PURDUE
UNIVERSITY

geri
Gifted Education
Research & Resource
Institute

MEHDI GHAHREMANI

Applying Sternberg's Theory of Mental Self-government to Explore Creative and Critical Thinking

1

---

geri
Gifted Education
Research & Resource
Institute

REVIEW OF THE LITERATURE – POTENTIAL TENSION?

Creative Thinking

- ☻ Unconscious and out-of-the-box thinking (Davis, Rimm, & Siegle, 2011)
- ☻ Intuitive and imaginative (Csikszentmihalyi, 1996; Davis, Rimm, & Siegle, 2011; Treffinger et al., 2002)
- ☻ Encourages risk-taking and being optimistic (Davis, Rimm, & Siegle, 2011; Sternberg, Jarvin & Grigorenko, 2011)
- ☻ Advocates tolerance for ambiguity and being easy-going (Davis, Rimm, & Siegle, 2011)

Critical Thinking

- ☻ Thinking based on and in light of an appropriate set of criteria (Lipman, 2003)
- ☻ Analytical and logical (Sternberg 2003, 2005; Sternberg, Jarvin & Grigorenko, 2011)
- ☻ Advocates being cautious and skeptical (Facione 2011; Fenstermacher & Soltis, 2009)
- ☻ Encourages seeking clarity and being meticulous/careful (Paul & Elder, 2009)

2

Dimensions	Styles	Types
Functions	1. Legislative	Type I
	2. Executive	Type II
	3. Judicial	Type I
Forms	4. Monarchic	Type II
	5. Hierarchical	Type I
	6. Anarchic	Type III
	7. Oligarchic	Type III
Levels	8. Global	Type I
	9. Local	Type II
Scopes	10. Internal	Type III
	11. External	Type III
Leanings	12. Liberal	Type I
	13. Conservative	Type II

- According to Sternberg's *Theory of Mental Self-government*, thinking styles can be seen as **individuals' habitual pattern** and/or **preferred ways of applying their abilities** of information-processing, managing cognitive activities, and dealing with tasks (Grigorenko, & Sternberg, 1997; Zhang, Sternberg, & Fan, 2013).

THEORETICAL FRAMEWORK | **Sternberg's Theory of Mental Self-government**

3

Slide 4

- The first group, **Type I** thinking styles, "normally fall on the right end of each of the first four continua of preference: low degrees of structure, cognitive complexity, nonconformity, and autonomy" (Zhang & Sternberg, 2005, p. 34)

- The second group, **Type II** thinking styles, "suggest preferences for tasks that are structured, that allow individuals to process information in a more simplistic way, and that require conformity to traditional ways of doing things and high levels of respect for authority" (Zhang & Sternberg, 2005, p. 34),

- The third group, **Type III** thinking styles, "fall neither into the Type I group nor into the Type II group of styles. Instead, they manifest the characteristics of both Type I and Type II intellectual styles, depending on the stylistic demands of a specific task and on an individual's level of interest in the task" (Zhang & Sternberg, 2005, p. 36)

THEORETICAL FRAMEWORK | **Threefold Model of Intellectual Styles**

4

Slide 5

According to Sternberg and Zhang (2005)

- Styles are not abilities;
- They are preferences;
- Not *good* or *bad*, that
- May vary across situations and activities, and across the life span.
- Individuals differ in terms of their strength in the stylistic preferences and stylistic flexibility.
- Styles are measurable and modifiable.

Based on both theoretical conceptualization and empirical evidence, Zhang (2002) and Zhang and Sternberg (2005) classified these 13 thinking styles into three types:

- Type I: Legislative, Judicial, Hierarchical, Global, and Liberal styles
- Type II: Executive, Local, Monarchic, and Conservative styles
- Type III: Anarchic, Oligarchic, Internal, and External styles

THEORETICAL FRAMEWORK | **Sternberg's Theory of Mental Self-government**
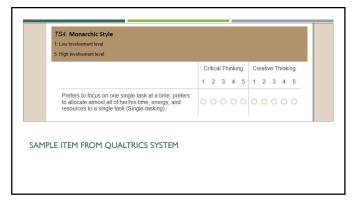
5

Slide 6

RESEARCH QUESTIONS

geri

- *Applying Sternberg's theory of mental self-government, in G/T experts' view, what are preferred ways of thinking in people who think critically and creatively?*

