

CHAPTER NINE

DEVELOPING A MEASUREMENT FOR THE PERCEPTION OF CREATIVE LEARNING ENVIRONMENTS IN EDUCATIONAL SETTINGS

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Abstract

The purpose of the present study was to develop a parsimonious measure that is specifically relevant to the study of creativity in school environments, and that can be easily administered. Based on the literature review, it was expected that our Creative Learning Environment Perceptions (CLEP) instrument would reflect three underlying dimensions: (a) creativity support; (b) curriculum design, and (c) motivations. Two studies are reported here: the first being a pilot study using a small sample and aimed at checking all coefficients and its internal consistency reliability of the measure, and the second being a large-scale study that assessed the construct validity of the measure through the methods of exploratory factor analysis and confirmatory factor analysis.

Introduction

Numerous scholars have investigated possible links between creativity and individual and contextual factors (e.g., Cummings & Oldham, 1997; Hunter, Bedell, & Mumford, 2007; Oldham & Cummings, 1996; Woodman, Sawyer, & Griffin, 1993; Zhou & Shalley, 2003). Collectively, their work suggests that people's environments – whether at work or in school – have significant impacts on their creative performance. Several studies have indicated that individuals' perceptions that they are working or studying in a creative environment can be enhanced through appropriate organizational structure and intervention (Mayfield & Mayfield, 2010; Sohn & Jung, 2010).

Mathisen and Einarsen (2004) reviewed four instruments (KEYS, Amabile, 1995; CCQ, Ekvall & Ryhammar, 1999; SSSI, Siegel & Kaemmerer, 1978; TCI, Anderson & West, 1998) which were all designed to measure creative or innovative environments, and noted that all four stressed positive rather than negative factors related to creativity and innovation. The notion of support also common to all instruments, might refer to either material

or spiritual support that the organization might provide to individuals in order to facilitate their creativity. Other factors that appeared repeatedly in the instruments reviewed by Mathisem and Einarsen studies were freedom, information flow, mental challenges, and a safe environment in which to be creative.

As the preceding discussion suggests, a number of efforts have been made to determine the degree to which various areas need to improve if an organization is to promote creativity and innovation, and to point out how such change might be achieved. As valuable as these studies are from the standpoint of organizational development, there remains a scarcity of literature on how creative-environment perceptions affect learners' perceptions of school. Special attention should be paid to this topic, insofar as learners (and learners' creative behavior in particular) are expected to be affected by their school environments.

It is therefore proposed that three dimensions are key to assessing perceptions of a creative-environment in an educational setting. The first is intrinsic and extrinsic motivation (Amabile, 1996) that support the student in being or becoming a creative learner. In particular, extrinsic motivation may include the attitudes expressed by teachers vis-à-vis the toleration of uncertainty and the free exchange of ideas, which has been found to play an important role in shaping creativity (Cremer, 2003; Oral, 2006). The second dimension is curriculum design (including pedagogy), which is treated as a potential resource for the facilitation of creativity development (Lin, 2011; Petocz, Reid, & Taylor, 2009). For example, some pedagogical techniques employed by teachers are more suitable to unleashing students' creative potential than others (Dineen, Samuel, & Livesey, 2005; Sawyer, 2004). Lastly, school policy may tend either to stifle or encourage the development of creative potential (Halpern, 2010; Shaheen, 2010). For instance, if the school supports teachers in their implementation of creative teaching, or sets up workshops for teacher development, it is more likely that its teachers will be willing to embrace a pluralistic or varied approach that is conducive to the establishment of a creative learning environment (Bleakley, 2004; Fasko, 2001).

The purpose of the present study was to develop a parsimonious measure that is specifically relevant to the study of creativity in school environments, and that can be easily administered. It is hoped that this instrument will be beneficial for educators and administrators seeking to understand learners' perceptions of the learning environment in terms of creativity development, with the wider aim of aiding the design of creativity-friendly learning environments. Two studies are reported here: the first being a pilot study using a small sample and aimed at checking all coefficients of our instrument's 30 items and its internal consistency reliability of the measure, and the second being a large-scale study that assessed the construct validity of the measure through the method of exploratory factor analysis and confirmatory factor analysis.

