

Singapore High School Students' Creativity Efficacy

Ai-Girl Tan
Nanyang Technological
University

Valerie Ho
National Institute of Education

Lim-Chyi Yong
Hillgrove Secondary School

Abstract

Background: Singapore education adopted nurturing creativity and developing creativity efficacy among their students and children. This study investigated Singapore high school students' creativity efficacy based on the contemporary model of creativity (Amabile, 1983, 1996), self efficacy (Bandura, 1989, 1997) and inclusion education.

Aims: Creativity efficacy of high school students was measured. Five scales were developed with reference to the context of learning of the participants: creativity self-efficacy (cognitive style), creativity self-efficacy (working style and personality trait), domain-specific efficacy with reference to everyday problem solving, civic responsibility and intercultural relationship.

Sample: The participants were 510 high school students (46.5%, girls). The age range of the students was between 12 and 18 years old ($M = 15.43$ years old and $SD = .87$ years old).

Method: The questionnaire survey was distributed to the participants who rated their responses on a five point Likert scale with anchors "1" "very much unlike me", "2" "unlike me", "3" "moderately like me", "4" "like me" and "5" "very much like me".

Results: Alpha reliabilities of all the scales were high, between .7 and .9, indicating the presence of internal consistency. Significant correlations were observed among creativity self-efficacy (working style and personality trait), creativity self-efficacy (cognitive style), and everyday problem solving efficacy. Exploratory factor analysis on the scales yielded one factor, creativity efficacy, accounted for 54.1% of variance. Confirmatory factor analysis was performed to all subscales resulted in one factor model, with high fit indexes (.98) and Cronbach's alpha (.76).

Conclusion: Singaporean high school students' scored moderately high for creativity efficacy, 80.5 (the lowest being 33, and the highest, 115). No significant gender difference was observed. Implications of the results of the study were discussed with reference to developing efficacies in the context of creativity education in Asian and Chinese societies.

Keywords: High school students, creativity efficacy, Singapore

新加坡高中生的創意自我效能感

摘要

背景：本文報告新加坡高中生的對自己的創意自我效能感作出回應。研究主題依據結構創意理論 (componential model of creativity, Amabile, 1983, 1996)，自我效能感概念 (self-efficacy, Bandura, 1989, 1997) 與全納教育 (inclusive education)。

目的：研究調查高中生的創意信念包括創意信念思維，創意人格，每日問題解決，社會責任感與跨文化友誼。

調查對象：510名新加坡高中生（46.5%女學生）。年齡是分別於十二與十八歲之間（平均 = 15.43歲，標準差 = .87歲）。

調查方法：第二與第三作者分發問卷給調查對象。調查對象用5級Likert量表回應自己的創意自我效能感：“1”為“與我很不相似”，“2”為“與我不相似”，“3”為“與我少許相似”，“4”為“與我相似”，“5”為“與我很相似”。

調查結果：調查測驗創意信念表問題內部一致性信度，可靠度高，Cronbach Alpha 系數.7 與.9之間。相關函數方法分析結果 - 創意自我效能思維表，創意人格自我效能感表，每日問題解決自我效能感表，社會責任自我效能感表與跨文化友誼自我效能感表之間有顯著相關。探索性因素分析確定創意信念量表含有1個主要因子共解釋總變異的54.1%，用驗證性因素分析顯示CFI分別為.9。證明理論結構的合理性。總結：高中生的創意自我效能感偏高，平均，80.5（最低點33，和最高點，115）。沒有性別差比。

關鍵詞：高中生，創意自我效能感，新加坡

Introduction

After more than half a century of deliberate efforts (since Guilford, 1950), researchers in the field of creativity have reached some converging views on conceptions of creativity, research directions, and theoretical frameworks of creative performances. Creativity shall be conceptualized within the person and his (her) socio-cultural milieu (Csikszentmihalyi, 1996; Sternberg 1999). Widely accepted are confluence theories of creativity such as the componential theory of creativity (Amabile, 1983, 1996). It is agreeable that novelty and appropriateness are two qualities of a product or a response to be regarded as creative (Amabile, 1996). Further, the creative product or response shall possess a heuristic nature, or an unclear, identifiable path to solution (Amabile, 1983). In education, increasing attention is given to ensuring students' holistic development and attainment of full functioning. Experiential learning is encouraged through school and extra-curricular programs. Students acquire skills that enable them to generate novel and appropriate ideas and to solve problems insightfully and meaningfully (Goh, 1997). It is aspired to facilitate growth through among others developing confidence in students to undertake real life, challenging responsibilities (Tharman Shamuganatham, 2003).

