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AN INTEGRATIVE ANALYSIS OF BENJAMIN BLOOM'S COGNITIVE DOMAIN AND BRUCE TUCKMAN'S DEVELOPMENTAL MODEL

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The purpose of the study was two-fold: (1) Do small group settings benefit students? (2) How can professors enhance the group environment through task related instructions? A 33-item Group Learning on Development Survey (GOLDS) was used to integrate Bruce Tuckman's developmental model with Benjamin Bloom's cognitive domain. Norming and Performing variables (Factor 1) contributed 31 percent to the total scale variance; furthermore, knowledge, comprehension, and application task variables loaded on Factor 2, for 9 percent of the total scale variance. Significant $p < .05$ differences were found. Empirical evidence suggested a Dynamic Group Learning Model (DGLM) be created to help explain the group learning on development construct.

INTRODUCTION

Learning is a construct inferred from observed behavior (Kerlinger, 1973). The cognitive domain (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956) includes objectives related to recall of knowledge and development of higher cognitive abilities. The cognitive domain contains six subdivisions (knowledge, comprehension, application, analysis, synthesis, and evaluation) representative of a hierarchy of mental abilities; it is perfectly suitable as a measurable construct. In this study, six subdivisions of Bloom's cognitive domain were measured against the five stages of group development (Tuckman & Jensen, 1977). Responses from the 33-item Group Learning on Development Survey (GOLDS) were tested using multivariate statistical controls and methods. Tuckman's (1965) model of small-group developmental processes organized existing research into a conceptual framework.

The literature could not be considered truly representative of small-group developmental processes because there was an overrepresentation of therapy and T-group settings and an under representation of natural or laboratory-group settings, making generalizing difficult. He suggested the need for further research on natural and laboratory groups, indicated the need for more rigorous methodological considerations in studying group process, and criticized the use of a single group for observation because it made control and systematic manipulation of independent variables impossible. Additionally, group members might possess unanticipated intervening variables that could be problematic for a group's developmental processes.

An intervening variable is an "in-the-head" variable. It cannot be seen, heard, or felt. It is inferred from behavior. "Hostility" is inferred from presumably hostile or aggressive acts. "Learning" is inferred from, among other things, increases in test scores. "Anxiety" is inferred from skin responses, from heartbeat, and so on. Designing a cause-effect single small group experiment that accounts for all of the truly meaningful and important intervening variables (while controlling for internal and external validity factors) is impossible. Tuckman (1965, p. 386) asserts "Certainly duration of group life would be expected to influence amount and rate of development.... Setting-specific differences and within-setting differences may affect temporal change as regards the specific content of the stages in developmental sequence, the rate of progression through the sequence, or the order of the sequence itself."

Social scientists engaging in small group studies are sometimes perplexed because their results can often appear spurious; counter arguments posed by others might be used to explain away research findings. A few small group studies where subjects' behaviors were recorded and rated by two or more raters still show problems that make it difficult to generalize results, even when inter-rater reliability is controlled (Artzt & Armour-Thomas, 1990, 1992; Bloom, 1975).

As a conceptual framework, the developmental model (Tuckman and Jensen, 1977) is potent enough to be construed as a measurable construct in asserting that small group processes result in developmental stages. Bloom's cognitive domain is ubiquitous to education, making it perfectly suitable as a measurable construct. Bloom et al. asserted "elements" of lower level intellectual abilities combine to form higher level mental abilities and thus "classified" levels into hierarchical categories.

Other factors may affect the learning process. Kerlinger (1973) referred to learning as an intervening or "in-the-head" variable. Tuckman (1965) referred to the intervening variable "hostility" as an element of the "Storming" stage in group development. We assert hostility can occur in groups as multiple intervening variables because more than one group member could be in possession of this "in-the-head" variable at one time. Moreover, hostility is not always manifested by outward aggressive actions. Passively aggressive attitudes can also occur. Group members experiencing such behavior might harbor salient emotional memories affecting their participation in existing and future groups. Cause-effect scientific studies of small group learning on stages of development are problematic in other ways.