Study 1

Method

Participants

The subjects were Chinese undergraduate art and design students from a small university located in Macau. They were mostly nontraditional students, in that they had part- or full-time jobs concurrently with their university enrollment. Participation in the study was voluntary and without incentives, and survey completion or non-completion did not affect course grades. There were 22 participants, 12 men and 10 women. The age range was 19-36 years old, not counting three students who declined to declare their age, with a mean age of 22.53 years ($SD = 3.78$).

Instrument

Based on the literature review, it was expected that our Creative Learning Environment Perceptions (CLEP) instrument would reflect three underlying dimensions: (a) creativity support; (b) curriculum design, and (c) motivations. The first measures how much encouragement a student receives from their school and classmates. The second focuses on how well the course structure and teaching strategies promote creativity. The third assesses the degree to which individuals are encouraged toward creative learning via strategies employed by teachers and the school's culture. The CLEP consists of 30 items, each of which is answered using a 5-point Likert-type scale, ranging from 1, "completely disagree" to 5 "completely agree." Three of the 30 items required reverse coding. All items were written in Chinese, but an English translation was created and is provided in full in the Appendix.

Results

Descriptive statistics and internal consistency

The pilot study examined response distribution of the CLEP items, screening the data set for means, standard deviations, skewness, and kurtosis. As shown in Table 1, all 30 items fell within the acceptable range in terms of both skewness and kurtosis values. The items as answered by the 22 pilot-study participants were also examined for internal consistency and item-scale correlation. Corrected item-scale correlations ranged from .36 to .88, indicating high internal consistency. Additionally, the internal-consistency rating for the CLEP as a whole was strong, at $\alpha = .96$. Split-half reliabilities for the two halves of the CLEP were $\alpha = .92$ (15 items of the first half) and $\alpha = .93$ (15 items of the second half).

| <i>Descriptive Statistics for Initial CLEP</i> | | | | |
|--|----------|-----------|----------|----------|
| Item | <i>M</i> | <i>SD</i> | Skewness | Kurtosis |
| CLEP 1 | 3.68 | 0.89 | .27 | -.97 |
| CLEP 2 | 3.50 | 1.01 | -.61 | .47 |
| CLEP 3 | 3.27 | 0.83 | .54 | .20 |
| CLEP 4 | 3.05 | 1.25 | .23 | -.83 |
| CLEP 5 | 3.27 | 0.83 | .54 | .20 |
| CLEP 6 | 3.23 | 0.87 | .47 | -.08 |
| CLEP 7 | 3.32 | 0.84 | .37 | -.09 |
| CLEP 8 | 3.23 | 0.87 | -.49 | 1.14 |
| CLEP 9 | 3.27 | 1.24 | -.24 | -.78 |
| CLEP 10 | 3.68 | 0.95 | -.40 | -.53 |
| CLEP 11 | 2.73 | 0.94 | .22 | .79 |
| CLEP 12 | 3.41 | 0.67 | .37 | .27 |
| CLEP 13 | 3.55 | 0.86 | .10 | -.44 |
| CLEP 14 | 3.59 | 0.85 | .45 | -.66 |
| CLEP 15 | 3.55 | 0.91 | -.15 | -.59 |
| CLEP 16 | 3.32 | 0.84 | .37 | -.09 |
| CLEP 17 | 3.27 | 0.94 | -.22 | .79 |
| CLEP 18 | 3.41 | 0.85 | .06 | -.40 |
| CLEP 19 | 3.41 | 0.80 | -.30 | -.38 |
| CLEP 20 | 3.82 | 0.96 | -.32 | -.75 |
| CLEP 21 | 3.32 | 0.99 | -.08 | .41 |
| CLEP 22 | 3.36 | 0.95 | .25 | -.68 |
| CLEP 23 | 3.09 | 0.97 | .83 | .06 |
| CLEP 24 | 3.55 | 0.86 | -.40 | -.31 |
| CLEP 25 | 3.41 | 0.96 | -.25 | .86 |
| CLEP 26 | 3.32 | 0.72 | .29 | .30 |
| CLEP 27 | 3.59 | 0.85 | -.06 | -.40 |
| CLEP 28 | 3.41 | 0.96 | .46 | -.62 |
| CLEP 29 | 3.14 | 0.89 | .61 | .04 |
| CLEP 30 | 3.64 | 0.90 | -.02 | -.65 |