The inclusive paradigm of creativity education calls for engagement of every child, teacher or parent in performing, expressing, as well as generating novel, appropriate and heuristic ideas and products. It also alerts us of the indispensability to provide supports for the above activities. Commonly believed is that in a creativity nurturing environment, developing unique and acceptable performances goes beyond a selected few (Amabile, 1983; Amabile, 1996; Simonton,

1999a, b; Sternberg & Lubart, 1999). Furthermore, creativity has moral significance and is indeed a human virtue (Martin, 2006; Runco & Nemiro, 2003).

We regard as important, in the context of inclusive education, for teachers to have the opportunities to realize efforts of developing confidence in and competencies of students and to encourage students to take part in creativity fostering activities. Inclusion education though less deliberate seems to be part of Asian conceptions of creativity. Specifically, Rudowicz and Hui (1997) reported the aspect of social style (e.g., contributing to society progress, improvement and betterment), a factor that emerged from the Chinese responses on creative personality. Space that allows interaction or "flow of chi" seems to encourage sharing, interaction and innovation (Hong, Kwang & Lin, 2003). For the past years, the participants of creativity research expanded from the gifted children (Chan, 2000a, b; Lau, Li & Chu, 2004) and teachers (Lee & Seo, 2006) to the mainstream children (Lau & Li, 1996). The paradigm of creativity seems to be culturally relevant. For instance, the Japanese brainstorming techniques (e.g., using key words) for creative problem solving enhance the incremental paradigm and recognize every person's contribution (Proctor, Tan & Fuse, 2004).

Given the above background and aspiration, our paper aims to first review the construct of creativity efficacy from the componential model of creativity (Amabile, 1983; Amabile, 1996), and then develop scales related to creativity-relevant and domain-relevant efficacies. Briefly, creativity efficacy refers to "the belief one has the ability to produce creative outcomes" (Tierney & Farmer, 2002, p. 1138). To perform creatively, a person

shall possess components which operate at different levels of specificity: Creativity-relevant skills (*general*), domain-relevant skills (*intermediate*) and task motivation (*specific*). The componential theory informs us that the higher the level of each of the three components, the more creative the product will be (Amabile, 1983, 1996).

As mentioned, the first component, *creativity-relevant skills* operate on a *general* level, where they influence responses in any content domain and determine the novelty of the response (Amabile, 1996): Cognitive style (e.g., suspending judgment, keeping option open for as long as possible and using 'wide' categories), knowledge of heuristics to generate novel ideas, and a work style (e.g., an ability to concentrate effort and attention for long periods of time, persistence when faced with difficulty, and conducive to creative production and willingness to work hard). Personality traits that can contribute to creativity-relevant skills include high levels of self-discipline when it comes to work, an ability to delay gratification, independence of judgment, perseverance when faced with frustration, tolerance for ambiguity, and a high level of self-initiated, task-oriented striving for excellence (Amabile, 1996). Creativity-relevant processes manifest in concept identification (e.g., analogies, "ahas" and transitions), a wide focus on goal statements and utterances irrelevant to the task, striving when facing difficulty and questioning how to do something. These are positive *predictors* of performance (Ruscio, Whitney & Amabile, 1998).

The second component, *domain-relevant skills* operate on an *intermediate* level of specificity, where the skills are relevant to a domain. The skills may be regarded as a set of cognitive pathways for solving a problem or for doing a task. New responses can be synthesized from a set of possible responses and the new response may be judged against domain-relevant

information, influencing the appropriateness or correctness of the response. The skills can be used in any specific task and may overlap with other tasks, within the domain, which includes factual knowledge, technical skills and special talents in a particular domain. An increase in domain-relevant skills can lead to an increase in creative performance, only if the domain-relevant information is organized appropriately (Amabile, 1996). In this manner, ample exposure to a wide array of information within a domain can enhance creativity. Domain-relevant processes manifested as assuredness, characterized by having high confidence and being fast-paced are positive *predictors*; while difficulty and exhibition of uncertainty are negative *predictors* of performance (Ruscio, Whitney & Amabile, 1998).

