

THE EXPLORATION OF INDICATORS OF IMAGINATION

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ABSTRACT

Although early studies in the fields of education and psychology appreciated the value of imagination, little work has been done pertaining to indicators of imagination. This study synthesized early works on imagination done between 1900 and 2011 to clarify its meaning and identify potential indicators. Then, two groups of samples were collected and validated through exploratory factor analysis and confirmatory factor analysis. There were two dimensions and ten indicators of imagination that emerged during this inquiry. The first dimension is “creative imagination,” which includes the indicators of intuition, sensibility, productivity, exploration, and novelty. The second dimension is “reproductive imagination,” which includes the indicators of focusing, effectiveness, transformation, crystallization, and dialectics. The two dimensions reveal not only distinct differences that characterize their uniqueness, but also certain shared features. Some suggestions for future studies are also proposed.

Keywords: confirmatory factor analysis, creative imagination, exploratory factor analysis, imagination, reproductive imagination

INTRODUCTION

Imagination is the basis for cultivating creative thinking, and thus the driving force of innovation. Creativity-related research has progressed for many years, but the understandings of imagination and its indicators still remain unclear. So far, few studies have clearly discussed how imagination manifests itself, let alone developed an evaluation tool for assessing imagination. Because of the potential applicability to the profession of educational technology and various fields, some general concepts of imagination must be explained before referring to them specifically with the indicators which might be observed or assessed.

IMAGINATION

The term imagination has its root in the Latin verb *imaginary*, meaning “to picture oneself”. This root indicates that imagination belongs to an individual scope, and has a denotation of self-reflection, an examination of one’s own feelings and thoughts. Imagination is thus viewed as “a creative faculty of the mind” or “a power of the mind” (Perdue, 2003).

Imagination enables people to go beyond actual experience and construct alternative possibilities in which a fragmented situation becomes a meaningful whole (Passmore, 1985). Finke (1990) claimed that individuals have the potential to make creative discoveries through their imagery. It is possible to demonstrate this experimentally for many types of creative discoveries. Reichling (1990) added that most of imagination is emotive content, with a meaning which is apprehended intuitively. Therefore, imagination can be viewed as the basis for cultivating creative thinking, and thus the driving force of innovation (Finke, 1996).

Vygotsky (2004) indicated that imagination is a function essential to human life as there are four ways that connect imagination with reality. First, imagination is derived from a person’s experiences which, in turn, are based on reality. Second, the final product of an individual’s imagination has a complex association with real phenomenon. The third type of association between the functioning of imagination and reality is related to emotion. Every emotion corresponds to specific images, and possesses a capacity to trigger impressions and thoughts at a particular moment. Finally, imagination that has been externally embodied into a tangible form

becomes an object existing in reality.

The definition of imagination in the Merriam-Webster Dictionary (2011) is as follows: “An act or power of forming a mental image of something not present to the senses or never before wholly perceived in reality; creative ability; fanciful or empty assumption.” This concept of image synthesis is also mentioned in the definition of imagination in The Oxford Dictionary of Philosophy (2008): “Most directly, the faculty of reviving or especially creating images in the mind’s eye. But more generally, the ability to create and rehearse possible situations, to combine knowledge in unusual ways, or to invent thought experiments.” In this study, “imagination” thus refers to “the process of transforming the inner imagery of students when they face a given assignment.” Such images are usually developed from an individual’s memory of images and shaped into something new.

IMAGINATION INDICATOR

Betts (1916) contended that the activities of human imagination can be classified into two different categories: reproductive imagination and creative imagination. Reproductive imagination is the type of imagination people use to reproduce in their minds either images described by others or images from their own experience which lack the completeness and fidelity to make them true memories. In more advanced levels of development, creative imagination emphasizes the attributes of initiation and originality. Creative imagination is the function which is present in the great discoveries and achievements of humankind’s scientific, artistic, literary and technological revolutions (Colello, 2007). From the related literature, nine indicators were compiled to assess human imagination. These indicators are transformation, crystallization, effectiveness, elaboration, exploration, intuition, novelty, productivity, and sensibility. The account of each indicator is presented as follows.

