Development of a multidimensional thinking styles scale based on theory of mental self–government for sixth grade students

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ABSTRACT

This study designed 1) to develop a multidimensional thinking styles scale based on theory of mental self-government for sixth grade student 2) to investigate quality of the developed scale 3) to study profile of styles of sixth grade student and a relation of profile of styles of student in each dimension and background of gender and grade with the group sample of 1,545 sixth grade students from schools affiliated with the Office of Basic Education Commission, Education Department Bangkok Metropolitan Administration, and Office of the Private Education Commission. Thinking styles scale for sixth grade student was utilized in this study and received information was analyzed by using Nominal Response Model (NRM), Confirmatory Factor Analysis and Cluster Analysis.

The results revealed that: 1) Thinking styles scale comprised 5 dimensions of function, form, level, scope and leaning with reliability at .872, .913, .722, .777 and .799 respectively and construct validity by confirmatory factor analysis found that 5 dimensions of thinking styles scale conformed to the empirical data (CFI were .918 to .975, TLI were .919 to .988 RMSEA were .036 to .046 and SRMR were .060 to .081). 2) The majority of students had judicial styles of function, hierarchical styles of form, local style of level, external style of scope and liberal style of leaning. 3) 96 Profiles of thinking styles be clustered into 3 groups those were Detail Conscious Thinking Procedural Thinking and Achievement Motivation Thinking. The Majority of students had Achievement Motivation Thinking. and 4) Thinking styles of students in each dimension related to their background of gender and grade with the level of significance at .05

Keywords: Thinking Style, Theory of Mental – Self Government, Scale

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INTRODUCTION

Individual difference has been a topic of study for a long time. Each person has their own personal characteristics that are different from those of others in several aspects such as physical, intellectual, emotional and social. Individual difference causes different expression and behavior of person.

The study of individual difference in the early days focused on the intellectual difference. It is believed that personal ability depends on different intelligence, therefore a number of mental ability and professional competency tests were created. Until the 19th century, there were many surveys showing that individual difference not only came from different intelligence but also difference in other characteristics i.e. personality, aptitude and interest (Sternberg, 1997).

These findings induced a number of researches on individual difference in other aspects than intelligence as well as the introduction of "style" concept in 1937 by Allport who defined "style" as identifying the difference of individuals in terms of personality and behavior.

Thinking styles is considered a kind of intelligence styles which was introduced in 1980 by a researcher in communications and psychology (Harrison and Bramson, 1988). The definition was that "thinking styles is not a mental process but a way or method of thinking chosen by individuals for their ability or aptitude to deal with problems, tasks, and situations." Thinking styles has different structures from thinking skills in many ways but is equally important to the success in education, working, and living of individuals. The thinking styles will help support, encourage and extract the existing potential to fully use their ability. It could be said that if any individual has good thinking skills and thinking styles conforming to the situations or problem domains to be solved, it will render him more successful than the one who has solely good thinking skills. In addition, a number of research indicated that different thinking styles would also create different level of thinking skills (Yeh, 2002).

Due to the fact that difference of thinking styles will affect different ability and behavior of individuals, having different thinking styles and usually estimating an action or behavior of the others from what they think will cause disagreement. Therefore, understanding both their own and others' styles of thinking will help prevent such misunderstandings. To comprehend their own styles of thinking will enable individuals to know whether their weak point and strong point are appropriate or inappropriate for circumstances. This will help find method to handle with and manage those situations as well as to develop and extend each style of thinking in themselves to create strategies and how to be flexible appropriately with work, study and living in different circumstances. Furthermore, to comprehend others' styles of thinking will enable to realize their expression and behavior better and to find methods or ways to communicate and interact with such individuals efficiently.

In the educational context, thinking styles is an essential part for learners to succeed in learning. The characteristics of subject matter, format of activities and different environment will affect learners with different thinking styles, i.e. one learning environment may have a beneficial effect on learners with one thinking styles but bad effect on those with another thinking styles. Learners can show their true ability when there are learning activities and evaluation conforming to their styles of thinking. Thus, educational activities and evaluation should take the difference of thinking styles into account for the highest benefit of learners.

According to the above significance of thinking styles, foreign academics and researchers take an interest in education by undirected thinking. A number of concepts and theories related to thinking styles were introduced. Each theory states different structure and content of thinking styles in terms of its theory basics, element and type. When we synthesize concepts/theories related to thinking styles, it is found that most concepts/theories have multidimensional structure comprising two dimensions

onward. Theory of Mental Self-government introduced by Sternberg in 1988 is regarded as popular theory for study of thinking styles in various countries worldwide (Stephen,2008; Zhang, 2006) because it includes the most elements of thinking styles and structures that correspond with both Western and Eastern contexts. In addition to that, the theory is created from 3 systems namely, intelligence-centered system, personality-centered system and activity-centered system; divides multidimensional styles of thinking into 5 dimensions and produces profile of styles for individuals rather than a single style as identified in other theories.