To conceptualize further creativity efficacy, we explore the features of the construct self-efficacy which is positively related to intrinsic interest (*specific*) (Bandura & Schunk, 1981). Self-efficacy refers to a person's belief in his(her) capability to exercise some level of control over his(her) own functioning and environmental demands where s/he organizes and executes courses of action required to attain desired results in a specific task or domain (Bandura, 1989, 1997). It is believed that self efficacy plays an influential role in human functioning (Holden, 1991; Multon, Brown & Lent, 1991; Stajkovic & Luthans, 1998) through its impact on cognitive, motivational, affective and selection processes (Bandura, 1989; Bandura, 1993; Bandura, Barbaranelli, Caprara & Pastorelli, 1996). *Efficacy belief* is the foundation on which human agency is built, affecting motivation, affect and action (Bandura, 1989). A person is regarded as an agent of experiences who acts with intention, sets goals and plans courses of action, self-regulates and motivates, and reflects on

their own functioning, instead of only being reactive to experiences (Bandura, 2001; Bandura & Locke, 2003). When a person believes that s/he has the ability to act creatively, s/he likely has the purpose and self-confidence to achieve his(her) creative goals. These beliefs influence aspirations and strengths of commitments towards aspirations (Bandura, Barbaranelli, Caprara & Pastorelli, 2001), the quality of analytic and strategic thinking, level of motivation and perseverance (Bandura & Cervone, 1983), especially in the face of difficulties and setbacks, resilience to adversity (Bandura, 1993), causal attributions for successes and failures, and vulnerability to stress and depression (Bandura, Pastorelli, Barbaranelli & Caprara, 1999).

Self-efficacy beliefs are domain-linked knowledge structures that vary across spheres of functioning, rather than a global trait (Bandura, 2001). Validation studies show that domain-specific self-efficacy operates differently in varying domains and affects social, cognitive and emotional determinants in unique ways (Bandura, Barbaranelli, Caprara & Pastorelli, 1996; Bandura, Pastorelli, Barbaranelli & Caprara, 1999). Performance accomplishments form a significant source of efficacy information far beyond vicarious experience through modeling or verbal persuasion (Bandura, 1977; Bandura, Adam & Beyer, 1977). Some recent studies investigated the relation between self efficacy or efficacy beliefs and creativity (Beghetto, 2006; Tierney & Farmer, 2002). It is believed that one way to promote creativity is to develop a person's self-efficacy (Edelson, 1999).

Method

Participants

A total of 510 high school students participated in this study. All of them were Singaporean citizens. Of the

total, 237 (46.5%) were girls. The age range of the students was between 12 and 18 years old ($M = 15.43$ and $SD = .87$ years old).

Measures

The domain of our study is *service learning*. In the inclusive education context, Singaporean students are required to observe reciprocal learning in line with the learning philosophy of community service (*qu zhi yu she hui, huan zhi yu she hui*, 取之于社會, 還之于社會). Recent years, service learning programs are introduced to Singapore's high schools as part of the holistic education curricula. The benefits of service learning include academic learning, greater self-efficacy and self-knowledge, interpersonal development, and community engagement (Astin, Vogelstang, Ikeda & Yee, 2000; Ethridge, 2006; Simons & Cleary, 2006). Our study measures students' creativity-relevant efficacies related to cognitive and working styles, and domain-relevant efficacies related to everyday problem solving, civic responsibility and intercultural relations. The items of our measures were constructed with reference to Bandura's (1997) recommendations. Self-efficacy scales should measure people's beliefs in their abilities to fulfill different levels of task demands within the selected domain (Bandura, 1997). They usually measure people's beliefs in their capabilities to fulfill task demands within the psychological domain selected for study (Bandura, 1989). Items of self efficacy scales were phrased in terms of "can do", "capable of", and "being able to". The participants shall judge their operative capabilities as of now, and not potential or expected capabilities (Bandura, 1997). The item content of efficacy scales must represent beliefs about personal abilities to produce specified levels of performance (Bandura, 1989).

