Chapter 2. Literature Review

2-1. Importance of the Classroom Learning Environment

Science teaching is conducted primarily in three types of learning environments: outdoors; laboratory; and classroom (Orion 1997). The importance of the classroom Learning Environment (LE) has been gradually acknowledged over the past two decades. Tsai (2000) stated that students' perceptions of LE, to a certain extent, also represent their beliefs about what constitutes learning and how knowledge is created. Entwistle *et al*. (1991) discuss the apparent paradox in the relationship between conceptions of and approaches to learning, and the learning context, in so far as the literature suggests both that conceptions and approaches are stable yet they can be influenced by the LE. Fraser (1994) suggested that the perceptions of classroom environment can influence students' outcomes.

Significant advancement has been made over the past 30 years in the conceptualization, assessment and investigation of the important but subtle concept of LE (Fraser 1986, 1994, Fraser and Walberg 1991, McRobbie and Ellett 1997). Some highlights from the field of LE include:

(1) The use of qualitative methods in LE research, including the combination of quantitative and qualitative methods (Fraser 1996).

(2) The development of preferred forms of instruments which permit investigations

of differences between actual and preferred LE (Fisher and Fraser 1983) and person-environment fit studies of whether students achieve better in their preferred LE (Fraser and Fisher 1983).

(3) Teachers' use of assessments of actual and preferred LE in action research attempts to improve their classrooms (Fraser and Fisher 1986).

(4) The incorporation of LE ideas into teacher education (Fraser 1993).

(5) The idea of 'grain sizes' in LE research (Fraser 1996).

In the recently years, many studies had use quantitative questionnaire to detected students' learning orientations towards science classrooms LE (see Fraser 1991, for an overview of the research). For example, the Constructivist Learning Environment Survey (CLES) (Taylor and Fraser 1991, Taylor *et al*. 1994, and Taylor *et al*. 1995) was developed to enable educators and researchers to determine students' degree of orientations to which constructivist approaches are present in classroom. Kim (1999) and Tsai (2000) had used it in Korea and Taiwan following the same line of research preceding an instrument. Tsai (2000) explored 10^{th} science classroom in Taiwan with Chinese-version CLES Instrument and suggested that Taiwanese students tended to have less preference for constructivist orientated LE and appeared not favored in student-centred LE. The results seem to indicate that 10^{th} students in Taiwan relatively do not accepted much more student-centred oriented LE in science

classroom and thought that teacher-directed teaching approach can more assist in their achievement.

2-2. Student-centred or Teacher-centred Classroom Learning Environment

Many studies suggested that student-centred oriented teaching approach could be more helpful to student's concept learning and teacher-directed oriented teaching approach might be more involving student's learning potential in classroom. However, it does not mean that which is better then the other. Campbell *et al*. (2001) reported that teachers adopting a combination of student-centred active learning strategy and teacher-directed transmission of information should be useful to students who are learning in both deep and surface approaches. Moreover, Campbell *et al*. (1996) suggested that students requiring being taught the skills and shown very clearly how to learn form various active learning experiences, and also how to make connections between theories and practice in classroom. Chang (2003) also suggested that the teacher-directed approach helps students to see and sift through a large amount of information and data, understand the key concepts and hence assist students in acquiring science knowledge and to apply this knowledge to new problems or situations.

In other words, the teacher-centred approach values a large quantity of decontextualized skills and facts and should be useful to students learning in surface approaches, whereas the student-centred approach values the acquisition of more

particular forms of knowing and acting and should be useful to students learning in deep approaches.

However, whether student-centred oriented LE or teacher-centred oriented LE is beneficial to students' school achievements are still in questions today (Chall 2000 and Chang 2003). Furthermore, whether learners have adequate ability and maturity to administer their self-learning or not is still a problem (Dick 1991).

In fact, the class size is constantly large more than 40 at secondary school in Taiwan and not every student could adopt the whole student-centred oriented LE. That is, teacher plays an important role in explaining scientific ideas and organizing information in science classroom. In other words, to a certain extent, some traditional, teacher-directed teaching approaches are required in Taiwanese science classroom.