Transformation

Ribot (1906) held that the essential element of imagination in the intellectual sphere is the capacity of thinking through analogies. The core principle behind analogy is transformation. Analogies occur not from thinking about a singular object, but from connecting one object or one field to another. Vygotsky (1978) stressed that this transformation enables children to learn how to control a situation through the use of symbols, “In play, thought is separated from objects and action arises from ideas rather than from things: a piece of wood begins to be a doll and a stick becomes a horse...” (p. 97). Imagination assists people in transferring a function from one object to another that did not previously have such a function. This ability helps people in dealing with unpredictable problems by using existing experiences. In addition, Beaney (2005) indicated that imaginative individuals are usually those who make fruitful connections between apparently disparate ideas in different fields, and those who project themselves into unusual situations. These works suggest that *transformation* is an indicator of imagination which represents the ability to perform tasks by transforming knowledge across multiple fields of study.

Crystallization

According to Aristotle, imagination bridges “images” and “ideas,” implying that rational thought takes place in the form of images, and are stored and combined in one’s imagination (Perdue 2003). In Hegel’s theory of mental activity, imagination connects “abstract properties” and “concrete universals” by law of association (DeVries, 1988). Ribot (1906) indicates that imagination can be reduced to three forms: sketched, fixed, and objectified. This demonstrates that no matter the form, imagination can facilitate people’s abstract ideas into concrete subjects. Thomas (1997) discussed the theory of mental images and claimed that imagery arises from the interpretative aspect of perception (‘seeing-as’). Vygotsky (2004) believed that imaginative activities are crystallized in culture. He asserted that all objects of common life appear as a crystallization of the imagination. In conclusion, *crystallization* emerges as another indicator of imagination which represents the ability of individuals to express abstract ideas by using concrete examples.

Effectiveness

Every invention results from a particular human need, acting within its own sphere and for its own special purpose. Under these circumstances, the aim of the invention is clear, and thus the imagination is influenced directly by the constitution of end products and confined within certain constraints (Ribot, 1906). Imagination thus could be examined by the inventions’ effectiveness. Betts (1916) supported these theories and added that people are in danger of drifting into daydreams, unless their imagination is guided by some purpose. Reiner and Gilbert (2000) further confirmed that imagination is goal-oriented, based on prior experiential imagery. Folkmann (2010) also believed that a sharp focus in imagination will often be associated with a goal-oriented process that is close to the given requirements as stated by the client. Therefore, the third indicator of imagination is *effectiveness* which represents the ability of individuals to generate effective ideas to a desired goal.

Elaboration

During the beginning of imagination, an individual's attention is spontaneous, natural, and effortless. As the process continues, imagination becomes a long, detailed, and laborious personal moment. It is a time full of painful and intermittent resumptions, especially in the higher levels of imagination where people intentionally reunite images to make novel combinations (Ribot, 1906). Through acts of dissociation and association, an inventor's imaginative constructs are challenged, sorted out, broken up, corrected, narrowed, and united, until they are adapted to a social consciousness. Reiner and Gilbert (2000) also indicated that people can "zoom in and out" to inspect particular imaginary situations, transfer objects, and predict paths of imaginary objects. Valett (1983) contended that incubation is an important way to facilitate imagination. This is a time where internalization of acquired knowledge and experience occurs whereby the ends of imagination would gradually emerge and take shape. Similarly, Folkmann (2010) claimed that the process of focusing and defocusing is open to ongoing reformulation. Due to the process's functional position in the interface between the inner consciousness and outer world, it lies in an area between clear and rational discourse and inaccessible mental space. Thus, *elaboration* is the fourth indicator of imagination and is the ability of individuals to seek improvement by formalizing ideas.

Exploration

Valett (1983) indicated that the mental process of imagination can be described by five stages of growth: sensory exploration, egocentric speculation, personal experimentation, symbolic representation, and functional verification. Valett continually illustrated that children explore the world through play, and then satisfy themselves through exaggerations of their intuitive impressions. Thomas (1999) contended that the process of controlled perceptual exploration takes individuals from a vague appreciation to a detailed understanding of reality. Colello (2007) also asserted that imagination consists of the possibility of creation as a qualitative leap, which allows one to explore, dare, and challenge institutional order, and thus overcome limits. In addition, Folkmann (2010) claimed that imagination can be seen as a structure in consciousness that negotiates, exchanges, and explores between the known and unknown (judged by the amount of presupposed knowledge). *Exploration* is thus the fifth indicator of imagination and represents the ability of individuals to explore the unknown.