Creativity-relevant self-efficacy (CRE, 8 items): Three items were adopted from Beghetto's (2006) creativity self-efficacy: "I am good at coming up with new ideas" (#1), "I have a lot of good ideas" (#2), and "I have a good imagination" (#3). In addition, referring to the elements of creativity-relevance, four items were constructed with respect to cognitive style: "I am good at combining existing idea" and working style" (#4), "I can focus on solving problems and complete activities" (#5), "I can focus on doing something new and valuable" (#6), "I constantly check to see how well I am doing" (#7) and "I continue doing my task and never give up even if I had difficulty" (#8) (Amabile, 1983, 1996). The first four items were termed creativity self-efficacy-cognitive style (CRE-CS) and the last four items creativity self-efficacy - working style (CRE-WS).

In the context of service learning, three efficacious subscales of domain-relevance were everyday problem solving efficacy (life skills, EPS-LS), intercultural efficacy (IFE) and civic efficacy (CE).

Everyday problem solving efficacy (EPS-LS, 4 items): Four items were adopted from the skills learned by the participants to be able to serve the people of their hosted institutions - I am able to use life skills or knowledge I have to come up with good ideas (#1), to help people I service (#2), to cope with difficult situations I face (#3), and to plan activities for people I service (#4).

Intercultural efficacy (IFE, 6 items): Six items were constructed to measure intercultural efficacy with respect to building international friendship - I am able to make friends with people of another country (#1); I am able to appreciate habits and customs (or life styles/ways of life) of people of another country, even if they are different from mine (#2); I am able to respect spiritual/religious practices or belief systems of people of another country,

even if they are different from mine (#3); I am able to work well/cooperate with people in another country (#4); I am able to enjoy beauty of the nature and simplicity of the culture of another country (#5); and I am able to accept without having ill-feeling when people of another country give me comment/feedback (#6).

Civic efficacy (CE, 5 items): One of the foci of reciprocal learning of inclusive education is serving the nation or fulfilling civic responsibility such as love towards one's society and nation. Five items of civic efficacy were "I am proud of being a citizen/resident in this country" (#1), "I know my country's story well" (#2), "I know well how my country succeeded against the old" (#3), "I understand well my country's unique challenges, constraints, and vulnerabilities" (#4), and "I am able to ensure my country's continued success" (#5).

Procedures

The participants filled out demographic data such as age and gender. They rated their perceived self efficacy beliefs using a five-point Likert scale with anchors "1" "very much unlike me", "2" "unlike me", "3" "moderately like me", "4" "like me" and "5" "very much like me". On average the participants took about 15 minutes to complete the survey questionnaire.

Results

All items of the five scales were subjected to exploratory factor analysis (EFA), as none of them was with a value of skewness or kurtosis beyond 1.64. EFA seeks to uncover the underlying structure of a large set of variables. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett-Test of Sphericity (BTS) were referred. The KMO is an index for comparing the magnitudes of the observed correlation coefficients to

the magnitudes of the partial correlation coefficients. The BTS is a statistical test for the presence of correlation among the variables. EFA suggested that all items of each efficacy scale could be deduced to one single factor.

Reliability refers to the extent that a measurement is consistent, can be reproduced, and avoids error (Heiman, 2001). Self-efficacy beliefs do not share the same major properties ascribed to personality traits (Bandura, 1997) as they do not necessarily remain constant over time. We do not question thus the issue of reliability which is invariant over time. Satisfactory internal consistency for all the scales at the time of measure was obtained indicated by high Cronbach's alphas, which was more than .7. Significant correlations among the efficacy scales were observed at the moderate level between .3 and .5 at the $p < .0001$ level (Table 1). [Table 1 Page 103.]

Second EFA was performed to all scales as none of skewness and kurtosis for the scales was higher than 1.64. The EFA on the five scales yielded one factor – *creativity efficacy* – accounted from 54.1% variance. The KMO was high .82, BTS chi-square was 649.78 at the $p < .0001$ level, and eigen-value 2.71. The Cronbach's alpha for the factor - *creativity efficacy* of the Singaporean students of our study was high, .77 indicating the presence of good internal consistency among the scales. Table 2 summarizes descriptive statistics and covariance matrix of the efficacious scales. [Table 2 Page 103.]

Confirmatory factor analysis (CFA) which is theory driven was used to evaluate the one-factor model of creativity efficacy (Amabile, 1983; 1996) using EQS Version 6.1 (Bentler, 2004). Table 3 summarizes fit indices of CFA for the one

factor model of "*creativity efficacy*". [Table 3 Page 104.]