Discussion

The preliminary results of the pilot study indicate good internal consistency for the 30 items CLEP as a whole. Response distributions of the 30 items were also checked, and indicate the reliability of the CLEP.

Study 2

Method

Participants

The sample for the second study consisted of 224 Chinese undergraduates (125 first-year students and 99 second-year students) attending the same university in Macau as the pilot-study participants. They were traditional students and among them, eighty seven were male and 137 female, and the mean age of the groups as a whole was 19.59 years ($SD = 1.60$), excluding four students who did not disclose their ages.

Instrument

Because the pilot study established that the 30-item CLEP had good reliability, the same instrument was distributed to students in the second study for further validity analysis. The internal consistency rating for the CLEP as a whole was $\alpha = .94$, indicating strong internal reliability.

Results

Exploratory Factor Analysis (EFA)

To assess the dimensionality of the CLEP'S 30 items, a preliminary Principal Components Analysis with maximum likelihood extraction and varimax rotation was conducted using SPSS. The initial run resulted in a four-factor solution, based on both the $EV > 1$ rule and the scree plot. Hair, Black, Babin, and Anderson (2009) suggest that when identifying significant factor loadings based on sample size, of 200, a factor loading of .40 is required to establish significance (p. 116). In addition, variables with communalities greater than .50 should be retained in the analysis (p. 121).

As Table 2 shows, the pattern of factor loadings indicated that all items had values larger than .40, and that eight items had cross loadings on two or more factors. In terms of communalities, only three items were less than .50. The three-factor model explained 62.51% of the total variance.

| Item | Factor loading | | | Communality |
|---------------|----------------|------------|------------|-------------|
| | 1 | 2 | 3 | |
| CLEP 1 | .51 | .61 | .15 | .65 |
| CLEP 2 | .40 | .57 | .22 | .53 |
| CLEP 3 | .43 | .69 | .16 | .69 |
| CLEP 4 | .20 | .74 | .34 | .71 |
| CLEP 5 | .14 | .75 | .32 | .68 |
| CLEP 6 | .34 | .72 | .20 | .67 |
| CLEP 7 | .30 | .73 | .29 | .71 |
| CLEP 8 | .32 | .68 | .36 | .68 |
| CLEP 9 | .38 | .62 | .13 | .54 |
| CLEP 10 | .55 | .55 | .17 | .63 |
| CLEP 11 | .02 | .25 | .64 | .48 |
| CLEP 12 | .38 | .47 | .46 | .58 |
| CLEP 13 | .35 | .54 | .29 | .51 |
| CLEP 14 | .70 | .35 | .19 | .65 |
| CLEP 15 | .46 | .36 | .34 | .46 |
| CLEP 16 | .43 | .38 | .47 | .55 |
| CLEP 17 | .49 | .35 | .42 | .54 |
| CLEP 18 | .73 | .30 | .35 | .75 |
| CLEP 19 | .40 | .16 | .52 | .46 |
| CLEP 20 | .75 | .27 | .23 | .69 |
| CLEP 21 | .14 | .21 | .75 | .63 |
| CLEP 22 | .42 | .16 | .70 | .68 |
| CLEP 23 | .31 | .31 | .70 | .68 |
| CLEP 24 | .57 | .28 | .50 | .66 |
| CLEP 25 | .38 | .21 | .68 | .64 |
| CLEP 26 | .55 | .43 | .31 | .58 |
| CLEP 27 | .65 | .34 | .18 | .57 |
| CLEP 28 | .80 | .28 | .27 | .79 |
| CLEP 29 | .69 | .37 | .30 | .70 |
| CLEP 30 | .70 | .34 | .29 | .69 |
| Eigenvalue | 15.80 | 1.59 | 1.36 | |
| % of variance | 52.68 | 5.29 | 4.54 | |

Note. Boldface indicates factor loadings > .40.

