

# Exploring Classroom Environment through Perception- An Overview of Various Inventories

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**Abstract:** This paper provides an overview of various inventories related to survey research on classroom learning environment. A brief introduction of seventeen inventories provides dimensions/scales, number of items per scale and response pattern. It has also been explored that what criterion is used for the development of these inventories. Some recommendations have been given to be useful for the development of another new instrument in future.

**Keywords:** Learning environment, students' perception, inventories, scales

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## I. INTRODUCTION

Greenwood (2002) argues that "the classroom environment has a powerful influence on learning and children's perceptions of that environment influence their behavior. The classroom events can be understood in terms of individuals' perceptions as indicated by Fraser (1986, p. 16). Walberg and Moos were eminent pioneers who worked on perceptions of classroom environment in late 1960s (Fraser). Working at Social Ecology Laboratory at Stanford University, Moos and his associates studied psychosocial qualities of eight diverse environments, and conceptualized three broad categories: relationship dimensions, personal development or goal orientation dimensions, and system maintenance and change dimensions (Loo, 1974). Cürebal (2004) writes that several batteries of survey have been developed to date to measure perceptions of both students and teachers on classroom environment. This paper looks at various batteries related to classroom learning environment accessible online and to review how these are alike or dissimilar with one another. Also, few recommendations have been given for future investigations.

## II. OVERVIEW OF VARIOUS INVENTORIES

Learning Environment Inventory (LEI) was developed in 1960s (Fraser, n.d.. & Rickards, 1998). This instrument was consisted of 15 dimensions: cohesiveness, friction, favoritism, cliqueness, satisfaction, apathy, speed, difficulty, competitiveness, diversity, formality, material environment, goal direction, democracy, and disorganization (Fraser, Anderson, & Walberg, 1982). It was constituted upon 7 items in each scale and measured on four point Likert scale (Rickards 1998).

Classroom Environment Scale (CES) was developed by Moos and Trickett in Stanford University (Baek & Choi, 2002; Rickards, 1998). This instrument had wide application not only within school classroom but also implemented for data collection from various dimensions, such as hospitals, military companies, university residences and work place environment (Rickards). Its nine scales were: involvement, affiliation, teacher support, task orientation, competition, order & organization, rule clarity, teacher control, innovation (Fisher, 1986). Each scale carried 10 items and the response format was true/false (Rickards).

In another study, Baek and Choi (2002) used CES nine scales as subscales of three dimensions into a new version of CES named Korean Classroom Environment Scale (KCES). The three dimensions were: relationship (involvement, teacher support, and affiliation), goal orientation (task orientation and competition), system maintenance and change (order and organization, rule clarity, teacher control, and innovation).

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Individualized Classroom Environment Questionnaire (ICEQ) was developed by Rentoul and Fraser in 1979 (Rickards, 1998). The response pattern was on five point Likert scale; personalization, participation, independence, investigation, differentiation were its scales with 15 items in each (Curebal, 2004; Dorman, 2002). In another version, the five scales were reduced to 10 items in each (Fraser & Fisher, 1983). Another short form of ICEQ with 5 items in each scale was also developed (Fraser & Fisher, 2006). Fraser & Fisher (2006) also mention its actual and preferred forms to measure perceptions of teachers and students for open and individualized classrooms.

My Class Inventory (MCI) was a short form of LEI (Fisher & Fraser, 1981, as cited in Fraser n.d.). Its format was consisted of 38 items with item response just on yes/no, so its use was best for younger children (Rickards, 1998). Fisher & Fraser (1981, as cited in Fraser) indicate the appropriate age of students 8-12 for this instrument. Its five scales were: student cohesiveness, friction, satisfaction, difficulty, competitiveness (Fraser et al, 1982). Goh, Young and Fraser (1995, as cited in Fraser, n. d.) changed its format of yes/no into three point response: 'seldom, sometimes, most of the times'. Fraser (n.d.) pointed out that 'task orientation' scale had also been a part of its modern version. Fisher (1986) has reported its further short form with 25 items that was used by Quek and Wong (2002) in their study for data collection from upper primary level.

Rickards (1998) argued that there was none of the instrument available, for a research on tertiary education, prior to the development of College and University Classroom Environment Inventory (CUCEI). Treagust and Fraser (1986) developed this instrument in actual and preferred forms. Logan, Crump and Rennie (2006); Rickards (1998); Treagust and Fraser (1986) have described its format consisted of seven scales, personalization, involvement, student cohesiveness, satisfaction, task orientation, innovation, individualization, each with 7 items with response pattern on four point Likert scale.