Intuition

Ribot (1906) held that in an individual's imagination, every intuition becomes concrete as a judgment and equivalent to a conclusion, which leads to a foresight of the future. Reichling (1990) contended that intuition could be defined as an immediate mode of knowing, knowledge gained directly as an insight, or a grasp of the whole. Reichling further elaborated that the insight may occur as a leap from the known to the unknown in the manner described by Dewey (1934): "When old and new jump together, like sparks when the poles are adjusted, there is intuition" (p. 266). Reiner & Gilbert (2000) supported that intuition leads people to test various thoughts, and possibly gain unexpected outcomes. Townsend (2003) anchored that the thrill of validation results in a more harmonious interaction between imagination and intuition. If people utilize more intuitive representations, then their imagination would last longer. All these works suggest that *intuition* is an important indicator of imagination which represents the ability of individuals to generate immediate associations to a target.

Novelty

The Platonic philosophy associates imagination with novelty, creativity, and irrationality. Betts (1916) held that imagination takes images from one's past experience or those gleaned from the work of others, and puts them together in new and original forms. Imagination is an inventive power which allows the ability to see old characteristics in new relations, and thus build new constructions out of old components. Vygotsky (2004) believed that although imagination builds using materials supplied by reality, but it would be productive from using combinations of concepts that are more removed from reality. Beaney (2005) contended that someone who is imaginative is good at creating new possibilities, and able to offer fresh perspectives on what is familiar. Note that any new ideas or acts derived from an individual's imagination should have positive social ends in order to promote well-being, enrich the act of consumption, or stimulate confidence in social cohesion (KEA European Affairs, 2009). Therefore, *novelty* can be perceived as another indicator of imagination which represents the ability of individuals to create uncommon ideas.

Productivity

Ribot (1906) indicated that imagination corresponds to four particular sets of conditions: quantity of images; quantity and intensity of images; quantity, intensity and duration of images; complete systematization. According to Ribot, mental images could team, break apart, and associate in various ways, but could still be assessed in terms of quantity, intensity and duration. All these evolving conditions of imagination are related to physical dimensions of imaginative productivity, continuity and fluency. Therefore, someone described as

imaginative might be able to come up with original ways of seeing or doing things in a short period (Beaney, 2005). Folkmann (2010) claimed that imagination relates to the start of the design process as either an overall conception of the design as a whole, or a more experimental exploration for details. Both positions clearly state the success criteria for the design task in terms of productivity. *Productivity* is thus another indicator of imagination which represents the ability of individuals to generate numerous ideas.

Sensibility

All forms of creative imagination imply elements of feeling. Similarly, all emotional dispositions may influence the creative imagination (Ribot, 1906). Because inventors strive to achieve their goals and overcome problems, they will often experience painful struggles in thoughts, feelings, and emotions during creative activity. Ricoeur (1978) suggested that these feelings are not merely inner states, but are really “interiorized thoughts” (p. 156). Scheffler (1986) extends this notion and suggests that emotion without cognition is blind, while cognition without emotion is vacuous. Reichling (1990) also confirmed that feeling, in terms of imagination, is assigned a cognitive dimension. In addition, Vygotsky (2004) believed that the ability to control imagination comes with the maturation of emotion. Gajdamaschko (2005) also stated that even if the construct of the imagination does not correspond to reality, the feelings it evokes are real. *Sensibility* is thus concluded to be an indicator of imagination which represents the ability for individuals to arouse feeling during the creating process.

METHOD

Participants and Procedure

The participants in the study consisted of two samples ranging from freshman to graduate students majoring in Educational Technology from universities across different regions in Taiwan. Sample 1 (N=402) served as the calibration sample for testing the most appropriate structure of the imagination scale using exploratory factor analysis. Sample 2 (N=380) served as the validation sample using confirmatory factor analysis for testing the established structure from the sample 1. The descriptive data for the samples used in the study are reported in Table 1.

