievement in Biology was significantly related to two out of seven dimensions in WIHIC, namely student cohesiveness (SC) and equity (EQ). Meanwhile, the significant relationship between achievement in Biology and teacher support (TS) and task orientation (TO) of AUSMAT 18 students is shown in Table 7. These findings were not surprising since different examinations results were used in this study. As mentioned earlier, the achievement in Biology by AUSMAT 17 students was based on the SSABSA final examination results or the written examination which included 50% internal assessment. The written examination

results were moderated based on the internal assessment in that particular group. The AUSMAT 18 students meanwhile used their end of the semester examination results. A set of questions was prepared by the Biology lecturer who had taught AUSMAT 18.

Table 7: Pearson Correlation between Classroom Learning Environment and Achievement in Biology of AUSMAT 18 Students

	BIO	SC	TS	INVLT	INVST	TO	CO	EQ
Pearson correlation	1	.071	.191*	-0.004	.014	.200*	-.093	.069
Sig. (2-tailed)		.420	.028	.960	.876	.021	.290	.432
N	132	132	132	132	132	132	132	132

* Correlation is significant at the 0.05 level (2-tailed)

Conclusion and Recommendations

Based on the results of the present study, it can be concluded that students at the AUSMAT Programme had positive perceptions towards their Biology classroom learning environment. They had high levels of task orientation, co-operation, student cohesiveness, equity and teacher support, but low levels of involvement and investigation. These findings could provide useful information to Biology teachers who are teaching at the matriculation level on how to encourage their students to participate in any class activities such as group discussions, answering teachers' questions and conducting more investigation besides keeping up good co-operation and task orientation. These two dimensions, investigation and involvement are very important for them at the university level as they need to carry out a research project in order to complete their studies. As such, they have to familiarize themselves before entering any university.

The research finding showed that the students in the 'medicine' group had a significantly higher level of task orientation. It seems that they were well prepared to achieve the goals that they set than the students in the 'non medicine' group. Meanwhile, the female students had a significantly high level of student cohesiveness than the male students. The study also showed that students' achievement in Biology were significantly related in a low positive correlation to two dimensions in WIHIC, namely student cohesiveness and equity ($\alpha = 0.05$) of AUSMAT 17, and significant relationships between achievement in Biology and teacher support and task orientation of AUSMAT 18 students. The findings of this study suggest that the same research should be continued the AUSMAT 18 students to determine whether the same perceptions and relationships would be obtained after spending eighteen

months at INTEC. A set of questionnaire on another important socio-psychological dimension that has a strong influence on student learning outcomes and is associated with teacher interpersonal behaviour could be administered to the same students.

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