Logan et al (2006) has mentioned that Nair and Fisher modified CUCEI in 2000 by replacing two of its scales 'involvement' and 'satisfaction' into 'cooperation' and 'equity'. Nair and Fisher had the thought that students cooperate with one another rather than to compete on learning tasks and therefore cooperation scale was incorporated; and equity was to investigate students' perceptions of the environment with respect to gender. Secondly, the response was also personalized from the four-point rating scale of 'strongly agree, agree, disagree and strongly disagree' to a five-point rating scale of 'almost never, seldom, sometimes, often and almost always'.

Kent and Fisher (1997, as cited in Rickards 1998) have described another instrument, Secondary College Classroom Environment Inventory (SCCEI) that was developed with the components of LEI and CUCEI.

Questionnaire on Teacher Interaction (QTI) questionnaire was developed for the field research on interpersonal relationship between teacher and students. It was developed in Netherlands (Wubbels & Brekelmans, 1998., Webbels & Lery, 1993, as cited in Fraser, n. d.). Leadership, helpful/friendly, understanding, student responsibility/freedom, uncertain, dissatisfied, admonishing, strict were its eight scales (Coll, Taylor, & Ali, 2001; Koul, & Fisher, 2004). Each scale was composed of six items, and the response was on five point Likert scale from 'never to always' (Tartwijk, Brekelmans, Webbels, Fisher & Fraser, 1998).

Constructivist Learning Environment Survey (CLEs) was designed so to investigate a particular classroom's environment consistent with constructivist epistemology (Rickards, 1998). The original version of the CLEs was based on the role of students in constructing their own knowledge (Fok & Watkins n.d.; Wanpen & Fisher, 2004). This instrument was composed of five scales: personal relevance, uncertainty, critical voice, shared control, student negotiation (Dorman, & Adam, 2004; Wanpen, & Fisher) with six items per scale (Rickards, 1998; Mvududu, 2003). Rickards has mentioned that initially CLEs was consisted of four scales and 58 items as in a range of 9-20 items per scale.

Constructivist Learning Environment Survey (CLES) was another instrument related with constructivist learning environment. It had four scales: anatomy, prior-knowledge, negotiation, student-centered, with five point Likert scale from 'very often to never'; each scale was consisted of 7 items (Beswick, 2007).

For the development of another questionnaire What Is Happening In this Class (WIHIC), a sample of 3980 high school students from Australia, Britain and Canada was used in the study (Dorman, 2003, as cited in Aldridge, Dorman & Fraser 2004). Initially, the instrument had nine scales with 10 items in each, in personal as well as class form, but final version was reduced to seven scales with 56 items (Rickards, 1998). Its seven scales were: student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, equity (Dorman & Adam, 2004).

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Rickards (1998) argued that the need of this instrument was felt because there was none of such an instrument to gauge culturally sensitive factors of classroom learning environment, prior to CLEQ. This Cultural Learning Environment Questionnaire was composed of seven scales: equity, collaboration, deference, competition, teacher authority, modeling, congruence, originally with 5 items in each (Waldrup & Fisher, 1998).

Technology-Rich Outcomes-Focused Learning Environment Inventory (TROFLEI) had specific dimensions to assess technology and outcomes dimensions of the learning environment. Aldridge et al (2004) claimed that this new instrument was built upon existing learning environment instrument the WIHIC. Its ten scales were: student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, equity, differentiation, computer usage, young adult ethos (Aldridge, Dorman & Fraser, 2004; Dorman, Aldridge & Fraser, 2006). Each scale was consisted of 8 items. The response was on five-points as 'almost never, seldom, sometimes, often, almost always'.

For school reforms, a longitudinal study was conducted by Queensland School in 2001 to make specific reference to supportive classroom environments in pedagogical framework (Dorman, 2002). The instrument, Queensland School Reform Longitudinal Study (QSRLS) developed for this purpose was composed upon five dimensions: student direction, social support, academic engagement, explicit quality performance criteria, and self-regulation (Dorman).