- *Based on this theory, what are dimensions of critical and creative thinking, in terms of 13 styles of thinking?*

6

METHODS

- Paired-sample Design
- Survey Research (Expert)

7

PROCEDURE

- **Phase 1: Instrument Development within Experts Panel from College of Education**
  - **Content Validation Phase:** n=26 participants (16 G/T PhD students and 10 University professors in G/T studies, educational psychology, counseling, and research methods).
- **Phase 2: Conducting our Survey Questionnaire**
  - **Sampling and Expert Participants (n=62):** Using Qualtrics system, we sent the consent letter and the link to the survey questionnaire via email to 273 scholars.
    - Criterion sampling: (a) being faculty members of universities that provide graduate programs for gifted education (b) having minimum of 20 publications
    - (a) officers and members of the board of directors of the National Association of Gifted Children, (b) current editorial board members of eight distinguished professional journals in the gifted field (i.e., *Gifted Child Quarterly*, *Gifted and Talented International*, *Journal of Creative Behavior*, *High Ability Studies*, *Creativity Research Journal*, *Journal for the Education of the Gifted*, *Roeper Review*, and *Journal for Advanced Academics*) and (c) first authors of three or more journal articles in the gifted field published from 2011 through 2015.

8

SAMPLE ITEM FROM QUALTRICS SYSTEM

9

Wilcoxon signed-rank test statistics [a] for comparing responses for 13 Thinking Styles

	1	2	3	4	5	6	7	8	9	10	11	12	13
Z	-4.801[b]	-5.562[c]	-6.022[c]	-3.097[c]	-1.302[b]	-5.333[b]	-4.620[b]	-2.801[b]	-5.351[c]	-.125[c]	-.110[b]	-4.964[b]	-5.738[c]
Asymp. Sig. (2-tailed)	<.001	<.001	<.001	.002	.193	<.001	<.001	.005	<.001	.901	.912	<.001	<.001
Effect Size	0.61	0.71	0.76	0.39	0.16	0.68	0.57	0.36	0.68	0.02	0.01	0.63	0.73

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

- We can consider the effect size (ES) to determine the degree of association between the groups. We use following Formula to calculate the ES:

$$ES = \frac{|z|}{\sqrt{n}}$$

where |z| is the absolute value of the z-score and *n* is the number of matched pairs included in the analysis. The ES ranges from 0 to 1. Cohen (1988) defined the conventions for ES as *small* = 0.10, *medium* = 0.30, and *large* = 0.50. (α = 0.05)

RESULTS — **Paired Sample Comparison**

10

Paired-sample T-test Statistics for Threefold Thinking Categories

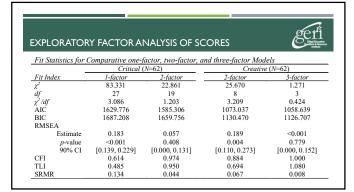|	Paired Sample Statistics							Paired Samples Test							
	Mean		SD		SEM			Paired Differences							Effect Size
											98.33% CI of the Difference				Cohen's d
	Critical	Creative	Critical	Creative	Critical	Creative		Mean	SD	SEM	Lower	Upper	t (df=61)	Sig. (2-tailed)	
Type I	3.693	3.945	.6259	.6243	.0795	.0792	Pair1	-.252	.5748	.073	-.431	-.072	-3.447	.001	0.4031
Type II	3.339	2.371	.8566	.5828	.1088	.0740	Pair2	.968	.8066	.102	.716	1.22	9.447	<.001	1.3213
Type III	3.020	3.568	.6375	.7203	.0810	.0915	Pair3	-.548	.7559	.096	-.785	-.312	-5.712	<.001	0.8056

RESULTS — **Paired Sample Comparison**

11

- These results provide evidence that in these experts' view, comparing to people who think critically (M=3.69, SD=0.63), individuals who think creatively (M=3.94, SD=.62) have more preferences towards tasks that allow for Type I thinking styles, ($t_{(61)}$=-3.45, *p*=.001, *d*=0.40), including the *executive*, *local*, *monarchic*, and *conservative* thinking styles.

- Further, these outcomes provide evidence that in these experts' view, compared to people who think creatively (M=2.37, SD=0.59), individuals who think critically (M=3.34, SD=.86) have more preferences towards tasks that allow for Type II thinking styles. (t_{61}=9.45, *p* < .001, *d*=1.32), including the *executive*, *local*, *monarchic*, and *conservative* thinking styles.