Table 1: Descriptive data of samples used in the study.

Profile	Sample 1 for EFA (n = 402)	Sample 2 for CFA (n = 380)
Gender		
Male	152 (37.8%)	94 (24.7%)
Female	250 (62.2%)	286 (75.3%)
Year		
Freshman	61 (15.2%)	88 (23.2%)
Sophomore	116 (28.9%)	91 (24.0%)
Junior	89 (22.1%)	75 (19.7%)
Senior	19 (4.7%)	62 (16.3%)
Graduate	117 (29.1%)	64 (16.8%)

Note. EFA=Exploratory Factor Analysis; CFA=Confirmatory Factor Analysis

In order to ensure the quality of this study, the research team communicated the survey with instructors in the target universities first, and then arranged similar assignments. The investigation process delivered in each university followed the same procedure. Each participant received a cover page and questionnaire in a package. On the cover page, all participants were informed that their involvement was voluntary and they could withdraw from the study at any point in time without incurring any penalties. Students were guaranteed anonymity, confidentiality, and the right to review the results of their responses. In the questionnaire, students were asked to determine the level of agreement with each indicator of imagination. Data collection of each survey was conducted by trained graduate assistants who were accompanied by the class instructor.

Instrumentation

The research team searched the Ovid PsycINFO, ISI and EBESCO databases for works from 1900 to the present regarding the scales of imagination. Surprisingly, there were none available with established reliability and validity. Therefore, the team decided to develop a scale of imagination to serve as a research tool. Based on the literature review in the earlier section, nine indicators were summarized related to the construct of imagination: transformation, crystallization, effectiveness, elaboration, exploration, intuition, novelty, productivity, and sensibility. These nine indicators were then placed in the two general categories of creative and reproductive imagination.

The instrument scale of the present study is a nine-item questionnaire designed to evaluate one's indicators of imagination on a 5-point Likert-type scale (1=*strongly disagree* to 5=*strongly agree*). With regards to the construct validity, three experienced experts in the related fields were invited to provide feedback on this scale and also accepted content analysis offered by 10 acknowledged scholars. Moreover, the validity was assured by pre-testing this scale with college students from related fields to examine its readability and flow. In the final analysis, the values of internal consistency of creative and reproductive imagination were .777 and .659 respectively for sample 1 and .819 and .659 respectively for sample 2, showing that the developed scale had appropriate reliability estimates.

Data were analyzed using SPSS version 17.0 software. A number of data analysis procedures were conducted including descriptive statistics (demographic data), exploratory factor analysis, and confirmatory factor analysis with LISREL 8.80 with maximum likelihood methods. This study used the following indicators recommended by Hu and Bentler (1999), Jöreskog and Sörbom (1996), and Tabachnick and Fidell (2001) to assess goodness of model fit: Comparative Fit Index (CFI; .95 or above indicating excellent fit, .90-.95 indicating an acceptable fit), Root-Mean-Square Error of Approximation (RMSEA; .05 or below indicating excellent fit, .05-.08 indicating an acceptable fit), Standardized Root Mean Squared Residual (SRMR; .05 or below indicating excellent fit, .05-.08 indicating an acceptable fit), Tucker-Lewis Index (TLI; .95 or above indicating excellent fit, .90-.95 indicating an acceptable fit).

DATA ANALYSIS AND DISCUSSION

All nine indicators of imagination were examined for accuracy in data entry, missing values, normality of distributions, and multivariate outliers. The absolute values for skewness and kurtosis were in the appropriate range (below |2|), indicating a normal distribution of scores across all variables. Additionally, calculation of the Mahalanobis distance statistics at the $p < .01$ significance level (Tabachnick & Fidell, 1996) indicated that none of the cases were multivariate outliers. Furthermore, all the means located within 1.5 standard deviations, further confirming the normal distribution of the data.

Table 2: Descriptive statistics for the sample 1 and the sample 2.

