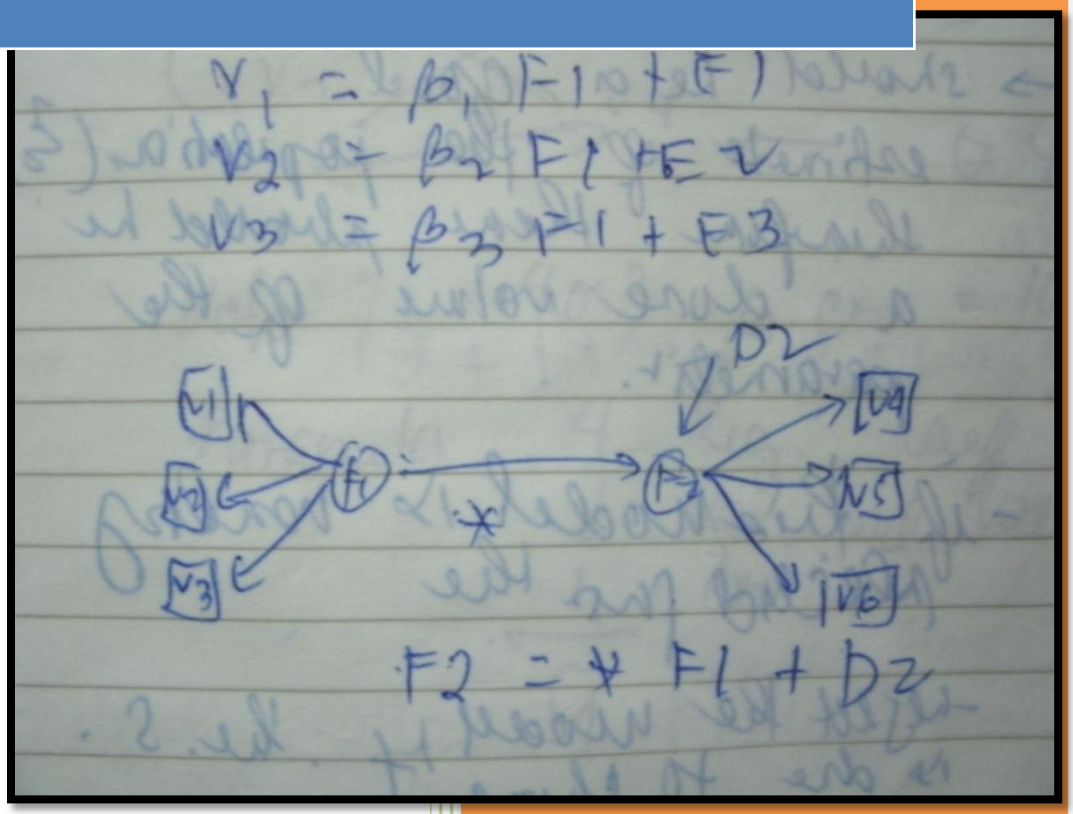
ISSN 2094-1412

2009

The Assessment Handbook

Special Issue on Scale Development, Reliability, and Validity Studies Using Structural Equations Modeling



Volume 2 December 2009

This Journal is Published by the Psychometrics and Educational Statistics Division of the Philippine Educational Measurement and Evaluation Association

The Assessment Handbook is one of the official publications of the Psychometrics and Educational Statistics Division of the Philippine Educational Measurement and Evaluation Association. The journal publishes special articles that are themed related in assessment, evaluation, measurement, psychometrics, psychological testing, and statistics. Each issue of the journal is themed managed by a guest editor. The journal is international, refereed, and abstracted. The journal is presently abstracted in the Asian Education Index, Social Science Research Network, Google Scholar, Open J-Gate, and NewJour.

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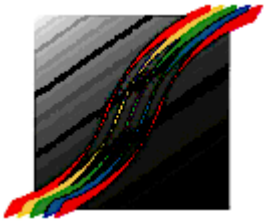

Publication Division of PEMEA
Philippine Educational Measurement and Evaluation Association

THE ASSESSMENT HANDBOOK

Volume 2, December 2009
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Assessing Grade School Students Metacognition in Solving Mathematical Problem

By
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This study constructed a measure of metacognition that is applicable for grade school students (fourth grade). The constructed measure is domain-specific contextualized in the metacognition of mathematical problem solving. There is a need to construct a more direct and domain-specific measure of metacognition specifically for grade school pupils because of the difficulty in assessment procedures for young children. The test is composed of eight items that measure declarative knowledge, conditional knowledge, procedural knowledge, prediction, planning, evaluation, and two items on monitoring. The test was administered to 280 grade four students in different public and private schools in the Philippines. The reliability of the test using Cronbach's Alpha is .78, indicating acceptable internal consistency of the items. Parallel form of reliability was conducted where it was significantly correlated with another measure of metacognitive skills (r=.21, p<.05). Intercorrelation of the factors showed that planning is negatively correlated with the other components. Confirmatory Factor Analysis (CFA) showed that all components of the measure are significant to metacognition as a latent construct. Adequate goodness of fit indicated that the measure is appropriate for grade four pupils given the eight items. Further implications of the findings on a cognitive development perspective and underlying metacognitive processes are discussed.

Keywords: Metacognition, mathematical problem solving

Contemporary education perspective explains that students become aware of their own learning and eventually control their learning process which leads to better performance. Given this perspective, teachers do not only teach the content but the process on how to learn the content as well. When students are taught to apply the strategies on how to learn effectively, they engage in a process called metacognition. Metacognition is defined by Shimamura (2000) as the ability to evaluate and monitor one's own cognitive processes, such as one's thoughts and memories, so that a reasonable assessment can be made about future performance. There are many

studies conducted that involve metacognition and attempted to measure it since Flavell (1976) pioneered the concept. In recent studies, the samples used to measure metacognition involve adolescents and adults since it is most evident in them. Literature showed that the level of metacognition increases as age increases, which probably gave way in using adults as participants in metacognition studies (Galotti, 2004; Sternberg, 2003). There is a growing literature of studies investigating the metacognition of preschool children. Assessing the metacognition of children such as preschool students is essentially different with the way metacognition is assessed for adults. Questionnaires and inventories are commonly used for adults but these may not be appropriate in the case of children.

Metacognition can be investigated in the context of problem solving. Through problem solving, learners will be able to execute the necessary procedures required in metacognition such as procedural knowledge and the regulation of different strategies to arrive with the solution (Veenman, Elshout, & Meijer, 1997). The aim of the present study is to construct an instrument that measures metacognition that is appropriate for grade school students in the context of solving mathematical problems. It is also aimed to describe metacognition among children through the results of the assessment in the instrument developed.

Metacognition

Metacognition is a valuable construct in studies about learning. The concept was introduced by Flavell (1976) in an effort to supply information about problem solving (Schurter, 2002). Metacognition enables learners to adjust consequently to changeable problem solving tasks, demands, and contexts (Allen & Armour-Thomas, 1992; Desoete, Roeyers, & Buysse, 2001; Montague, 1998). According to Winn and Snyder (1998), metacognition as a mental process consists of two simultaneous processes: Monitoring the progress in learning, and making changes and adapting one's strategies if one perceives they are not doing well. However, Schraw and Dennison (1994) were able to identify not only with two components, but with eight factors of metacognition when they arrived with its measure, which brought contemporary researchers to work and expand on the existing framework. The concept of metacognition composed of multiple dimensions was identified by many researchers in the area of cognitive and educational psychology prior to the construction of various measures. Ridley, Schutz, Glanz, & Weinstein (1992) recognize that metacognition is composed of multiple skills that include taking conscious control of learning, planning, and selecting strategies, monitoring the progress of learning, correcting errors, analyzing the effectiveness of learning strategies and changing learning behaviors and strategies. Ertmer and Newby (1996) specified that the multiple components of metacognition are characteristics of an expert learner. Given various studies on metacognition, Hacker (1997) made three general categories on the studies of metacognition. These are studies on cognitive monitoring, cognitive regulation, and combination of monitoring and regulation. It can be noted that even the studies, when categorized, reflect the multidimensionality of metacognition as a construct and the dynamics on how its dimensions relate with each other. Compared to other models of metacognition, the one by Schraw and Dennison (1994) gives a

clear illustration of the factors of metacognition empirically. Not only does it bring clarity in the concept of metacognition but it also confirmed its factors, and different studies proved that the structure proposed is valid (Allen & Armour-Thomas, 1993; Desoete, Roeyers, & Buysse, 2001; Fang & Cox, 1999; Fortunato, Hecht, Tittle, & Alvarez, 1991; Panaoura, n. d.). In the model of Schraw and Dennison (1994), metacognition is composed of two major components: Knowledge of cognition and regulation of cognition. Knowledge of cognition is the reflective aspect of metacognition. It is the individuals' awareness of their own knowledge, learning preferences, styles, strengths, and limitations as well as their awareness that the use of this knowledge can determine how much they can perform different tasks (de Carvalho, Magno, Lajom, Bunagan, & Regodon, 2006). According to Flavell (1987), metacognitive knowledge can be subdivided into three categories: Knowledge of person variables, task variables, and strategy variables. Knowledge of person variables refers to the kind of acquired knowledge and beliefs that concern human cognitive, affective, and emotional functions. Knowledge about task-related variables refers to how the nature of the task encountered affects and constrains how one should deal with it. Finally, knowledge about strategy variables refers to knowledge about the availability and appropriateness of different strategies to the task at hand. In the model, it is composed of three subprocesses that include:

(1) Declarative knowledge – knowledge about one's skills, intellectual resources, and abilities as a learner.
(2) Procedural knowledge – knowledge about how to implement learning procedures (strategies)
(3) Conditional knowledge – knowledge about when and why to use learning procedures.

Regulation of cognition, on the other hand, is the control aspect of learning. It is the procedural aspect of knowledge that allows effective linking of actions needed to complete a given task (de Carvalho & Yuzawa, 2001). Regulation of cognition refers to the procedural aspect of knowledge (know how…) enabling the effective linking of actions needed to perform a given task. It encompasses planning, monitoring, and correction of on-line performance (de Carvalho, 2001). In the framework of Schraw and Dennison (1994), it is composed of the subprocesses that include:

(1) Planning – planning, goal setting, and allocating resources prior to learning.
(2) Information Management Strategies – skills and strategy sequences used on-line to process information more effectively (organizing, elaborating, summarizing, selective focusing).
(3) Monitoring – Assessing one's learning or strategy use.
(4) Debugging Strategies – strategies used to correct comprehension and performance errors
(5) Evaluation of learning – analysis of performance and strategy effectiveness after learning episodes.

According to Desoete, Roeyers, and Buysse (2001), metacognition is also vital in understanding successful performance. There is a rich literature that provides

evidence on the effects of metacognition on academic success (Blakey & Spencer, 1990; Corsale & Ornstein, 1980; Kluwe, 1982; Lopez, Little, Oettingen, & Baltes, 1998; Magno, 2009; Schneider, 1985; Rock, 2005), although it is not clearly specified what domains are used as indicators.

Assessing Metacognition

There is a growing literature of studies about the different ways of assessing metacognition among samples using children. Each of the studies are showing consistent framework on the components of metacognition. Veenman (2005) explained that the use of concurrent instruments (administered as the task is performed) is more effective for the assessment of metacognition. Panaoura (n. d.) considered constructing a self-report inventory as a measure of metacognitive ability for very young children who are not able to express their thoughts in detail. Moreover, Fortunato, Hecht, Tittle and Alvarez (1991) reported in their study how they successfully used nine questions to practice metacognition over a wide range of ages. Likewise, a series of metacognitive tests were specifically designed by Desoete, Roeyers, and Buysse (2001) called the 'Metacognitive Attribution Assessment (MAA)' and the 'Metacognitive Skills and Knowledge Assessment (MSA).' These instruments were tested in a pilot study (n = 30) in order to determine their usefulness for preschool students and their sensitivity in measuring individual differences. Analyses showed that students without reading problems could handle the instruments well. Students were interviewed after the test about (a) the reasons they gave for certain predictions and evaluations; (b) their planning and monitoring following the prediction; and (c) the reasons why they thought exercises are difficult or easy. Allen and Armour-Thomas (1993) made a self-report measure of metacognition. It was developed in order to assess the validity of a number of processes of metacognition in a variety of problem-solving situations. The results contribute to a more informed understanding of the nature and function of the metacognition construct in various contexts. Fang and Cox (1999) studied preschoolers' metacognitive behavior and constructed a way of measuring metacognition while they are dictating a self-generated story. All utterances during the dictation that suggested self-management metacognitive functions were distinguished from the story text proper dictated text- and parsed into utterance units. In order to be considered a metacognitive utterance, an utterance has to be an implicit or explicit attempt by the child to strategically plan for dictation/composing (e.g., Now what do I do? Let me think; This is about my field trip), monitor the dictating/composing process (e.g., Did I already say that? Did you already write `because'? Is that the way you spell 'mommy'?), and regulate (through self or the scribe) the comprehensibility of text for a readeraudience (e.g., I don't want you to write that part down; I want to change the word; He cut, he tried to cut; He listen to them, to his 'mommy').

Given the different studies on assessing metacognition, there is a need to construct an appropriate measure of metacognition for children. There is a strong evidence from the studies presented that conducting an assessment in measuring metacognition is deemed more effective and domain-specific (Desoete, Roeyers, & Buysse, 2001; Fang & Cox, 1999). Directly assessing metacognition through

performance assessment can spontaneously give the insights of children after undergoing a particular task.

Problem Solving

A person's cognitive style can influence his performance and achievement in learning (Riding & Pearson, 1994). The ease that an individual experiences solving a problem also depends on the study strategy employed. According to Leahey and Harris (1997), a problem occurs when there is a gap that separates a person from his goal. Problem solving is present in several aspects of problem solving, from games to real life problems. Leitze and Melser (2005) said that if students were able to connect what they have learned inside the class with the events outside, they were able to maintain and appreciate information better.

Mathematics involves solving simple equations to complicated ones. Mathematics is a field claimed to be not only limited to solving problems with the use of complicated formulae, but a stepping stone on how one should think and apply what one has learned to real life (Aquino, et al., 2003). Mathematics is also a field that determines the success and failure rates of the students depending on the learning strategy they utilized.

Problem solving is not limited to mathematics but it also extends to the events occurring in the real world. There are many studies where problem solving is linked to mathematics (Reyes, 1994). Mathematical problem solving was said to be a transfer challenge requiring individuals to develop schemata for recognizing novel problems as belonging to familiar problem types which they knew solutions for (Fuchs, Fuchs, Finelli, Courey, & Hamlett, 2004). Individuals may also have to learn to make use of synthesis, which was defined by Tall (1991) as the putting together of various elements of a problem to come up with other solutions.

Strategies used in problem solving had been one of the main focuses of research regarding mathematics education (Schurter, 2002). Mathematical operations and problem solving make use of algorithms, a type of strategy used by people and which were sure to generate solutions for given problems (Leahey & Harris, 1997). Sternberg (2003) mentioned that a type of mathematical concept that could be considered as an algorithm would be multiplication. Mathematics involves a number of formulae and equations, and yields the result needed without failure if properly used. Unfortunately, the field of mathematics requires several thinking (Hong & Aqui, 2004) and considered as one of the most difficult subject matters (Aquino et al., 2003). Garofalo (1985) mentioned that the problem with a number of students was that when it comes to mathematics, they believe that certain problems are unsolvable if they are not able to detect a solution for the problem at once (Jaramillo, 1992). In mathematical problem solving, one needs the application of several cognitive skills such as identifying the elements, computing, analyzing the problem, synthesizing, and evaluating. In Bloom's taxonomy, problem solving is said to consist six major categories (knowledge, comprehension, application, analysis, synthesis and evaluation) that starts from the simplest behavior going to the most complex. These categories could be considered as degrees of difficulty and one must master the first category before going to the next (Clark, 1999).

Mathematical problem solving was said to be pioneered by George Polya (Higgins, 1997). He was able to develop a four-phase model of the problem-solving process. This model involved: (1) Understanding the problem, (2) devising a plan, (3) carrying out the plan, and (4) looking back. These steps are involve: The first one is understanding the problem where an individual gets a clear idea of what information are being asked in the problem. The next step involves the planning stage where an individual decides which information will be useful in his search for an answer and what strategy he must use to get the desired result. In the third step, the person will try to implement his plan. If his first plan does not succeed, he continues to implement other plans until he is able to succeed. The last step, looking back, involves taking a step back and checking whether or not the result satisfies the data being asked in step one.

Problem solving is manifested in certain field. In mathematics, students are asked to comprehend a question, extract the necessary details and form a solution to get the correct answer (Aquino et al., 2002). Obtaining the proper answer enables an individual to make use of his metacognitive processes. Metacognition, or the knowledge of one's own cognition system and how it is regulated (Flavell, 1979; Kluwe, 1982), is used when an individual is solving a mathematical problem. Metacognitive techniques are important because they ensure individuals to keep track of what they are doing and the things they might do in the near future (Finkel, 1996). Another important contribution of metacognitive techniques would be allowing individuals to make connections between their accumulated knowledge in mathematics and the current mathematical problem they are solving (Finkel, 1996). It is believed that the more an individual makes use of metacognitive processing, the better the individual solved problems in mathematics (Case & Gunstone, 2002).

There is a number of evidence showing the connection between problem solving and metacognition. A research done by Swanson (1990) focused on the influence of metacognitive knowledge and aptitude of a student in problem solving. He investigated whether or not students with low aptitude were able to make up performance-wise if they had high metacognitive skills. Swanson (1990) made use of children from grades 4 and 5 from four different elementary schools. He first administered a modified metacognitive questionnaire by Kreutzer, Leonard and Flavell (1975) and Myers and Paris (1978) in order to assess the students' metacognition in problem solving. After the metacognitive questionnaire, the children were given the problem solving tasks. The research done by Swanson (1990) revealed that students with high metacognitive knowledge and low aptitude were indeed able to obtain scores significantly higher than those with low metacognitive knowledge but high aptitude. It was found that high metacognitive ability could offset one's low aptitude level.

Another experiment done is about the role of metacognition and mathematical problem solving. In the study, Lester, Garofalo, and Kroll (1989) used the cognitive-metacognitive framework made by Garofalo and Lester (1985) in order for them to analyze the metacognitive aspects of 7th-grade students' problem solving performance. Lester, Garofallo, and Kroll's (1989) study showed that those who were able to monitor and regulate their problem solving activities were more successful in problem solving. The characteristic that distinguished successful

problem solvers from those who were unsuccessful was the interaction that the students had with both the metacognitive processes and the understanding of the mathematical concepts. Garofalo and Lester (1985) concluded that the students who participated in their study were lacking regulatory skills, which was important especially in mathematical problem solving.

There is no certain guarantee that the use of metacognition leads to better performance in problem solving. Yeap (1997) explained that when an individual knew how to use their metacognitive skills properly, the success rate of their problem solving would increase. The way people utilized their metacognitive knowledge when they require it also determined their attempt in solving problems. Cognitive actions, metacognitive knowledge, and experience were likely to generate good results in problem solving. Consistent with this finding is the study made by Wilson (1999). It was again explained that even with the use of metacognitive actions, problem solving might still end up as failure. This was due to the fact that metacognition was better used with challenging tasks. Less challenging tasks could then be answered successfully without the use of metacognition. Another factor that might have contributed to the failure of metacognition was the inaccuracy of the user's metacognitive judgment, or there were omitted or incomplete data given by the individual.

Objectives of the Study

Given that previous literature stated that there is a need to assess the metacognitive skills of students contextualized in mathematics that is domain-specific and is different from the adults, this study aims for the following:

(1) To construct a metacognitive measure that is appropriate for grade school children.

(2) To determine the reliability of the metacognitive measure using cronbach's alpha, and parallel forms with the 'Metacognitive Skills and Knowledge Assessment' by Panaoura and Philippou.

(3) To determine the convergence of the factors of the metacognitive measure by correlating each of its subscales (declarative knowledge, conditional knowledge, procedural knowledge, prediction, planning, evaluation of learning, and monitoring).

(4) To determine the goodness of fit and significant paths of the seven dimensions
of metacognition through confirmatory factor analysis.

(5) To describe the process of metacognition among children using the results of the measure devised.

Method

Participants

A total of 280 Grade four Filipino students were asked to participate in the study. The average age of participants is 9.3 and all possessing the same content and competencies in mathematics. In the Philippines, Grade four students are usually 9 years old and are turning 10 at the end of the school year. These grade school students belong to three public schools and two private schools located in the Southern Luzon region of the Philippines. All students are currently undergoing the same curricular program in mathematics which is the Revised Basic Education Curriculum.

Instrument Construction Procedure

Content Domain. The model is composed of the knowledge of cognition and regulation of cognition. In the knowledge of cognition component, there are subprocesses that include declarative knowledge, procedural knowledge, and conditional knowledge. The regulation component covered prediction, planning, evaluation, and monitoring.

Item Writing. There were eight items constructed to measure each domain of metacognition in the context of mathematical problem solving. A mathematical problem solving involving a three-step operation was introduced at the beginning of the instrument that is appropriate for grade four students. Grade 4 mathematics teachers were consulted regarding the appropriateness of the problem. The follow-up questions were asked so that students can verbalize the processes occurring while undergoing the problem solving task. The follow-up questions reflect the seven metacognitive domains. There is one item for each metacognitive domain (declarative, conditional, procedural, prediction, planning, evaluating, and monitoring) and two for monitoring (See Appendix A). The multidimensional item response theory posits that a single item can be representative of a strong indicator of the domains measured or even a variety of abilities (Antal, 2007). A short form of the measure was constructed considering the length of time in the administration to young children.

Table 1
Table of Specifications

Metacognitive Domain	Description	Scaling Technique	Item number
	Knowledge of Cognition		
Declarative knowledge	Knowledge about self and about strategies	Semantic differential scale	1
Conditional knowledge	Knowledge about when and why to use strategies	Open ended 4-point scale rubric	2
Procedural knowledge	Knowledge about how to use strategies	Open ended enumeration	3
	Regulation of Cognition		
Prediction	Assumed outcome of performance	Multiple choice	4
Planning	Goal setting	Rank Order	5
Evaluation	Analysis of performance and strategy effectiveness after learning episode	Multiple choice	6
Monitoring	Assessment of one's learning and strategy	Open ended 2-point scale Numerical scaling	7 8

Scaling and Scoring Technique. Each item was answered by the participants differently. For the first item on declarative knowledge, the semantic differential scale was used to assess whether the problem solving task was easy or difficult in a continuum. For the conditional knowledge item, the rating on the difficulty is justified in a 4-point scale rubric (see Table 2).

Table 2
Rubric for Item on Conditional Knowledge

Points	Description of response
1	If the answer does not sufficiently justify the difficulty given
2	If the answer can be accepted but does not sufficiently support the rating on the difficult
3	If the answer somewhat sufficiently justified the difficulty given
4	If the answer sufficiently justifies the difficulty given

For the procedural knowledge in item 3, the participant is tasked to enumerate the steps for the problem solving. A point is given for each relevant problem solving step that is provided. For the prediction in item 4, the participants assessed if they can solve the problem correctly given 4 options in relation with their correct answer for the problem. The point system is shown in Table 3.

Table 3
Point System for the Item on Prediction

Item	Point system
"I am absolutely sure I can solve the problem correctly"	With correct answer 4 points; with wrong answer 1 point
"I am sure I can solve the exercise correctly"	With correct answer 3 points; with wrong answer give 2 points
"I am sure I cannot solve the problem correctly"	With correct answer give 2 points; with wrong answer give 3 points
"I am absolutely sure I cannot solve the problem correctly"	With correct answer give 1 point; with wrong answer give 4 points

For the planning in item 5, the participant places the correct order on how to proceed with the problem solving given four steps. For the evaluation on item 6, the participant selects how sure he is in his answer given four options. The point system is shown in table 4.