2-3. The potential property of the preference of classroom LE

As the description in previous section, the purpose of this study highlighted the orientations in classroom LE from students' viewpoints which include their preferences and experiences. Accordingly, the orientations in classroom LE would be subdivided into student-center and teacher-center in this study (Lee and Chang, *in press*).

Aldridge *et al.* (1999) stated that the LEs were influenced by the nature of curriculum. Walker (1990) stated that the curriculum was mainly put into practice in the classroom. After make a comprehensive review on the scales' descriptions of quantitative research in LE (e.g. Aldridge 1999 and 2000, Dart *et al.* 2001, Scott 2000, Taylor and Fraser 1991, Taylor *et al*. 1994, and Taylor *et al*. 1995, etc.). Generally, the teaching method and teaching content were two major components of the curriculum in classroom LE (Lee and Chang, *in press*).

Additionally, the teaching assessment was another major component of the curriculum in classroom LE. The National Science Education Standards in the USA state that:

> Assessment and learning are so closely related that if all the learning outcomes are not assessed, teachers and students likely will redefine their expectations for learning science only to the outcomes that are assessed. (NRC 1996, p. 82).

British science educators compiled a report entitled 'Beyond 2000: science education for the future' (Millar and Osborne 1998), which also stated that assessment should

exert a positive and benign influence on teaching and learning of science. Consequently, the classroom LE has three components: teaching method, teaching content and teaching evaluation (assessment), which were present simultaneously in classroom LE (Lee and Chang, *in press*). Figure 1. represent the potential property of the preference of classroom LE.

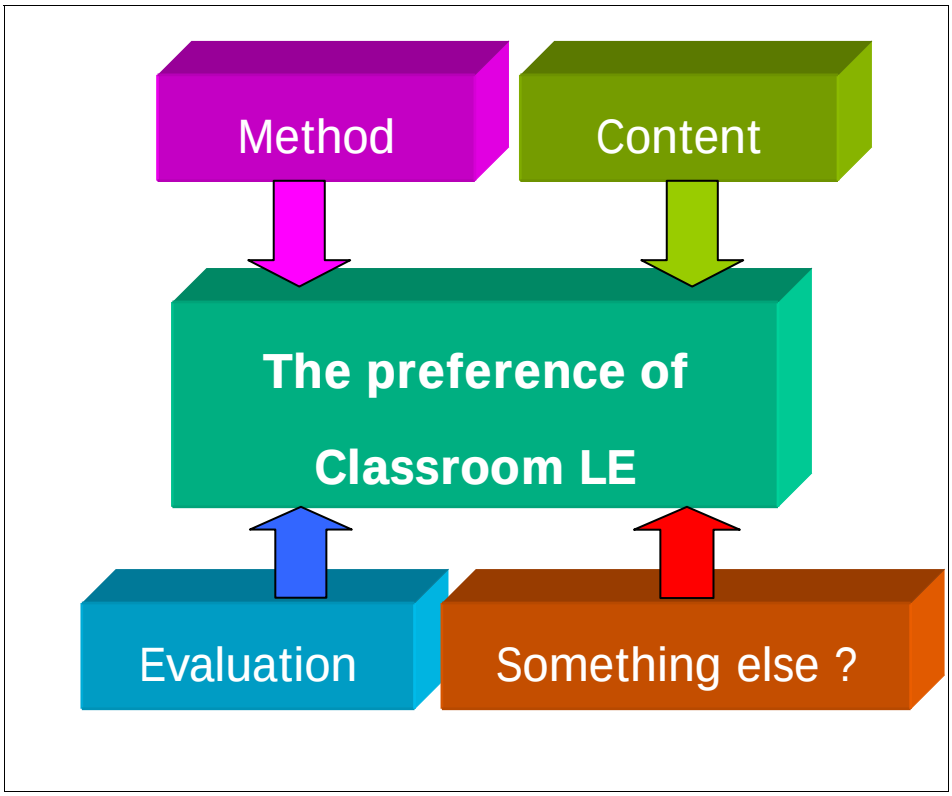

Figure 1. The potential property of the preference of classroom LE.