Wierstra et al (1999) have reported their study of the experiences of 610 Dutch students and 241 European students of other countries studying in Dutch university. A new questionnaire, Inventory of Perceived Study Environment (IPSE), was used to gauge students' perceptions of the university learning environment concerning the home university, the host university and the ideal learning environment. The IPSE format was consisted of 37 items, eight scales (4–6 items per scale) and on Likert scale response pattern. The scales were: innovation, personalization, participation, individualization, connectedness, reproduction, application, task orientation (Wierstra, Kanselaar, Linden & Lodewijks, 1999).

Chin and Wong (n.d.) reported My Science Class Inventory (MSCI) in their study in Singapore. This new instrument was developed by using Science Laboratory Environment Inventory (SLEI) and My Class Inventory (MCI). There were eight scales with 5 items in each. The scales were: competitiveness, difficulty, cohesiveness, open-endedness, integration, rule clarity, material environment (Chin & Wong). Chin and Wong examined students' perceptions by using actual and preferred forms from seven intact classes of grade 5.

Hofstein (2004), Fraser and Griffiths (1992), Chin and Wong (n.d.), Rickards (1998) have described the development of first instrument to be used for research on science laboratory at secondary and tertiary level known as Science Laboratory Environment Inventory (SLEI). SLEI was initially consisted of eight scales, with 9 items in each, but the modified version was changed it into five scales, with 7 items in each (Fraser & Griffiths, 1992). The scales of modified version were: student cohesiveness, open-endedness, integration, rule clarity, material environment (Abudhim, Yunanxiang & Mutahar, 2008). Wong and Fraser (1994) have described various forms of this questionnaire: class form (actual or preferred), personal form (actual or preferred).

Although, SLEI has also been used for chemistry laboratory, however, Quek, Wong and Fraser (2002, 2005) developed a particular Chemistry Laboratory Environment Inventory (CLEI) parallel to SLEI with scales: student cohesiveness, open-endedness, integration, rule clarity, material environment. The response was five point Likert scale with options: never, seldom, sometimes, often, and very often.

### III. DISCUSSION

Many inventories have been developed for conducting survey on learning environment in classrooms from primary to university level. The same prototype has been observed in seventeen inventories studied. Fraser, Giddings, & McRobbie, (1993, as cited in Clayton, 2007) have talked about following five steps usual in practice.

1. A literature review to identify dimensions for classroom learning environment.
2. Guidance to identify dimensions by examining the scales in existing classroom environment inventories.
3. Selection of dimensions on the basis of Moos dimensions i.e. relationship, personal development and system maintenance and system change.
4. Taking views of teachers and students on an initial draft to make sure dimensions and items to be salient.
5. To consider economy in terms of time required for answering and scoring.

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Moos model is a well-known parameter to which scales and respective elements are adjusted. These are three scales: Relationship, Personal Development and System Maintenance and System Change (Rickards 1998) facilitate developer of the questionnaire to focus his interest towards a specific dimension. In these three categories, many scales have been developed until now. Table 1 shows different scales related to relationship category. These have been classified into three types of relationships: teacher-student, student-student, and student-learning. Relationship dimension on Moos category defines the intensity of personal relationship within the environment where individuals are supportive and helping for one another (Goh, and Khine, 2002, p 30). According to Harts and Hodson (2004, p 22), a relationship based classroom is made upon mutual contribution where needs of teachers and students are respected. Harts and Hodson (pp 30-40) have defined four types of relationships: teacher-self, teacher-student, student-student, and student-learning relationship. In the first, a teacher is aware of his/her own teaching intentions, qualities, talent, and interests towards teaching. In the last, a student is aware of his/her own learning process, and to make connections with the world to get benefits from the opportunities.