Categories Indicators (Items)	Sample 1		Sample 2	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Creative Imagination	3.58	.56	3.61	.61
Exploration (I like to explore the unknown)	3.92	.69	3.91	.72
Intuition (I often come up with new ideas through my intuition)	3.78	.76	3.72	.76
Sensibility (I often help myself imagine through feelings)	3.70	.73	3.69	.78
Productivity (I constantly have ideas toward my designs)	3.27	.80	3.38	.83
Novelty (I often have uncommon ideas compared to others)	3.21	.78	3.34	.81
Reproductive Imagination	3.52	.60	3.48	.60
Effectiveness (I often complete my tasks by focusing on effective ideas)	3.57	.71	3.54	.71
Transformation (I think flexibly and can transfer ideas to multiple fields of tasks)	3.55	.76	3.49	.75
Crystallization (I am good at expressing abstract ideas by using concrete examples)	3.50	.81	3.46	.79
Elaboration (I improve my thoughts by focusing on formalizing ideas)	3.44	.82	3.42	.83

Exploratory Factor Analysis

A principal component analysis (PCA) with promax rotation was conducted to determine the structure of the developed imagination scale. The number of factors to be extracted for this analysis was determined by using a number of criteria: eigenvalues above 1.0 (Kaiser, 1960), examination of Cattell's scree test (Cattell, 1966), communality values greater than .30, and the total variance accounted for by each factor. Initial examination of Cattell's scree plot strongly suggested the possibility of two factors with a marked eigenvalue slope change after two factors. The Kaiser-Meyer-Olkin measure of sampling adequacy was .84, indicating that the sample had a sufficient level of factorability.

Based on these criteria, the two-factor solutions (explained variables of 52.82%) with an oblique rotation provided the best factor structure both conceptually and statically. Factor 1 included items related to intuition, sensibility, productivity, exploration, and novelty, which explained 40.32% of the variance (eigenvalue 3.629), and was named creative imagination. Factor 2 included items related to elaboration, effectiveness, transformation, and crystallization, which explained 12.49% of the variance (eigenvalue 1.124), and was named reproductive imagination.

The results of this study also showed that the values of internal consistency of creative imagination (from .659 to .777) and reproductive imagination (from .659 to .819) were considered stable. The correlation coefficients among different items within the same category (from .66 to .79) were higher than those between the different

categories (from .24 to .53) which mean that the discriminate validity between the identified two categories was also acceptable (Brown, 2006).

Table 3: Results of exploratory factor analysis from sample 1.

Indicators	PCA			PCA with Rotation		
	Factor 1	Factor 2	Com.	Factor 1	Factor 2	Com.
Intuition	.84		.615	.80		.497
Sensibility	.75		.558	.72		.328
Productivity	.72		.609	.63		.530
Exploration	.64		.443	.51		.328
Novelty	.61		.428	.44		.318
Elaboration		.83	.602		.52	.228
Effectiveness		.73	.574		.73	.462
Transformation		.54	.573		.61	.535
Crystallization		.48	.352		.30	.219

Note. Com= Communality values

Confirmatory Factor Analysis

The research team next conducted a CFA to test the generalizability of that two factor solution using sample 2. The values of the goodness-of-fit indices were satisfactory, indicating a good fit of the two-factor structure for this sample. Moreover, in order to further test this structural model, a competing model strategy was used to compare the proposed two-factor model against a single-factor model (a baseline model, Kline, 1998). The superiority of the two-factor model over single-factor model was further evidenced by the significant chi-square difference, $\Delta\chi^2_{(1)} = 60.81, df = 1, p < .005$ (See Table 4). Factor loading from the results of confirmatory factor analysis of the sample 2 is reported in Figure 1.