Table 4
Point System for the Item on Evaluation

Item	Point system
"I am absolutely sure I have solved the problem correctly"	With correct answer 4 points; with wrong answer 1 point
"I am sure I have solved the exercise correctly"	With correct answer 3 points; with wrong answer give 2 points
"I am sure I have not solved the problem correctly"	With correct answer give 2 points; with wrong answer give 3 points
"I am absolutely sure I have not solved the problem correctly"	With correct answer give 1 point; with wrong answer give 4 points

Both items 7 and 8 measure monitoring. On the first part (item number 7), the participant gives an answer on the kinds of mistake that students commit in problem solving. Two points is given for an explicit answer and one point for a not explicit answer. For item 8, there are four options and the participant responds to each given four-point scale from 'most important' to 'not important at all.'

Item Review. The procedure and items of the measure was checked and reviewed by experts in the field of metacognition research and education from two universities in Japan and Hong Kong. In the process, the conceptual definition was provided for each domain and the table of specifications indicating the scaling technique and description of the items. The experts have reviewed the appropriateness of the items based on the conceptual definition. Necessary changes were made after and the assessment tool was revised.

Data Gathering. The instrument was administered to Grade four students grouped according to their section. There were three teachers in mathematics that

were trained to use and administer the instrument. During the administration, the students were informed that answering the scale is part of their activity in their mathematics class. The scale was administered to each student individually. The teacher records the responses of the students for each item. If a student is unable to answer an item, they are asked further questions to elicit the answer. After answering the devised measure, the 'Metacognitive Skills and Knowledge Assessment' by Panauori and Philipou was administered to the same participants to be correlated with the measure.

Data Analysis

The data was tabulated and scored by three raters. The raters were oriented on the standards of scoring. The concordance of the three raters using Kendal's ω is .78. The Cronbach's alpha was used to determine the internal consistency of the items of the Metacognitive Performance Assessment. The Pearson *r* was used for the parallel form of reliability, and the scores on the devised measure was correlated with the scores on the 'Metacognitive Skills and Knowledge Assessment.' Convergent validity of the devised measure was conducted by correlating the scores for each domain. This technique provides information on the homogeneity of the domains.

To study the factor structure of the seven domains of devised measure, the model was tested using Confirmatory Factor Analysis (*CFA*). The software STATISTICA was used to analyze the data where covariance matrix was used to derive path estimates and goodness of fit. The analysis involves determining the significant paths of the components of metacognition. Confirmatory Factor Analysis was used to establish the model with the closest fit to the data. It applied Structural Equation Modeling (SEM) in items which were associated with a priori factors, and the adequacy of a model was tested through fit indices that measure the degree to which the factor model reproduces the empirical covariance matrix. The models' goodness of fit was also determined using Chi-square, *CFI*, Joreskog, and *RMSEA*. The chi-square statistic (x^2) was used to assess the difference between the sample covariance matrix and the implied covariance matrix from the hypothesized model (Fan, Thompson, & Wang, 1999). A statistically non-significant x^2 indicates adequate model fit. Because the x^2 test is very sensitive to large sample sizes (Hu & Bentler, 1995), additional absolute fit indices were examined. The *RMSEA* is moderately sensitive to simple model misspecification and very sensitive to complex model misspecification (Hu & Bentler, 1998). Hu and Bentler (1999) suggest that values close to .06 or less indicate a close fit. The *RMSEA* is very sensitive to simple model misspecification and moderately sensitive to complex model misspecification (Hu & Bentler, 1998). Hu and Bentler (1999) suggest that adequate fit is represented by values of .08 or less.

Results

Reliability

The analysis indicates that the total mean of the scores of the 280 participants is 22.37 with a standard deviation of 4.78, which means that the scores do not vary

that much from the central tendency with a variance of 22.5. The skewness of the scores is –0.56, which tends to be normally distributed, and the kurtosis is -.420. The internal consistency using the Cronbach's alpha is .78 which indicates an adequate consistency of the individual items. Table 6 shows the alpha derived for each item with item deletion and the item total correlation.

Table 5
Item Total Correlation and Alpha with Item Deletion

	M if Deleted	Variance if Deleted	*SD* If Deleted	Item-Total Correlation	Alpha if Deleted
Declarative	15.87	10.80	3.29	0.25	0.36
Conditional	20.64	18.57	4.31	0.22	0.33
Procedural	19.64	19.9	4.46	0.12	0.38
Prediction	19.28	19.62	4.43	0.37	0.31
Planning	21.75	23.84	4.88	-0.23	0.46
Evaluation	19.26	19.66	4.43	0.35	0.32
Monitoring	20.95	21.18	4.60	0.22	0.36
Monitoring	19.19	18.07	4.25	0.21	0.33

Parallel form of reliability was conducted where the total scores of the metacognitive measure and the Metacognitive Skills by Panaoura and Philippou was correlated. The Pearson *r* correlation shows a significant correlation coefficient of .21 ($p<.05$) for the two assessment forms. The coefficient also showed a positive magnitude where metacognition instrument scores increase with the other scale used. This indicates that the consistency of response of the two tests is not due to chance. Each of the scores for each item of the metacognitive measure was correlated with the total score of Panaoura and Philippou's metacognitive skills as shown in table 6.

Table 6
Correlation of the Factors of Metacognition Measure with Metacognitive Skills Inventory

Factors of Metacognition Measure	Metacognitive Skills Inventory
Declarative	.44*
Conditional	.21*
Procedural	-.11
Prediction	.0021
Planning	-.15*
Evaluation	-.01
Monitoring	-.14*

*$p<.05$

The correlations between each of the metacognition measure with the total score of the metacognitive skills show significance for most factors except for procedural, prediction, and evaluation components. The coefficients found are mostly

low to moderate which is consistent with the results of the parallel form correlation for the total scores of each assessment.

Convergent Validity

The validity of the assessment was established by assessing the convergence of each of the factors. The pattern to which each pair of variables increases and decreases for certain conditions indicates the consistency of the components.

Table 7
Correlation Matrix

	1	2	3	4	5	6	7
(1) Declarative	---						
(2) Conditional	.31*	---					
(3) Procedural	.02	-.02	---				
(4) Prediction	.25*	.03	.04	---			
(5) Planning	-.15*	-.20*	-.10	-.01	---		
(6) Evaluation	.20*	.03	.07	.75*	-.03	---	
(7) Monitoring	.08	.14*	.28*	.16*	-.17*	.18*	---

*p<.05

The correlation coefficients showed a pattern where planning is consistently negatively correlated with all other factors in the measure. It is only significant for declarative, conditional, and monitoring. For all other significant coefficients, most of them showed a positive magnitude. Most of the factors converge with declarative knowledge and monitoring since significant correlations were found as compared with other pairs of factors.

Confirmatory Factor Analysis

Since the seven factors (declarative, conditional, procedural, prediction, planning, evaluation, and monitoring) are strongly supported in literature as components of metacognition, these constructs as factors need to be confirmed empirically. The method of estimation used for the CFA is the General Least Squares to Maximum Likelihood. The RMSEA was determined with a point estimate of .09 indicating that the data is close to fit in the model specified. The chi-square obtained is not significant that indicates good fit (χ^2=79.47, *df*=14). The PGI and CFI indices showed adequate fit with values .96 and .94, respectively. The model estimate showed that each factor is a significant construct of metacognition as shown in Table 8.

Table 8
Parameter Estimate for the Confirmatory Factor Analysis

Factor	Parameter Estimate	*SE*	*t*	*p* value
Declarative	0.73**	0.174	4.222	0.00
Conditional	0.69**	0.084	3.824	0.00
Procedural	0.92**	0.080	8.150	0.00
Prediction	0.69**	0.060	11.531	0.00
Planning	-0.26**	0.046	2.560	0.00
Evaluation	0.68**	0.061	11.166	0.00
Monitoring	0.34**	0.108	3.117	0.00

*p<.05
**p<.01

The parameter estimates showed that all the factors of metacognition are significant. This proves that the factors are indeed components of metacognition. The significance indicates that the factors correspond to prior theoretical notions about the components of metacognition. The data supports the truthfulness of the model proposed.

Since the sample used is only one and the data was only used to confirm the model, single sample fit indices were used to determine the goodness of fit of the model (see Appendix B). The Joreskog (0.92) value reflects an adequate fit since it is close to .95. The Akaike Information Criterion and Schwartz's Bayesian criterion are also large but there is no other nested model to compare them to determine whether the values are smaller or larger. The model was cross-validated using the Browne-Cudeck Cross Validation Index which has the same values with the pervious data.

Discussion

The findings of the present study explained metacognition among children in two aspects. First, there is evidence that grade school children are able to manifest metacognition through the developed measure. Second, the pattern how the metacognition components work among grade school pupils in the context of mathematical problem solving is explained.

The instrument for assessing metacognition of grade school pupils showed appropriate psychometric properties. The reliability of the metacognition measure was determined using the Cronbach's Alpha (.78) and alternate forms (r=.21). The results of the two reliability procedures are consistent in indicating adequate consistencies of the scores. Obtaining a reliability coefficient that is not so high can be a function of the measure consisting of fairly few items. A short form is necessary considering that it is designed for children unlike conventional inventories that is comprised of many items. Having few items in an assessment instrument affects the coefficient since the idea involves the representativeness of items. The correlation between the two measures is just moderate since the scores of the overall score for

the devised measure is affected by the different patterns in each of the seven factors measured.

The correlations for the parallel form, declarative, and conditional knowledge are significantly correlated with the metacognitive skills. This shows that declarative knowledge and conditional knowledge are consistent with the other measure and this result is consistent with other studies (Swanson, 1990; Ertmer & Newby, 1996; de Carvalho, 2001). This shows that the overall metacognitive process increases when a learner uses his declarative and conditional knowledge. These findings indicate that the use of one's knowledge of intellectual resources and the need to learn information greatly comprises an increment on metacognitive abilities. The factors regulation of cognition, planning, and monitoring are significantly related to metacognitive skills measure. The magnitude shown by the coefficients are negative, which means that they are not parallel with the metacognitive skill measure. There is a pattern shown in the correlation that both knowledge of cognition factors (declarative and conditional) significantly increase with the other metacognition scale, while the other two regulation of cognition (planning and monitoring) decrease with the said measure. The negative correlations give further differentiation for knowledge and regulation of cognition. This also indicates that the assessment of knowledge of cognition is more accurate than the executive functions of metacognition. This is due to low scores obtained both for planning and monitoring factors where respondents show weakness specifically in the context of mathematical problem solving. The negative correlations indicate that executive skills like planning and monitoring factors among children are not translated into general metacognition skills. This pattern extends developmental theory of metacognition in children where knowledge of cognition becomes more accurate during grade school (fourth grade) while executive processes like planning and monitoring (regulation of cognition) is still developing (Kopp, 1982; Rafaelli, Crocket, & Sheng, 2005).

For the convergence of the factors of metacognition, declarative knowledge is significantly correlated with conditional, prediction, planning, and evaluation. On the other hand, monitoring is also significantly related to all factors except for declarative knowledge. This indicates that the use of one of these strategies increases the use of other strategies. This pattern indicates that children at a young age can already translate one skill to another and use multiple metacognitive skills.

For planning, a negative correlation was found with declarative, conditional, and monitoring. The direction of the relationship is also negative with the other metacognitive factors but they are not significant. This shows the limitation of young children in using metacognition. Considering the age of the participants, the negative correlation indicates that the children are having difficulty implementing their planning across other metacognitive skills. Among adults and adolescents who have developed cognitive skills, all metacognition components increase with each other. This difference can be explained as a developmental trend highlighting the limitation of the metacognition process among children. More specifically, children execute other metacognitive tasks without careful planning. Children, when engaged in a task, usually use trial and error strategies (Flavell, Friedrichs, & Hoyt, 1970). The outcome of the trial and error results to outcomes that are not predicted. The child only determines the success and failure of a task depending on the outcome but there is no

foresight on what will be the outcome (Flavell, Miller, & Miller, 1993). Planning as a construct involves higher executive skills such as foresight, organization, and impulse control. Grade school children are characterized to demonstrate impulsiveness and lack of control, which makes them unable to see the clear paths in the outcome of their goal. For example, a child may be aware of what they know (declarative) and when to use such strategies (conditional) but they lack the executive skill of planning and monitoring to accomplish their goals. This relationship is particularly true when undergoing difficult mathematical problem solving tasks. When a grade school child is faced with a difficult mathematical problem solving, the child would just implement courses of action readily taught by the teacher without careful consideration of its appropriateness and the conditions that needs to be met. The child would assume that the strategy will lead to the correct answer. There is no accurate prediction of getting the correct answer. In another account, metacognition works well in tasks where a child has complete mastery and expertise. In cases of expertise in tasks, metacognition components are expected to converge with one another. But in cases of difficult tasks such as mathematical problem solving, the planning stage does not accurately result in other metacognitive components.

The confirmatory factor analysis shows that the components of metacognition are all significant and the data fits the model. This provides evidence that the processes of declarative, conditional, procedural, prediction, planning, evaluation, and monitoring indeed are components of metacognition. The adequate fit indicates that the measurement model fits primary school children. This implies that it is possible to assess the metacognition of children and the instrument is appropriate for them. The adequate fit also solves the issue of the length of the instrument where only eight items were used to measure the metacognition components. The eight items, when structured in the measurement model, turned out to fit the sample indicating that a single item is acceptable to assess metacognition in mathematics problem solving. The findings made not only the assessment of metacognition among children possible but the appropriateness of a measure and procedure for them as well. The process of translating each metacognition component came out as unique among children as shown by the divergence of planning with other metacognition components.

Given the acceptable reliability, significant path estimates, and goodness of fit of the data for the model, the measure for metacognition is useful for research that involves grade school students as participants. Primarily, previous studies usually use adults as participants because of the difficulty in assessing young children on their metacognitive ability. Provided that a measure for metacognition for children is now available, it can be used to assess this variable quantitatively. The assessment procedure can also show the underlying processes of metacognition among children if one component increases or decreases with another. The present study identified how metacognition occurs among children (grade four) in two aspects: A developmental perspective and underlying cognitive process. In a developmental perspective, it was found that declarative and conditional knowledge are assessed accurately and these factors are developed among grade four pupils while executive skills like planning and monitoring are still developing. As a cognitive process, planning does not increase

with other components indicating that this executive and regulation skill is still limited among children.

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Appendix A
Items of the MPA

Read the problem solving without solving it:

Mario has 2 jobs in a day. He is earning a minimum wage of P 275.00 as an ordinary factory worker during daytime. At night he works as a waiter and earns P 250.00 a night. How much does he earn in a month with 31 days?

(1) How difficult is the problem for you in a scale of 1 to 10? *(declarative)*

Easy ←----------→ Difficult
10 9 8 7 6 5 4 3 2 1

(2) Why did you give that rating for the difficulty? (conditional)

_____
_____
_____

(3) What are the steps that you will do to solve the problem? Enumerate below (procedural)

(4) Can you solve the problem correctly? *(check one)*(prediction)

__ I am absolutely sure I can solve the problem correctly
__ I am sure I can solve the exercise correctly
__ I am sure I cannot solve the problem correctly
__ I am absolutely sure I cannot solve the problem correctly

(5) How will you proceed to solve this problem? Put the number (1 – 3) of the correct order in the sentences. (planning)

___ Choose the appropriate strategy
___ I read the assignments well
___ I extract the information necessary for the solution

What is the answer?

(6) Are you sure that your answer is the correct answer? *(Check one)(evaluation)*

__ I am absolutely sure I have solved the problem correctly.
__ I am sure I have solved the problem correctly.
__ I am sure I have not solved the problem correctly.
__ I am absolutely sure I have not solved the exercise correctly

(7) What do you think are the kind of mistakes do students make in such problem solving? (monitoring)

_____
_____
_____

(8) What do you think is the most important to succeed in Problem solving using the following scale? (monitoring)

4 – the most important reason
3
2
1 – not important at all

___ To solve the needed answers first
___ To know the multiplication table
___ To pay attention to what is asked
___ To finish as soon as possible

Appendix B

Single Sample Fit Index

	Value
Joreskog GFI	0.922
Joreskog AGFI	0.843
Akaike Information Criterion	0.385
Schwarz's Bayesian Criterion	0.568
Browne-Cudeck Cross Validation Index	0.388
Independence Model Chi-Square	340.443
Independence Model df	21.000
Bentler-Bonett Normed Fit Index	0.767
Bentler-Bonett Non-Normed Fit Index	0.692
Bentler Comparative Fit Index	0.795
James-Mulaik-Brett Parsimonious Fit Index	0.511
Bollen's Rho	0.650
Bollen's Delta	0.799

A Belief Scale on Cooperative Learning

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Cooperative learning is one of the widely-used instructional strategies in the world, and the development of the intricacies of its procedures and processes is a necessity to ensure effective instruction leading to effective learning. Beliefs highly influence the performances and outputs of students in general. The purpose of this study is to formulate and construct a belief scale about cooperative learning that would investigate the various perceptions of students on knowledge attainment and construction. The factor structure was tested using Confirmatory Factor Analysis where three models were analyzed. Results showed that the third model, which indicates the irrelevance of two subscales, result to a better goodness of fit compared to the other two. The reliability of the instrument was measured using Cronbach's alpha. The obtained alpha is 0.87 that indicates a high correlation among the items and guarantee its internal consistency.

Keywords: Cooperative Learning, Belief Scale

In a student-student interaction, students either work individually toward a goal without paying attention to other students or work cooperatively with a vested interest in each other's learning as well as their own which made the teachers and students develop beliefs about the efficiency of these approaches, especially on cooperative learning approach.

Cooperative learning approach, for many years, has been adapted by schools and teachers in their classrooms to empower students in conceptual learning, knowledge construction and even in the development of leadership and collaborative skills. In theory, cooperative learning exists when a group of students work together towards one common goal or the perceived learning outcome. Together, they share experiences, discuss insights, develop skills and construct knowledge as indicated in the learning outcomes set by the teacher. It is popular because

of its efficiency in student's behavior cannot be denied. It is also considered as one of the teaching methods used in an ordinary classroom (Johnson & Johnson, 1998). Despite its progressive and constructive nature, has been mainstreamed and is being used as an instructional strategy even in conventional classrooms. Cooperative learning refers to a method of instruction whereby students work together in groups to reach common goals (Kagan, 1994). With this, teacher's involvement affects the cooperative learning approach since the quality of the education given the students highly depends on the instructional methods used by the teacher. Moreover, the development and formulation of such strategies and techniques require intricate procedures and measures. This encourages the teachers to involve their students in the development of these methods.

Within cooperative learning, students benefit from sharing ideas rather than working alone. Students help one another so that all can reach some measure of success. This is in contrast with the traditional method where students work individually or competitively. In the traditional method, students are generally concerned with improving their own grade, and goals are individualistic rather than group-wide (Kagan, 1994).

Cooperative learning does not only focus on working as a group, it also focuses on knowledge gained by the students through working together. The epistemological beliefs system focuses on how perceptions of students and teachers influence the development, construction, attainment, and retention of cognition (Schommer, 2004). It highlights the importance of identifying the factors and beliefs that are consistent with effective teaching and learning strategies. Exploring the relationship of cognitive development and beliefs might help in the growth of effective educational practices (Chan, Lai, & Wong, 2009). In this study, only the "simple knowledge" dimension, conception and knowledge construction per se and "innate ability" dimension, innate to acquired ability of learning, are investigated.

Cooperative learning, though used in everyday classrooms, is a very specific and complex matter. Sophisticated instructional procedures are required to ensure efficiency and competency wherein several misconceptions arose. With this, the researchers constructed a scale that will measure the beliefs of the students towards cooperative learning. Cooperative learning principles developed by Kagan (1994) and epistemological belief scale constructed by Schommer (2004) were combined and used in constructing the scale on student's belief on cooperative learning. Teacher involvement was included in the list of factors to be investigated since it plays a big role and highly influences students' beliefs and perceptions about learning and performance Capraro (2005).

Laferrier, Harasim and Campos (n.d.) formulated a three-level collaborative learning scale in 2001. This collaborative scale divides student beliefs into 3 levels. The vague level explores the views of a student being in a group but not necessarily performing a task together. The modest level investigates the students' beliefs and views when co-participating with others but not necessarily constructing knowledge together. The strong level investigates student beliefs and views about the real and highest level of collaborative learning which is working interdependently that result to knowledge construction.

In a research in a maritime institute in Turkey, Asyali, Saatcioglu and Cerit (n.d.) highlighted the importance of Kagan's cooperative learning theory in the students' (cadets') performances in academics and in ranks. It used a perception scale on cooperative learning which they adapted from Veenman, et. al. It is a 51-item scale that explores student perception about cooperative learning with the emphasis on the development of group ethics rather than cognition. That is why they found that team work is an entirely different skill from collaborative learning skills. Teamwork behaviors include: team leadership, team orientation, mutual performance monitoring, backup behaviors and adaptability. Team work skills are competencies and capabilities that individuals must have to properly perform proper teamwork behaviors.

Students' beliefs highly influence their performance and goal setting (Okamoto, Leighton & Cor, n.d.) Because of this, the exploration of student beliefs might be a necessity and an underlying factor in developing strategies in teaching and learning. According to Schommer (2004), beliefs highly influence almost all aspects of learning such as, how students learn and how teachers teach. If teachers are aware of their students' epistemological beliefs, then perhaps they could adapt techniques in instruction which are at par with how their students perform and guide their students towards much compelling and prolific outputs and performances.

According to Fujiwara and Phillips (2006), the development of personal beliefs about the nature of knowledge and knowing of Thai is said to be affected by cultural influence 266 Thai freshmen students from international schools, schools abroad and local Thai school with an age range of 15 to 24 years old were given a 28-item questionnaire that was based on middle school version which only contains 29 statements compared to original which contains 63 items asking the participants how they agree or disagree with the statements about epistemology. Through factor analysis, three dimensions were identified: Fixed ability, stable knowledge, and simple knowledge but it was complicated to interpret because of the structure that piled each other. The research results confirm that there is a cultural influence on epistemological development through education.

Another study is Chan's (2002) where he pointed out in his research the students' epistemological beliefs and approach of teacher education students is related. There were 292 students in a Hong Kong Institute of Teacher Education with age range 18 to 30 years old were given two questionnaires, the first one is a 30-item questionnaire developed by the author that used a 5-point Likert scale which has four dimensions of epistemological beliefs: Innate/fixed ability, learning effort/process, authority/expert knowledge and certainty knowledge that was validated through confirmatory factor analysis and Cronbach's alpha was used for reliability. The second questionnaire was Biggs 42-item student approach questionnaire which has been designed for the tertiary level students which three subscales measure students' study motives (surface, deep and achieving) and three subscales those measures students' learning strategies (surface, deep and achieving) used by the students. Pearson correlation analysis was used to determine the relationship of the study approach, motives and strategy dimensions. As a result, there is a highly positive significant relationship between the four dimensions of epistemological beliefs and three study approaches constructs which includes the students' motives and learning strategies.

In a research about a mathematics belief scale conducted by Capraro (2005), it evidently showed the importance of Teacher roles in student learning and understanding. 39 teachers were asked to answer a mathematics belief scale with a 5 point Likert scale questionnaire which was adapted from Fennema, Carpenter and Peterson in 1987. Teacher beliefs affect the roles that they play in the classroom whether it is in a constructivist or traditional environment. And the performances of students are affected by their beliefs; both mathematical beliefs are highly correlated. Meaning, teacher perceptions highly impact student learning. Thus the role that they play is also very vital.

The scale is appropriate enough for the respondents because they themselves experience cooperative learning in their classrooms. The scale would be useful in helping the teachers determine students' beliefs that positively or negatively influence performance in group works. Also, it helps the teacher in determining misconceptions that the majority has that hinders student development through cooperative learning. Through the use of the results elicited from administering the scale, teachers might be able to create ways on how to eradicate misconceptions that might influence performance. Furthermore, Teachers may also be able to develop cooperative learning techniques from the positive beliefs of the students since this study aims to formulate a belief scale that measures student perceptions about cooperative learning based on the two main aims of the Cooperative Learning Theory proposed by Kagan (1994) which are (1) fostering positive cooperative relationships between learners studying any subject in a class, (2) promote high achievement for all learners.

Method

Participants

The participants are 300 students from a university in Manila from all the colleges were randomly asked to answer the scale. Age, gender and college of the participants will not be given consideration since the focus of the study is on the student's belief about cooperative learning.