Theory of Mental Self-government explains styles of thinking divided into 5 dimensions; 1) functions which comprise 3 types – legislative, executive and judicial thinking styles; 2) forms which consist of 4 types – monarchic, hierarchic, oligarchic and anarchic styles of thinking; 3) levels are global and local thinking styles; 4) scope is composed of internal and external styles of thinking; and 5) leanings include liberal and conservative thinking styles.

As the styles of thinking is a characteristics hidden in each individual, it is difficult to measure directly and the method of measuring general styles of thinking is self report by using a scale created according to related concepts and theories. The tools are in the form of rating scale with situational questions, behavioral terms or individual activities. The study found that the most of researches on styles of thinking would apply thinking styles scale from Theory of Mental Self-government – Thinking Style Inventory: TSI – by adapting to the appropriate context related to education as well as translating the scales in other languages.

Thinking styles scale according to the Theory of Mental Self-government is characterized by 13 subscales each of which comprises 8 questions of 7-leveled rating scales. Respondents must set priority of all choices to convert into scores. By this scale, it cannot be clarified that which of thinking styles each individual has in each dimension and also some respondents have all types of thinking styles in the high or low level when we occasionally bring total scores of each scale to compare with norms. With the limitation about clarity of individual thinking styles, Sternberg (1997) suggests that the creation of situational scale with multiple choices of which the number in each dimension equal to that of thinking styles in such dimension will indicate a specific type of thinking styles without priority setting. It will be able to identify clearer individual styles of thinking. Moreover, when considering the quality of Thinking Style Inventory (TSI) scale found in research and study, a low reliability is also showed in a number of researches when the scale is applied for study of thinking styles in Eastern society and culture context. The study found only suggestion for TSI improvement to suit Eastern society context but none of research is to develop such thinking styles scale to resolve the stated issue.

With regard to importance and benefit of thinking styles as well as limited study of such issue, the author think that Thailand should turn its attention to the study of thinking styles. Considering from substance in the research or study issues in the past, it can be seen that many issues can be brought to study in Thai context for more extensive and clearer conclusion and also more of them have never been studied. However, study of various issues on thinking styles requires a standard tool conforming to the context of Thai living culture and education. Therefore, the author have an interest to develop a standard and suitable thinking styles scale based on Theory of Mental Self-government for learners and Thai society and culture context. The created thinking styles scaled is a situational scale to analyze profile of styles as well as to study learners' difference of profile of styles according to background factors as a tool to truly understand the individual difference of learners and to bring obtained information for consideration to the learning activities, educational measurement and evaluation of each learner.

The scale, as a result, will enable learners to develop completely their quality and potentiality in terms of intellectual, physical and mental aspect.

The development of thinking styles scale is for sixth grade learners because as in this level they are able to perceive abstract information and understand circumstances more as well as to set priorities well. Furthermore, learners in this age are to determine their own personality; to express what they like or are expert in, have ability in social skill, communications, working with others; to learn and pass on model of behaviors resulting in development of individual characteristics in terms of belief, career, motto and goal of living.

Aims

1. To develop a thinking styles scale suitable and conforming to Thai culture context as well as based on Theory of Mental Self-government for sixth grade students.
2. To examine quality of a thinking styles scale suitable and conforming to Thai culture context as well as based on Theory of Mental Self-government for sixth grade students.
3. To study profile of styles of sixth grade students and a relation of thinking styles of students in each dimension and background of gender and grade.

METHODS

Population and Sample

Study Population is sixth grade students from schools affiliated with the Office of Basic Education Commission, Education Department Bangkok Metropolitan Administration, and Office of the Private Education Commission.

Study Samples is 1,545 sixth grade students from schools affiliated with the Office of Basic Education Commission, Education Department Bangkok Metropolitan Administration, and Office of the Private Education Commission by Four-stage random sampling.

Development of Thinking Styles Scale

Procedures of Development

The development of thinking styles scale based on Theory of Mental Self-government is composed of 9 following steps:

Step 1 Determine goal of scale development: Development of this thinking styles scale aims to develop a standard thinking styles scale based on Theory of Mental Self-government for measuring thinking styles of sixth grade students.