Table 4: Results of confirmatory factor analysis from the sample 2

	χ^2	df	SRMR	RMSEA	TLI	CFI
Single-factor model	157.95	27	0.06	0.11	0.90	0.93
Two-factor model	97.14	26	0.05	0.08	0.95	0.96

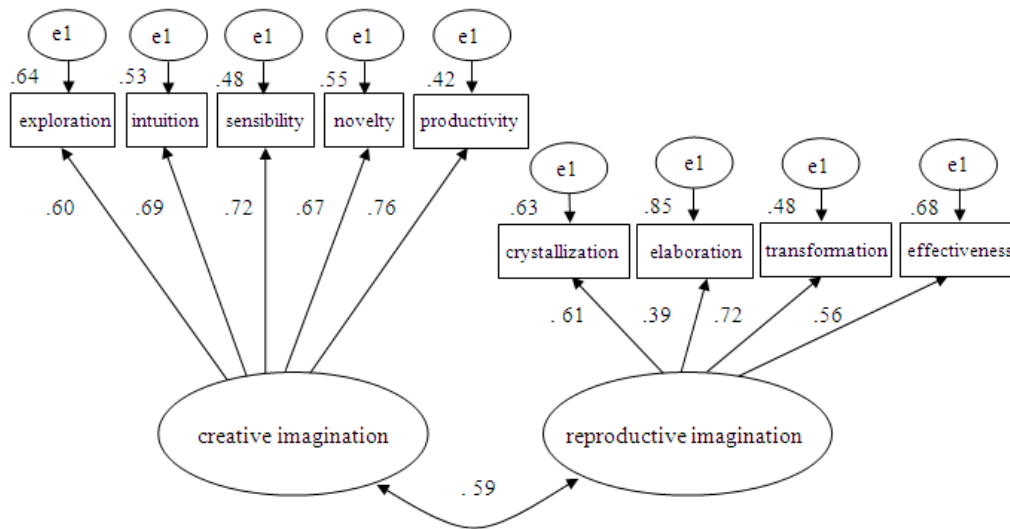


Figure 1: Factor loading from the results of confirmatory factor analysis of the sample 2.

Although the validated results of this study were theoretically acceptable, both values of internal consistency of reproductive imagination in two samples were below .7, and the explanation of the variance

of reproductive imagination was only 12.49%. Taking these potential drawbacks into account, the research team initiated follow-up inquiries.

Follow-up Inquiries

This follow-up study used a combination of document analysis and in-depth interviews with selected scholars. The document analysis focused on several well-known works regarding the principle of unity (Ribot, 1906), the theory of flow (Csikszentmihályi, 1975), self-regulation theory (Vygotsky, 1978), processes of incubation and internalization (Valett, 1983), metaphorical and paradoxical imagination (Reichling, 1990), and the structure of focusing and defocusing (Folkmann, 2010).

In addition, a series of interviews with experts were conducted in October 2011. The team interviewed six distinguished scholars representing five different universities and research institutions. The experts selected in this follow-up study shared the common qualifications of having more than fifteen years of research in psychology-related fields, and were part of the first groups of imagination research supported by the Taiwan's government. The issues discussed included criticisms about the preliminary studies of reproductive imagination and additional insights regarding imagination indicators. The problems of "elaboration" indicator emerged in this stage.

Taking the results of document analysis and the low factor loading (.39) in the confirmatory factor analysis into account, the indicator of elaboration was further divided into two independent items: dialectics and focusing. A quick review of these newly emerged indicators of imagination is summarized below.

Dialectics — Any imagination, especially the reproductive one, starts from an unstable form. During this period, an individual's attention is spontaneous, natural, and without effort. As imaging proceeds, the individual experiences a laborious personal moment, a time in which imagination takes effort. Any inventor in that period struggles with miserable turns, as described by Ribot (1906). Valett (1983) contended that incubation is an important way to facilitate imagination. Incubation is a time where acquired knowledge and experience is internalized such that the ends of imagination can be gradually shaped. DeVries (1988) also asserted that imagination goes through a process of abstraction, analysis, and generalization. When discussing the final level of imagination, Reichling (1990) indicates that intuition leaps for the unknown, while reason is continually challenged to find an image that resolves the contradictions with which it is presented. Also, within their imagination, people can 'zoom in and out' to inspect particular imaginary situations, transfer objects, and predict paths of imaginary objects (Reiner & Gilbert, 2000). Therefore, *dialectics* can be viewed as an indicator of imagination which represents the ability of individuals to seek improvement through analyzing ideas.