Instrument: Factors and Subscales

The researchers constructed a scale based on the cooperative learning principles and epistemological beliefs. The factors of the scale are divided into three major categories, a combination of the adaptations from different researchers and experts. These categories are as follows: (a) Beliefs about behavior in cooperative learning, (b) beliefs about teacher roles in cooperative learning and (c) epistemological beliefs in cooperative learning.

Based from the elements of cooperative learning as proposed by Kagan (1994), the behavioral belief factors that should be investigated by the scale would be the following: (1) Positive interdependence, (2) individual accountability, (3) equal participation, and (4) simultaneous interaction. However, the equal participation factor was combined with the positive interdependence factor due to their

similarities in scope and significance because the researchers do not want the items to overlap each other. The included subscales are based on the conceptual definition of each factor that the authors formulated.

Positive interdependence is developed and manifested when students work in groups, and are able to accomplish good products with the help of each other (Lotan & Whitcomb, 1998). This interdependence goes a long way from just equally participating in tasks, but it's more of how students rely on and assist each other for the completion and success of activities. Moreover, positive interdependence is best epitomized by peer tutoring, which is how students motivate each other and ensure the development of one another. Since it is an efficient learning vehicle, it is a complex student capability that teachers need to reinforce, best through cooperative learning (Schmuck & Schmuck, 1997).

Simultaneous interaction encompasses the function of the group as one. It explores how students compromise with each others differences to come up with consistent thoughts that resulted from their discussions (Kagan, 1994). When a group was not successful in their attempt to reach a consensus then probably their group skills are not what the teacher is hoping for.

Individual accountability gives students a sense of individual success and accomplishment. Researches have shown that cooperative learning has provided students with opportunities to show their work thus increasing their self-esteems and self direction, where students become more intrinsically motivated (Kagan, 1994). If students are entrusted with a role or a task, and they take that role seriously the time-on-task increases thus creating a better output. This factor explores the beliefs about capabilities of individuals to cope with time and individual task assignments.

Teacher roles in cooperative learning are most often viewed as mere facilitators. This factor, as suggested by Capraro (2005), explores the beliefs of students about teacher involvement in learning and how it affects their performance and development. How student beliefs manipulate their performance is the main focus of this instrument (scale). According to Kagan (1994), teachers in a cooperative classroom should channel student capabilities into positive and more meaningful directions.

"Cooperative learning promotes higher achievement than competitive and individualistic learning" (Kagan, 1994). This is the factor where the beliefs that students have about the construction of knowledge is explored. Epistemological beliefs, according to Schommer (2004), are of different aspects. However, the researchers find it only necessary to look into student beliefs regarding "simple knowledge" and "innate ability".

Table 1
Factors and Subscales of Cooperative Learning Belief Scale

Factors	Subscales
Positive Interdependence	Shared Leadership Division of Labor Equal Participation
Simultaneous Interaction	Group Structure Group Processing
Individual Accountability	Doing share of works Time-related outputs Social Loafing
Teacher Involvement	Teacher's role Teacher's instruction Teacher's evaluation
Academic Achievement	Knowledge Construction Skill Development

Item Review

The researchers asked a faculty of educational leadership to review the first draft of the items to ensure the content of the items included in the scale focusing on pedagogical approaches of cooperative learning. The researchers also asked a faculty of counseling and educational psychology to ensure that the statements included in the scale are constructed focusing on student's behavior and beliefs.

Item Writing

The number of items included in each subscale is not equal since some of the items were rejected by the experts who reviewed the scale. Each item is based on the definition of the subscale it belongs to. A total of 13 subscales summing up to 126 items were included in the scale. A 5-point Likert scale that range from 5 (strongly agree) to 1 (strongly disagree) was used to measure the belief of the students about cooperative learning.

Procedure

The researchers constructed a scale on student's belief towards cooperative learning. They asked two experts to review the items and then made revisions based on the comments of the item reviewers. After the revision, the researchers asked 300 students from a university in Manila across different levels to be their participants since the overall curriculum of the institution revolves on transformative learning, teachers would surely be using cooperative learning as an instructional strategy in their classes. The participants were asked to rate a 5-point Likert scale ranging from 5

(strongly agree) to 1 (strongly disagree). The gathered data were computed using Cronbach's alpha and Confirmatory Factor Analysis to test the validity and reliability of the constructed scale.

Data Analysis

Reliability. The reliability of the scale will be analyzed through the use of Cronbach's alpha. Cronbach's alpha determines the internal consistency or average correlation of items in a survey instrument to gauge its reliability (inter-item correlation). It measures how well a set of items measure a single construct and how the items of the instrument are internally consistent. If the Cronbach's alpha is high, then the inter-item correlation is high, thus the items measure only a single construct.

Validity. The validity of the scale was analyzed using an informal *content validity* done through the item review where an expert or a number of experts would view the list of items to see if the scale measures what it intends to measure. Another type of validity used is the c*onvergent validity* which hypothesizes that as one of the factors increase, other factors increase as well. Convergent validity measures if a factor measures the same construct as the other factors of the scale. Also, a Confirmatory factor analysis was used to determine if the hypothesized structure complements the factors developed. Confirmatory factor analysis is used because it would verify the dimensionality of the factors and items since it has been pre defined by other literature.

Results

Table 2
Distribution of Scores

	M	*MD*	Min	Max	95% CI(-)	95% CI(+)	*SD*	Skewness	Kurtosis	Alpha
SL	3.02	3.00	0.28	4.80	2.60	3.40	0.55	-0.20	1.42	0.87
DOL	3.80	4.00	0.40	5.00	3.56	4.22	0.66	-1.70	4.89	0.88
EP	3.77	3.89	0.47	4.78	3.56	4.22	0.71	-1.27	2.10	0.86
GS	3.08	3.00	0.22	4.50	2.88	3.25	0.50	-0.24	4.41	0.85
GP	3.46	3.47	0.26	4.78	3.22	3.78	0.54	-1.16	5.41	0.87
DSOW	3.35	3.40	0.29	4.70	3.10	3.60	0.56	-0.95	4.81	0.86
TRO	3.32	3.36	0.27	4.73	3.00	3.64	0.55	-0.94	3.77	0.86
SLF	3.07	3.00	0.39	4.44	2.78	3.44	0.64	-0.39	1.02	0.86
TR	3.30	3.40	0.32	4.50	3.00	3.70	0.59	-1.05	2.85	0.87
TI	3.76	3.90	0.54	4.90	3.40	4.30	0.76	-1.53	2.78	0.86
TE	3.74	3.78	0.57	5.00	3.44	4.22	0.77	-1.52	2.82	0.86
SD	3.85	4.00	0.64	5.00	3.40	4.40	0.82	-1.09	1.60	0.86
KC	3.82	3.90	0.60	5.00	3.60	4.30	0.79	-1.25	2.21	0.85

Note. SL = Shared Leadership; DOL = Division of Labor; EP = Equal Participation; GS = Group Structure; GP = Group Processing; DSOW = Doing Share of Work; TRO = Time-related output; SLF = Social Loafing; TR = Teacher's Role; TI = Teacher's Instruction; TE = Teacher's Evaluation; SD = Skill Development; KC = Knowledge Construction

The coefficient alpha obtained from the results is 0.87. This means that the items strongly correlates with each other and the internal consistency of the instrument is strong. A value greater than 0.7 signifies the acceptability and the reliability of the instrument. This means that since the alpha is 0.87, the items of the instrument (scale) measures the same construct. The aim is to create an instrument that would measure the same construct, the value of 0.87 indicates a good reliability which means that the items are related but still contribute uniqueness in information.

Figure 1
First Model of Cooperative Learning Belief Scale

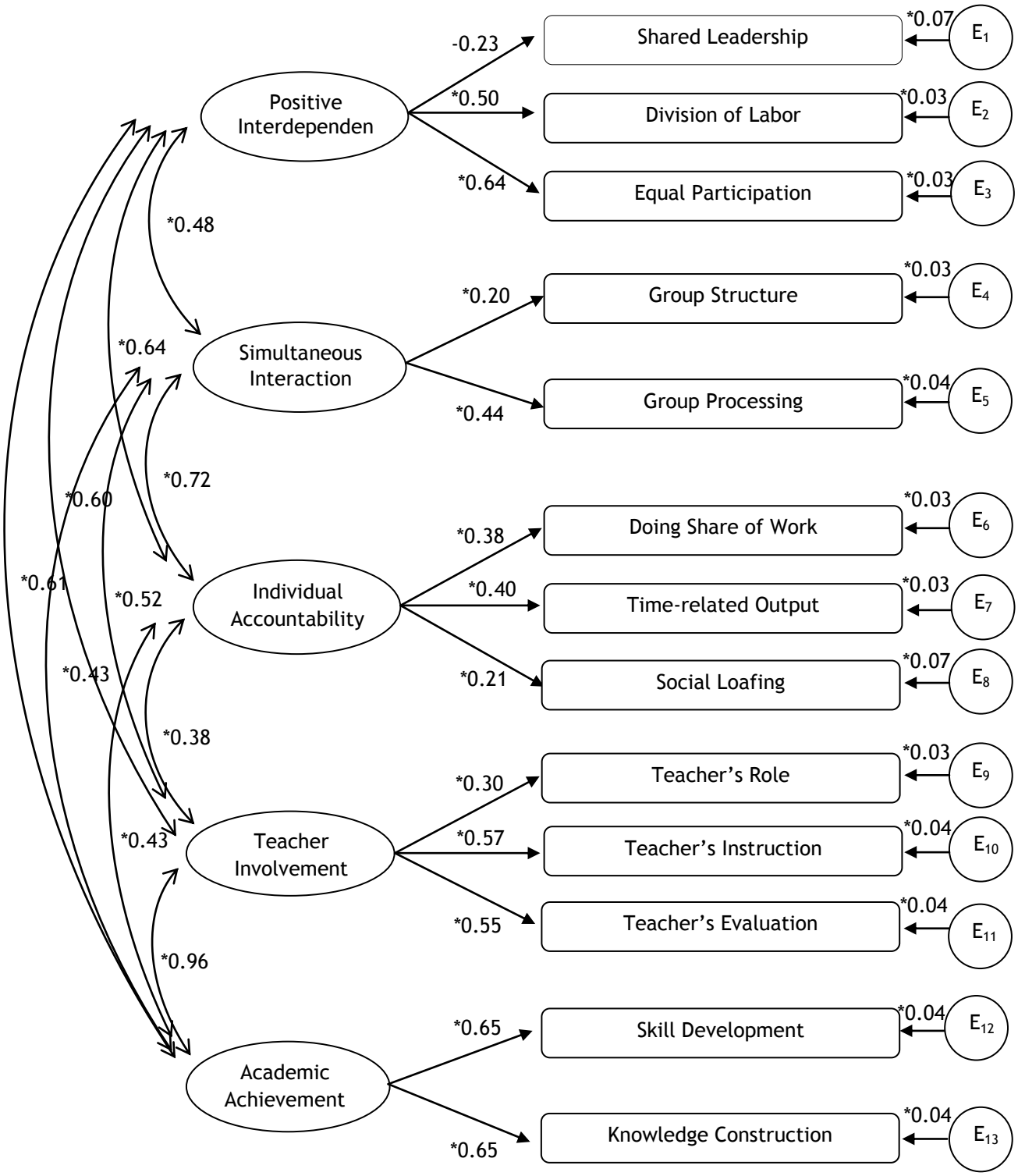


Figure 2
Second model of Cooperative Learning Belief Scale

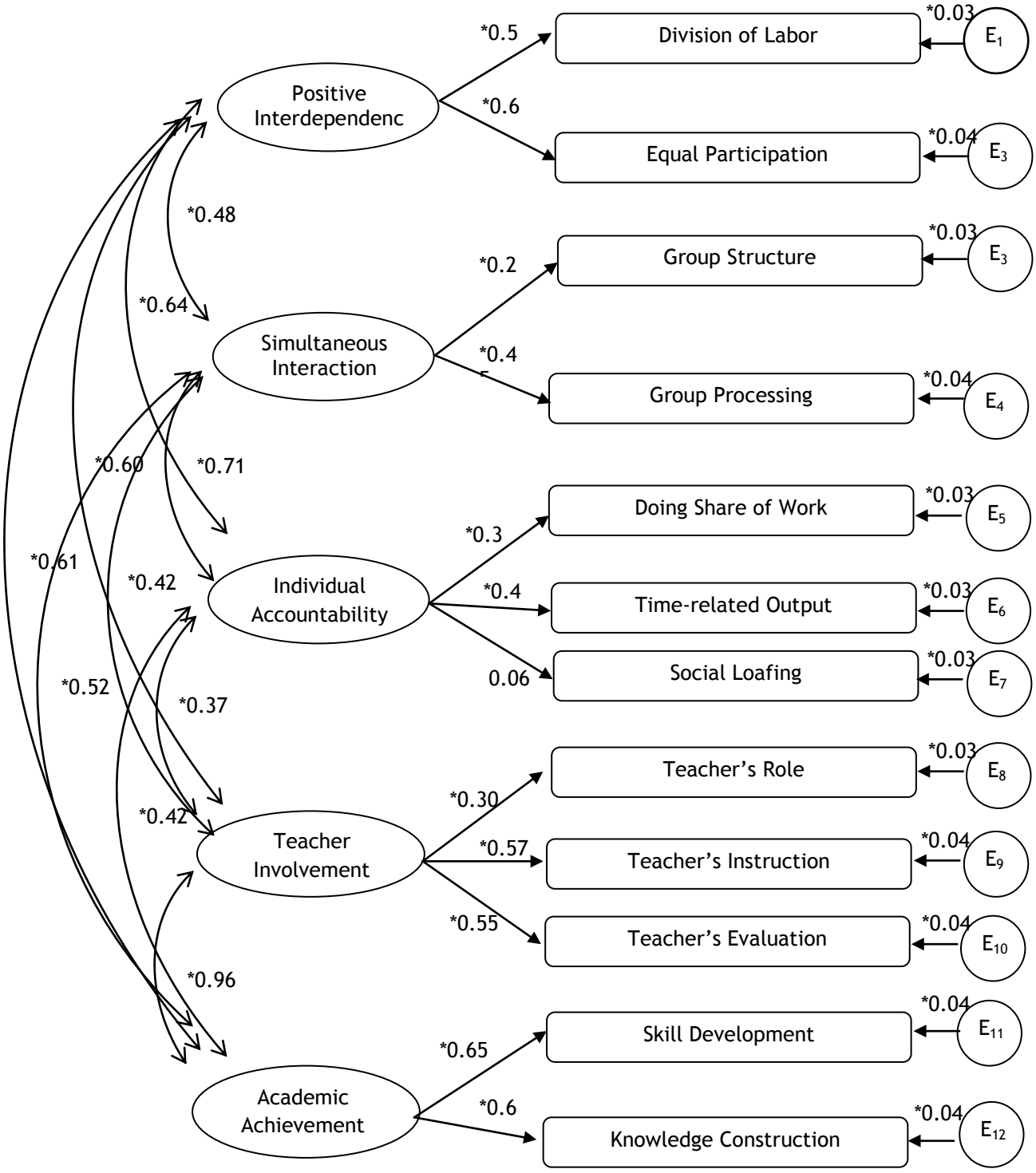
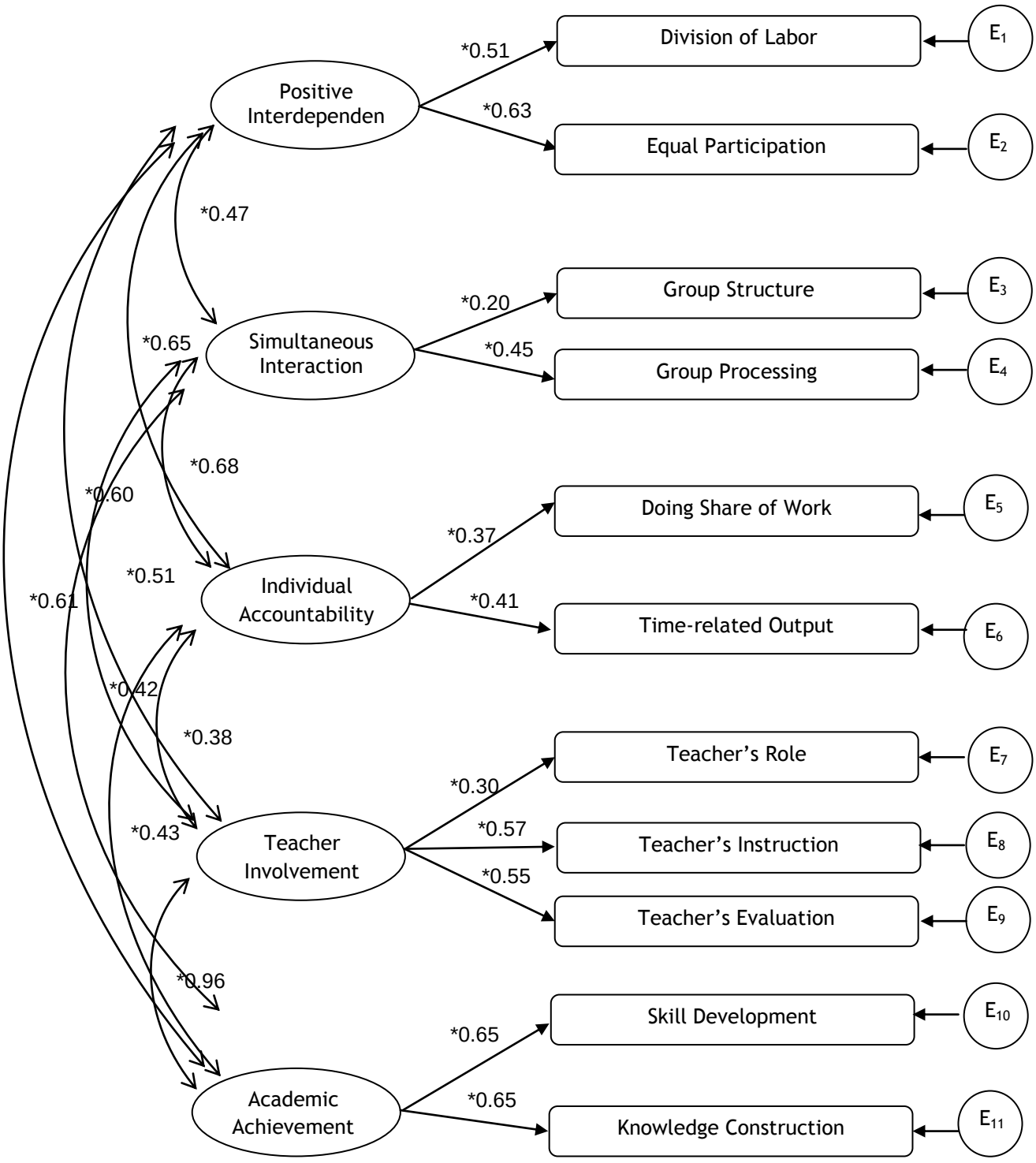


Figure 3
Third model of Cooperative Learning Belief Scale



In model 1, the results show that the relationships among factors are significant. But, due to the negative parameter estimate of positive interdependence to shared leadership, the goodness-of-fit is affected significantly. The RMSEA state that the model does not have a good fit. Other indices, such as the McDonald's index, the AGFI and Joreskog GFI, show that the fit is nearly good with values near 0.8 and 0.9. The negative parameters in model 1 lead to the construction of model 2 which indicates the removal of the shared leadership subscale.

The insignificance in parameters as seen in model 2 leads to the construction of model 3. In this model, both shared leadership and social loafing subscales were removed. If examined, it would be evident that all of the parameters are significant. Also, the indices measuring goodness-of-fit improved at a significant value. Even if it still showed that the fit is bad, compared to the values of Joreskog GFI and Population Gamma Index (PGI) in the first and second models (as shown in Tables 3 and 4), the value for the third model is significantly higher and nearer 0.95.

Table 3
Comparison of Single Sample Fit Indices

	Model 1	Model 2	Model 3
Joreskog GFI	0.88	0.88	0.91
Joreskog AGFI	0.78	0.79	0.83
Akaike Information Criterion	1.31	1.19	0.81
Schwarz Bayesian Criterion	1.75	1.63	1.21
Browne-Cudeck Cross Validation Index	1.32	1.20	0.81
Independence Model Chi-Square	1595.98	1595.98	1485.07
Independence Model df	66	66	55
Bentler-Bonett Normed Fit Index	0.81	0.83	0.89
Bentler-Bonett Non-Normed Fit Index	0.74	0.77	0.85
Bentler Comparative Fit Index	0.83	0.85	0.91
James-Mulaik-Brett Parsimonious Fit Index	0.53	0.55	0.55
Bollen's Rho	0.71	0.74	0.82
Bollen's Delta	0.83	0.85	0.91

Table 4
Comparison of Non-centrality Fit Indices

	Model 1	Model 2	Model 3
Population Noncentrality Parameter	0.46	0.78	0.61
Steiger-Lind RMSEA Index	0.10	0.14	0.12
McDonald Noncentrality Index	0.68	0.80	0.74
Population Gamma Index	0.89	0.93	0.91
Adjusted Population Gamma Index	0.79	0.87	0.83

Goodness-of-fit indicates the maximum-likelihood a gathered set of data estimate a particular hypothesized model or structure (Bock, 1998). This also indicates how well a set of data is modeled.

Tables 3 and 4 above show the comparison of the single sample fit indices and non-centrality indices of the three models. As seen, the Joreskog GFI and AGFI of model 3 has a value near 0.9, compared to the other two models, this means that the third model has the best fit. Other non-centrality fit indices and single-centrality indices also indicate which model has a better and more acceptable goodness-of-fit. Akaike Information Criterion (AIC) decreased from 1.307 in Model 1 to 1.193 in model 2 and down to 0.805 in model 3. Comparing all three values, the criterion value for model 3 is the smallest. This indicates that model 3 shows the best data approximation. Same is true with the Schwarz and Bayesian Criterion with the value of 1.212 in model 3. It decreased from the value of 1.753 in model 1 to 1.626 in model 2 and down to 1.212 in model 3. This indicates the same interpretation as that of the AIC – model 3 has the better approximation of data. Other indices illustrate the same Interpretation such as the Browne-Cudeck Cross Validation Index.

Table 5
Correlation Matrix of the Factors

	Positive Interdependence	*Simultaneous Interaction*	*Individual Accountability*	*Teacher Involvement*	*Academic Achievement*
Positive Interdependence	---				
Simultaneous Interaction	.52*	---			
Individual Accountability	.43*	.49*	---		
Teacher Involvement	.36*	.29*	.37*	---	
Academic Achievement	.42*	.21*	.36*	.72*	---

*p<.05

Inter correlation among factors indicate the convergence or divergence of the factors with each other. It measures the degree of relationship among variables. Table 5 above shows the inter correlation of factors. The magnitude of the correlations clearly indicates that the factors and coefficients in inclined to a positive direction. The obtained correlation values are positive and significant, meaning they are convergent. This means that as one factor or dimension increases, the other dimensions increase as well. Strong correlations are shown in (simultaneous interaction-positive interdependence) pair up and the (teacher involvement-academic achievement) pair up. The only considerably low ones, which indicate positive and significant but slight correlations, are the correlations between academic achievement and Simultaneous interaction and Teacher involvement and simultaneous interaction. Generally, all the correlation values are good enough.

Discussion

Over all, the CFA analysis proves that there are five factors encompassing cooperative learning as shown in model 3. Despite the slight differences in value of the indices and the parameter estimates of models 1, 2 and 3, model 3 still has a better goodness-of-fit compared to the other two. Only minor revisions were made with the eradication or removal of 2 manifest factors which are social loafing and shared leadership.

This proves that the factors that compose cooperative learning according to the beliefs of the sample population are: Positive interdependence, simultaneous interaction, teacher involvement, academic achievement, and individual accountability. Also, model 3 indicates the irrelevance and insignificance of shared leadership and social loafing to measuring beliefs of students about cooperative learning.

