

Chapter 5. Discussion and Conclusion

This study attempted to facilitate future research and relate issues involving the science teaching and learning of classroom LE which teachers constructed and students perceived by an alternative, transverse or macrocosmic standpoint. For this purpose, a new instrument, the Earth Science Classroom Learning Environment Instrument (ESCLEI) was developed. This instrument assessed two dimensions included student-centred and teacher-centred orientation of science classroom LE from the students' viewpoints. Validation data provided here and elsewhere (Lee and Chang, *in press*) have confirmed the reliability and validity of the ESCLEI for use in Taiwan.

In this study, as the descriptive statistics shown in Table 6, it was found that students preferred their classroom LE tended to both student-centred and teacher-centred setting which occur between 'Sometimes' and 'Often' in both pre- and post-test. However, before and after semester, they perceived (actual) more teacher-centred setting classroom LE which occur between 'Sometimes' and 'Often', and less student-centred orientation which occurs between 'Seldom' and 'Sometimes'. Correspondingly, as shown in Figure 3-a and 3-b, we can see the classes' favors and experiences, for the most part, located on ST-quadrant and T-quadrant before semester. The similar results after semester shown in Figure 4-a

and 4-b. It indicated that Taiwan's 10th grade students preferred both the student-centred and teacher-centred setting LE, which seems to be a domestically unique situation. And it also revealed that students perceived (actual) more teacher-centred setting classroom LE, which reflected that classroom LE in Taiwan are oriented chiefly toward teacher-center setting. The results are, to a certain extent, in line with previous studies (Aldridge *et al.* 2000, Aldridge *et al.* 1999, Chang 2003, Lee and Chang *in press*), which revealed that teaching in Taiwan is often teacher-center oriented setting.

It also found that students' preferred and perceived (actual) classroom LEs are much more teacher-centred oriented setting than toward the student-centred settings in both pre- and post-test, in spite of the preferred classroom LEs revealed by students responses on both subscales (i.e., teacher-center and student-center) are quite similar to each other. No matter before or after semester, there is a noticeable gap between students' preferred and actual (perceived) classroom LEs on both subscales. Especially in the student-centred settings, the gap between preferred and actual (perceived) classroom LE in student-centred situation (i.e. PEFS) was much higher than that in the teacher-centred settings (i.e. PEFT) in both pre- and post-test (as shown in the seventh row in Table 7 and Table 8). Apparently, the classroom LEs in Taiwan are oriented chiefly toward teacher-centred setting, although students also

preferred student-centred situation and it still had a certain extent gap between their preferred and actual (perceived) classroom LEs. In other words, Taiwan's teachers may still had efforts on construct more student-centred oriented classroom LE to fit what students preferred.

The results of present study also provide evidence of the variations in students' preferences of and experiences of classroom LE when they were taught during a semester. Campbell *et al.* (2001) stated that teaching strategies of teachers influenced students' perceptions. Tsai (2000, 1996) stated that students' epistemological beliefs may come mainly from their formal schooling and were an essential component in determining their learning perceptions and orientations. However, students' perceptions of classroom LE before a semester were influenced by the instructions in earlier periods, and which of that after a semester were influenced by present teachers' teaching strategies.

In this study, the students' perceptions in the classroom LEs include preferences and experiences; we found that the students' preferred and perceived (actual) classroom LEs had a noticeable gap between pre- and post-test on both subscales (as shown in Table 9). Students' preferred classroom LEs on both subscales tend to decrease when they were taught during a semester and their perceived (actual) classroom LEs on teacher-centred orientation have similar situation (see Table 9). It

is worthy noted that students perceived (actual) much more student-centred oriented classroom LE when they were taught during a semester (as shown in the fifth row in Table 9).

Moreover, we can found that the gap between preferred and actual (perceived) classroom LE on both subscales (i.e. PEFS and PEFT) tend to regression when they were taught during a semester, especially in PEFS ($p < 0.01$, $d = 1.25$) (as shown in the seventh and eighth row in Table 9). In 'ideal' classroom, there would be no difference between the preferred and actual classroom climate which PEF scores would be zero (Diamantes 2002). It may be inferred that teaching strategies in Taiwan had some positive reflection in students' perceptions.

Despite that a teacher-centred teaching strategies to education generally results in higher academic achievement than a student-centred teaching strategies (Chall 2000 and Chang 2003). In this study, results form the simple correlation (r) revealed that there were some positive relationship between CVS and the diversities of leaning outcomes (i.e. attitude and achievement), and were no significant relationship between CVT and the diversities of learning outcomes (as shown in Table 10).

It seem to indicate that the diversities of learning outcomes were tended to increase which if teacher didn't fitted for students' perceptions on student-centred orientations in light of current study. It may be because students felt not enough

direction given from teacher in student-centred oriented classroom LE while they had adopted teacher-centred oriented and examination-driven classroom LE in past formal schooling. Students in Taiwan are generally quiet and passive learners and not inclined to enjoy self-learning very much (Chang 2003). Aldridge *et al.* (2000) stated that diversions from teacher-centred methods can be viewed off-task by parents and students in Taiwan. Besides, the conventional teaching method has prevailed in the science classrooms for so long and students in Taiwan are used to listening to the teachers (Chang and Mao 1999). And it may be because, as proposed by Novak (1985), implies that the traditional way of testing or evaluation cannot effectively differentiate the meaningfulness of students' science learning.

That is, the result of the present study revealed that the fitness of students' perceptions on student-centred oriented classroom LE were probably a component in influencing their learning outcomes.

Research focusing on classroom LE as students' viewpoints and specifically dealing with student-centred and teacher-centred orientation at the secondary school earth science classrooms is limited and sparse. This study has described the development and validation of a questionnaire (ESCLEI) which consists of two subscales (student-centred and teacher-centred LEs) with both preferred and actual (or perceived) form pooled together. Overall, this study revealed the present structure of

classroom LE at the secondary school earth science classroom in Taiwan, and it also revealed students' perceptions and the fitness in classroom LE. Principals and supervisors may use it to help teacher improve their classroom environments. It is noted, however, that there were some relationships between classroom climate vector and diversity of learning outcomes; it still needed some further investigations to interpret the data given form present study which were currently conducting in fact.

The results of current study could shed lights on teaching and learning on earth sciences and have a potential benefit for further studies. It is noted that the instrument need to further simplify and modify in order to explore something impacted on classroom LE (e.g., teaching method, teaching content and teaching evaluation) which were currently conducting in fact.