- These results provide evidence that in these experts' view, comparing to people who think critically (M=3.02, SD=0.64), individuals who think creatively (M=3.57, SD=.72) have more preferences towards tasks that allow for Type III thinking styles, ($t_{(61)}$= -5.71, *p* < .001, *d*=0.81), including the *anarchic*, *oligarchic*, *internal*, and *external* styles

RESULTS — **Paired Sample Comparison**

12

Slide 13

Correlations among the 13-item Thinking Styles Subset in CCS

	1	2	3	4	5	6	7	8	9	10	11	12	13
Legislative		-.15	-.09	-.18	.26*	.35**	.35**	.25*	-.09	-.08	.18	.41**	-.37**
Executive	.01		.54**	.37**	-.08	-.25*	.08	-.02	.30*	.05	-.06	-.37**	.55**
Judicial	.01	.34**		.31*	-.09	-.30*	-.08	.11	.28*	.08	.05	-.27*	.52**
Monarchic	-.08	.08	.15		-.19	-.17	-.15	.03	.24	.07	-.03	-.11	.39**
Hierarchical	.45**	-.04	.08	-.21		.37**	.29*	.11	-.07	.32*	.23	.34**	-.15
Anarchic	.43**	-.18	-.25	-.01	.41**		.43**	.33**	-.12	.21	.33**	.60**	-.40**
Oligarchic	.21	.00	.03	-.15	.39**	.47**		.48**	-.08	.16	.21	.23	-.11
Global	.35**	.01	.00	-.16	.23	.40**	.53**		-.07	.17	.29*	.30*	-.15
Local	-.05	.04	.32*	.18	.17	.15	.05	-.04		.20	-.03	-.17	.36**
Internal	.30*	.15	.15	.07	.37**	.46**	.47**	.38**	.012		-.21	-.02	.12
External	.014	-.13	-.02	.17	.19	.20	-.02	-.02	.39**	-.19		.38**	-.11
Liberal	.61**	-.11	-.10	-.04	.44**	.55**	.30*	.30*	.10	.44**	.15		-.42**
Conservative	-.21	.41**	.44**	.35**	-.21	-.44**	-.05	-.10	.08	.04	-.07	-.28*	

Note. Correlations for critical thinking ($N = 62$) above the diagonal, and creative thinking ($N = 62$) below the diagonal.
*$p < .05$, two-tailed. **$p < .01$, two-tailed.

RESULTS **Intercorrelations Among Thinking Styles**

Slide 14

EXPLORATORY FACTOR ANALYSIS OF SCORES

Fit Statistics for Comparative one-factor, two-factor, and three-factor Models

Fit Index	Critical (N=62)		Creative (N=62)	
	1-factor	2-factor	2-factor	3-factor
χ^2	83.331	22.861	25.670	1.271
df	27	19	8	3
χ^2/df	3.086	1.203	3.209	0.424
AIC	1629.776	1585.306	1073.037	1058.639
BIC	1687.208	1659.756	1130.470	1126.707
RMSEA				
Estimate	0.183	0.057	0.189	<0.001
p-value	<0.001	0.408	0.004	0.779
90% CI	[0.139, 0.229]	[0.000, 0.131]	[0.110, 0.273]	[0.000, 0.152]
CFI	0.614	0.974	0.884	1.000
TLI	0.485	0.950	0.694	1.080
SRMR	0.134	0.044	0.067	0.008

Slide 15

EFA: UNDERLYING FACTOR STRUCTURE

Structural equation modeling techniques were used to examine the underlying factor structure of these concepts, resulted in:

- a *2-factor model* for critical thinking (χ^2/df=1.203, CFI=0.974, TLI=0.950, RMSEA=0.057):
  - Factor one: Executive, Judicial, Local, and Conservative thinking styles
  - Factor two: Legislative, Anarchic, Oligarchic, Global, and Liberal thinking styles
- a *3-factor model* for creative thinking (χ^2/df=0.424, CFI=1.000, TLI=1.080, RMSEA<0.001):
  - Factor one: Legislative and Liberal thinking styles
  - Factor two: Anarchic, Oligarchic, and Global thinking styles
  - Factor three: Local and External thinking styles

CREATIVE THINKING: DEFINITION

- Plucker, Beghetto, and Dow (2004) combined many views on the concept of creativity, and proposed this definition:

  Creativity is the interaction among **aptitude**, **process**, and **environment** by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context. (p. 90)

  This definition has recently been adopted by some scholars in gifted and talented education (Li & Kaufman, 2013).