According to Johnson and Johnson (1998), success in cooperative learning is assured when the students have the same aims and goals. Also, it is every member's responsibility to assure other's learning and understanding. Team effectiveness would not be attained when these elements are not present. Maybe this is why shared leadership was removed and disregarded as a manifest factor. Because shared leadership and social loafing are invariably similar factors, too similar that they might cause repetition in the items.

Shared leadership and social loafing may just be two ends of a continuum, where the existence of one leads to the existence of the other. If leadership isn't shared, as Cohen (1989) wants to point out, "group members may have very little to do with each other and may simply respond to the leader's directions" thus leading to social loafing. As one student assigned to lead takes over the entire group, one other student may just sit back and quietly take advantage of his group mates' hard work (Lotan & Whitcomb, 1998). Probably, that's the reason why social loafing became insignificant after the removal of shared leadership as shown in model 2. To add to that, a part of the teacher intervention factor which is assessment would be responsible for social loafers. How the teacher structured the cooperative learning task and how students would be evaluated would give the students an idea that they are individually accountable for their own learning gains.

To avoid mishaps and confusions and to prevent social loafing and promote shared leadership, it must be the teacher's role to designate specific and standard tasks and roles to be played by each member of the group (Cohen, 1989). This is where Schmuck and Schmuck's (1997) peer tutoring theories and Capraro's (2005) teacher intervention concepts play a great role,

Since the factors measure the same construct, it is true that the importance of teacher involvement in measuring student beliefs and performance according to Capraro (2005) is significant. Also, elements of cooperative learning that are indicated by Kagan in his researches are highly significant in measuring student beliefs. To add to that, his elements encompass a wide range of concepts and pedagogy as indicated in his books and researches. Same manifestations are shown in the researches of Cerit, Saatcioglu, and Asyali (n.d.).

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Student's Attitude Towards Participation During Class Time

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The development of a new self-assessment tool, the measure of student participation scale which is created by the researchers, aims to aid in the self-assessment processes of students. Though it was created for Filipino-based classroom setting, the researchers deem it to be utilized by other settings to help in measuring their students' view on classroom participation as well as in making them realize their own attitude towards classroom participation. Originally, four (4) sub-scales or factors were extracted from student participation items which are based on the previous study of Howard, Short, and Clark (1996) and these are: Bank of knowledge, civil attention, interactive facilitative orientation, and knowledge transmission. A total of one hundred (100) items were created divided equally into twenty-five (25) items per factor and these were administered to three hundred (300) college students with no particular course or age range at target except that they should have taken at least one (1) major class already on the course of their stay in school. To further validate if there could still be a better model for scaling student participation, the researchers created another model and they tested it in the same way as to how they tested reliability and validity of the first scale. Results show that the first model of student participation, which is based on Howard, Short, and Clark's (1996) had a better fit, reliability, and validity.

Keywords: Self-assessment, Student Participation

Participation is the student's active engagement in the classroom to promote effective learning (Howard, Short, & Clark, 1996). The student's activities may include reciting in class, having conversations with the instructor or their classmates, doing written outputs, and sharing ideas with others (Howard, Short, & Clark, 1996; Howard & Henney, 1998). Based on these examples, clearly, a participative learner is one that is not passive. As Fraser (1982) defines it, it (participation) is the extent to which students are encouraged to participate rather than be passive

listeners. Both researchers defined participation then as students who *actively* engage in classroom discussions, rather than be passive learners who simply take in knowledge.

In a classroom-based learning, participation can be a positive feedback given by students to either the lesson or the teacher which can lead to possible ways in the development of an improved classroom learning experience. Because of this, the researchers purposely gave student participation in the classroom setting as their focus. With all the tedious discussions done in college classrooms, the researchers wanted to find a way to measure how much one student can actually have an interest in participating in class. Aside from this, they too want their fellow students to realize how much interest they have left for simple classroom discussions and/or lectures. Preferably, the researchers wished to target students who already have taken at least one major class in college.

The main purpose of the present study is to construct a scale that would be able to measure student participation during class time and to check if the factor structure of the model presented by Howard, Short, and Clark (1996) would fit the data. The current study also aims to address if the students in the university are participating during their class time. Since the university has adopted already a transformative learning pedagogy, the curriculum should be more student-centered and the students are engaging themselves in the learning process actively.

Howard, Short, and Clark (1996) broke down student participation into four factors: (1) bank of knowledge, (2) civil attention, (3) interactive facilitative orientation, and (4) knowledge transmission orientation.

Bank of Knowledge

The bank of knowledge typically refers to students who make minimal contributions during class discussions and get their information from the instructor alone (Howard, Short, & Clark, 1996). An example of this kind of participation is students who listen and take down notes during the lecturer's lesson and do not share their own insights or thoughts with the instructor or the class.

Civil Attention

This is similar when students appear to be paying attention in order to mask that they are actually not focused on what is being discussed (Howard, Short, & Clark, 1996). An example of this so-called "mask" is when instructors give lectures, student/s tend to look at the speaker without actually understanding what he/she is saying.

Knowledge Transmission Orientation

This factor is manifested when the students tend to memorize material solely for the sake of reproducing it on an examination (Howard, Short, & Clark, 1996). This is when students focus on the notes given by the instructor, use the information on the test, but do not remember it after it has been discussed and tested.

Interactive Facilitative Orientation

This refers to the "deep learning process" which focuses on the primary subject or topic through the use of materials and outputs (Howard, Short, & Clark, 1996). When an instructor gives alternative forms of assessment to the students in order for them to understand one topic which is being discussed, this can be considered as an example of this factor.

Three out of four of these factors show some negativity. Actually, these factors are increasing as to whether or not one student really is an active learner in the classroom setting. In Bank of Knowledge, there is not much classroom participation aside from the fact that the learner is physically present in class. In civil attention, the learner gives some attention to what is happening in class by giving time to glance at the lecturer. In knowledge transmission orientation, learning is happening only to a certain extent which is normally based on the effect of grades to the learner. A learner can only be said as a fully active class participant if he/she arrives at the level of Interactive Facilitative Orientation. With these subscales, the researchers can find out how affective transformative learning is in universities in terms of student participation in class time.

The next part of the review is divided into two main sections: (1) Student participation in the classroom; and (2) previously used scales.

Student Participation in the Classroom

Alpert (1991) found that students resists in the classroom for three reasons: (1) the components of adolescent culture, such in language and interests; (2) upper-middle class aspirations for success; and (3) the teaching approach used. Students resisted in four ways: (1) they were either silent (not answering) or mumbling their answers; (2) they argued with their teacher over a topic; (3) they conformed to the rules of the teacher, although they were silent; and (4) resisted the rules which were considered a danger to their grades (Alpert, 1991). The findings show that students' behaviors of resistance are common among other classes because the students feel it is a legitimate medium of expression and reaction in the classroom (Alpert, 1991). It is recommended to not keep the students productive for the entire class time because it will lead to behaviors such as socializing with their classmates, walking around the room, daydreaming, etc.

In addition to the factors which affect student resistance, there are factors which affect the actual participation in the classroom. Four factors affect student participation: (1) class size; (2) gender balance; (3) discipline of the course; (4) instructor behavior; and (5) instructor behavior (Crombie, 2003). Students said that in

larger classes, they are more reluctant to participate; in courses which are concerned with arts and social sciences, there is higher student participation than in courses with math and sciences (Crombie, 2003).

Lastly, Howard and Henney (1998) reported that were three kinds of verbal contributions of students during class: (1) student initiated interactions; (2) instructor initiated interactions; and (3) directed questions. Student initiated interactions were the instances where the students interrupted the instructor's discussion to ask a question or make a comment without the invitation to do so (Howard & Henney, 1998). Instructor initiated interactions were the instances where the instructor invites students' comments and questions towards one student and he or she answered, it was considered a direct question. Students also enumerated reasons why they would participate in class. The most common answer of the students were that they participated in class was that they were "seeking information or clarification" (Howard & Henney, 1998). The other reasons why they participated were that they learned by participating, they have something to contribute to the class, and they enjoy participating. In addition to that, students gave their reasons for non-participation in their class. The reasons are as follows: (1) they felt that their reasons were not well formulated enough; (2) they felt they knew little about the subject matter; (3) they did not do the reading assignment; and (4) the class size was large (Howard & Henney, 1998).

Previously Used Scales

Crombie (2003) used the 24-Item Classroom Experience Questionnaire for his study. This scale measured the students' perceptions of their own behavior, of other students' behavior, and of their instructor's behavior (Crombie, 2003). The scale was broken down into three parts: (1) the activity level, which measured students' perceptions of their general level in class; (2) students' perceptions of their own behavior, which measured the frequently used method of raising one's hand in class and interrupting; and (3) students' perceptions of their instructor's behavior, which measured the instructor's "positiveness", personalizing, and probing for elaboration (Crombie, 2003). The last factor measured more of the instructor's reaction to the students' participation; such how much he encouraged the student for elaboration, and how often the use of the student's name was used.

Howard and Henney (1998) then used three scales in their study. The first scale was the Individualized Classroom Environment Questionnaire (ICEQ). It is five ten-item scales which measures the perceptions of classroom environment (Howard & Henney, 1998). It answered using a 5-point scale with responses Almost, Never, Seldom, Sometimes, Often, and Very Often. The five scales are personalization, participation, independence, investigation, and differentiation (Howard & Henney, 1998). An example of a participation item is, "There is a class discussion" (Howard & Henney, 1998). The second scale is the Classroom Environment Scale (CES). This questionnaire is composed of ninety items of true or false questions which are divided into nine subscales. These subscales are involvement, affiliation, teacher support, task orientation, competition, order and organization, rule clarity, teacher control, and innovation (Howard & Henney, 1998). An example of an involvement question is,

"Most students in this class really pay attention to what the teacher is saying" (Howard & Henney, 1998). The last scale used is the My Classroom Inventory (MCI). This scale was the simplest, as it was made for 8-12 year old students to answer and it was composed of only thirty-eight yes or no items (Howard & Henney, 1998). MCI had five subscales: satisfaction, friction, competitiveness, difficulty, and cohesiveness (Howard & Henney, 1998). An example of the satisfaction item is, "This class is fun" (Howard & Henney, 1998).

Method

Test Design

Originally, the scale developed by the researchers was composed of one hundred (100) items which they administered to three hundred (300) college students who have already taken at least one major class during the course of their stay in the university. Both genders were included as well as the variety of nationalities. These students came from different year levels and different colleges (Business and Economics, Liberal Arts, Computer Studies, Education, Engineering, and Science). The scale was equally divided into four (4) sections having twenty-five (25) items per sub-scale. The scale used a 5-point Likert scale that measures frequency of how often they follow the said behavioral description. These five points are as follows: (1) Very Seldom; (2) Seldom; (3) Sometimes; (4) Occasionally; and (5) Often.

Search for Content Domain

This factors used in the present study were student participation, its factors namely bank of knowledge, civil attention, interactive facilitative orientation, and knowledge transmission orientation, in the classroom setting. These subscales can be used by universities who wish to employ the transformative learning pedagogy for their students, as transformative learning is more student-centered rather than teacher-directed. This scale can also provide local researchers more information to how private school students in the Philippines behave in the classroom environment. It can also be a stepping stone for other developing nations who wish to study classroom participation of their students in their own countries' classrooms.

Item Writing and Review

The items used in this scale were reviewed by a faculty of English and applied linguistics and educational leadership. A checklist was provided to both faculties where they could judge which items to remove, retain, and/or revise. After having received the updated checklist, the researchers revised the necessary items deemed to be redundant.

Data Analysis

Preliminary Model and Revised Model. Originally, the researchers based their model on the Student Participation Factors model of Howard, Short, and Clark (1996).

The researchers decided to revise the previous model to make it more uniform and because of the insignificant value for its Cronbach's alpha. The researchers decided to remove the only positive factor, Interactive Facilitative Orientation. They equally divided the items of these factors and omitted one so that all three factors will be added 8 additional items. The score/value of the transferred items were switched to its negative coefficient since the other three factors were switched to its opposite in the Likert scale as well. The revised scale is now composed of ninety-nine items with 33 items per factor. All these items are negatively stated and the answers are thus inverted in the scoring of the scale.

Cronbach's Alpha. The researchers used several types of reliability measures. One of the statistical methods used by the researchers is the Cronbach's alpha reliability. The researchers particularly utilized this reliability test because of one of its key features which is that it gives assessment a multi-dimensional purpose. It views student participation not just as a whole but it emphasizes the different parts that make up assessment which in the researchers' case were the factors provided by Howard, Short, and Clark (1996). Preliminary to all other statistical methods used in the scale, the researchers decided to get the value of the Cronbach's alpha first to check the original scale's reliability. After conducting this to the original scale, the researchers also got the value for Cronbach's alpha in the second model.

Confirmatory Factor Analysis. Confirmatory Factor Analysis (CFA) was conducted for the scale in order to check how many factors can be rationally extracted from the model. This also tests the reliability of the scales/models.

Goodness of Fit Indices. The goodness of fit was used to check if the respondents and their results were of good fit to the scale. Noncentrality fit indices and single sample fit indices were the ones utilized by the researchers to check the goodness of fit of both scales.

Correlations and Covariances. Correlation matrices of both scales were by the researchers to show the relationship of each factor towards each other. Covariance matrices were also done to show how dispersed the values of each factors are.

Results

Cronbach's Alpha

With the original scale, the problem is that the Cronbach's alpha value is low. Its original value was 0.0898. Because of this, the researchers decided on creating or modifying the model into a new model for the scale. In the revised scale, the Cronbach's alpha was smaller as compared to the first scale which was solely based on the premise that student participation is composed of three negative factors and one positive factor. The value of the second scale's Cronbach's alpha is -.11348.

Table 1
Cronbach's Alpha of Original Scale

	M if Deleted	Var. if Deleted	SD if deleted	Item-Total Corralation	Alpha if deleted
IFO	149.12	54.52	7.38	.06	.03
BK	199.41	56.81	7.54	.02	.10
CA	198.82	53.23	7.30	.05	.05
KT	199.12	58.13	7.62	.03	.09

Note. Mean=248.82, SD=8.73, N=300, Cronbach's alpha=.089, IFO=Interactive Facilitative Knowledge, BK=Bank of Knowledge, CA=Civil Attention, KT=Knowledge Transmission Orientation

Table 2
Cronbach's Alpha of Revised Scale

	M if Deleted	Var. if Deleted	SD if deleted	Item-Total Corralation	Alpha if deleted
BK	264.02	48.33	6.95	-.08	.02
CA	264.91	43.36	6.58	.00	.00
KT	264.10	50.14	7.08	-.07	.00

Note. Mean=396.52, SD=8.28, N=300, Cronbach's alpha=.089, IFO=Interactive Facilitative Knowledge, BK=Bank of Knowledge, CA=Civil Attention, KT=Knowledge Transmission Orientation

Confirmatory Factor Analysis

In the Conformity Factor Analysis, the researchers utilized the Statistica program to evaluation the facet-to-domain analysis of data. The researchers' model shows the significance of each factor to student participation as a whole. Though the original had a better fit.

Figure 1
CFA Model of the Original Scale

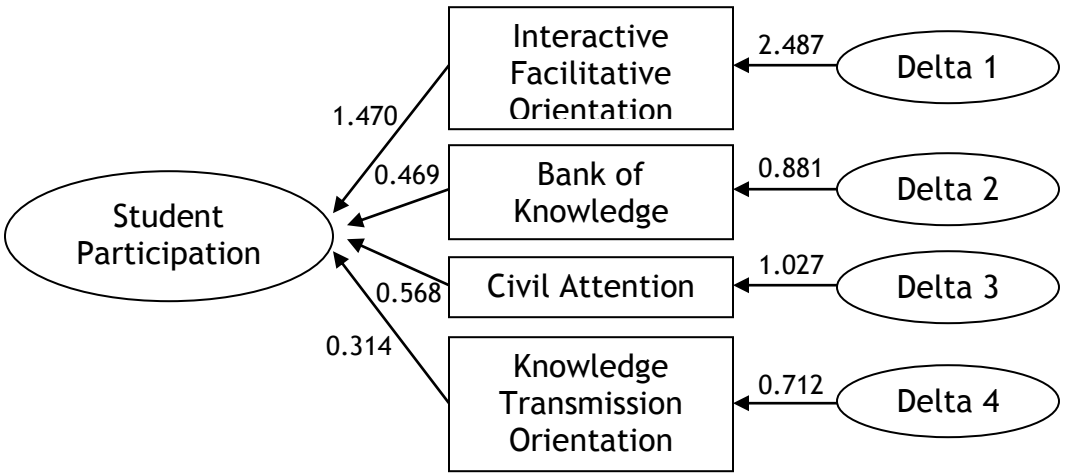
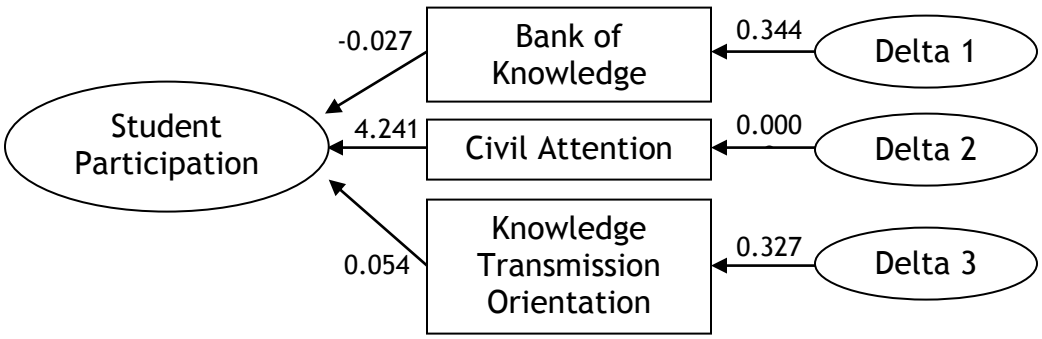


Figure 2
CFA Model of the Modified Scale



Single Sample and Noncentrality Fit Indices

The single sample fit indices of both scales were estimated and compared. Based on these measurement of goodness of fit, the modified model was not a better scale such that the values did not increase in its goodness of fit which means that the respondents who took this scale wasn't fit for it or vice versa. This goes the same to the results of the noncentrality fit indices.

Table 3
Single Sample Fit Indices of the Original and Modified Scale

	Model 1 Original Scale	Model 2 Modified Scale
Joreskog GFI	0.999	0.992
Joreskog AGFI	0.995	0.951
Akaike Information Criterion	0.055	0.046
Schwarz's Bayesian Criterion	0.155	0.108
Browne-Cudeck Cross Validation Index	0.056	0.046
Independence Model Chi-Square	1.946	3.746
Independence Model df	6.000	3.000
Bentler-Bonett Normed Fit Index	0.708	0.009
Bentler-Bonett Non-Normed Fir Index	0.72	0.782
Bentler Comparative Fit Index	0.72	0.638
James-Mulaik-Brett Parsimonious Fit Index	0.236	0.003
Bollen's Rho	0.124	-1.974
Bollen's Delta	-28.933	0.012

Table 4
Noncentrality Fit Indices for the Original and Modified Scale

	Lower 90% Conf. Bound	Point Estimate	Upper 90% Conf. Bound
Original Scale			
Population Noncentrality Parameter	0.000	0.000	0.012
Steiger-Lind RMSEA Index	0.000	0.000	0.079
McDonald Noncentrality Index	0.994	1.000	1.000
Population Gamma Index	0.994	1.000	1.000
Adjusted Population Gamma Index	0.969	1.000	1.000
Modified Scale			
Population Noncentrality Parameter	0.000	0.009	0.043
Steiger-Lind RMSEA Index	0.000	0.095	0.206
McDonald Noncentrality Index	0.979	0.996	1.000
Population Gamma Index	0.972	0.994	1.000
Adjusted Population Gamma Index	0.835	0.964	1.000

Correlation Matrices

In Tables 5 and 6, the correlation matrices of both scales are shown. It shows that there are more dispersed variable relationships in the second scale as compared to the first. This could mean that the factors in the original scale are more related with each other.

Table 5
Correlation Matrix of the Original Scale

	IFO	BK	CA	KT
IFO	1.00	--	--	--
BK	0.04*	1.00	--	--
CA	0.04*	0.01*	1.00	--
KT	0.02*	-0.02*	0.04*	1.00

Note. IFO = Interactive Facilitative Orientation; BK = Bank of Knowledge; CA = Civil Attention; KT = Knowledge Transmission Orientation
*p<.05

Table 6
Correlation Matrix of the Modified Scale

	BK	CA	KT
BK	1.00	--	--
CA	-0.04*	1.00	--
KT	-0.11*	0.01*	1.00

Note. BK = Bank of Knowledge; CA = Civil Attention; KT = Knowledge Transmission Orientation
*p<.05.

Covariance Matrix

The covariance matrices of both scales were also examined. These matrices show that the original scale only had one negative relationship between factors which is bank of knowledge with knowledge transmission orientation. The rest of the factors have a direct relationship which means that if someone gets a high score in one of the factors such as Bank of Transmission, he/she is most likely to have a high score for civil attention given that they have a positive covariance. As for the second scale which is found in Figure 16, it has two factors that are in an indirect relationship. These factors are civil attention and knowledge transmission orientation both with bank of knowledge.

Table 7
Covariance of Original Scale

	IFO	BK	CA	KT
IFO	17.52	0.82	0.75	0.42
BK	0.82	17.87	0.16	-0.32
CA	0.75	0.16	19.48	0.74
KT	0.42	-0.32	0.74	16.18

Note. IFO = Interactive Facilitative Orientation; BK = Bank of Knowledge; CA = Civil Attention; KT = Knowledge Transmission Orientation

Table 8
Covariance of Modified Scale

	BK	CA	KT
BK	25.71	-0.10	-2.72
CA	-0.10	24.81	0.23
KT	-2.72	0.23	23.23

Note. BK = Bank of Knowledge; CA = Civil Attention; KT = Knowledge Transmission Orientation

Discussion

The original scale was a better scale in terms of goodness of fit as to the modified scale but it still showed poor Cronbach's alpha as well as the values of its parameter estimates and standard error values.

Revised Model Validity and Reliability

The revised and modified model actually shows smaller standard error values but then its parameter estimates are more dispersed as compared to the original scale. The researchers decided to get the reliability and validity of this new model through Confirmatory Factor Analysis, Cronbach's Alpha, and the other Indices (both single sample and noncentrality fit) to measure the goodness of fit of this new model.

The original scale's discrepancy function which is 0.002 shows that it is a good fit because it should really be less than 5. Next, the Maximum Likelihood (ML) Chi-Square (χ^2) is equivalent to 0.568 which should not be significant therefore it is a good fit. Then, the Root Mean Square (RMS) Standardized Residual is equivalent to 0.014 which is less than 0.06 and thus, it is a good fit.

The scales' Steiger-Lind RMSEA Index is equivalent to 0.00 which is also a good fit because it should be less than 0.05. Its McDonald Noncentrality Index is also 0.994 and is again a good fit since it should be greater than 0.95. The Population Gamma Index is 0.969 which is greater than 0.95 and is a good fit.

The scales' Joreskog GFI is equivalent to 0.999 which is not a good fit since it should be greater than 0.95. Its Joreskog AGFI is equivalent to 0.995 which is greater than 0.90 is a good fit. Its Akaike Information Criterion (AIC) which is 0.055 is less than 1.0 and thus a good fit. However, the Bentler-Bonett Normed Fit Index is 0.708 is not a good fit since it should have been greater than 0.90.

All in all, 9 out of 10 criterions showed that the original scale is a good fit so we can say that it is the more acceptable model.

Arriving at this conclusion brings us back to the original purpose of this scale. We aimed to create a scale and we also aimed at checking the factor structure of the model. In Howard, Short, and Clark's (1996) framework on student participation, based on the results that we have gathered, these factors are indeed factors that compose student participation. Though some may be negative, they help in measuring student participation as well. Because of this, the researchers have concluded that student participation really is better with the four factors complete as compared to that of the three negative factors alone. They have proven that student participation is a two-faceted figure that has both a positive and negative side that need not have an equal ratio with each other. Visibly, it is rarely seen that there are more ways to measure if a student does not participate in class as compared to measuring a student that really participates. This statement is backed up by the existence of the three negative factors of student participation and its ratio to the only positive factor which is interactive facilitative orientation. In contrast to the modified three-factor model, though it was more uniform in structure, the results showed that student participation cannot best be measured only in one area or that measuring the absence of participation will not suffice.