Step 2 Determine frame of measurement: Development of this thinking relies on the structure of thinking styles based on Theory of Mental Self-government which comprises 5 dimensions of function, form, level, scope and leaning. By synthesizing details of each dimension, many significant issues are found resulting in synthesized structure of thinking styles with following detail of dimensions – 1) functions signify way or method to be chosen by individuals for carrying out activities encompassing 2 elements i.e. characteristics of chosen activities and way of carrying out activities; 2) forms mean aspect of setting priority for things covering 2 elements i.e. setting priority for activities and procedures of operating activities; 3) levels is a way or method to be chosen by each individual for

perceiving obtained information including 2 elements i.e. perception of information and consideration of activity details; 4) scopes mean characteristics of individuals' preference for working with others covering 2 elements i.e. interaction and expression, and working with others; and 5) leanings are characteristics to be chosen by individuals when confronting with social values including 2 elements i.e. acting with social values and dealing with any occurred change.

Step 3 Theoretical definition, operational definition, behavior indicators, and creating question layout of 12 items per each dimension totaling 60 items.

Step 4 Design and create questions of thinking styles scale: The thinking styles scale to be created is in form of situational scale comprising developed questions to cover determined structure of thinking styles. Each question has 2 – 4 choices based on each dimension of thinking styles and such will be arranged systematically according to each dimension while choices in each item will be alternated to prevent respondents from guessing possible answers. By creating this question, the author hold the principle of creating good question which must have 25% spare of all questions . Thus, the author created 76 items of question and then reviewed them all by considering the suitability of measurement and clarity as choices of language used.

Step 5 Examine content validity, content bias, language bias and structure and format bias: I brought the developed thinking styles scale to 7 experts in the field of educational measurement and evaluation, research and psychology to review all developed questions whether or not each item is able to measure according to determined structure by selecting questions with Item Objective Congruence from .50 onward. Moreover, the author also brought the developed thinking styles scale to an expert of Thai language for sixth grade students i.e. 2 teachers and teachers of academic standing in senior professional level of Thai language to review content and language whether or not it is appropriate. The result showed that all items of question have appropriate content and language for sixth grade students.

Step 6 First trial of thinking styles scale: the author tested the revised thinking styles scale with 30 sixth grade students in order to examine their understanding of doing thinking styles scale, clarity of language and time to do the scale and obtained the following information – 1) 100% or all 30 students being asked questions understood the content in each item of question well; 2) 5 students being interviewed understood content of questions clearly and able to answer them; 3) Time spent on the test was between 30 minutes to 1 hour with average time of 45 minutes. From the interview of 5 students, it showed that they took a long time because there were a number of questions and they occasionally needed time to take a break. Therefore, the author improved the scale in the second trial by assigning students to do questions divided into dimensions and allowed them 5-minute break before starting the new dimension.

Step 7 Second trial of thinking styles scale: the author tested the thinking styles scale received from the step 6 with 200 sixth grade students to examine the quality of tool by items and due to the fact that the thinking style scale in this trial featured situational questions with multiple choices in which characteristics of information was in nominal scale, checking the quality by items will be analyzed by means of prediction ratio with the principle of selecting questions considered from PR values. At least one type of question must have PR values higher than .62 and the analysis result found that questions contained PR values between .24 - .94 with 7 questions below criteria. The above stated result helped eliminate questions below criteria keeping 13 question items in each dimension.

Step 8 Application of thinking style scaled to sample: the author applied the revised thinking styles scale to sample of 1,545 persons to examine the tool quality in terms of reliability and validity 1) by means of Item Response Theory analysis using Nominal Response Model (NRM); 2) by means of confirmatory factor analysis in each dimension for structural validity; 3) by means of Item Response Theory analysis using Nominal Response Model (NRM) for

parameter values of difficulty, discriminant, information function by items and information function of thinking styles scale; and 4) by means of Mantel – Haenszel and Log Odd Ratio for differential item functioning.

Step 9 Making of thinking styles scale and manual: After having examined the quality of tool, the author made the scale with manual in the form of computer program package.

Thinking Styles of Thai Students

To study profile of styles and a relation of profile of styles of sixth grade students and their background, analysis of data was carried out with the following procedures:

1. Analyze fundamental data about background factors of sample by using frequencies and percentage.
2. Analyze profile of styles of sample by frequencies and percentage.
3. Analyze to study the relation of thinking styles of students in each dimension of their background i.e. gender, school affiliation and grade using Chi-square Test Statistic.

RESULT

Result on development of thinking styles scale based on Theory of Mental Self-government for sixth grade students by examining its quality of structural reliability and validity

Structural Validity of Thinking Styles Scale

In analysis to show structural validity evidence by means of confirmatory factor analysis with Mplus program in examining the conformity to the empirical data by construct validity by confirmatory factor analysis found that 5 dimensions of thinking styles scale conformed to the empirical data (CFI were .918 to .975, TLI were .919 to .988 RMSEA were .036 to .046 and SRMR were .060 to .081).