The reliability coefficients or Cronbach's alpha was .76, reliability co-efficient Rho .77, maximal weight internal consistency reliability .80. R square for the scales ranged between .3 and .6: CRE-CS (.37), CRE-WS (.44), CE (.31), IFE (.46) and LSE (.55).

The total score for *creativity efficacy* was computed by summing scores of all the five scales. The range of scores for creativity efficacy was between 33 and 115 with a mean 80.46, standard deviation 11.93, skewness -.49 and kurtosis .94. Across gender groups, no significant difference was observed from the independent t-test on the factor - *creativity efficacy*.

Discussion

From the recent increase in symposiums and publications on creativity (Tan, 2007a) we are convinced that the theme *creativity* has gradually been accepted in research, socio-cultural and educational domains in Singapore.

The study designed has in its limited scope explored some Singaporean students' efficacy beliefs in creativity of the inclusive educational contexts. It resembled somewhat the philosophy of education in Chinese and other Asian societies that highlights developing full person, good values, virtues and social responsibilities. Integrating Amabile's (1983, 1996) componential model of creativity and Bandura's (1989, 1997) concept self-efficacy and properties of efficacy scales, we constructed 23 items to measure Singaporean students' efficacy beliefs in creativity-relevance and domain-relevance. In total five efficacy scales were developed, of which two were related to creativity-relevance and three to domain-relevance. Items related to domain-

relevance were contextual, social and cultural. All items were subjected to exploratory, principal component factor analysis (see methodology in Bandura, Barbaranelli, Caprara & Pastorelli, 1996) and yielded one factor solution with satisfactory psychometric properties. The same satisfactory psychometric properties were observed in the second factor analysis on the five scales which yielded one factor, *creativity efficacy*. The stable internal structure of our factor, *creativity efficacy*, confirms Amabile's (1983, 1996) componential model of creativity and relates well to Bandura's (1997) specific efficacy beliefs.

Amabile's componential model of creativity also informs us that task motivation operates at the most specific level, determining an individual's approach toward a particular task. It operates *specifically* to particular tasks within the domain and may vary over time for a particular task. It contains *two elements*: the individual's baseline attitude toward the task and the individual's perceptions of the reasons for undertaking the task in a given instance. We investigated creativity efficacy which is task or domain-specific and which is now and then. Recent studies on creativity efficacy found that creativity self-efficacy can be positively correlated to students' mastery and performance approach beliefs and teacher feedback on creative ability (Beghetto, 2006). Students with higher creativity self-efficacy were also more likely to possess more positive beliefs about their academic abilities than those with lower creativity self-efficacy levels. We are yet to explore the relationship between creativity efficacy and creative performance. Future studies shall attend to the investigation of creativity efficacy if it is a good predictor for creative performance.

Our instrument referred to the componential model of creativity, and included both creativity relevant and

domain-relevant items. From the correlational analysis, we found that the two components of creativity were significantly positively related (.3 and .5, Table 1). The high fit indexes of the one-factor model confirmed a comprehensive model of creativity which includes both components of creativity-relevance (general) and domain-relevance (specific). In the Asian context, the socially relevant items were suitable to be included into the inclusive, creativity education. In another study, we measured the creativity efficacy of students at two time intervals, before and after they performed the tasks. We found an increase in positive significant correlations between creativity-relevance and domain-relevance (Tan, 2007b, a significant increase in correlation of .1, $p < 0.001$). As discussed in the componential model of creativity, the higher specificity of creativity-relevance and domain-relevance components, the more creative the product will be (Amabile, 1983, 1996). It is noted in the review above that creativity efficacy can be a *positive* predictor of creative performance. As such, to ensure creative performances, educators and researchers in Singapore shall work together to design programs that would enhance Singaporean students' creativity efficacy and skills.

A key component of Bandura's method is that tasks are ordered hierarchically, so that a target level of accomplishment or mastery is set and self-efficacy judgments are made at each level of task difficulty. Our instrument can be refined and extended to include specific tasks and tasks with different levels of difficulty. Furthermore, creative self-efficacy *predicted* creative performance beyond the predictive effects of job self-efficacy. For employees with higher creative self-efficacy, their self-expectations for creative behavior were more strongly related to creative work involvement than their counterparts with low creative self-efficacy (Carmeli & Schaubroeck, 2007).