The four factors namely bank of knowledge, civil attention, knowledge transmission orientation, and interactive facilitative orientation are of significant importance in the measure of student participation. To fully support this statement, the researchers have broken down into simpler explanations how each factor is truly important to the latent variable that is student participation. It is *evident* in a regular classroom setting that these four factors exist. For the first factor which is bank of knowledge, there are truly students who only rely on the instructor's knowledge for their own learning. Some students do not wish to participate and they simply comply with what the instructor is stating. The instructor then becomes *their* bank of knowledge (Howard, Short, & Clark, 1996).

The second factor, civil attention, can also truly be proof enough of the lack of student participation and this is usually *felt* by the instructor. It may not be physically

seen but it can be tested that there will be students who don't participate and who only *pretend* to be listening (Howard, Short, & Clark, 1996).

The third factor, knowledge transmission orientation, exists in its context as "surface learning" which all learners undergo. It is when students learn simply because they find it necessary for extrinsic motivational desires such as simply the skill of memorizing for the sole reason of passing an examination. This happens, if not all, then to the most of the student population (Howard, Short, & Clark, 1996).

Finally, there exists the last factor which was proven important by the researchers which is the interactive facilitative orientation. The researchers tried to create the scale without measuring this factor simply to create a uniform scale that measures a more specific variable which was the absence of student participation. The problem, however, is that the researchers found out that there was no way of possibly creating a good scale without measuring the whole aspect of student participation. In short, they couldn't create a good scale that would ignore either the negative side or the positive side of student participation. In order for student participation to exist, both sides should be taken into consideration. The fourth factor, interactive facilitative orientation, is the stage where learning has fully developed. In the words of Howard, Short, and Clark (1996), it is the stage of "deep learning which focuses on the underlying meanings of projects and reading". The researchers reiterate that without this factor, there wouldn't be a good scale that would fully measure student participation as it serves important and is proven by this study that student participation *is* a two-faceted variable that needs both its negative side (absence factors) and its positive side (presence factor).

Originally, the scale was answered by students at a University in Manila in the Philippines but because of the variety of nationalities that the school has, the researchers deem it to be adapted by different cultures who wish to pursue further studies on student participation, its two facets, and its factors. Though this study only proved that the four factors previously studied by Howard, Clark, and Short (1996) truly affect student participation, there is still a great possibility that there are more factors under student participation and that student participation need not only happen during class time.

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Appendix A
Items per Factor

Bank of Knowledge – instructor has all the information and the students get their information from the instructor, while making minimal contributions

1. Whenever the teacher discusses, I listen to the teacher's lecture.
2. Whenever the teacher discusses, I take down notes.
3. Whenever the teacher discusses, I raise my hand.
4. Whenever the teacher discusses, I ask questions.
5. Whenever the teacher discusses, I contribute my knowledge by reciting.
6. Whenever the teacher discuss, even if he/she doesn't call my attention, I make side comments.
7. My teacher calls on me when I raise my hand.
8. My teacher always leads class discussions.
9. I participate in class discussions despite the size of the class.
10. I participate in class discussions despite the gender-biased topics or issues.
11. I participate in class discussions despite unclear concept of the topic in class.
12. I answer the teacher's questions during class discussions.
13. I answer the teacher's questions during class discussion in a clear, modulated voice.
14. I answer the teacher's questions during class discussions in complete thoughts.
15. I disrupt the class discussion to ask a question.
16. I disrupt the class discussion to make a comment.
17. I ask questions during a lull in the general discussion or conversation.
18. I make comments during a lull in the general discussion or conversation.
19. I read the text selections during class whether or not it was assigned on that day or not.
20. I ask questions during class discussions when the teacher invites the class to do so.
21. I make comments during class discussions only when the teacher invites the class to do so.
22. I answer the question when the teacher directs it towards me.
23. I answer the question, even though the question was directed to someone else.
24. I make comments when the teacher directs a question towards me.
25. I make comments aloud, even though the question was directed to someone else.

Civil attention – students appear to be paying attention to mask that they are not focused on what is being discussed

1. I make efforts in attending class.
2. I make sure to bring my homework.
3. I keep quiet during lecture time.
4. I usually nod my head in class whenever someone is discussing.
5. I take down notes or draw in my notebook/paper while the discussion is going on.
6. There are extra things in my notes that are not necessarily relevant to the discussion.
7. I am thinking of other things that are not necessarily related to the lesson.
8. I activate my imagination in class.
9. I keep my mind busy during discussions such that I don't necessarily think of what the lecturer is saying.
10. I read other things that are not necessarily inclined to the lesson during class time.
11. I catch up with friends/acquaintances during class time.

12. I prefer to do homework during discussions (whether or not if it's in that class).
13. I find ways to keep myself awake during discussion.
14. I listen to other people's conversations in class.
15. I make side comments which I keep to myself.
16. I tend to tell my seatmates what's on my mind (side comments, ideas, etc.) in class.
17. I read other texts in class.
18. I write down my thoughts during class discussion.
19. I text during class time.
20. I use any other technical devices such as iPods/MP3 players while class is going on.
21. I listen to what's going on outside the classroom.
22. I speak up my mind whenever something distracts me in class.
23. I skim through whatever is on my desk (notebook, books, etc.) while class in on-going.
24. I try to maintain eye contact with the teacher during discussion.
25. I wait for the teacher to call me before I recite.

Interactive facilitative orientation – process of "deep learning" which focuses on the primary subject/topic through the uses of materials and outputs

1. I review my notes before I go to class.
2. I review my notes after I go to class.
3. I read my handouts whenever they are given.
4. I read the texts assigned in class.
5. I take down notes while the lecture is going on.
6. I take down notes to sum up what I have learned in class.
7. I listen clearly in discussions.
8. I voluntarily raise my hand for class recitations.
9. I focus my attention to what is happening in class during class time.
10. I finish my homework.
11. I make sure that whatever I submit is something that is worth submitting.
12. I review for my quizzes.
13. I list down important details whenever I review my notes.
14. I re-write my notes to check its accuracy.
15. I re-write my notes for organizational purposes.
16. I do additional library researches to back-up my understanding in class.
17. I do additional online researches to back-up my understanding in class.
18. I talk to other about what I understand in class.
19. I ask my teacher/s whenever I don't understand something in class.
20. I ask others about their insights of the lessons in class.
21. I listen attentively when other people are reporting in class.
22. I have my own learning log for my classes.
23. I make sure I fully understand every lesson discussed in class by discussing it to my classmates.
24. I ask the teacher questions during class discussion to further validate my understanding.
25. I listen to the different views that other people have about a lesson in class.

Knowledge transmission – students only memorize given material for the examinations

1. I review my notes before examinations.
2. I take down notes that can serve as guide for my examinations.

3. I write my own reviewer for examinations.
4. I listen attentively in class as a form of self-review.
5. I make sure I have a copy of the text that will be used for the examination.
6. I review the text for the examination.
7. I memorize the text for the examination.
8. I write down important terminologies that I need to memorize.
9. I ask someone to check if I have clearly memorized the keywords that might appear before an examination.
10. I listen during discussion and list down keywords that I think might appear in an exam.
11. I listen whenever my classmates review important keywords in class.
12. I suggest other possible keywords to my classmates to help them review.
13. I correct others' mistaken definitions of key terms.
14. I tell others if their concept is incorrect.
15. I only read to memorize.
16. I listen and repeat whatever is said by the teacher.
17. I talk while memorizing.
18. I verbalize what I'm reading to make memorizing easier.
19. I apply different reading strategies to help me memorize what I'm reading for an exam.
20. I memorize for an examination and focus only on what my teacher's exact words are.
21. I write down what I have memorized.
22. I create a checklist of the things that I need to memorize.
23. I listen well and mentally repeat what the teacher says in class.
24. I do a verbatim type of note-taking to make memorizing accurate.
25. I intend to be accurate whenever I define a concept/terminology thus avoiding a personal definition of it.

A scale was constructed to measure Achievement Goal Orientation of college students in mathematics. A sample size of 119 college students was asked to complete the scale. The scale made use of a five-point Likert scale with 80 items. The data was analyzed using Confirmatory Factor Analysis (CFA). Results showed the the hypothesized subscales to have significant parameter estimates. The obtained goodness of fit was adequate. Furthermore, the use of the Cronbach's Alpha showed that the attained values were reliable.

Keywords: Achievement Goals, Affective Scale, Math

Achievement Goals in Mathematics

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One of the most useful scales to measure the involvement of the students inside the classroom as well as their participation and motivation is the achievement goals. Elliot and Murayama (2008) describe the achievement goals as a cognitive dynamic wherein the primary focus is the competence of the students. However, in the study conducted by Cury, Da Fonseca, Elliot, and Moller (2006) they stated that the achievement goals are simply the "individuals representations of competence-based outcomes that they strive to attain or avoid" (as cited in Cury, Da Fonseca, Elliot, & Moller, 2006). Achievement goals are used to see how engaged the students are inside the classroom. How much attention they give in learning something new, or even to see if the students are willing or not through their competence level. The use of the achievement goals can also further address the relationship of the students with each other as well as its perseverance.

There are two kinds of achievement goal structures, namely the mastery goal and the performance goal. The mastery goal structure focused on describing the students wherein they believe that there is importance in learning. In the study made by Wolters (2004), it mention about the mastery goal structure which stated that it is

"an environment in which the instructional practices, policies, and norms convey to students that learning is important, that all students are valued, that trying hard is important, and that all students be successful if they work hard to learn" (Midgley et al., 1998). Mastery goal are shown by individuals who value learning something as well as understanding and their mastery of the task. Another kind of achievement goal structure is the performance goal which shows the ability and capacity of the students. This kind of structure is based on the different level of performance of the students. Wolters (2004) again made mention of the performance goal structure as "an environment that communicates to students that being successful means getting extrinsic rewards demonstrating high ability, and doing better than others" (Midgley et al., 1998 as cited in Wolters, 2004). It shows how the students present themselves and also how they compare themselves with other students. This structure brings up the demonstrating ability of the students through their performance inside the classroom.

Certain points have been raised in the achievement goal orientation. As cited by Nicholls (1989, 1992) in the article of Kaplan et al, Nicholls pointed out that "success in a task is defined by deep understanding and that success in school can be achieved through strategies such as working hard, cooperating with others, helping others, and trying to understand " fall under the mastery goal. However, if the student "believed that success in a task is defined by demonstrating high ability and endorsed strategies for success such as trying to do better than others, impressing others, and behaving as if you like the teacher this shows that the student possesses the performance goal (Nicholls, 1989; 1992 as cited in Kaplan, Lichtinger & Gorodetsky, 2009).

In the study of Daron et al, they stated that the mastery goals is the "desire to acquire knowledge" while performance goals is the "desire to perform well compared with others" (as cited in Daron, Pulfrey, Butera, Dompnier, and Delmas, 2009).

There are two types of achievement goal orientation, the approach orientation and the avoidance orientation. The two types are used to classify the success and failure of an individual when it comes to achieving ones goal. The approach orientation refers to the "possibility of success while the avoidance orientation refers to the possibility of failure based on the performance being shown by the students" (Elliot, 1999 as cited in Kaplan, Lichtinger, & Gorodetsky, 2009).

Both the mastery and performance goal structure are considered as the competence of the students. Mastery as the intrapersonal standard focuses only on the learning of an individual and performance as the normative standard which focuses on an individual's performance (Elliot & Maruyama, 2008). In the study of Elliot and Maruyama (2008), they raised the valence dimension of competence which talked about the distinction between the approach and avoidance orientation. That the "competence may be valenced in terms of whether it is focused on a positive possibility to approach (i.e., success) or a negative possibility to avoid (i.e.,failure)" (as cited in Elliot and Maruyama, 2008). This gave rise to the revised achievement goal wherein they integrated the achievement goal structure with the achievement goal orientation. There are now four possible factors such as the *mastery-approach* which focused on students who are attaining task-based or the intrapersonal competence, the *performance-approach* which focused on students who are after the

normative competence, the *mastery-avoidance* which focused on the students who are avoiding task-based or the intrapersonal incompetence, and lastly, *performance-avoidance* which focused on the students who are avoiding normative incompetence (Elliot & Maruyama, 2008). Daron et al, mentioned that the division of the performance goals lead to performance approach goals which means that students are "trying to outperform others", while the performance avoidance goals means that students are "trying to not perform more poorly than others" (as cited in Daron, Pulfrey, Butera, Dompnier, and Delmas, 2009).

Kaplan, Lichtinger, and Gorodetsky (2009) as well made use of the achievement goal orientation in line with student's engagement in the classroom. The achievement goal orientation showed the different scenarios in which the student's engagement can be measured. Kaplan et al used the mastery approach goal as "engagement with the orientation towards increasing competence" mastery avoidance goal as "engagement with the orientation towards avoiding deterioration of competence or of missing opportunities for learning" performance approach goals as "engagement with the orientation toward demonstration of high ability" performance avoidance goal as "engagement with the orientation to avoid demonstration of low ability" (as cited in Kaplan, Lichtinger, & Gorodetsky, 2009).

In another study, Wolters (2008) explained the four achievement goals explicitly. Students who manifest the *Mastery Approach* are said to be focused on "learning as much as possible, overcoming a challenge, or increasing their level of competence" while students who manifest the *Mastery Avoidance,* are described as "students who work in order to avoid a lack of mastery or a failure to learn as much as possible" on the other hand, students who are said to manifest the *Performance Approach,* are said to be focused on students who "demonstrate their ability relative to others or want to prove their self-worth publicly" and lastly, students who manifest the *Performance Avoidance,* are described as "students who wish to avoid looking incompetent, lacking in ability, or less able than their peers" (as cited in Wolters, 2004).

Achievement Goal Theory

Achievement goal theory propose that students' motivation and achievement-related behaviors can be understood by considering the reasons or purposes they adopt while engaged in academic work (Ames, 1992; Dweck & Legget, 1988; Urdan, 1997 as cited in Wolters, 2004). It talks about the different responses of the students or reasons whenever they are engaged in academic work. The achievement goal theory shows the relationship of the students' competence, participation and engagement whenever they are inside the classroom.

The achievement goal theory "also proposes that the goal structure of an environment might affect students' motivation, cognitive engagement, and achievement within that setting" (Ames & Archer, 1988 as cited in Wolters, 2004).

The main factor measured in the preset study is the achievement goals which points out to four subscales namely: the mastery approach goal orientation, the mastery avoidance goal orientation, the performance approach goal orientation and the performance avoidance goal orientation.

Method

Test Design

The test was designed using a five point Lickert scale. The scale was from "strongly agree" to "strongly disagree," making "5" as the highest and "1" as the lowest. Self-made statements were constructed and given to the participants asking them to check whether they agree or not in the items.

Participants

A number of one hundred nineteen (119) students from a private college participated in the study. The researcher made sure that the students who answered the scale have a math subject or had taken a math before for reference. The sample participants have an age range from 17 years of age to 21.

Item Writing and Review

There are four subscales, therefore there are 20 items given for each subscales having a total of 80 items. The test items were reviewed by a professor from with a doctorate degree. Some items were accepted but most of the items needed revisions. Comments had also been given to better improve the items. After the item review, the comments and suggestions were taken into consideration and revisions to the scale has been made.

Procedure

The researcher asked the students if they have time to answer the scale, and if they are taking or at least were able to have taken a math subject in their school. The researcher explained to the students the use and purpose of the study. The students who participated in answering the scale were provided with a short introduction before they started answering. The researcher let the students read on the instructions given in the scale and stayed put if ever they would ask certain questions about the scale that they are to answer.

After answering the scale, the researcher thanked the students for their cooperation in taking time in answering the scale. The researcher then added that their answer in the scale will remain confidential and if ever there are still certain questions about the scale that are in need further explanations, the researcher would gladly answer them.

Data Analysis

The data gathered from the 119 participants was analyzed using the use of the Confirmatory Factor Analysis. The use of the Confirmatory Factor Analysis allowed the researcher to interpret the significance of the factors as well as the goodness of fit. The Goodness of Fit Indices was also needed in the data analysis, to compare the data and see if the given results were of good fit or not. And the Cronbach's alpha was used to test the reliability of the scale.

Results

The achievement goal scale was administered to 119 participants. The proposed model was tested using Confirmatory Factor Analysis or the CFA. The CFA also allowed to test the Goodness of Fit of the model. However, the results also showed some non-significant values and bad fit of the factors.

Table 1
Distribution of Scores

Factors	*M*	*SD*	Min	Max	95%CI(-)	95%CI(+)	Skewness	Kurtosis
Mastery Approach	3.60	.36	1.75	4.30	3.45	3.85	-1.98	7.52
Mastery Avoidance	3.22	.40	2.15	4.50	3.00	3.45	.05	.85
Performance Approach	3.14	.54	1.60	4.65	2.80	3.50	-0.27	.69
Performance Avoidance	3.22	.55	1.30	4.40	2.90	3.65	-0.85	1.04

Among the subscales, the Mastery Approach or the MAP showed the highest mean (3.60) followed by the Mastery Avoidance and Performance Avoidance which got the same value of 3.22 and the lowest was the Performance Approach (3.14). The lowest for the SD is the Mastery Approach (.36), followed by the Mastery Avoidance (.40), Performance Approach (.54) and the highest Performance Avoidance (.55). Furthermore, the highest in Kurtosis was the Mastery Approach (7.52) while the lowest value was the Performance Approach (.69).

Table 2
Convergent Validity

	MAP	MAV	PAPA	PAV
MAP	---			
MAV	.24*	---		
PAP	.01	.13	---	
PAV	-.02	.03	.46*	---

Note. MAP= Mastery Approach; MAV=Mastery Avoidance; PAP=Performance Approach; PAV=Performance Avoidance. *p<0.05

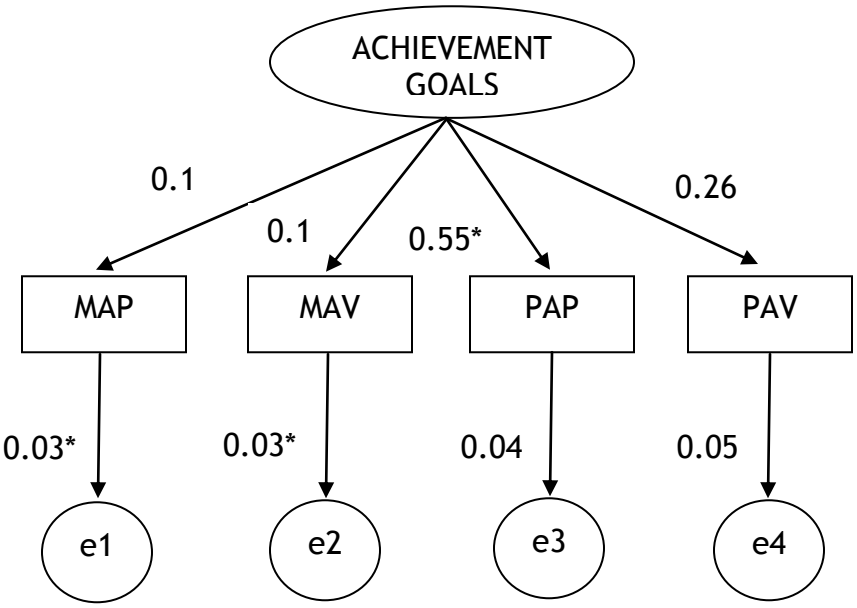
Convergent validity was conducted by correlating the factor scores of the subscales. The results showed significant correlation of the MAP and MAV (.24*) as well as PAP and PAV (0.46*).

Table 3
Cronbach's Alpha Reliability

	Cronbach's Alpha
Mastery Approach (MAP)	.81
Mastery Avoidance (MAV)	.73
Performance Approach (PAP)	.87
Performance Avoidance (PAV)	.87

The items per subscale showed high reliability by means of the Cronbach's Alpha. The Performance Approach (.87) as well as the Performance Avoidance (.87) was able to have the highest value than the rest of the Achievement Goal subscales. However, the Mastery Avoidance (.73) attained the lowest value.

Figure 1
Measurement of Achievement Goals Subscales using Confirmatory Factor Analysis



Note. MAP=Mastery approach, MAV=Mastery avoidance, PAP=Performance approach, PAV=performance avoidance.

Results from the Confirmatory Factor Analysis showed that all the subscales of of the achievement goal in mathematics have a significant value.

The Goodness of Fit shows the support of the hypothesized structure. Adequate fit was obtained for the model. The Discrepancy Function 0.002 as well as the Maximum Likelihood or the Chi Square (0.23) and Root Mean Square or the Standardized Residual (0.015) all showed goodness of fit. For the Advanced Non Centrality Based Indices, the Steinger-Lind RMSEA Index (0.000), McDonald Noncentrality Index (0.98) and the Population Gamma Index (0.98) that also showed goodness of fit. A number of Single Sample Fit Indices also showed goodness of the items such as the Joreskog GFI (0.99), Joreskog AGFI (0.99), Akaike Information Critereon (AIC) which had 0.15, and Bentler-Bonett Normed Fit Index which had 0.99 which all showed goodness of fit.

Other simple sample indices were also measured such as the Schwarz's Bayesian Criterion which had a value of (0.37), Browne-Cudeck Cross Validation Index (0.16), Independence Model Chi-Square (37.87), Independence Model df (6.00), Bentler-Bonette Non-Normed Fit Index (1.15), Bentler Comparative Fit Index (1.00), James-Mulaik-Brett Parsimonious Fit Index (0.17), Bollen's Rho (0.97) and Bollen's Delta (1.02).

Discussion

The use of the Confirmatory Factor Analysis shows the number of common factors and if those factors fit the model to the observed data. It also shows support

to the hypothesized structure such as the achievement goals are said to measure four subscales. Furthermore, it also measures the participation and motivation of the students. Under this factor are four subscales that further support achievement goal which are the mastery approach, mastery avoidance, performance approach and performance avoidance. The items in the mastery approach show the focus of the students on intrapersonal competence. For the mastery avoidance, it shows the intrapersonal incompetence, where the students try to avoid the task. For the performance approach, the focus of the items is on the students' normative competence, while the performance avoidance focused on the students' avoidance in normative incompetence. In this study, it showed in the results that the items formed under their respective factors turned to be significant. Such as in the use of the CFA, it showed that only all of the subscales attained the significant value. Also, to further support the factor structure of achievement goals, the models' goodness of fit indices were also tested. It showed that the model with four subscales attained an adequate fit. The goodness of fit was measured among the basic indices, non-centrality Indices and the single sample indices. Most of the values acquired shows that the scale is in good fit.

The reliability of the scale was further determined using Cronbach's alpha. The mastery approach had a value of .81, the mastery avoidance had a value of .73, the performance approach had a value of .87 which is also the same with the performance avoidance. All of the subscale showed scores that are close to 1.

The sample size affected by the results of the present study. There was only 119 students as participants who answered the scale. And since the data made use of the CFA, it is in need of a larger sample size. It is suggested that future studies have at last a sample size with high statistical power (N=380) students to be part of the study to achieve the significant results. However, even if the there was a lack of participants in the study, some of the results showed significance. But of course, to have a better understanding and interpretation of the study, the need for a larger range of data is needed.