**Table 1: Scales Associated with Relationship Dimension of Moos, Description of Scales**

Relationship Type	Scales on Relationship Dimension of Moos	Description
Teacher-Student	Admonishing	Extent to which the teacher shows anger/temper and is impatient in class.
	Dissatisfied	Extent to which teacher shows unhappiness/ dissatisfaction.
	Favoritism	Extent to which the teacher treats certain students more favorably than others.
	Helpful/Friendly Teacher Support	Extent to which the teacher is friendly and helpful towards students. Extent to which teacher helps, befriends, trusts, and shows interest in students.
Student-Student	Understanding	Extent to which teacher shows understanding and care to students.
	Affiliation	Extent to which students help each other, get to know each other easily, and enjoy together.
	Apathy	Extent to which students feel no affinity with the class activities.
	Cliqueness	Extent to which students refuse to mix with the rest of the class.
	Collaboration	Extent to which students perceive they collaborate with other students rather than act as individuals.
	Deference	Extent to which students feel they defer to the opinions of others.
	Equity	Extent to which the teacher treats students equally; the extent to which students perceive male and females are treated equally (Gender Equality)
	Friction	Amount of tension and quarrelling among students.
Student-Learning Relationship	Involvement	Extent to which students have attentive interest, participate in discussions, do additional work and enjoy the class; an interactive way of thinking.
	Participation	Students are encouraged to participate; students having a say in the method and content of instruction.
	Student Cohesiveness	Extent to which students know, help and are friendly towards each other.
	Personal Relevance	Focuses on how school science and students' out-of-school experiences are connected.
	Personalization	Opportunities are provided for individual students to interact with the teacher; socio-emotional distance between students and teacher.
	Satisfaction	Extent of enjoyment of class work.
	Social Support	Extent to which classroom characterized by an atmosphere of mutual respect and support among teachers and students.
	Uncertainty	Extent to which opportunities are provided for students to experience the inherent uncertainty and limitations of scientific knowledge as arising from theory-dependent inquiry involving human experience and values, and as evolving, non-foundational, and culturally and socially determined.

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Personal development is the second dimension on Moos category. Walshe and Smith (2011) have related personal development with the intensification of feelings, attitude, behavior and cognition which are further used to enhance understanding of practical goals. Wikipedia has discussed three different aspects of personal development. First, it is self-help, including activities to develop talent and potential and enhancing quality of life. Second aspect covers the activities related to the involvement in developing others as teacher, coach, mentor, guide, counselor or manager. The third aspect belongs to institutional role to provide opportunities in personal development. Table 2 shows diversity in scales under the framework of personal development category of Moos.

**Table 2: Scales Associated with Personal Development Dimension of Moos, Description of Scales**

Scales on Personal Development Dimension of Moos	Description
Autonomy	Extent to which students control their learning and think independently.
Competitiveness	Emphasis on students competing with each other.
Computer Usage	Extent to which students use their computers as a tool to communicate with others and to access information.
Congruence	Extent to which the students perceive learning at school matches their learning at home.
Cooperation	Extent to which students cooperate rather than compete with one another on learning tasks.
Critical Voice	Extent to which a social climate has been established in which students feel that it is legitimate and beneficial to question the teacher's pedagogical plans and methods, and to express concerns about any impediments to their learning.
Difficulty	Extent to which students find difficulty with the work of class.
Independence	Students are allowed to make decisions.
Integration	Extent to which laboratory activities are integrated with non-laboratory and theory classes.
Investigation	Extent to which there is emphasis on the skills and their use in problem solving investigation.
Open-Endedness	Extent to which laboratory activities emphasize an open-ended, divergent approach to experimentation.
Self Regulation	The direction of student behavior implicit and self-regulatory.
Shared Control	Extent to which students are invited to share with the teacher control of the learning environment including the articulation of learning goals, the design and management of learning activities, and the determination and application of assessment criteria.
Speed	Extent to which class work is covered quickly.
Student Direction	The extent to which students determine specific activities or outcomes of the lesson.
Task Orientation	Extent to which it is important to complete activities planned and to stay on the subject matter; explicit clearness of instructional goals and procedures.
Young Adult Ethos	Extent to which teachers give students responsibility and treat them as young adults.

The third aspect on Moos deals with System Maintenance and System Change. According to Cummings and Worley (2015, p.4), the change in a system of an organization is mainly intended to move in a particular direction and to be more responsive and effective. There are multiple dimensions which can be addressed in this concern. Table 3 shows the variables defined under system maintenance and system change dimension of Moos.

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**Table 3: Scales Associated with System maintenance & System Change Dimension of Moos, Description of Scales**