Job tenure, job self-efficacy, supervisor behavior, and job complexity also contributed to creative efficacy beliefs (Tierney & Farmer, 2002). Accordingly, our study shall be refined to include

expectations of peer, teacher, and community leader of the students' creativity efficacy and the possible positive predictors of these variables in students' creative outcomes.

References

- Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualisation. *Journal of Personality and Social Psychology*, 45(2), 357-376.
- Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview.
- Astin, A. W., Vogelstang, L. J., Ikeda, E. K., & Yee, J. A. (2000). *Executive summary: How service-learning affects students*. Los Angeles: Higher Education Research Institute.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215.
- Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist*, 44(9), 1175-1184.
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, 28(2), 117-148.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, 52(1), 1-26.
- Bandura, A., Adams, N. E., & Beyer, J. (1977). Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology*, 35(3), 125-139.
- Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology*, 41(3), 586-598.
- Bandura, A., & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology*, 45(5), 1017-1028.
- Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development*, 67(3), 1206-1222.
- Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (2001). Self-efficacy beliefs as shapers of children's aspirations and career trajectories. *Child Development*, 72(1), 187-206.
- Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G. V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology*, 76(2), 258-269.
- Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology*, 88(1), 87-99.
- Beghetto, R. A. (2006). Creative self-efficacy: Correlates in middle and secondary students. *Creative Research Journal*, 18(4), 447-457.
- Bentler, P. M. (2004). *EQS 6 structural equations program manual*. Encino, CA: Multivariate Software.
- Carmeli, A., & Schaubroeck, J. (2007). The influence of leaders' and other referents' normative expectations on individual involvement in creative work. *The Leadership Quarterly*, 18(1), 35-48.
- Chan, D. W. (2000a). Identifying gifted and talented students in Hong Kong. *Roeper Review*, 22(2), 88-93.
- Chan, D. W. (2000b). Developing the creative leadership training program for gifted and talented students in Hong Kong. *Roeper Review*, 22(2), 94-97.
- Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: HarperCollins.
- Edelson, P. J. (1999). Creativity and adult education. *New Directions for Adult and Continuing Education*, 81, 3-13.
- Ethridge, E. A. (2006). Teacher modeling of active citizenship via service-learning in teacher education. *Mentoring & Tutoring*, 14(1), 49-65.
- Goh, C. T. (1997). Shaping our future: Thinking schools and a learning nation (Prime Minister Singapore's address at the opening of the 7th International Conference on Thinking), *Speeches*, 21(3), 12-20.
- Guilford, J. P. (1950). Creativity. *American Psychologist*, 5(9), 444-454.