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Appendix
Revised Items

1. I try to memorize the formulas needed for problem solving.
2. I strive to understand the content of the whole lesson as carefully as possible.
3. I enjoy learning new topics.
4. I study hard for exams.
5. I enjoy memorizing formulas.
6. I actively participate in class.
7. I do not chat with my seatmate especially when there is a new topic being taught.
8. I go to school everyday.
9. I listen to the lessons attentively.
10. I learn so many things whenever I go to school.
11. Learning is fun.
12. Learning something new from the lesson makes me happy.
13. I try to familiarize myself with the computations for each formula.
14. I copy notes during discussions.
15. I avoid cutting classes.
16. I stay up all night to study for the test the next day.
17. Whenever I get home, I immediately go to my room and study.
18. I spend more time studying than watching television.
19. I'd rather listen to my teacher rather than my seatmate.
20. After classes, I usually go to the library to study.
21. It makes me worry that I am not learning enough of the topic given.
22. I strive to avoid having an incomplete understanding of the lesson.
23. I think I learn less of the topic.
24. Whenever there is a new topic, I feel that I learned only few from it.
25. I am scared whenever I cannot understand the computations.
26. Sometimes, I am terrified that I am the only one in class who doesn't have a full understanding of the lesson.
27. I strive to at least learn something rather than nothing.
28. I feel that I am not learning from my past lessons.
29. I feel that I have a less awareness of what is needed to do whenever we have problem solving.
30. I feel that I always have an incomplete understanding when it comes to computations.
31. I am satisfied even if I just have a little understanding of the lesson.

32. I feel worried whenever I cannot understand the steps in problem solving.
33. After attending classes, I feel like I did not learn much of everything that was discussed.
34. Every time we would have a quiz on computations I always forget the next step.
35. I am striving to avoid an insufficient memory of the formulas needed for the tests.
36. During tests, I feel like I could not answer half of it.
37. It is hard for me to remember the step by step computations.
38. During problem solving, I usually forget the formula that is needed.
39. At the start of the period, I already have a feeling that I will not learn much from it.
40. When it comes to numbers, I usually have mental blocks.
41. My goal is to have higher grades than the other students.
42. I love competition.
43. My goal is to make sure that I do better than the other students.
44. It is important for me to perform better than other students.
45. I ask for bonus points to make my grade higher.
46. I make sure that my grades will all be 4.0.
47. It is important for me to excel especially during periodical tests.
48. To become first in class is my top goal.
49. During exams, I make sure that I get the highest score.
50. I make sure that my grades are higher than my classmates at all times.
51. My goal is to pass the test.
52. I strive to be the top 1 in the class.
53. I try my best in beating my classmates in by having the highest score especially in math.
54. Being on top of everyone is one of my priorities.
55. My goal is to have a grade that will stand out of the whole class.
56. Every time we would have a quiz, I compete with my friends on whose going to get the highest grade.
57. During recitations, I make sure that the teacher calls me more than my classmates.
58. I do not help my classmates during problem solving activities in the classroom so that I'll be the only one to get the highest grade.
59. I do my best to excel in class.
60. I make sure that the teacher would give me more compliments than my classmates.
61. My aim is to at least have a passing grade rather than a failing mark.
62. I strive to avoid performing worse than my classmates during exams.
63. My goal is to avoid having the lowest grade in problem solving compared to others.
64. I try my best to avoid having the lowest score in seat works.
65. During graded recitations, I feel embarrassed whenever I give out wrong answer.
66. I am worried whenever I feel than I have the lowest rank in class.

67. My goal is to maintain a grade not lower than my classmates.
68. During exams, I make sure that I don't get the lowest score.
69. To perform poorly than my other classmates is what I strive to avoid.
70. I am scared whenever my classmates perform better than me.
71. I try to maintain an average grade.
72. During problems solving I try to not finish last.
73. Whenever I get a low grade, I ask my classmates their grades to see if anyone got a grade lower than mine.
74. Being the slowest learner in class makes me feel embarrassed.
75. I strive to avoid being the lowest in the class rank during card distribution.
76. During quizzes, I make sure that I am not the last person to leave the room.
77. I feel ashamed whenever I get the lowest score in the test.
78. During group works, I make sure I don't get the hardest part.
79. I avoid trying to do things I know I cannot do.
80. During graded recitations, I try to perform an equation that is not worst than the answer of my classmates.

Academic Engagement Scale for Grade School Students

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An Academic Engagement Scale for Grade School Students (AES-GS) was constructed with 102 items. There are 34 items in each of the three subscales (Behavioral, Emotional and Cognitive). The AES-GS was administered to 250 sixth and seventh graders. Data was analyzed using Confirmatory Factor Analysis (CFA), Convergent Validity, and Cronbach's Alpha. Results indicate the reliability of the scale is high because it has a Cronbach's Alpha of .89. There were three models constructed using CFA. The second model showed to be the best fitting where the removal of Items 11-20 improved the results also indicating significant parameter estimates.

Keywords: Academic Engagement Scale, Grade School

Previous studies done on engagement in the classroom setting have explained two significant aspects, the indicators (inside the construct) and the facilitators or causal factors (Skinner, Furrer, Marchand and Kindermann, 2008). It is essential to distinguish such because it would help to determine which aspect effectively supports the student in an academic setting. This is essential in segregating facts that actually measure engagement not as a metaconstruct. Studies also indicate that student engagement changes with additional years in school. Years in school is a contributor to student achievement as well as has its possible negative effects (if low or absent within the learner) that results to dropping out of school and other teenage mishaps (Hughes, Luo, Kwok, & Loyd, 2008; Skinner, Furrer, Marchand and Kindermann 2008). There is also that issue of early engagement as predictors of achievement and engagement types as stable or continuously changing thru time (Ladd & Dinella, 2009). Therefore, it is necessary to measure academic engagement accurately.

There are many types of engagement such as interpersonal, community, and academic. Scales measuring all three levels of students' engagement

have also been made including items in an academic scenario such as "I would highly recommend that other students take this course." and "I became more interested in the field represented by this course." For community engagement, an example is "I learned about the community." In the same scale, they measure interpersonal engagement as well. For instance, under such factor is "I have developed friendships with other students" (Gallini & Moely, 2003). In the Research Assessment Package for Schools (RAPS), the students, teachers, and parents' perception of the child's engagement is also measured. For the version made for the students (RAPS-S), sample items are "I work very hard on my school work" and "I pay attention in class"(Klem & Connell, 2004). In the scale devised by the researcher, only the academic aspect is measured. In order to construct accurate items under the subscales, literature on engagement in school was used. This basically explained the construct as "the intensity and emotional quality of children's involvement in initiating and carrying out learning activities. Children who are engaged show sustained behavioral involvement in learning activities accompanied by a positive emotional tone. They select tasks at the border of their competencies, initiate action when given the opportunity, and exert intense effort and concentration in the implementation of learning tasks; they show generally positive emotions during ongoing action, including enthusiasm, optimism, curiosity, and interest" (Skinner & Belmont, 1993 as cited in Chapman, 2003). Using the definition of Chapman (2003), which states that "student engagement depict students' willingness to participate in routine school activities, such as attending classes, submitting required work, and following teachers' directions in class" (Chapman, 2003), it has made engagement for academic purposes easier to measure.

Academic engagement contains three subscales namely, behavioral, emotional and cognitive. Behavioral Engagement is "involvement in academic and social or extra-curricular activities" (Hughes, Luo, Kwok, & Loyd, 2008). Under this are three components: (1) Behavior related to learning which is "effort persistence, concentration, attention, asking questions, and contributing to class discussions", (2) Compliance, which is shown in abiding by school rules and regulations, as well as misbehavior i.e. cutting class, frequent absences etc. (3) Participation in extracurricular activities. The second subscale is Emotional Engagement that involves the "positive and negative reactions to people and activities at school" (Hughes, Luo, Kwok and Loyd, 2008). In other words, it is also the "student's feelings about school and to the degree to which they care about their school; belongingness, safety, comfort and pride in the institution; relationships with teachers and peers". Lastly, Cognitive Engagement is associated with how much the student invests in his education and how much he motivates himself. This also includes the significance of academics to the student as well as getting good grades and the ability to finish tasks while going beyond what is expected. The three dimensions helps in the complete understanding "student's relationships to their school" (Sciarra & Seirup, 2008).

There is a need to construct a scale that focuses on Academic Engagement alone using contemporary approaches. Scales devised measure classroom engagement but has rarely been focused and detailed the subscales proposed in past syudies. It is also essential to measure the level of involvement of a student to allow educators to assess as well as improve the learning environment of the student. Furthermore, in

the academic scene, the teachers should determine what motivates the student, why they choose the tasks they do, etc. The issues presented by previous studies boil down to improvement in the social support aspect of the productive pedagogy (Gore, Griffiths, & Ladwig, 2004). By measuring academic engagement, educational institutions will have a clear view of how to better the learning experiences of each student.

Method

Sampling or Participants

The scale was administered to 250 sixth and seventh grade students from a private educational institution.

Search for Content Domain

Items constructed for the Academic Engagement Scale for Grade School Students (AES-GS) were based on the studies done by Chapman (2003), Hughes, Luo, Kwok and Loyd (2008) and Sciarra & Seirup (2008). These studies were able to define engagement extensively as well as enumerate significant factors under such construct including Behavioral Engagement, Emotional Engagement and Cognitive Engagement.

Table 1
Table of Specifications for the Preliminary Test Form

Factors	Item Number
Factor 1: Behavioral Engagement	1-34
Factor 2: Emotional Engagement	35-68
Factor 3: Cognitive Engagement	69-102

Item Review and Item Writing

The division of the latent variable was based on previous studies. To measure the Academic Engagement levels of the student, there are 34 items in each subscale. Necessary revisions were made after it was reviewed by an educational psychology major, and a professional.

Scaling Technique

The scale made use of a verbal frequency scale with five as always and one as never. For negative statements, the scores were reversed. The ratings are recorded as raw scores. Clear self-referenced statements were constructed. The participants are to indicate their responses using the 5-point scale.

Pilot Testing

With the use of the comments given during item review, the scale was revised then administered to 250 grade 6 and 7 students from random schools in Manila.

Data Analysis

Exploratory Factor Analysis was initially conducted to assess the correlation of the items that goes together to form factors. It was used before the CFA. Principal Component Analysis was used in the study to create parcels among the items that were used as indicators in the CFA.

The data was analyzed using Confirmatory Factor Analysis (CFA) that aims to determine how well the items fit in the factors or subscales used in the AES-GS. CFA is used to show how well the data fits the hypothesized structure. It is also used to assess the best subscale of a construct where the parameters of the model are projected, and evaluation is done in the goodness of fit of the solution to the data.

To describe the reliability and internal consistency of items, Cronbach's Alpha was used. This type of analysis can also be used for responses that are not binary such as the verbal frequency scale and other response formats that are expressed in numbers such as the usual Likert scales. In this case, affective scales and inventories, which do not have right or wrong answers, are considered non-binary.

Convergent validity was established to confirm the relationship of the variables. A scale or a test is valid when it correlates significantly from the variables it is related to (Magno & Ouano, 2008).

Results

Score Distribution of Preliminary Pilot Data

Using the data (n=250, items = 102) in the preliminary pilot testing, mean and standard deviation per subscale were determined as well as the total mean, standard deviation, variance, skewness and kurtosis. The total mean score of the 250 test takers is *M* = 378.528. The skewness is -.370, where the score distribution tends to be negatively skewed. The kurtosis is .232, where the peak of the normal curve distribution tends to be mesokurtic (close to normal).

Factor Analysis

When factor analysis was conducted, the eigenvalues indicate that three subscales can be produced which have values that are greater than 1.00 (See Table 1).

Table 1
Eigenvalues

Value	Eigenvalue	% Total Variance	Cumulative Eigenvalue	Cumulative Percent
1	13.79	13.51	13.79	13.51
2	12.51	12.26	26.30	25.78
3	11.81	11.58	38.12	37.36

Scale Reliability

The internal consistency of the scale using Cronbach's Alpha is .89, indicating high reliability. The reliabilities, means and standard deviations for each of the subscales using the inter-item correlation are shown in Table 2. The reliability levels of the items range from .68 to .97 which indicates high internal consistency of the items.

Table 2
Cronbach's Alpha

Variable	M if deleted	Var. if deleted	SD If deleted	Itm-totl Correl.	Alpha if deleted
Behavioral Engagement	245.53	1213.20	34.83	.70	.97
Emotional Engagement	254.85	621.83	24.94	.94	.68
Cognitive Engagement	256.68	592.75	24.35	.90	.74

To test the convergent validity of the scale, the factor scores are correlated. Table 3 shows the correlations of the variables in the scale. The magnitude of the correlations are all positive indicating convergence of the factor scores.

Table 3
Convergent Validity

	Behavioral Engagement	Emotional Engagement	Cognitive Engagement
Behavioral Engagement	---		
Emotional Engagement	.73*	---	
Cognitive Engagement	.65*	.94*	---

*p < .05

Confirmatory Factor Analysis

The preliminary scale with 102 items was administered to a sample of 250 participants. The three subscales or factors measuring Academic Engagement were tested (as a results of the exploratory factor analysis) using Confirmatory Factor Analysis. In Model 1, the three factors extracted were tested which included

Behavioral, Emotional and Cognitive (each was taken separately). In the model, the three latent factors of engagement were represented with artificial parcels. The parcels are basically the grouping of the intended items under each latent factor.

Artificial parceling was conducted for the original model. This was done by adding together items scores of 10 items for each parcel. For the second model after the removal of insignificant items in the CFA, a Principal Component Analysis was conducted for each of the latent variables. This technique determined the correlations between the factors and variables through the factor loadings. The grouping of items was formed by adding items with the highest and lowest factor loadings in consecutive order (see Little, Cunningham, Shahar, & Widaman, 2002).

Table 4
Artificial Parcels

Parcels used for Models 1 and 2		Parcels used for Model 3	
PARCELS	ITEMS	PARCELS	ITEMS
APARCELB1	1-10	BPARCELB1	2, 3, 17, 25, 26
APARCELB2	11-20	BPARCELB2	4, 5, 27, 28
APARCELB3	21-34	BPARCELB3	16, 19, 22
APARCELE1	35-45	BPARCELE1	36, 43, 52, 58, 64, 68
APARCELE2	46-55	BPARCELE2	27,44, 53, 57, 65
APARCELE3	56-68	BPARCELE3	39, 46, 55, 61, 67
APARCELC1	69-80	BPARCELC1	70, 77, 83, 85, 88, 92, 101
APARCELC2	81-90	BPARCELC2	71, 73, 78, 80, 89, 96, 102
APARCELC3	91-102	BPARCELC3	69, 76 82, 84, 87, 100

Model 1: Three Factors of Engagement Using Artificial Parcels. The factor structure of the model is shown in Figure 1. The CMNI (261.215), NFI (.879), RFI (.774), IFI (.889), TLI (.790), CFI (.888) and RMSEA (.198) show an adequate fit of the first model constructed. All the parameter estimates are significant excluding ParcelB2 (.042), which is comprised of items 11-20.

Model 2: Removal of ParcelB2. Using the results from the first Confirmatory Factor Analysis, the insignificant parameter (ParcelB2) was removed. Another CFA was conducted and successfully made an improvement in the model as seen in the values of the CMNI (242.249), NFI (.887), RFI (.761), IFI (.894), TLI (.774), CFI (.893) and RMSEA (.229).

Figure 1

CFA Model 1

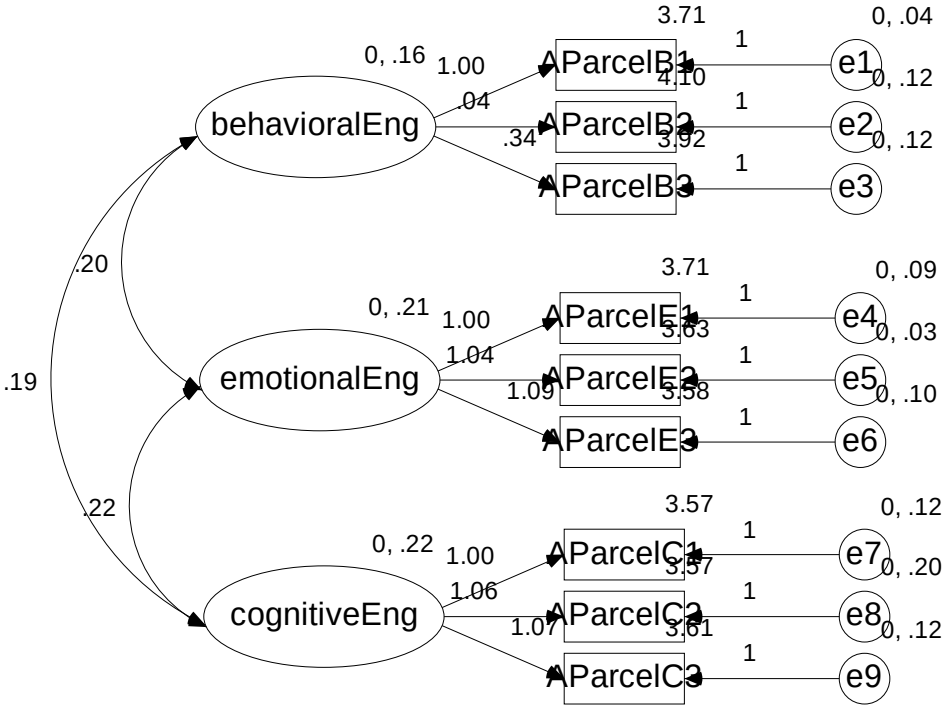
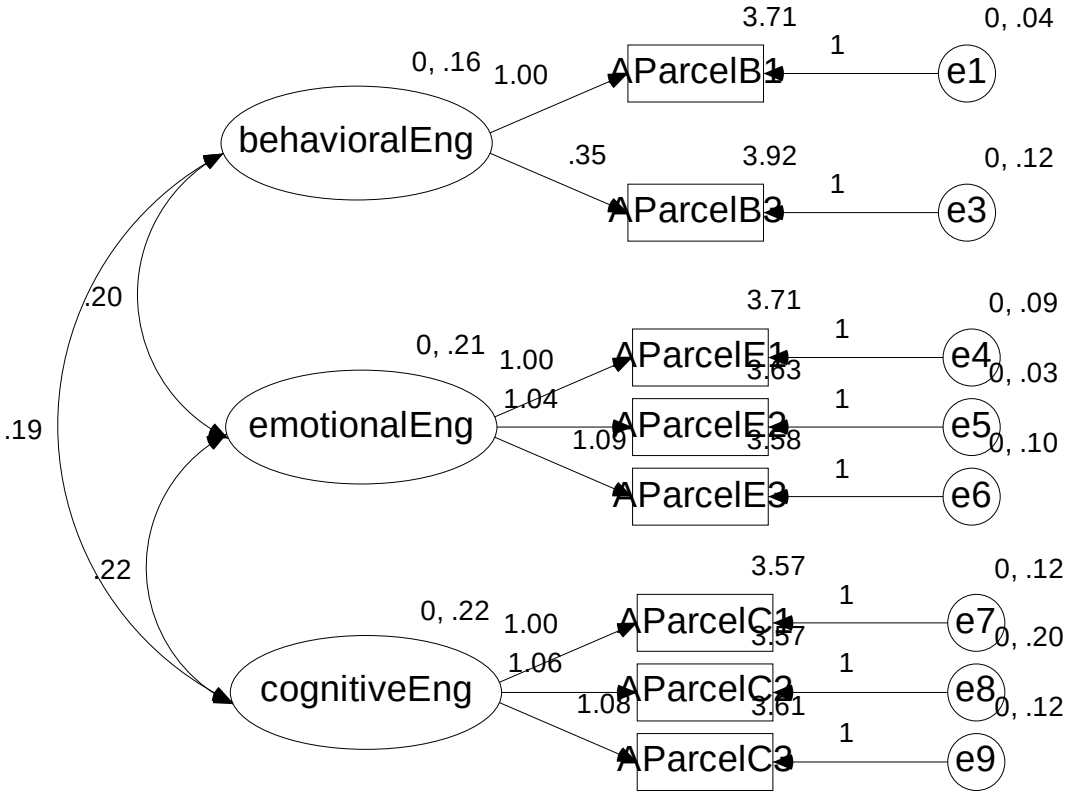
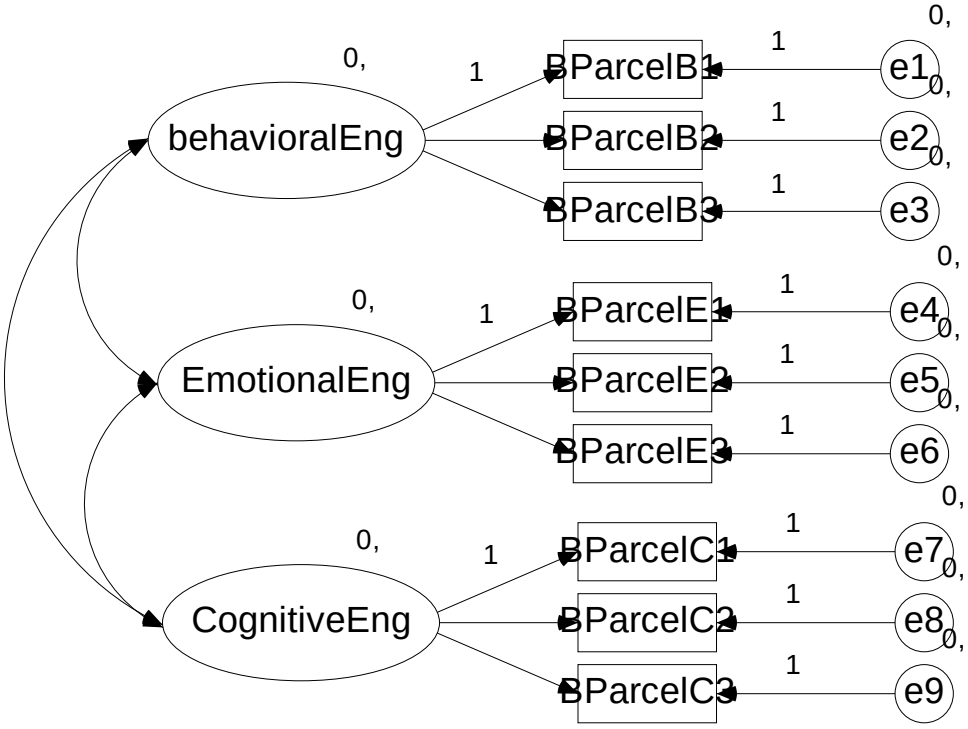


Figure 2
CFA Model 2



Model 3: Parceling Based on Principal Component Analysis. Before conducting another CFA in a new model, the Principal Component Analysis was used to classify items into new parcels for each of the latent variables (namely behavioral, emotional and cognitive). Only the items with high loadings were included when tested using CFA. However, this showed a bad fit compared to the previous two models that utilized artificial parcels. There was a CMNI of 1257.602, NFI of .336, RFI of -.246, IFI of .340, TLI of -.252, CFI of .332 and RMSEA of .451.

Figure 3
CFA Model 3



*T*he correlation matrices indicate that the three subscales used are indeed significant. Therefore, all three subscales (behavioral, emotional and cognitive) are necessary to measure academic engagement. The reliability measures are also high because the Cronbach's alpha is .885.

Through the use of Confirmatory Factor Analysis, three different models were used to determine if the how well the items fit in the corresponding manifest factors of the main construct, which is academic engagement. The first model shows significant values excluding the chi-square value. This means that the items fit the model constructed. Because the parameter estimate of ParcelB2 is not significant, in model 2, it was simply removed before conducting another CFA. As a result, it made an improvement in the items of the scale. Therefore, it would be best if items 11-20 were removed from the scale because it improved the scale. To further determine the best factor structure, the third model was constructed which resulted to a bad fit. In this study, the best model to use is model 2.

Discussion

The Academic Engagement Scale for Grade School students was devised to measure the level of engagement of a student in his education. Here, there are three subscales used to assess the entirety of academic engagement including Behavioral Engagement, Emotional Engagement and Cognitive Engagement, which were patterned from the studies done by Chapman (2003), Hughes, Luo, Kwok, and Loyd (2008) and Sciarra and Seirup (2008). It is essential to construct such a scale because it could be an avenue of improving the education of a student. With this, it would also help teachers determine what aspects the student is not able to respond well. For instance, a student does not do his schoolwork because he simply wants to move to another school, where he will be accepted by his peers. By administering such a scale to the student, the teacher will address the issue before it can become even worse. Academic engagement, above all things, is what all educational institutions must focus on due to the fact that it can determine whether the problem is within the school or the student himself.