16

DISCUSSION: INTERPRETATION OF FACTORS

Critical Thinking

- Factor one: Executive, Judicial, Local, and Conservative thinking styles → **Criterion-based thinking** (Philosophical view on CT)
- Factor two: Legislative, Anarchic, Oligarchic, Global, and Liberal thinking styles → **Habits of mind** (Psychological view on CT)

Creative Thinking

- Factor one: Legislative and Liberal thinking styles → Aptitude for **Originality**
- Factor two: Anarchic, Oligarchic, and Global thinking styles → Procedural **Flexibility**
- Factor three: Local and External thinking styles → Making Environmental **Connections**

17

Discussion: Path-diagram Notation of Latent Variable Model of Critical ond Creative Thinking in Terms of 13 Thinking Styles

18

DISCUSSION: COMPARING FACTOR STRUCTURES

Comparing Factor Structure of Thinking Styles for Critical and Creative Thinking

Dimensions	Critical Thinking 2-factor Model		Creative Thinking 3-factor Model		
	Factor I	Factor II	Factor III	Factor II	Factor I
Functions		Legislative			Legislative
		Executive			
		Judicial			
Forms		Anarchic		Anarchic	
		Oligarchic		Oligarchic	
Levels		Global		Global	
			Local		
Scopes					
			External		
Leanings		Liberal			Liberal
		Conservative			

- According to three **types** of thinking in Sternberg's *Theory of Mental Self-government*, creative thinking factor structure only involves Type I and Type III thinking styles, except for Local style.

19

COMMONALITIES AND AREAS OF DIFFERENCE

20

CONCLUSION

- These results provide evidence for critical and creative people's *preferred ways of thinking and learning*. If there are preferred ways applying their abilities of information-processing, managing their cognitive activities, and dealing with tasks, for individuals who think creatively or critically, as these results suggest, **these habitual patterns and preferred ways of thinking need to be taken into account to provide students with better educational and instructional fit.**

21

CONCLUSION

Instructional Differentiation

What these results are suggesting is consideration of how to differentiate development of creativity and critical thinking using thinking styles as a basis for differentiation, in terms of students' **preferences** for *functions, levels, scopes,* and *leanings*.

- For instance, if students who think creatively prefer the anarchic style of thinking, and students who think critically prefer the hierarchical thinking style, the learning opportunities can be differentiated accordingly. "The anarchic student has a predilection for tasks, projects, and situations that lend themselves to great flexibility of approaches, and to trying anything when, where, and how he or she pleases" (Sternberg & Zhang, 2005, p. 247). This is in contrast to the hierarchical style, in which individuals have preferences for tasks, projects, and educational settings that allow for developing hierarchy of goals to fulfill.

22

LIMITATION & FUTURE RESEARCH

- Sample size on the Phase II (n=62)
  - CFA
  - Delphi Study
- Different Population
  - Teachers, Students
  - Expertise area of the participants (Psychology)
- High cognitive load of questionnaire (?)

23

SELECTED REFERENCES

- Alborzi, S., & Ostovar, S. (2007). Thinking styles of gifted and nongifted students in Iran. *Psychological reports, 100*(3c), 1076-1082.
- Bailin, S. (1987) Critical and creative thinking. *Informal Logic, 9 (1),* 23-30.
- Callahan, C. M., & Hertberg-Davis H. L., (Eds.). (2013). *Fundamentals of gifted education: Considering multiple perspectives.* New York, NY: Routledge.
- Csikszentmihalyi, M. (1996). The creative personality. *Psychology Today, 29*(4), 36-40.
- Dai, D.Y. (2010). *The nature and nurture of giftedness: A new framework for understanding gifted education.* New York: Teachers College Press.
- Daniel, M., & Auriac, E. (2011). Philosophy, critical thinking and philosophy for children. *Educational Philosophy and Theory, 43*(5), 415-435.
- Davis, G. A., Rimm, S. B., & Siegle, D. (2011). *Education of the gifted and talented* (6th ed.). Upper Saddle River, NJ: Pearson Education. ISBN-13: 9780135056073