- Ai-Girl Tan, Valerie Ho, Lim-Chyi Yong
- Hong, J.C., Hwang, M.Y., & Lin, C.L. (2003). Chi and organizational creativity: A case study of three Taiwanese computer firms. *Creativity and Innovation Management*, 12(4), 202-210
- Heiman, G. W. (2001). *Understanding research methods and statistics: An integrated introduction* (2nd Ed.). Boston, MA: Houghton Mifflin.
- Holden, G. (1991). The relationship of self-efficacy appraisals to subsequent health related outcomes: A meta-analysis. *Social Work in Health Care*, 16(1), 53-93.
- Lau, S., & Li, W. L. (1996). Peer status and perceived creativity: Are popular children viewed by peers and teachers as creative. *Creativity Research Journal*, 9(4), 347-352.
- Lau, S., Li, C.S., & Chu, D. (2004). Perceived creativity: Its relationship to social status and self-concept among Chinese high ability children. *Creativity Research Journal*, 16(1), 59-67.
- Lee, E.A., & Seo, H.A. (2006). Understanding of creativity by Korean elementary teachers in gifted education. *Creativity Research Journal*, 18(2), 237-242.
- Martin, M. W. (2006). Moral creativity in science and engineering. *Science and Engineering Ethics*, 12, 421-433.
- Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology*, 38(1), 30-38.
- Proctor, T., Tan, K.H., & Fuse, K. (2004). Cracking the incremental paradigm of Japanese creativity. *Creativity and Innovation Management*, 13(4), 207-215.
- Rudowicz, E, & Hui, A. (1997). The creative personality: Hong Kong perspective. *Journal of Social Behavior and Personality*, 12(1), 139-157
- Runco, M.A., & Nemiro, J. (2003). Creativity in moral domain: Integration and implications. *Creativity Research Journal*, 15(1), 91-105.
- Ruscio, J., Whitney, D. M., & Amabile, T. M. (1998). Looking inside the fishbowl of creativity: Verbal and behavioral predictors of creative performance. *Creativity Research Journal*, 11(3), 243-263.
- Simons, L., & Cleary, B. (2006). The influence of service learning on students' personal and social development. *College Teaching*, 54(4), 307-317.
- Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. *Psychological Bulletin*, 124(2), 240-261.
- Simonton, D. K. (1999a). Creativity from a historiometric perspective. In R. J. Sternberg (Ed.), *Handbook of Creativity* (pp. 116-135). Cambridge, UK: Cambridge University Press.
- Simonton, D.K. (1999b). *Origins of genius: Darwinian perspectives on creativity*. New York: Oxford University Press.
- Sternberg, R. J. (1999). *Handbook of Creativity*. New York: Cambridge University Press.
- Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In R. J. Sternberg (Ed.), *Handbook of Creativity* (pp. 3-15). New York: Cambridge University Press.
- Tan, A.G. (2007a). Creativity for teachers (introduction). In A. G. Tan (Ed.), *Creativity: A handbook for teachers* (pp. xxxi - liv). Singapore: World Scientific.
- Tan, A.G. (2007b). *Development of creativity efficacy scales*. Unpublished manuscript. Singapore: National Institute of Education.
- Tharman Shamugatnam (2003). *The next phase in education – innovation and enterprise*. Speech at the MOE work plan seminar, October 2, <http://www.moe.gov.sg/speeches/2003/sp20031002.htm>, downloaded on July 14, 2007.
- Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *Academy of Management Journal*, 45(6), 1137-1148.

Table 1

Alphas [in bracket] and Correlations of Students' Responses to the Efficacy Scales

	1	2	3	4	5
CRE-CS (1)	[.82]				
CRE-WS (2)	.37***	[.75]			
EPS-LS (3)	.49***	.50***	[.87]		
IFE (4)	.41***	.45***	.49***	[.85]	
CE (5)	.30***	.46***	.39***	.37***	[.87]

Note: *** p<.0001

Table 2

Descriptive Statistics, Skewness, Kurtosis, and Covariance Matrix of the Efficacious Scales

	M	SD	Skew- ness	Kurto- sis	CRE- CS	CRE- WS	CE	IFE	LSE
CRE-CS	13.34	2.66	-.50	1.20	7.07				
CRE-WS	10.46	2.16	-.72	1.31	2.09	4.66			
CE	17.08	3.97	-.47	.84	3.17	3.71	15.75		
IFE	22.83	4.00	-.24	.28	4.49	3.92	5.86	16.04	
LSE	13.50	2.85	-.44	1.09	3.73	2.97	4.38	5.65	8.13

Note: n =505, CRE-WS (3 items, excluding #8).

Table 3

Summary of Fit Indices from the Confirmatory Factor Analysis (CFA)

Model	Chi-sq	df	probability	CFI	IFI	RMSEA	RMSEA(CI)
1-factor model	13.10	5	.22	.99	.99	.06	.02-.095

Note: CFI = Comparative fit index, IFI = Bollen's fit index, RMSEA = Root mean-square error of approximation (RMSEA) and RMSEA(CI) = 90% confidence interval of RMSEA.

Acknowledgements

The authors thank Benjamin Kiu for his comments on the earlier draft, Yin-Hong Cheah and Steve Ow for data administration.

Authors

Ai-Girl Tan is an Associate Professor of the Psychological Studies Academic Group, National Institute of Education, Nanyang Technological University. Visiting professor, University of Munich.
1 Nanyang Walk, Singapore 637616 Email: aigirl.tan@nie.edu.sg

Valerie Ho is a graduate student of the National Institute of Education.

Lim-Chyi Yong is a teacher of Hillgrove Secondary School.

作者:

陳愛月現任南洋理工大學副教授，慕尼黑大學客研教授（2008-09）。
何維莉現為南洋理工大學碩士生。
楊琳祺現為新加坡高中教師。