On a larger spectrum of measuring the indicated construct of academic engagement, the modern day productive pedagogy that aids in improving teacher effectiveness has also indicated that a socially supportive environment must be established regardless of the level the teacher is handling. Without measuring student engagement (i.e. academic engagement, student control, explicit criteria, self-regulation), creating a healthy learning atmosphere for the student would be difficult. It would also hamper the child's willingness to be part of the class. Only a part of the supportive classroom environment has been solved by the researcher and that is by constructing the scale and analyzing data to improve it. Although, there were changes based on the Confirmatory Factor Analysis (CFA), the scale is ready to be used in order to assess the involvement of the child in his education. Based on the results, it is best to remove some items that are not needed in the scale and that is parcelB2 (items 11-20). Further research focusing on engagement could possibly improve the scale specifically the items that fall under each factor.

The researcher recommends that not only scales for the grade school students must be constructed. There should also be ones especially made for the grade school parents and teachers. It would be best to pattern the items in such a way that each would assess the three different types of engagement (behavioral, emotional and cognitive) in the academic arena. This was seen in the Research Assessment Package for Schools (RAPS). However, as indicated in the scope of the present study, the specific subscales that measure academic engagement was self-assessment. In the future studies, the researcher could construct a Perceived Academic Engagement Scale of Students assessed by parents and teachers. This would really aid in assessing the involvement of the child through a triangulation of perspectives.

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Appendix
Academic Engagement Scale

1. I actively recite in class.
2. I completely do my homework.
3. I ask questions when I don't understand the lesson,.
4. I concentrate in class.
5. I take down notes.
6. I am involved in extra curricular activities.
7. I am attentive during class discussions.
8. I submit the requirements on time.
9. I actively participate in group activities.
10. I go to class.
11. I am an active member of my organization/s.

12. I go to class.
13. I follow the classroom rules.
14. I try to answer the questions of the teacher during discussions.
15. I give my personal insights during discussions.
16. I listen intensively to lectures.
17. I exert my best effort in all requirements.
18. I create a healthy learning environment for my peers.
19. I prepare for quizzes, tests etc.
20. I help my classmates who do not understand the lesson.
21. I correct the teacher when there is something wrong with the lecture.
22. I approach the teacher when I have to clarify something.
23. I listen to the suggestions of my group mates.
24. I leave the classroom when I do not like the subject.
25. I study in advance.
26. I give up when the task is hard.
27. I daydream while the teacher lectures.
28. I do not like working with a group when it comes to requirements,.
29. I am the free-loader in group projects.
30. I am usually distracted by my classmates.
31. I am physically in the classroom but not mentally.
32. The teacher sends me to the Discipline Office for not submitting requirements.
33. I answer back to the teacher.
34. I cut class.
35. I am happy when there are homeworks.
36. I love going to school.
37. I appreciate the hard work of the teachers.
38. I feel safe in school.
39. I feel that I belong when I am at school.
40. I am comfortable in my class.
41. I feel that I have good relationships with the teachers.
42. I feel that I have good relationships with my classmates.
43. I feel proud being a student at my school.
44. I feel confident that my school will help me have a bright future.
45. I am satisfied with the quality of education in my school.
46. I am interested in our school activities.
47. My peers make me enjoy going to class.
48. I feel that I have a good relationship with the maintenance (i.e. janitors, guards) in school.
49. I want other people to study in my school.
50. I am myself when I am in school.
51. I look forward to going to class.
52. I learn a lot from my school.
53. I share what I have learned in class to my friends from other schools.
54. I am satisfied with the activities offered to me.
55. I feel my school is a good learning environment.
56. I feel excited when we have activities in school.
57. My school is a safe place.
58. I feel that I am not safe in school.
59. I feel ignored by my classmates.
60. I have a bad relationship with my teachers.

61. I worry about being alone in school.
62. I feel frustrated when I have to go to school.
63. I feel that teachers are inconsiderate.
64. I feel that school is a waste of time.
65. I feel that I have no friends in class.
66. I feel that I should transfer to another school.
67. I do not like the teachers in school.
68. I feel bored during lectures.
69. I want to get good grades.
70. I believe that going to school is important.
71. I want to submit quality projects.
72. I give my best in all requirements.
73. I want to complete my homeworks in advance.
74. I make sure I work hard in school.
75. I exert good effort in my tests.
76. I want to correct the mistakes I made in the previous tests.
77. I want to go beyond what is expected of me.
78. I believe I surpass challenges in school.
79. I aim to be an achiever academically.
80. I want to attain the goals that I have made for myself.
81. I push myself to perform well in academic tasks.
82. I try to improve my grades every year.
83. I keep myself from being distracted in class.
84. I "cheer" for myself to perform my best.
85. I view hard requirements as a challenge.
86. I am disturbed when I get low grades.
87. School is my priority.
88. I want to devote my time studying for tests.
89. I choose to read in advance before class.
90. I reward myself for getting good grades.
91. I know good grades will get me far in the future.
92. I am determined to accomplish the tasks given.
93. Fortitude is a virtue I possess.
94. I strive to be an excellent student.
95. I keep myself focused when I have take an exam.
96. I choose to allot extra hours for studying.
97. I am open to failing subjects.
98. I submit mediocre papers.
99. I submit what I have even if it is incomplete.
100. I think that the easier the task, the better it is for me.
101. I pass projects just to get a passing grade.
102. I quit easily when given tasks.

Construction of the Teaching Metaphors Scale

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The objective of the study was to construct a teaching metaphors scale. Teaching metaphors that were classified by Alger (2009) has six dimensions that are either teacher-centered or student-centered. The test consists of 120 items with six subscales, which are "teaching is guiding", "teaching is nurturing", "teaching is molding", "teaching is transmitting", "teaching is providing tools" and "teaching is engaging in community". The instrument constructed by the researchers is a 4-point Likert scale that was used to measure teachers' teaching metaphors and use it as a guide in their teaching. There were 10 items constructed in each teaching metaphors based on the dimensions by Alger (2009). The initial item was administered to 150 teachers from different parts of Metro Manila. The exploratory factor analysis was used to determine if the same dimensions from Alger (2009) will be extracted. The reliability of the scale was determined using Cronbach's alpha. After the analysis, items with low factor loadings were removed. The new form was administered again to 500 teachers to confirm the factors arrived at. Results show that the teaching metaphors scale has different factors from the teaching metaphors identified by Alger (2009), the factors of the scale were intercorrelated and found to be reliable.

Keywords: Teaching metaphor, teacher-centered, student-centered

Teachers have different beliefs of what teaching is. Their different beliefs about the nature of teaching is called teaching metaphors. Metaphors structure our part of thinking, which are perceptions, thoughts and actions (Saban, Kocbeker, & Saban, 2007). There are different conceptions of teaching metaphors from different studies, one example of a teaching metaphors in teaching mathematics includes "mathematics as a language", "mathematics as a toolkit", "mathematics as a journey" and "mathematics as a structure" (Noyes, 2006); another example are the two metaphors, which are "education as production" and "education as cure" (Cook-Sather, 2003, as cited in Saban, Kocbeker & Saban, 2007). In addition, Martinez, Sauleda, and Huber (2001) said that teacher's types of metaphors are behaviorist, cognitive, and socio-historic. Alger's

(2009) teaching metaphors dimensions had four teacher-centered metaphors, which are teaching is guiding, teaching is nurturing, teaching is molding, teaching is molding, teaching is transmitting, and two student-centered metaphors, which are teaching is providing tools and teaching is engaging in community.

There are different versions of teaching metaphors because different methods were used to arrive with them across different studies (Alger, 2009; Martinez, Sauleda & Huber, 2001; Noyes, 2006; Saban, Kocbeker & Saban, 2007). In the study by Alger (2009), he used the on-line survey method sent via e-mail to southwestern high school district teachers. She asked the teachers to analyze the metaphors in line with the role of the teacher, the learners, and teaching and learning before choosing one that best characterizes their conception of teaching. Likewise, Saban, Kocbeker, and Saban (2006) and Saban, Kocbeker & Saban (2007) used the survey method by completing the statement "A teacher is like…because…". They analyzed the themes and arrived with a different set of teaching metaphors. Morever, Martinez, Sauleda, and Huber (2001) conducted a group discussion about teachers' and pre-service teachers' metaphors of how students learn. In the same way, Noyes (2006) required the students of secondary school mathematics teacher education course to submit an assignment regarding their starting position as teachers. To determine the teaching metaphors, they are instructed to write about their experiences of learning mathematics, both at school and in their lives, about teaching, and about how they understand the nature of mathematics. Leavy, McSorley, and Bote (2007) engaged pre-service teachers in metaphor construction activities in one whole semester. Every week, the participants submitted reflective journals, attend to focus group discussions and thinking about their teaching and learning beliefs by recalling their microteaching experiences.

There is a need to construct a scale that measures teaching metaphors because of the following reasons: (1) Previous studies only identified the different types of teaching metaphors. Having a scale helps identify specific teaching metaphors through behavioral indices provided. (2) There is an absence of teaching metaphor scales in published researches. (3) Previous studies have been conducted about teaching metaphors mostly using qualitative analysis and interview methods. The researchers will use a quantitative way of measuring teaching metaphors. (4) The teachers will not only identify their specific teaching metaphor but will also identify other teaching metaphors that they may posses as well. It justifies the researchers to construct a teaching metaphors scale given the following reasons.

The framework by Alger (2009) was used in constructing a teaching metaphors scale. Alger (2009) identified six teaching and learning metaphors. She classified the six teaching metaphors under teacher-centered and student-centered: Guiding, nurturing, molding, and transmitting falls under teacher-centered metaphors, while the student centered are providing tools and engaging in community to construct his or her own knowledge, or engaging in community such that teachers and students are constructing knowledge together. Grossman and Stololsky (1995), as cited in Alger (2009), said that the common culture with secondary teachers teaching the same subject and the same school matter share the same beliefs that could help characterize the possibilities on how teachers perceive their work and present situations. Ben-Peretz, Mendelson, and Kron (2003) and Fisher and Grady (1998), as

cited in Alger (2009), showed that teachers who share the same environment, they most likely share similar metaphors. In addition, Alger (2009) said that although teachers may share the same environment, they do not share similar conceptions of teaching. 80% of the teachers are reported to have teacher-centered conceptual metaphors while newer teachers have student-centered conceptual metaphors.

The items used in the textual descriptions served as the researcher's basis for writing a teaching metaphors scale (see Table 1 for the textual description). The teaching metaphors by Alger (2009) were chosen because his model of teaching metaphor dimensions were a product of all studies conducted about teacher metaphor for the last two decades. In addition, Alger's (2009) framework is the most recent that studied the construction of teaching metaphors.

Table 1
Teaching Metaphors by Alger (2009) and the Textual Descriptions

Teaching metaphors	Textual Description
1. Teaching is guiding (teaching-centered)	I see myself leading my students on a treasure hunt. I have a map that shows us the way. Sometimes the path is hard and sometimes it is easy, but it is always worth it when we get to the end.
2. Teaching is nurturing (teaching-centered)	It is a sunny day. I see myself holding a watering can and carefully attending to my seedlings. I make sure that the soil, water, and climate are rich and right for each seedling so that each will develop and blossom.
3. Teaching is molding (teaching-centered)	I am seated at a potter's wheel with a lump of clay. I carefully mold the clay into a well shaped and beautiful vase. Sometimes it takes pushing and prodding to get the vase to develop.
4. Teaching is transmitting (teaching-centered)	I have a large sum of money, which I deposit into a series of accounts. The goal is to deposit as much money as I can into each account so that each account has a high balance.
5. Teaching is providing tools (student-centered)	I wear a large tool belt. As each worker constructs his or her house, I provide the builder with the tools he or she will need to be successful in completing the project.
6. Teaching is engaging in community (student-centered)	I am part of a community that is building a house. We collectively decided that we need a house and then we design and build it together. The textual description was placed because metaphors can have multiple meanings. The descriptions identified the teacher and the students' place in the metaphor.

In this section, the researchers will present the highlights on how previous studies arrived with different conceptions of teaching metaphors. A historical view how teaching metaphors are conceptualized is presented and the succeeding studies that followed, giving a clear explanation as we arrived with the present study.

The first concept of metaphors that was related in teaching metaphors was based on the work of Lakoff and Johnson (1980). They studied metaphor in order to fill the gaps which are the limited theories of metaphor and that the definition of a metaphor in a dictionary is based on language only. This theory of metaphor by Lakoff and Johnson (1980) had been the basis of other researchers as their theory of metaphor that is used to relate in teaching. He explained that as individuals, we seek out personal metaphors to highlight and make consistent what we have in common with someone else. These metaphors are made to be consistent to individuals' own pasts, present activities, dreams, hopes, and goals as well.

After the studies of Lakoff and Johnson (1980) on metaphor, there came more researches on metaphors were related with other variables. But after some time, Bullough (1992) tried to explore the relationship between curriculum and teaching development by conducting a case study with English teachers. He collected data from the one pre-service teacher's and one teacher's historical background, which includes memories with their classmates and personal metaphors. Results show that the difference in age and personal maturity are important factors in teacher development. This is due to past experience, personality, and context influence decision making that beginning teachers make as they negotiate a teaching role and adopt, adjust or create a program of study for their students.

Extending study of Bullough (1992), he teamed up with another researcher. Bullough and Stokes (1994) found out how personal metaphors assist in development of pre-service teachers' professional development. They explored on how metaphors guide the process of teachers' self-formation and self- exploration. They gathered data by collecting 22 pre-service teachers' life-histories and metaphors. Results show different metaphors of the pre-service teachers coming from their life experiences. The analysis of the results showed three different group themes of different teaching metaphors, which are change, loss of innocence and rhythm.

From seeing how metaphors help in teachers' development, Grant (1992) related metaphors and teaching by examining the sources of structural metaphors of three secondary teachers who construct meaning to their students. She used reanalysis based on narratives and interviews. Results show that the metaphors of teachers are rooted in personal and professional contexts. This explains how the teachers' metaphors are not described as abstract thoughts but as metaphors formed with personal and professional meaning. One case says that he could teach anything from tennis, history or even mathematics using his metaphor of game.

Teachers who teach in a specific subject were investigated by Chapman (1997) where she tried to look at the metaphors behind teaching problem solving in mathematics. She collected data through interviews and observations with three teachers on how they make sense of teaching problem solving. She collected teaching documents and recorded the interviews on tape. The interviews were guided by open-ended questions and a flexible interview approach to allow the teachers the freely share their own way of thinking. Results show that metaphors played significantly in giving meaning of how teachers taught problem solving. Another thing is that the teachers draw out their metaphors out of the conflicts they need to be solved out of their own contexts. It was also found out that letting students use their problem solving technique was more effective than following a problem solving format in the

text book. In this technique, the students incorporate more of their real-world, personal and school experiences in problem solving.

Martinez, Sauleda, and Huber (2001) summarized the previous studies by explaining how three domains of metaphors affect a teacher's teaching. First is behaviorist perspective where the teacher's role is described as transmitter or trainer of skills. Learner was seen as a recipient of knowledge that is likened to an empty slate or a container. Second is cognitive perspective where learning is defined as individual construction of knowledge. It focuses more on the students' notions of organization and elaboration of knowledge, active role in restructuring experiences and achieving conceptual coherence, understanding of theories and concepts, and the development of general skills, intrinsic motivation and transfer. In this perspective, the teacher's role is pictured as a facilitator and coach. Third is socio-cultural perspective where learning is seen as a participation in the activities in the social community. In this perspective, the classroom is seen as a community of practice and everyone participate in search of knowledge. They were able to find out these metaphors by starting out with a group discussion with teachers about their metaphors of learning. From each of the teachers' answers, they were put in one of the three categories.

After a year, Patton (2002) discussed in his study the effectiveness of teaching and training with metaphors. He showed the relevance of using metaphors by making something understandable to the students by connecting it to certain experiences and situations. He used this method to make portfolios more effective for evaluation and emphasis of the desired meaning.

From the previous literature that conducted qualitative interviews and theory development, another approach was used by Greeves (2005) where he conducted a workshop to show how the use of metaphors guides pre-service teachers' pedagogical theory and practice. She developed a metaphor-based activity called "The Butterfly Project" to seeing how they address students' diversities and demonstrate a constructivist approach to teaching. The activity started out by giving an instruction to the pre-service teachers to make and bring a butterfly to class. The pre-service teachers brought butterflies that vary in shapes, sizes, color and materials used. The teacher now presented her own butterfly's history and torn its wings in each episode that was presented. The teacher now discussed the pre-service teachers' difference in their butterfly's features. The pre-service teachers also described the story behind their butterflies in their given features.

A unique relation of a metaphor with teaching is explained by Breault (2006) where he related jazz improvisation and blues with teaching and the process of developing curriculum. Through literature reviews, he explained how teaching and methods in jazz and blues were related. To explain how they were related, he enumerated 4 categories, which are "Internal vs. External Complexity", "Intimidation and Respect", "Experience and Individuality" and "Expresion and content". In "internal vs. external complexity", he described how the thousand decisions that teachers make are related in the improvised chords that jazz players make in every song. In "intimidation and respect", how jazz music intimidates a novice musician is also likened to how a teacher's work discourages admiration and intimidation with teaching peers. "Experience and individuality" says that how jazz supports its

improvisations is through its rhythmic nature and dependence on primary chord, while blues was known as a solo flight throughout the history. In its relation to teaching, teachers view their jobs as an extended form of parenting that relied with personal experience and instincts. The last category, which is "expression and content", says that jazz players and blues players blend rhythms and harmonic structures among other musicians, and expression through their music forms great music. This is related to how teachers use their materials to communicate effectively with their students.

Related to Chapman's (1997) study on how teachers make sense out of problem solving, Noyes (2006) developed the concept of metaphor in teaching math. He found four dimensions of metaphors in teaching mathematics, which are "mathematics as structure", "mathematics as tool kit", "mathematics as journey" and "mathematics as language". Noyes (2006) found these dimensions by exploring on the pre-service mathematics teachers' beliefs on learning mathematics and teaching mathematics.

Using a qualitative method, Saban, Kocbeker and Saban (2006) tried to find out which metaphors do pre-service teachers use to describe what a teacher is, including what conceptual categories can be taken from the different metaphorical images and how do the themes vary across participants' program type and gender. A complementary study by Saban, Kocbeker and Saban (2007) says that teacher educators can use metaphor analysis to assist in examining teacher's values, beliefs and philosophies about teaching and learning. This brings to their explanation that Metaphors invite researchers to explore comparisons, notice similarities, and use a situation as an image of another.

Comparing two nationalities using the theory of Martinez, Sauleda and Huber (2001), Leavy, McSorley and Bote (2007) tried to found out how individuals construct their metaphors affects their beliefs about teaching and learning using Irish and American pre-service teachers as participants. They based their metaphor construction in the three domains attributed by metaphors by Martinez, Sauleda and Huber (2001). Leavy, McSorley and Bote (2007) found out that there is a high percentage in the behaviorist domain in both Irish and American pre-service teachers. But as the semester ends the percentage on constructivist domain the survey conducted had a high percentage on the behaviorist domain. They also found out that aside from the three domains identified by Martinez, Sauleda and Huber (2001), they found that there are still other domains that could be found.

Related to the findings of Leavy, McSorley and Bote (2007), Alger (2009) saw how metaphors of teaching and learning change over time. Oftentimes these metaphors are conventional, meaning that they are prevalent in the culture and their meaning is shared by the culture. Teachers' use of metaphorical language to describe and explain their beliefs about students, the teacher's role, and their profession is widespread (Munby, 1987; Tobin, 1990, as cited in Alger, 2009). Wideen, Mayer-Smith and Moon (1998), as cited in Alger (2009), found that change in teacher beliefs was resistant to short-term interventions. Six metaphors identified by Alger (2009) were acquired through literature reviews. In result, he developed a survey that in order to explore on teachers' metaphors when they started their pre-service program, while in the teaching profession and metaphors desired to operationalize. He asked the teachers to state which metaphors are most common in teaching and teachers.

Based on the literature reviews, the researchers saw the specific dimensions that will be used for the teaching metaphors scale which are results from subsequent studies from the last two to three decades. Previous literatures also strongly related metaphors in the teaching field. The researchers are now extending the study on teaching metaphors by creating a teaching metaphors scale. In this matter, there is a need to construct a teaching metaphors scale and introducing a different method of collecting metaphors through quantitative technique since previous studies used qualitative methods to collect teachers' and pre-service teachers' teaching metaphors.

The purpose of the study is to construct an instrument that will measure teaching metaphors specifically:

(1) Will the extracted factors in the study be the same with the dimensions proposed by Alger's (2009) study with six dimensions?
(2) Will the items be internally consistent?
(3) Will the factors of the teaching metaphor scale related to each other?

Method

Test Design

This instrument used a 4-point Likert scale ranging from 1, being strongly disagree to 4, being strongly agree. A high score indicates a high level of adherence to a certain teaching metaphor while a low score would indicates otherwise. The items are written for the six teaching metaphors dimensions of Alger (2009), which are teaching is guiding, teaching is nurturing, teaching is molding, teaching is transmitting, teaching is providing tools and teaching is engaging in community. A teaching metaphors questionnaire was answered by teachers from different schools. The teaching metaphors questionnaire aims to collect information based on the identified teaching metaphors by Alger (2009). The use of the instrument is to find the teachers' teaching metaphors and use it as a guide in daily teaching through activities, lectures and classroom management. In this matter, the instrument will not dictate what the teacher will do but will serve as basis for using the other five metaphors that they also have. In addition, the different classes that teachers handle and different students will help adjust and develop the other metaphors they possess.

Search for Content Domain

The teaching metaphor scale indicates the dimensions of teaching metaphors, which are teaching is guiding, teaching is nurturing, teaching is molding, teaching is transmitting, teaching is providing tools, and teaching is engaging in community. In order to see the teaching metaphor that the teacher possesses, the researchers administered the teaching metaphors scale.

Item Writing

The items for the teaching metaphors questionnaire were solely based from the literature reviews of the researchers. The 60 item questionnaire was based from the teaching metaphors of Alger (2009). Each dimension of teaching metaphors includes 10 items which were made by the researchers that has the elements of a good questionnaire should be: simple vocabulary, short as possible, includes all the key ideas and not misleading.

Item Review

Based from the survey, 60 items under six factors were constructed. The items were reviewed by experts in Educational Psychology and teaching assessments. The teaching metaphors questionnaire designed by the researchers was thoroughly checked on how they arrived to come up with their items and factors. The experts who checked the items in the questionnaire were given the teaching metaphors items together with the definitions of the each dimension. The item reviewers judged each item by checking whether it is relevant, not relevant, and needs revision. After the items were reviewed, the scale was administered to the target participants.

Scaling Technique

The instrument used is a 4-point Likert scale ranging from 1, being strongly disagree to 4, being strongly agree. A high score indicates a high level of adherence to a teaching metaphor dimension while low scores in other dimensions would indicate some metaphors that the teacher might posses.

Likert scale was used to attain teacher's teaching metaphors and this scale measures the opinion of teachers. This scale also measures the degree of disagreement and agreement according to the participants' opinions regarding the study. The scale was able to obtain the summated value of the participants' responses.

Procedure for Pretesting

The items in the scale were administered to 150 teachers. They were asked to answer the instrument in their own time and their own pace with a given deadline. This means that the teachers could answer the items during their free time. The teachers who were asked are teachers who teach in high school and college level whose age range from 20-35 years old and teaching within one to three years. The teachers will answer each item by putting 1 if they strongly disagree, 2 if they disagree, 3 if they agree and 4 if they strongly agree about the statements in the instrument.

After they complete the scale, the teachers were asked if they are still willing to answer the scale again next time for the pilot testing.

Reliability Analysis

In the data-analysis, the reliability of the test instrument was determined using Cronbach's alpha and interitem correlation. The 60 items were intercorrelated to see if the items written are consistent with each other.

The Cronbach's alpha was used to determine whether the items in the teaching metaphors scale are internally consistent. Cronbach's alpha was used as a measure of internal consistency and reliability. The researchers used Cronbach's alpha in order to know whether the Teaching Metaphors Questionnaire is internally consistent and reliable. Also it is recommended to use Cronbach's Alpha because the researchers used Likert scale which is a multiple choice type of test (1 if strongly disagree, 2 if disagree, 3 if agree and 4 if strongly agree).