24

SELECTED REFERENCES

- De Villiers, Marietjie R, De Villiers, Pierre JT, & Kent, Athol P. (2005). The Delphi technique in health sciences education research. *Medical Teacher., 27*(7), 639-643.
- de Winter, J. D., Dodou, D., & Wieringa, P.A. (2009). Exploratory factor analysis with small sample sizes. Multivariate behavioral research, *44*(2), 147-181.
- Facione, P. (2011). *Critical thinking: What it is and why it counts.* Millbrae, CA: Insight Assessment, California Academic Press. Retrieved from http://www.insightassessment.com/pdf_files
- Grigorenko, E. L., & Sternberg, R. J. (1997). Styles of thinking, abilities, and academic performance. *Exceptional children, 63*(3), 295-312.
- Gubbins, E. J. (2013). Cognitive and affective outcomes of pull-out programs: Knowns and unknowns. In Callahan, Carolyn M., and Holly L. Hertberg-Davis, (Eds). *Fundamentals of Gifted Education: Considering multiple perspectives* (pp. 176-187). New York, NY: Routledge.
- Halpern, D. F. (2007). The nature and nurture of critical thinking. In Sternberg, H. L. R. III & D. F. Halpern (Eds.), *Critical thinking in psychology*, 1-14. New York, NY: Cambridge University Press.

25

SELECTED REFERENCES

- Jeste, D.V., Ardelt, M., Blazer, D., Kraemer, H. C., Vaillant, G., & Meeks, T. W. (2010). Expert consensus on characteristics of wisdom: A Delphi method study. *The Gerontologist, 50*(5), 668-680.
- Lipman, M. (2003). *Thinking in Education* (2nd ed.). Cambridge: Cambridge University Press.
- Löfmark, A., & Mårtensson, G. (2017). Validation of the tool assessment of clinical education (AssCE): A study using Delphi method and clinical experts. *Nurse Education Today., 50*, 82-86.
- McCoach, D. B., Gable, R. K., & Madura, J. P. (2013). Instrument development in the affective domain. *New York, NY: Springer.*
- McNeish, D. (2016). Exploratory factor analysis with small samples and missing data. *Journal of personality assessment*, 1-16.
- Michalak, E., Suto, J., Barnes, J., Hou, S., Lapsley, S., Scott, W., . . . CREST.BD. (2016). Effective self-management strategies for bipolar disorder: A community-engaged Delphi consensus consultation study. *Journal of Affective Disorders., 206*, 77-86.

26

SELECTED REFERENCES

- Paul, R., & Elder, L. (2008). Critical and creative thinking. Dillon Beach, CA: The Foundation for Critical Thinking.
- Paul, R., & Elder, L. (2009). The miniature guide to critical thinking concepts and tools. Dillon Beach, CA: Foundation for Critical Thinking Press.
- Pfeiffer, S. I. (2003). Challenges and opportunities for students who are gifted: What the experts say. *Gifted Child Quarterly, 47*(2), 161-169.
- Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to   educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educational Psychologist*, 39(2), 83-96.
- Sternberg, R. J. (1988). Mental self-government: A theory of intellectual styles and their development. *Human Development, 31,* 197–224.
- Sternberg, R. J. (2003). WICS as a model of giftedness. *High Ability Studies, 14*(2), 109-137.

27

SELECTED REFERENCES

- VanTassel-Baska, J. (2013). The integrated curriculum model. In Callahan, Carolyn M., and Holly L. Hertberg-Davis, (Eds). *Fundamentals of gifted education: Considering multiple perspectives* (pp. 315-326). New York, NY: Routledge.
- Zhang, L. F. (2011). The developing field of intellectual styles Four recent endeavors. *Learning and Individual Differences, 21*(3), 311-318.
- Zhang, L. F., & Shin, J. C. (2015). The research–teaching nexus among academics from 15 institutions in Beijing, Mainland China. *Higher Education, 70*(3), 375-394.
- Zhang, L. F., & Sternberg, R. J. (2005). A threefold model of intellectual styles. *Educational Psychology Review, 17*(1), 1-53.
- Zhang, L. F., Sternberg, R. J., & Fan, J. (2013). Revisiting the concept of 'style match'. *British Journal of Educational Psychology, 83*(2), 225-237.

28

PURDUE
UNIVERSITY

THANK YOU!

Mehdi Ghahremani
Beering Hall, Room 5121, 100 N. University Street,
West Lafayette, IN 47907
mghahrem@purdue.edu

29