Scales on System maintenance & System Change Dimension of Moos	Description
Academic Engagement	Extent to which students are engaged and on-task during the lesson.
Application	Instruction is directed on application contexts.
Connectedness	Instruction is directed on internal relations in the learning domain.
Democracy	Extent to which students share equally in decision-making related to the class.
Differentiation	There is emphasis on the selective treatment of students on basis of ability, learning style, interests and rate of working.
Dimension	Description
Disorganization	Extent to which classroom activities are confusing and poorly organized.
Diversity	Extent to which differences in students' interest exist and are provided for.
Explicit Performance	Quality The criteria for judging the range of student's performance made explicit.
Formality	Extent to which behavior within the class is guided by formal rules.
Goal Direction	Degree of goal clarity in the class.
Individualization	Attention to a student's self-steering with regard to form and content of the teaching-learning process.
Innovation	Extent to which the instructor plans new, unusual class activities, teaching techniques and assignments.
Leadership	Extent to which teacher provides leadership to class and holds student attention.
Material Environment	Extent to which books, equipments, material, space, and lighting are adequate.
Modeling	Extent to which the students expect to learn by a process of modeling.
Order & Organization	Emphasis on students behaving in an orderly, quiet and polite manner, and on the overall organization of classroom activities.
Prior-Knowledge	Extent to which students' knowledge and experiences are meaningfully integrated into their learning activities.
Reproduction	Emphasis on student reproduction of teaching content.
Rule Clarity	Emphasis on clear rules, on knowing the consequences for rules-breaking, and on the teacher dealing consistently with students who break rules.
Strict	Extent to which the teacher is strict with demands of the students.
Student Negotiation	Extent to which students socially interact for the purpose of negotiating meaning and building consensus; to explain and justify to other students their newly developed ideas.
Student Responsibility/Freedom	Extent to which the students are given opportunities to assume responsibilities for their own activities.
Student-Centeredness	Extent to which students experience learning as a personally problematic experience.
Teacher Authority	Extent to which students perceive the teacher has authority in the classroom.
Teacher Control	-----
Uncertain	Extent to which teacher exhibits her/his uncertainty with the students.



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All inventories under study were not entirely distinct in their construction; rather, they have used scales of other inventories. In a study of seventeen inventories, 21 scales out of 67 have been used by different inventories. Among these, ‘student cohesiveness’ scale has been used in eight inventories, shown in table 2. However, 46 out scales have never been used other than a single inventory. Table 3 enlists these scales. QTI, QSRLS and CLTLEI have all of their scales entirely different from others. CLEI was developed parallel to SLEI. Both of these inventories have same scales.

**Table 4: Scales Used in Different Inventories**

Dimension	Inventories
student cohesiveness	CLEI, CUCEI, LEI, MCI, MSCI, SLEI, TROFLEI, WIHIC
competitiveness	CES, CLEQ, LEI, MCI, MSCI
involvement	CES, CUCEI, IPSE, TROFLEI, WIHIC
task orientation	CES, CUCEI, WIHIC, TROFLEI, IPSE
material environment	CLEI, LEI, MSCI, SLEI
rule clarity	CES, CLEI, MSCI, SLEI
difficulty	LEI, MCI, MSCI
equity	CLEQ, TROFLEI, WIHIC
integration	CLEI, MSCI, SLEI
investigation	ICEQ, WIHIC, TROFLEI
open-endedness	CLEI, MSCI, SLEI,
personalization	CUCEI, ICEQ, IPSE
satisfaction	CUCEI, LEI, MCI
teacher support	CES, TROFLEI, WIHIC
cooperation	TROFLEI, WIHIC
differentiation	ICEQ, TROFLEI
friction	LEI, MCI
individualization	CUCEI, IPSE
innovation	CES, CUCEI
participation	ICEQ, IPSE
student negotiation	CLEs, CLES

The response pattern of all the statements of a questionnaire is follow Likert scale. Although, it’s a good practice, however, different statements can be tackled differently with respect to response pattern. Sometimes it’s too hard to set all the items on a same response pattern within a questionnaire. Moreover, Bean and McFadden (2001) argue that the questionnaire is structured; even then, an opportunity should be given to collect the general comments and opinions, which can provide useful and surprising information.

### IV. RECOMMENDATION

Available inventories are useful for constructing another new questionnaire. However, there is a need to make an initial draft based on detailed notes from the field. This may help in getting a better view of the field and making the research a true discovery rather merely collection of data. Secondly, the usual practice of adjusting same response pattern may bind all statements to be tuned on a set criterion. Another, concern is related to the questionnaire not to be open-ended. Sometimes, a researcher can skip very useful information if not providing a chance to the subjects to use their own opinion. For that purpose, the questionnaire should be avoided to have an extensive length. According to Anderson and Bourke (2000) a potential problem is associated with the length of a questionnaire because of the time required for completing it. They further argue that for giving response to a questionnaire the young children should not be expected to give more than 20 minutes of time; even it’s hard for adults to sustain their attention more time to young children. A shorter length can cover another aspect by which the questionnaire can be used by the school management rather than to be used merely by the researchers.

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