Validity Analysis

Factor analysis determined if the dimensions of teaching metaphors by Alger (2009) could be the same in the present study. The analysis will indicate the items' factor loadings of .40 and above as acceptable. Also factor analysis examines the correlation between set of variables in order to identify groups of variables which are relatively homogeneous (Deikhoff, 1992). The number of factors was examined using the scree plot. After identifying variables with high intercorrelations, the researchers also measured underlying variables that were called factor scores and factor loadings. The good items that remained in the teaching metaphors scale was used for the pilot testing. The researchers also saw that there were other variables formed through the factor analysis and considered if the new variable formed could help improve the researchers' study.

Confirmatory factor analysis was used to assess the number of factors and the loading variables. CFA was used to investigate whether the established dimensionality and factor-loading pattern fits a new sample from the same population and fit for hypothesis testing. Factor correlations also show strengths of the association between factors. In addition, the researchers used fit index measures like Goodness of Fit Index (GFI), chi-square (χ^2) and Root Mean Square Error of Approximation (RMSEA). The GFI measured how the observed variance and covariance are related. The χ^2 was used to test the probability of getting the frequencies observed if the null hypothesis were true. The RMSEA will measure the amount of inconsistency per degree of freedom and will also find out the error of approximation in the teachers who answered the test. For GFI, a score of 0.90 is needed for it to be a good/accepted scale while for χ^2 a low value will show adequate goodness of fit. For RMSEA, a score of 0.05 is needed for it to be a good/accepted scale.

Procedure for Pilot Testing

For the pilot testing, another set of 500 teachers were requested to answer the researchers' teaching metaphors scale with the new set of items based on the factor analysis. They were asked to answer the instrument in their own time and their own

pace with a given deadline. This means that the teachers could answer the items during their free time. The teachers answered each item by putting 1 if they strongly disagree, 2 if they disagree, 3 if they agree and 4 if they strongly agree about the statements in the instrument. After they finish the test, the teachers were thanked for participating in our study.

Reliability Analysis

In the data-analysis, the reliability of the test instrument was determined again. The 120 items were intercorrelated and the factors' reliability was obtained once again using Cronbach's alpha.

Results

Phase 1

This section first presents the means, standard deviations, Cronbach's alpha, skewness, and kurtosis of the instrument created. The principal components analysis of the items of the teaching metaphors scale for further data reduction is also presented. Furthermore, the items that remained and their new dimensions are presented in this section.

Table 2
Means and Standard Deviation of Teaching Metaphor Instrument

Teaching Metaphor Dimension by Alger (2009)	*M*	*SD*	*N*	Cronbach's Alpha	*Skewness*	*Kurtosis*
Guiding	2.83	0.41	150	0.57	-0.28	0.61
Nurturing	2.77	0.39	150	0.54	-0.05	-0.36
Molding	2.67	0.40	150	0.51	0.22	-0.29
Transmitting	2.72	0.35	150	0.40	-0.23	-0.65
Providing Tools	2.75	0.41	150	0.55	0.12	-0.42
Engaging in Community	2.65	0.38	150	0.48	0.13	-0.25

Note: Means that score 1-1.5 is very low, 1.51-2 is low, 2.01-2.5 is moderately low, 2.51-3 is moderately high, 3.01-3.5 is high, and 3.51-4 is very high

The means scores obtained for each factor of the Teaching Metaphor scale were almost in the same level. The means of each of the factors of the Teaching Metaphor Scale fall under moderately high. The low values of standard deviation

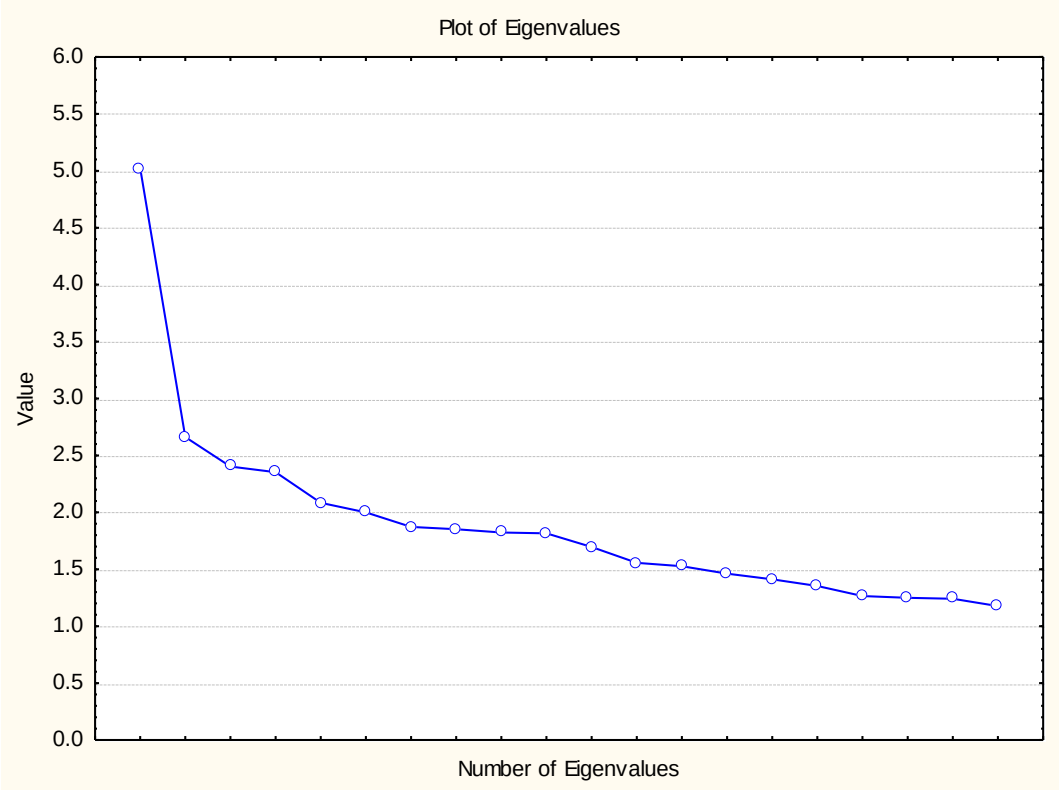
indicate that there is less variation of the scores of each Teaching Metaphor Scale. The Cronbach's Alpha of the whole test is 0.78, which means that the items in the test have high internal consistency. However, the Cronbach's Alpha of each dimension has lower internal consistency because the items for each dimension have only 10 items, which splits the consistency of the whole scale. The skewness of the test is typical of a normal distribution though it tends to be negatively skewed. The kurtosis of the scale is mostly negative except for the dimension "Teaching is Guiding", which indicate a relatively flat distribution.

The researchers were able to find that the 60 items loaded under four factors, which did not support Alger's (2009) six factors. The researchers used varimax rotation to see where the factors will load unlike in quartimax rotation where it tends to produce one general factor and has and contains smaller sub-factors. The Eigenvalues were assessed using screen plot, which showed that having all four factors account for a total variance of 3.92% (for the first factor total variance is 8.37%, for the second factor total variance is 4.44% and 4% for the third factor). Factors beyond the fourth were not considered because the total variance extracted are low and almost have the same Eigenvalues (for the fifth factor total variance is 3.47%, for the sixth factor total variance is 3.33%). Since the teaching metaphors instrument is reduced to four factors, a different dimension name was given to them. The new dimension name was based on the items that loaded on the following factors.

Table 3
Table of Eigen Values for the Teaching Metaphors Instrument
Eigenvalues Extraction: Principal Components

	Eigenvalue	% Total	Cumulative Eigenvalue	Cumulative %
1	5.02	8.37	5.02	8.37
2	2.66	4.44	7.69	12.81
3	2.4	4	10.09	16.81
4	2.35	3.92	12.44	20.73
5	2.08	3.47	14.52	24.21
6	2	3.33	16.52	27.54

Figure 1
Scree Plot of Eigenvalues of the Teaching Metaphors



Items with factor loadings of 0.40 and above were the ones that are accepted: 8 items loaded under the first factor, 5 items loaded for the second factor, 2 items loaded under the third factor, and 3 items loaded under fourth factor. The newly named dimension was as follows: Teaching as Choice-based, Teaching as a Stewardship, Teaching as a Part of a System, and Teaching as an Art. The researchers gave the first factor the name of "Teaching as Choice-based" because the items tell about the teacher's role as the one who leads the students to success by giving information on the right decisions while the students are given the freedom of choice (see table 3, example: A teacher is like a gasoline station that has many varieties). On the second factor, the researchers gave the name "Teaching as a Stewardship" because the items tell about how the teacher is an expert on the teaching field; equipping students with information that would aid students have a better grasp on the lesson. (See Table 4, example: A teacher is like a parent that sees to it that a child is properly guided). The third factor is given the name "Teaching as a Part of a System" because the items tell about how the student is involved in a system wherein he/she is needed in order for learning to work (See Table 5, example: Students are like batteries that need to be recharged). The last factor is given the name "Teaching as an Art" because the role of the students here is a raw material wherein the teacher and/or student are the ones who will help hand in hand to create a work of art (See Table 6, example: A student is like a wall that is painted with colors).

Table 3 to 6 shows the new dimension names and their factor loading scores. Out of the six factors by Alger (2009), there were a total of four factors that

remained. Two of these factors are teacher-centered metaphors and the other two factors are student-centered metaphors.

Table 4
Items and factor loadings of "Teaching as choice-based"

Items	Factor
1. A teacher is like a gasoline station that has many varieties.	0.43
2. A teacher is like toolbox that provides materials needed for building a house.	0.61
3. A teacher is like a chemical that are added to create materials.	0.47
4. Students are like critics that provide a commentary.	0.56
5. A teacher is like a platoon leader that encourages the soldiers to fight.	0.44
6. A teacher is like a newspaper that makes society aware of the events.	0.42
7. A student is like a candidate that chooses the right political party.	0.40

Table 4
Items and factor loadings of "Teaching as Stewardship"

Items	
1. A teacher is like a parent that sees to it that a child is properly guided.	0.45
2. A teacher is like a manual that helps users operate a product.	0.42
3. A student is like a train that runs on a rail track.	0.48
4. A student is like a tourist that needs guide in a new place.	0.63
5. A teacher is like a gardener that takes care of the little seedlings to ensure its proper growth.	0.54

Table 5
Items and factor loadings of "Teaching as a Part of a System"

Items	
1. Students are like batteries that need to be recharged.	0.49
2. Students are like ants that contribute in a colony.	0.50

Table 6
Items and factor loadings of "Teaching as an art"

Items	
1. A student is like a wall that is painted with colors.	0.65
2. A student is like hair that can be fixed when messy.	0.44
3. A teacher is like a wire that conducts electricity.	0.46

Phase 2

Phase 2 of the present study confirms the four factors of teaching metaphors (using a sample of N=500) obtained in phase 1. The items which loaded highly on the four new factors were administered to 500 teachers with the same criteria as to the first pilot testing. The means, standard deviations, Cronbach's alpha, skewness, and kurtosis of the four new teaching metaphors were obtained. The interitemcorrelation of the four new factors are also presented to test for its convergence. The four new factors of the teaching metaphors were confirmed using a four factor measurement model with the use CFA.

Table 7
Means and Standard Deviation of Teaching Metaphor Instrument

4 factor Teaching Metaphor	*M*	*SD*	*N*	Cronbach's Alpha	*Skewness*	*Kurtosis*
Teaching as Choice-based	2.71	0.39	500	0.56	0.55	0.26
Teaching as a Stewardship	2.74	0.44	500	0.51	0.44	0.09
Teaching as a System	2.68	0.54	500	0.30	0.16	0.31
Teaching as a Work of Art	2.65	0.51	500	0.33	0.28	0.34

Note: Means that score 1-1.5 is very low, 1.51-2 is low, 2.01-2.5 is moderately low, 2.51-3 is moderately high, 3.01-3.5 is high, and 3.51-4 is very high

The means scores obtained for the four new factors of Teaching Metaphor were almost in the same level (M=2.71, 2.74, 2.68, 2.65). The means of each of the four new factors of fall under moderately high. The low values of standard deviation indicate that there is less variation in the scores among the 500 cases. The Cronbach's Alpha of the whole test is 0.67, which means that the items in the test have high internal consistency. However, the Cronbach's Alpha of each dimension has lower internal consistency because the items for each dimension have only 7, 5, 2 and 3 items respectively. The skewness of the test is typical of a normal distribution though it tends to be positively skewed. The kurtosis of the scale is positive, which indicates a relatively peaked distribution.

The researchers established the relationship of the four new factors by testing its convergence.

Table 8
Intercorrelation of the Four Factors of the Teaching Metaphors

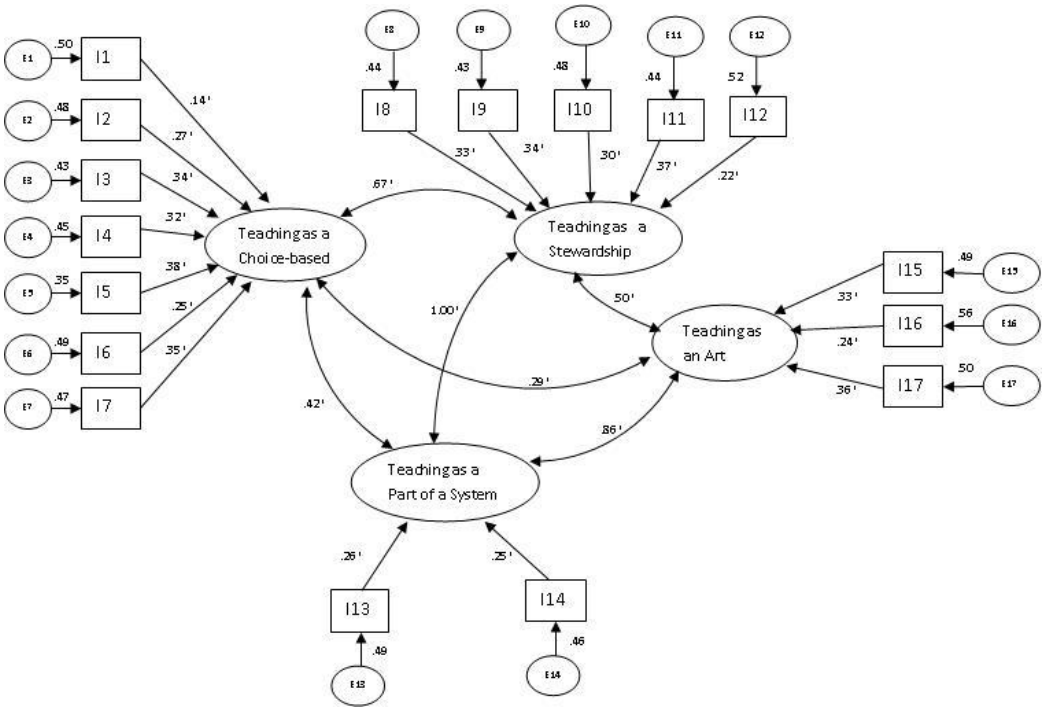
	Choice-based	Stewardship	Part of a System	Art
Choice-based	---			
Stewardship	.35*	---		
Part of a System	.17*	.35*	---	
Art	.14*	.24*	.27*	---

*$p < .05$

Results shows that each factor of the teaching metaphor is significantly related with each other, $p < .05$ (See Table 8). The factors also show a positive relationship where there is an increase in one teaching metaphor, the others also significantly increase. The moderate correlation coefficients indicate that each factor is still distinct to each other due to less collinearity.

The four factors of the teaching metaphors were confirmed in a measurement model. The four factors of the teaching metaphors were structured as latent variables and their corresponding items as indicators. The four factors were tested if they are intercorrelated and at the same time their respective items as loading to that factor. The goodness of fit of the mode was also tested if it is representative of the sample.

Figure 3
A Four Factor Structure of Teaching Metaphor



The measurement model in figure 2 shows that the four factors have a significant relationship. This means that an increase in variance in one teaching metaphor significantly increases the others. Each factor has their own respective indicators that show significant path with their own factors. This means that the items under each of the respective factors really belong to their respective teaching metaphor.

The model is tested for goodness of fit using the chi-square (χ^2), Goodness of Fit Index (GFI) and Root Mean Square Error of Approximation. The chi-square indicates a model of a bad fit (χ^2=332.70, *df*=113, χ^2/df=2.94) but the other fit indices show better fit. The model showed adequate goodness of fit, as indicated by the GFI (.93), which is high and the RMSEA is satisfactory (0.05). These indicate that the sample of 500 represents the path model well.

Discussion

The results present study showed a new model of teaching metaphors for Filipino teachers. This is reflected by the first and second pilot testing. The 150 participants that answered prove that teachers here in the Philippines are both teacher-centered and student-centered since what they answer reflects their conception of teaching.

The first factor, "Teaching as Choice-based", although student has a choice in whether he/she will choose to follow the teacher, the teacher is still the one who give options/choices to the students on how one student could learn. Like the item that tells about tools in this category "A teacher is like a tool box that provides materials needed for building a house", the students have a variety of tools to use to build a house but it would be the students' choice on how they will be using these tools to build the house. An example here is letting the students make a kite with materials provided by the teacher. The kite that the students will make will vary since there are different choices that the students make. Although given certain materials, the teacher is still the one who gives options/choices to the students on how one student could make the kite. The reason for labeling it as a teacher-centered metaphor is because five out of seven items tell about the importance and the things that the teacher does and how they aid in the need of the student. On the other hand, two out of seven items tell about what the student can do with different choices to choose from.

The second factor, "Teaching as a Stewardship" the teacher serves as an expert on the teaching field; equipping students with information that would aid students have a better grasp on the lesson. The teacher plays the role of a steward that would help you and provide assistance in times dire need. Teachers conduct lessons in a way the students will understand them better by providing them examples related to the students' lives. Given the freedom to do what they will, the teacher will keep them under surveillance, as to keep the students in line. In this factor, three items tell about how the teacher takes action in maintaining what the students need. An example here is conducting a lesson and in order to help the students understand the lesson more, the teacher will provide more examples that would relate to the students lives. By doing so, this will make the students feel the

relevance of the lesson in their lives. In this factor, three items tell about how the teacher takes the action in providing for what the students need.

The third factor, "Teaching as a Part of a System" is all about how the teachers teach their students information or knowledge that will help them be the productive part of society; the students will be working and will be using what is taught to them by their teachers to help them function. The students will acquire the recommended skills and perform their best to be able to contribute their abilities and to share their knowledge to the world that we refer to as the system. Like the ants who contribute to their colonies, the students will become those ants who will be giving back to the system with their own insights and opinions that could help themselves and others. This is related to one of the three domains of metaphors by Martinez, Sauleda, and Huber (2001), which is the cognitive perspective. This is because the student here plays an active role in restructuring experiences and achieving conceptual coherence, understanding of theories and concepts, and the development of general skills. The teacher's role in this perspective is a facilitator or coach.

Lastly is the fourth factor, "Teaching as an Art" wherein the students are like raw materials that are to be molded and created with the help of both the teacher and the students to create a beautiful work of art. This is just like the "Butterfly Project" of Greeves (2005) where the teacher asked the students to make their own butterflies and resulted in different kinds of butterflies. The teacher here assigned the students to build butterfly out of any materials. This resulted in making different kinds of butterflies varying in shapes, sizes and materials used in creating the butterfly. As seen in this factor, the teacher lets the students are the ones who organize their thoughts and ideas.

The first pilot test proves that teachers here in the Philippines are teacher-centered and at the same time student centered. This is because the factors have two teacher-centered metaphors and two student-centered metaphors. This also proves that Alger's teaching metaphors are different from the teaching metaphors of the researchers. Although Alger's (2009) dimensions are the same when it comes to the number of factors in the student-centered dimension, the overall factors of the whole scale is less than the factors of Alger (2009). This states that teachers in the West have different structure of thinking compared to the Filipinos because as Saban, Kocbeker and Saban, (2007) said that metaphors structure our part of thinking, which are perceptions, thoughts and actions.

The first pilot test also proves that the education system here in the Philippines is still developing student-centered teaching. This is seen from the lower items acquired from the student-centered metaphors than the teacher-centered metaphors. This implies that teachers here in the Philippines view teaching more as the teacher who contribute more to the learning of the students. Having the teacher contribute more to the students' learning does not mean that the students are inactive since there are some items in the two factors that have student-centered metaphors.

The 500 teachers in the second pilot test validated the four factor structure teaching metaphors scale, which is seen in the confirmatory factor analysis conducted by the researchers. The factors and their respective indicators are all significant to each other. This means that when one factor goes high, the others will go high as

well. Although the factors have low correlation, this implies that each teaching metaphors are distinct to each other. Being distinct means that they all fall under the category of teaching metaphors but their characteristics are all different from each other.

The means of the four factors fell to the moderately high score which is 2.5-3. This means that the teachers answer somewhat high and tends to answer in the middle. The standard deviation also states that the answers of the teachers are not far from each other.

The acceptable fit indices from the Goodness of Fit Index (GFI) and Root Mean Square Error of Approximation (RMSEA) states that the teaching metaphors scale is reliable to measure teaching metaphors. This is because the GFI show strong relationship between the variance and covariance. The RMSEA, on the other hand, measured that there is less inconsistency per degree of freedom and less error of approximation in the teachers who answered the test.

Having a scale that is internally consistent, the teaching metaphors scale is reliable to measure a teacher's teaching metaphor and other metaphors that he/she may have. The teaching metaphors scale can be an answer to the question in their head concerning why they are good at a certain part of teaching. By having the teacher know what teaching metaphor he/she may have, it will enlighten the teacher in his/her conception. This is because not all teachers are aware of their teaching metaphors. For example, a teacher got high results in the dimension, "Teaching as a Choice", one way where he/she can be effective is by improving that skill in that certain factor. It is something like focusing on one strength and use it as an advantage in his/her teaching skills. Another way is that knowing that the teacher is low on other dimensions; he/she can try to improve on those other dimensions in order to be more effective in making lesson plans and class performance.

The following conclusions were made based upon the review of data in the researchers' study: the teaching metaphors of Alger (2009) are different from the teaching metaphors of the researchers, education system in the Philippines tries to develop and improve the way of teaching just like in other countries and the teaching metaphor scale made by the researchers were reliable.

The six teaching metaphors of Alger (2009) were not the same to the four factor teaching metaphor scale of the researchers. The four new four factors were same with Alger's (2009) teaching metaphors in a way that it has teacher-centered and student-centered items. But the four new factors of teaching metaphor scale do not have high internal consistency due to the small number of items. The first and second pilot testing supported that here in the Philippines the education system is both teacher and student-centered.

Forming a four factor teaching metaphor scale that contains teacher-centered and student-centered items means that the education system here in the Philippines strives to improve the present condition of how students are educated. Now, the teacher does not only focus on how to deliver and provide information to the students and also how the student would be able to develop his/her own learning. The researchers gathered data from schools ranging from public, private, non-sectarian, college, high school, etc., it showed that teachers belonging to these kinds of schools are teacher-centered and student-centered. Also, finding out that teachers here in

the Philippines are both teacher-centered and student-centered, it reflects on how the Philippines deal with providing education. Although there is scarcity of resources for teaching materials in schools that would force the teachers to be more teacher-centered, gradually the teachers try to be student-centered in order for the students to benefit and be trained on how to learn without the help of the teachers. The pursuit to modify traditional teaching in the Philippines is a good indication that the Filipinos are striving to more student-centered. This is due to the results that show little student-centered items in the factor loadings. Although the student-centered metaphors are partial, this still shows that the Philippine educational curriculum is beginning to adjust more on the student's needs.

The four factor teaching metaphor scale by the researchers was reliable and has good fit. This is because of the high internal consistency of the first pilot test, which is 0.78 and the second pilot test, which is 0.67. The Eigenvalues shown in the scree plot show that a four factor model is necessary since the total variance extracted in the next factors are low and almost have the same Eigenvalues. In order to confirm the four factor model, CFA was used and it shows that the four factors in the model have significant relationships. The four factor model also got a GFI of 0.93, which is high and a 0.05 RMSEA that is satisfactory.

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