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ter deleting 12 items that had cross loadings, the same factor analysis procedure was employed to assess the factor structure. As shown in Table 3, a new three-factor solution emerged, which retains 18 of the original 30 CLEP items. All factor loadings were larger than .40, all communalities were larger than .50, and no items had cross loadings on two or more factors. The new three-factor model explained 67.01% of the total variance, an improvement of 4.50% compared to the previous model.

Confirmatory Factor Analysis (CFA)

To determine the validity of the previously hypothesized three-factor solutions, CFA with maximum likelihood estimation procedure was conducted. The results indicated fit indices as follows: $\chi^2 = 190.36$, $df = 124$, $p < .001$, RMSEA = .049 (90% CI = .035, .062), CFI = .975, GFI = .920, TLI = .969. Although the chi-square statistic was statistically significant, all other measures of goodness of fit supported the three-factor model. A path diagram of this model with the complete set of parameters from the standardized solution is depicted in Figure 1, which shows that the standardized coefficients for all 18 indicators were statistically significant ($p < .001$) as well as moderate or high in magnitude. The sizes of the factor loadings ranged from .52 to .87, reflecting the convergent validity of the construct. The values of average variance extracted (AVE), a summary measure of convergence among a set of items representing a latent construct, were also calculated. AVE values ranged from .66 to .78, suggesting adequate convergence. Construct reliability (CR), values greater than .70 suggest good reliability of the construct, and in this case, they ranged from .80 to .93. The correlations among the three factors (creativity support, design, and motivation) were between .41 and .46, moderate correlations that suggest the discriminant validity of these three dimensions.

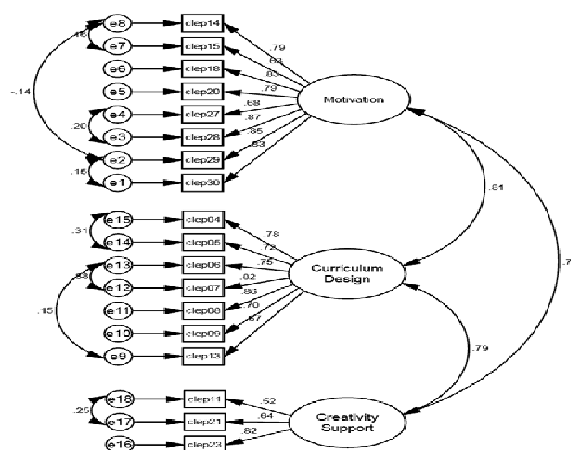


Figure 1: Standard coefficients for the 18-items CLEP

| Table 3 | | | | |
|---|----------------|------------|------------|--------------|
| <i>Factor Loadings From Principal Component Factor Analysis: Communalities, Eigenvalues, and Percentages of Variance for the 18 Final Items of the CLEP</i> | | | | |
| | Factor loading | | | |
| Item | 1 | 2 | 3 | Communnality |
| CLEP 4 | .26 | .76 | .27 | .71 |
| CLEP 5 | .17 | .77 | .25 | .69 |
| CLEP 6 | .37 | .71 | .16 | .67 |
| CLEP 7 | .36 | .75 | .22 | .74 |
| CLEP 8 | .37 | .74 | .23 | .73 |
| CLEP 9 | .40 | .64 | .03 | .58 |
| C L E P 11 | .12 | .14 | .84 | .74 |
| C L E P 13 | .40 | .59 | .20 | .51 |
| C L E P 14 | .73 | .29 | .20 | .67 |
| C L E P 15 | .51 | .29 | .40 | .51 |
| C L E P 18 | .77 | .31 | .21 | .74 |
| C L E P 20 | .79 | .25 | .16 | .69 |
| C L E P 21 | .22 | .24 | .75 | .66 |
| C L E P 23 | .37 | .39 | .56 | .60 |
| C L E P 27 | .66 | .37 | .05 | .57 |
| C L E P 28 | .84 | .27 | .20 | .82 |
| C L E P 29 | .74 | .35 | .25 | .73 |
| C L E P 30 | .75 | .33 | .21 | .71 |
| Eigen- value | 9.63 | 1.32 | 1.11 | |
| % of variance | 53.51 | 7.32 | 6.18 | |
| <i>Note.</i> Boldface indicates factor loadings > .40. | | | | |