Focusing — Development of self-control is related to the ability to create and sustain an imaginative scenario (Vygotsky, 1978). This may explain why many children enjoy role-playing games. According to Csikszentmihályi (1975), people are happiest when they are in flow—"a state of concentration or complete absorption with the activity at hand and the situation". He believed that being in a flow implies focused attention, where people are completely immersed in what they are doing. Folkmann (2010) claimed that the process of focusing is open to ongoing reformulation. Due to its functional position in the interface between the inner consciousness and outer world, the focusing process lies in the span between clear and rational discourse and the inaccessible mental space. Thus, the discussion of the structure of focusing and defocusing explains how meaning is not just given but is developed as a result of the designer's mental setting, and underlines that this meaning contains definite as well as elusive elements. As a result, *focusing* is an additional indicator of imagination which represents the capability of individuals to formalize ideas through focus.

DISCUSSIONS

The current study collected two groups of samples majoring in Educational Technology, and validated this data with the methods of exploratory factor analysis and confirmatory factor analysis. The results showed that there were two dimensions and ten indicators of imagination that emerged during the research process. The first dimension is "creative imagination" which is composed of five indicators: intuition, sensibility, productivity, exploration, and novelty. The second dimension is "reproductive imagination" which comprises another five indicators: focusing, effectiveness, transformation, crystallization, and dialectics. In this study, the two dimensions reveal distinct validity, but still are co-related.

The indicators of imagination proposed by this study are characterized as follows:

1. Intuition: individuals are able to generate immediate associations to the target.
2. Sensibility: individuals are able to evoke feelings during the creation process.

3. Productivity: individuals are able to productively generate ideas.
4. Exploration: individuals are able to explore the unknown.
5. Novelty: individuals are able to create uncommon ideas.
6. Focusing: individuals are able to formalize ideas through focus.
7. Effectiveness: individuals are able to generate effective ideas about the target.
8. Transformation: individuals are able to perform tasks by transforming what they have known across multiple fields of knowledge.
9. Crystallization: individuals are able to express abstract ideas by using concrete examples.
10. Dialectics: individuals are able to seek improvement by logically analyzing ideas.

The authors' wish is to identify potential indicators to assess imagination. This wish cannot be achieved by only a couple of studies. In order to facilitate the wish to be reached, the authors invite all of the readers to test and validate the indicators proposed in this study, by using the following items in a variety of fields and in different circumstances.

- I often come up with new ideas through my intuition
- I often help myself imagine through personal emotions
- I constantly have ideas toward my designs
- I like to explore the unknown world
- I often have uncommon ideas compared to others
- I improve my thoughts by focusing on formalizing ideas
- I often complete my tasks by focusing on effective ideas
- I think flexibly and can transfer ideas to multiple fields of tasks
- I am good at expressing abstract ideas by using concrete examples
- I am good at seeking improvement by logically analyzing ideas

As educational technologists, we need imagination to construct activities, build system, and anticipate conversations and actions that will bring learners' inquiry to fulfillment, enabling their growth toward desirable skills and understandings. As Goodyear and Retalis (2010) described, technology-enhanced learning involves imagining how our learners learn, how they respond to a task, where they work, with whom, how, using what resources, under what circumstance, and over what timescale. In addition to the indicators, some issues for the future study are worthwhile for further exploration. The substance of creative and reproductive imagination can be clarified, but there are many questions that can be asked. Could the indicators be grouped in absolutely exclusive categories? What is the exact relationship between creative and reproductive imagination?

Though there have been an enormous number of studies done in the subject of creativity, more efforts need to be put into the study of imagination. What is the relationship between imagination and creativity? What environmental factors influence imagination stimulation? What psychological factors influence imagination stimulation? What kinds of personalities influence imagination stimulation? How are these factors enabled? How do these factors function? How do they function differently at the individual, team, and organizational levels?

In terms of talent development, what instructional methods and learning strategies should be proposed to cultivate imagination? What are the differences in imagination cultivation between schools and industries? Are there any differences among diverse fields? What is the relationship between imagination and professional knowledge in different fields? What are the differences in terms of gender, academic standing, major, institution, nationality, and culture? All of the issues raised above are meaningful not only for theoretical constructs, but for practical applications in the field of Educational Technology.

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