Reliability of Thinking Styles Scale in Each Dimension

In analysis to find the validity of thinking styles scale in each dimension according to the Item Response Theory using Nominal Response Model (NRM) with Multilog program, it was revealed that estimation of validity values in the dimension of function, form, level, scope and leaning was at 0.872, 0.913, 0.722, 0.777 and 0.799 respectively indicating thinking styles scale in each dimension showed the validity values evidence in high level.

Differential Item Functioning of Thinking Styles Scale in Each Dimension

In analysis to fine the DIF of thinking scale in each Dimension according to Mantel – Haenszel and Log odd Ratio method with DDFS (Pencield, 2010), it was revealed that 2 items in dimension of function, 1 item of form and 1 item of level had found DIF.

Result on Profile of Styles of Sixth Grade Students

Thinking Styles of Sixth Grade Student in Each Dimension

Analysis of thinking styles of sixth grade students in each dimension by basic statistic i.e. frequencies and percentage found that in the dimension of functions, most of students at 51.65 percent had judicial style of thinking, followed by executive style of thinking at 28.03 percent and legislative style of thinking at 20.32 percent respectively.

In the dimension of style, most of students at 58.96 percent had hierarchic style of thinking, followed by monarchic style of thinking at 24.79 percent, anarchic style of thinking at 9.13 percent and oligarchic style of thinking at 7.12 percent respectively.

In the dimension of level, most of students at 61.36 percent had local style of thinking followed by global style of thinking at 38.64 percent.

In the dimension of scope, most of students at 58.06 percent had external thinking style followed by internal thinking style at 41.94 percent.

In the dimension of leanings, most of students at 78.51 percent had liberal style of thinking followed by conservative style of thinking at 21.49 percent.

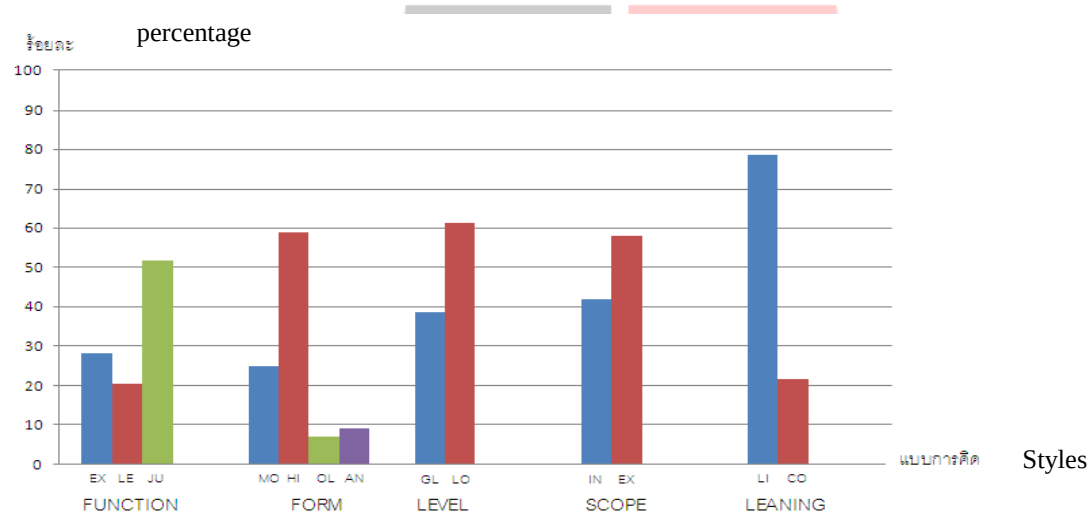

Figure 1: Thinking styles of sixth grade students in each dimension

Profile of Styles of Sixth Grade Students

Profile of styles of sixth grade students comprises 5 dimensions of thinking styles – function, style, level, scope and leaning and it was found that most of students at 13.53 percent had judicial – hierarchic – global – external – liberal profile of styles followed by 7.38 percent of judicial – hierarchic – global – internal – liberal profile of styles; and 6.99 percent of judicial – hierarchic – local – external – liberal profile of styles respectively.

Result on the relation of thinking styles of sixth grade students in each dimension and their background of gender and grade

According to the analysis on relation of students' thinking styles and their background of gender and grade, it was revealed that those 3 backgrounds were related to the styles of thinking in various dimensions with statistical significance at the level 0.5. Gender was related to styles of thinking in the dimension of function, form, scope and grade was related to styles of thinking in the dimension of function, form, level and leanings.

