

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 *convergent 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

| | <i>M</i> | <i>MD</i> | Min | Max | 95% CI(-) | 95% CI(+) | <i>SD</i> | 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 |
| DSO W | 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

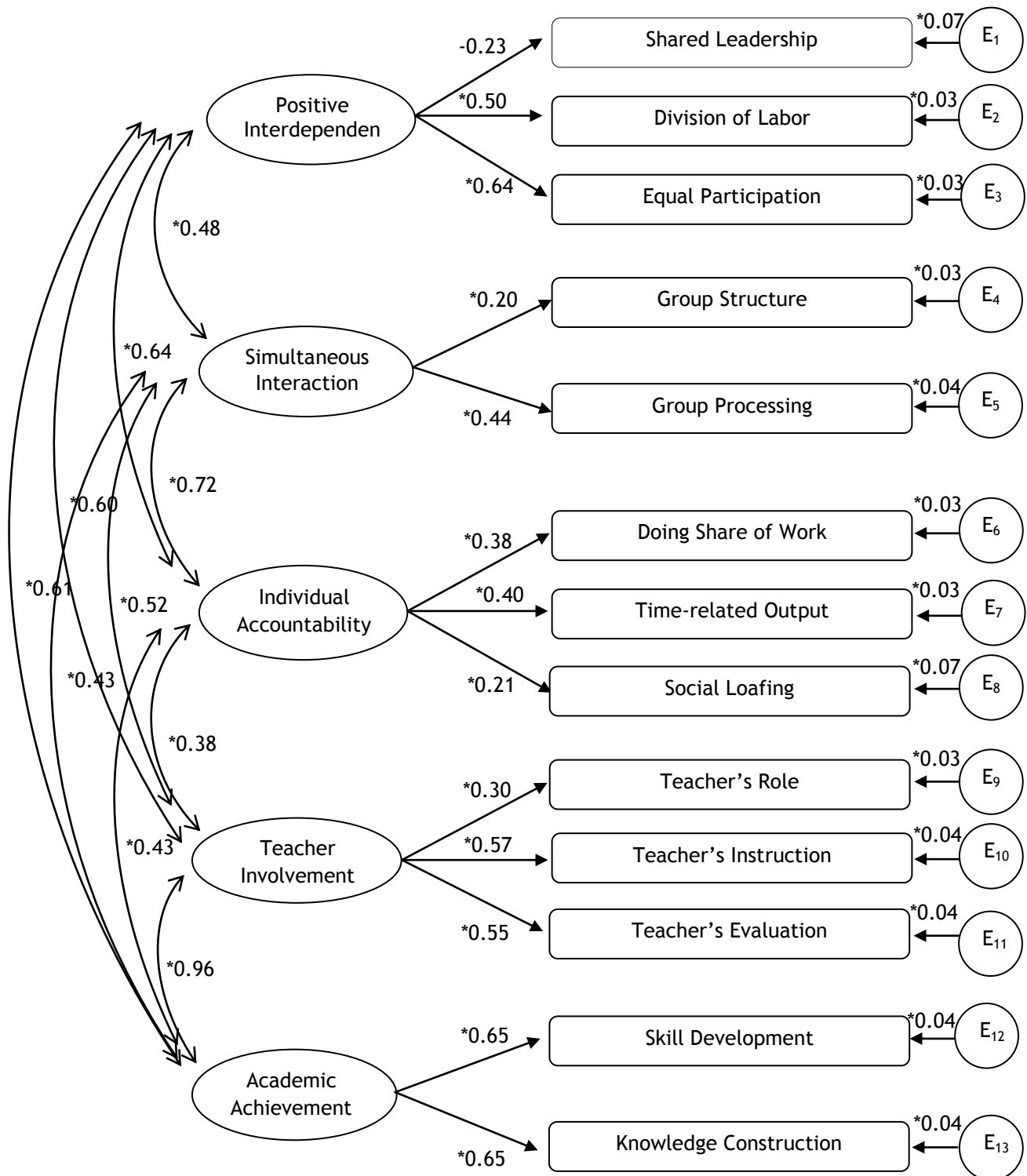


Figure 2
Second model of Cooperative Learning Belief Scale

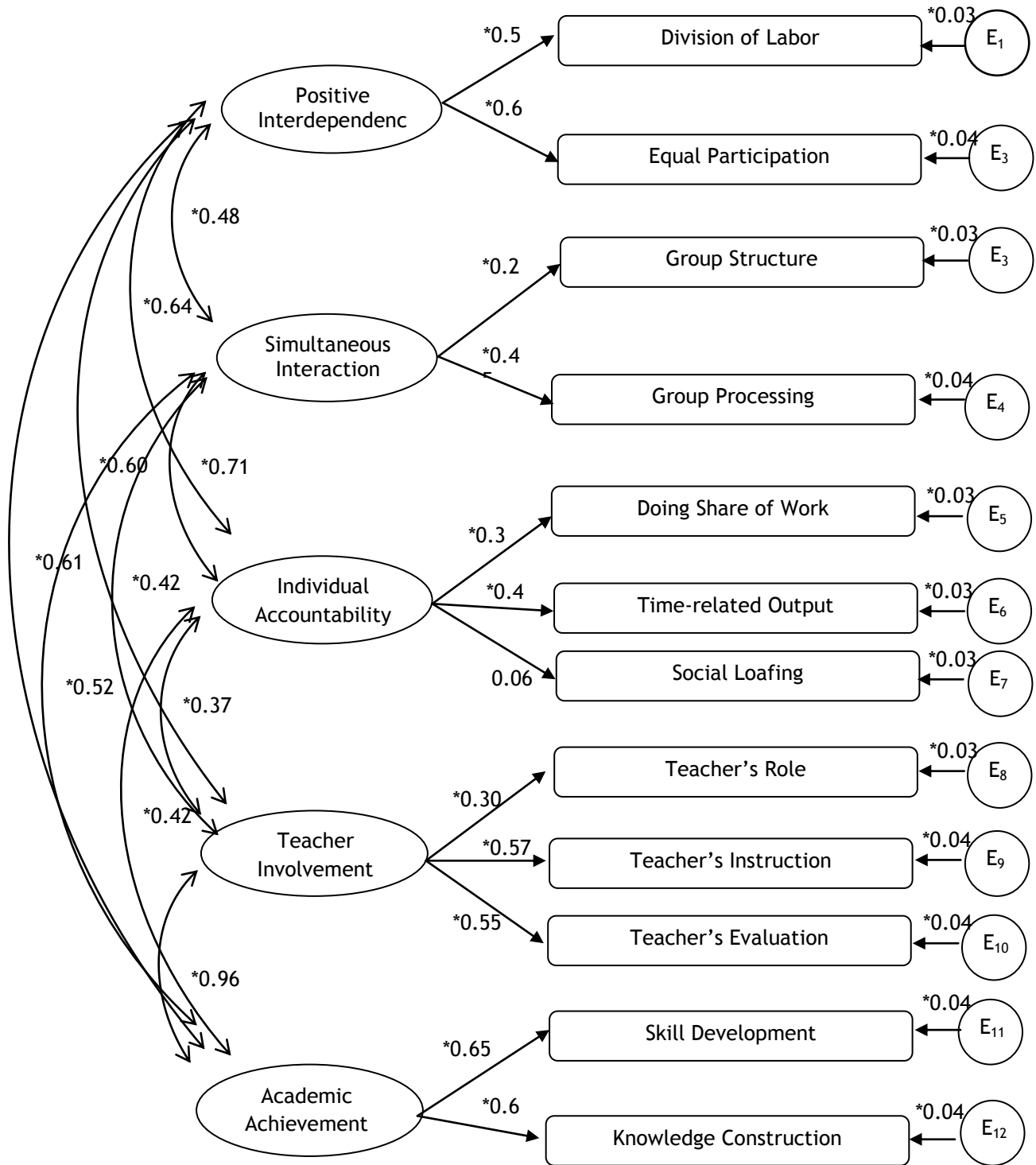
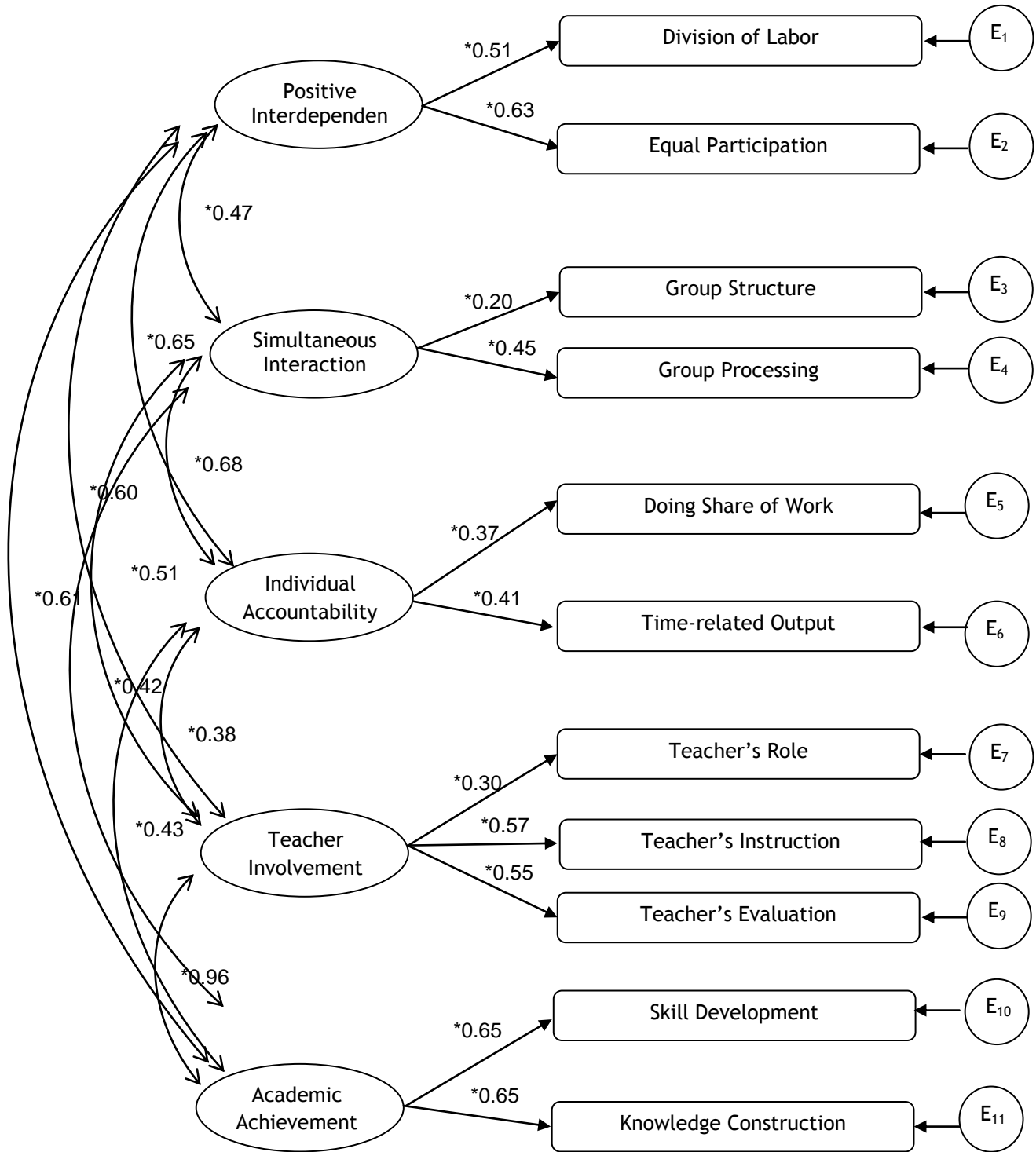


Figure 3
Third model of Cooperative Learning Belief Scale



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

| | <i>Positive Interdependence</i> | <i>Simultaneous Interaction</i> | <i>Individual Accountability</i> | <i>Teacher Involvement</i> | <i>Academic Achievement</i> |
|------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------|---------------------------------|
| 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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