Discussion

EFA and CFA results indicated that the 18-item CLEP had good measurement qualities. The scale was a good fit with the sample data, and all items significantly loaded on the expected latent factors, with acceptable construct reliability, convergent validity, and discriminant validity. In addition, these latent variables significantly covaried with each other. In sum, the 18-item CLEP provides a useful measurement instrument for assessing perceptions of a creative learning environment in university level educational settings.

General Discussion

The CLEP that we developed is a useful instrument with psychometric properties including a three-factor structure—creativity support, design, and motivation—were confirmed via the evidence of high internal consistency, model fit indexes, construct reliability, convergence validity, and discriminant validity. The correlated three-factor structure is consistent with previous theoretical accounts of the effects of extrinsic motivation on people's creativity. Furthermore, our findings show that the attitudes of educators toward supporting creativity, and the strategies they employ also play important roles in shaping students' perceptions of creative learning. In addition, the results suggest that school policy and culture might facilitate creativity.

Perhaps most importantly, our findings show that perceptions of creative learning can be measured by an instrument that involves both personal and school-environment dimensions. The CLEP was deliberately designed as a measure to capture learners' perceptions about their learning as influenced by outside factors. As such, CLEP can provide richer information and better critical perspectives for the identification of creative learning environments, appropriate intervention in enhancing learning experience, and curriculum design than other measures that have been devised in the past. In sum, three variables—creativity support, design, and motivation—in the CLEP were a first look we have studied. The preliminary results show that the CLEP is a reliable and valid scale, and could provide a criterion by which to efficiently measure and study students' perceptions of creative learning environments. It is parsimonious and easily administrable. As such, it provides a useful measurement instrument for researching creativity-learning issues among learners.

Limitations and Implications

Though the results of the present research are encouraging, several possible limitations should be kept in mind. First, the sample's age was both relatively uniform and quite low (approximately 20 years old). Future studies should test this limitation by including older learners. It should be noted that the cur-

rent study was at the university level, and future researchers might examine other educational levels, such as k-12 or middle school levels. Additionally, the study was conducted on a homogenous selection of learners from a single institution and the same cultural background. This relative lack of diversity raises the possibility that the scale may not be suitable in other institutional and/or cultural contexts. Future work will need to include multiple learning sites, and subjects from multiple cultural groups. Lastly, the examination of external validity was not included in the present study, and future research is needed to address this limitation.

Author's Brief Bio

Kuan Chen Tsai is assistant professor at the City University of Macau. He earned his PhD in Organizational Leadership at the University of Incarnate Word. He is the author of two book chapters and numerous journal articles. His current research interests include creativity, adult learning, organizational behavior, and arts & design.

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Appendix

CLEP Items

Motivation Items

I am encouraged to attain my goals which I am interested of.
My teacher is tolerant of uncertainty.
My school is open to independent thoughts and autonomy.
My teacher expects me to show more creative behaviors.
I feel more creative in this environment.
My teacher uses a lot of teaching strategies to help me being creative.
I believe that I am currently very creative in my learning.

Curriculum Design Items

I have the resources I need to be creative.
My studying is challenging.
My teacher gives me more freedom to approach how I lean the subject.
The curriculum makes it easy to be creative.
The school policies promote creative thinking.
There is cultural diversity in my school.
People in my surroundings have different perspectives.

Creativity Support Items

My classmates challenge most of my ideas rather than accepting them.
*My school determines many of my decisions.
People value my observations and unique thoughts.
*means reversed coding.