Discussion

Quality of Thinking Styles Scale

1.1 According to the result on examining structural validity of thinking styles scale in each dimension using confirmatory factor analysis, it was found that the thinking styles scale in every dimension conformed to the empirical data. It was showed from the criteria that all statistical values were in the acceptance criteria being the evidence for structural validity of thinking styles scale.

1.2 According to the result on analyzing of validity value of thinking styles scale, when reliability evidence was presented by means of Item Response Theory analysis using Nominal Response Model (NRM) which gained values indicating thinking styles scale aimed to measure in each characteristics at high level had validity value from .722 to .913. When considering from acceptance criteria of validity value at level of .700 onward (Nunnally and Bernstein, 1994), it can be said that validity value of developed thinking styles scale was above acceptance criteria in every dimension. Thus, such evidence represents reliable validity of thinking styles scale.

Study on Profile of Styles of Sixth Grade Students

2.1 Dimension of function – most of students have judicial styles of thinking which indicates students in the sixth grade like to judge things from both structure and content, to assess rules, procedures and concepts as well as to enjoy analysis-using problem. This is because sixth grade students are in their early adolescence or age range from 11-12 years old which is in the course of physical and emotional change. One characteristics of children in this age range is that they have their own thought, less abeyance to adults, attempt to be independent hence decision-making by themselves based on personal experience, belief and value . In addition, children in this age range are developing their ability of analytical thinking and can synthesize things more enabling them to make decision. However, it should be aware that children in this age are still lack of experience, circumspection. The student's decision making which is thought to be accurate may not always be so because they just follow their belief and concept, therefore, close supervision and advice is necessary to have right experience for next decision-making.

2.2 Dimension of form – most of students have hierarchic styles of thinking indicating that students in the sixth grade like to set priority of target and objective of assigned work as well as to manage time for activities. The main reason why most of students have this type of thinking styles is perhaps due to the fact that the educational system in Thailand nowadays focuses on more procedural teaching-learning i.e. project teaching, experiment as well as teaching aimed to develop the thinking ability of students instilling procedural work into them in the same time.

Furthermore, a number of content to study and activities to do requires students to set work plan automatically to finish on time.

2.3 Dimension of level – most of students have local styles of thinking which indicates that they like to do concrete work with detail conforming to Piaget's Theory of Intellectual Development. It describes that children in this age have mental ability to think reasonably but process of thinking and reasoning to resolve problem still depends on concrete stuff. However, children in this age begin to develop their thinking more about abstract matter by imagining and to see situations and things from various points of view.

2.4 Dimension of scope – most of students have external styles of thinking showing that they are straightforward, assertive and happy to work interactively with other persons and in group according to the social development of children in this age which states that they start to have bigger society, become more mature, and have friends as well as group of friends will play the role in working and daily living. Most of activities for children in this age are group activities. Moreover, because of changing social condition, expression of adolescents to various matters has grown along with media and society resulting in their increasing confidence and assertiveness.

2.5 Dimension of leaning – most of students have liberal styles of thinking showing that they like to work free from regulations and do activities with new form and method as well as be able to handle with any kind of change. This is because children in this age like trial and error, and challenge. In addition, learning nowadays is learner-focused activities enabling students to have more opportunity to think, do and solve problems as well as to deal well with the change of learning.

Study on Relation of Thinking Styles of Sixth Grade Students in Each Dimension and Their Background of Gender and Grade

3.1 Relation of thinking styles of sixth grade students and gender showed that gender was related to students' thinking styles in the dimension of function, form, scope and leaning. Male students had the most legislative styles of thinking while female students had the most judicial styles of thinking. This was because during their adolescence male students had ability of research, study, and experiment enabling them to see structure and principle and apply them to daily life better than female students. Moreover, male students had more independent thought to various circumstances than female students. On the contrary, female students had judicial ability and perception of information for faster and nimbler than male students.

The reason why result showed that male students had the most external thinking styles but female students had the most internal thinking styles was probably due to the Thai culture of upbringing – males had characteristics of leadership and grouped in working more than females. Furthermore, the study found that sixth grade female students had more independent role in terms of education than male students prompting the former to prefer working independently than in group.

3.2 Relation of thinking styles of sixth grade students and grade indicated that grade was related to student's styles of thinking in the dimension of functions, style, level and leaning. Students with good grade tended to have judicial, hierarchic and liberal styles of thinking which was probably due to the fact that students of judicial and hierarchic thinking styles liked critical and synthetic thinking, knew time management and set priority of contents as well as sought new knowledge with technology more than those of other styles of thinking.

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