

Abstract

In the past 30 years, the international academic circle of science education has made the considerable progress in the learning environment research, and it has been widely applied in fields of evaluation for curriculum reform, teaching improvement, teacher training and so on. This research, using the two questionnaires of construction learning environment survey(CLES) and science laboratory environment inventory (SLEI) and analyzing the actual perceptions and preference of the senior 3 students in Macao, discusses the science learning environment as well as the relations among background variables

This research samples 411 senior 3 science subject students by Stratified Delphi Sampling, uses statistical methods like frequency, factor analysis, internal consistency, discriminant validity, t test, single factor variance analysis and so on, finally draws up the conclusions following: .

First, the translated version of questionnaire construction learning environment survey (CLES) has good reliability and validity, and the laboratory environment (SLEI) validity is still ok.

Second, in actual classroom, the highest score of student's actual perception is the uncertainty scale, the lowest score is the control scale. The ranking of the five scales of CLES actual version from the highest to the lowest is: uncertainty, student negotiation, personal relevance, critical voice, shared control.

The highest score of student's preferred classroom learning environment is the personal relevance scale, the lowest score is the control scale, the ranking of the five scales of CLES preferred version from the highest to the lowest is: personal relevance, student negotiation, critical voice, uncertainty, shared control.

The difference of the five scales of CLES between students' preferred and actual environments have reached a significance level, the preferred scores are higher than the actual perception in the four scales: personal relevance, student negotiation, critical voice,

shared control, on the contrary, the preferred scores are lower than actual perception in the uncertainty scale .

Third, the highest score of students' perception of laboratory learning environment is the integration scale, the lowest score is the open-endedness scale. The ranking of the five scale of SLEI actual version from the highest to the lowest is: integration, student cohesiveness, rule clarity, material environment, and open-endedness.

The highest score of students' preferred laboratory learning environment is the material environment scale, the lowest score is also the open-endedness scale. The ranking of the five scale of SLEI preferred version from the highest to the lowest is: material environment, student cohesiveness, integration, rule clarity, open-endedness.

There are four scales reached the significance level, which are material environment, student cohesiveness, integration, open-endedness. The preferred scores are higher than actual perception in the four scales but there is no significance difference in the rule clarity scale.

Fourth, there are differences between different genders students' actual perceptions in the science learning environment. In the classroom, there are two scales reached the significance level. The male students are more positive in the personal relevance scale, while the female students are more positive in the student negotiation scale .In the laboratory, there are significance differences in two scales named student cohesiveness and integration. The female students are more positive in these two scales.

Fifth, students in the different class sizes have different perceptions in the actual learning environment. In the classroom, only one scale, i.e. shared control which has reached the significance level .The students in the small classes which have less than 25 members are more positive than the students in the big classes which have more than 35 members. But there is no difference between the students in the medium classes (25-35 students) and students in the small classes as well as big classes.

In the laboratory, there are significance differences in three scales, which are student cohesiveness, material environment, open-endedness. In the student cohesiveness scale, the

students in the small classes are more positive than the students in the medium and large size classes, but there are no significance difference between the students in the medium classes and large classes. In the open-endedness scale, the students in the medium classes are more positive than the students in the large classes.

In the material environment scale, the students in the small classes and medium classes are both more positive than the students in the large classes, but there are no significant difference between the small classes and medium classes.

Finally, in order to building a more positive science learning environment, this research provides some suggestions for the improvement of the questionnaire, teaching, educational administrative department and teacher training and so on, simultaneously also provides suggestions for the further research.

Key words: science classroom learning environment ; laboratory learning environment