Cognitive ability is correlated with small group development. Learning might largely be dependent on how the

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group forms and on the amount of time it remains and works together. Temporal complexities associated with scientific studies of a single small group's developmental processes preclude many treatment group designs; yet, they do not preclude using statistical controls (factor analysis, effect size, large samples, MANCOVA, etc.) in place of experimental controls. Knowledge about small groups is likely to be better understood by determining the latent nature of simultaneously occurring "in-the-head" variables associated with a group's developmental processes by sampling populations of individuals with histories of small group participation. Students may develop precepts of their true experiences long after any particular small group has adjourned. Tuckman (1965) contended duration of group life would be expected as a variable of influence on the rate of development. Therefore, duration and rate associated with small group development are important when designing a scientific group study.

Typically, student groups do not resemble workplace and laboratory groups. Business professors using peer-learning strategies strive to prepare students for real-world group successes. Group work should be a skill a student can transfer to industry; however, it is not known to what extent cognitive abilities correlate with group development. The research question was apparent: at what level of learning do students perceive that a group begins to norm and perform necessary tasks to accomplish its communal goal(s)? This unanswered question poses a problem for educators using peer learning methods.

Problem

The problem faced by business educators is two-fold: (1) how do professors know if students benefit from their group interactions? Many professors find it is difficult to assess the group learning environment. Assuming students progress temporally through the five stages of development, what learning occurs and at what cognitive levels? And (2) can professors accommodate learning by offering groups task-related instructions beneficial to a broad range of ability differences, comparable to one-to-one tutorials (Bloom, 1984; Larson et al., 1984)?

Teachers make judgments on what groups should accomplish based on supplemental materials, empirical research papers, and books read. McKeachie, Chism, Menges, Svinicki, and Weinstein (1994) offer a definition of peer learning as follows: "We shall use the term "peer learning" to include both "collaborative" and "cooperative" learning. Collaborative and cooperative learning involve interdependence of group members in working towards a common goal" (143). In this study, the definition of small groups shall henceforth adopt the McKeachie et al. (1994) definition of peer learning. Groups assigned at random work better than imposed learning structures (Slavan, 1985).

Groups should be assigned a wide array of peer learning activities to cultivate mutual support and to stimulate learning (Neal & Echternacht, 1995). Several authors reported the positive impact learning groups have on motivation, interpersonal relationships, and attitudes toward learning (Lazarowitz & Karsenty, 1990; Slavin, 1985; Sharan & Shaulov, 1990). Since Tuckman asserted the use of a single group for observation makes control and systematic manipulation of independent variables impossible, a good way to measure the influence of small group learning on development is to assess the perceptions of business students who participated in group learning activities. We reviewed a number of scholarly articles across a broad range of learning environments that guided our research question.

Related Literature

Cooperative learning studies span at least four decades. Webb and Grib (1967) investigated the effectiveness of small student-led discussion groups as a method of instruction. When achievement was the criterion of efficacy, the results of the comparative findings were favorable to both students and teachers. Similarly, Solomon (1990) found relationships between students' cooperative learning experiences and their attitudes toward school. In that study, students in all classes had at least some experience with small group learning and that the effects of cooperative learning on students' academic and social development were a function of the quality of the group interaction. Moreover, Healey and Matthews (1996) assert cooperative learning in small groups produced higher achievement; cooperative learning enabled development of more positive relationships among students and healthier psychological adjustment to the social setting than did competitive or individualistic experiences.

Hauserman (1992) reports on cooperative learning methods pertaining to laboratory and field-based studies of cooperative learning. The study emphasized field-tested methods that can increase the repertoire of effective teaching methodology. Antony and Boatsman (1994) investigated college faculty use of cooperative pedagogical techniques in their classrooms. A survey of over 35,000 faculty revealed that faculty use of cooperative pedagogy was best measured by a seven-item construct. Results showed women used cooperative pedagogy more than men; faculty in the soft sciences used cooperative methods more often than did faculty in the hard sciences. Articles on peer learning and individual outcomes were reviewed.

Wright and Duncan (1986) examined relationships between attraction to group and individual outcomes in groups and between group cohesiveness and individual outcomes in groups participating in a group psychotherapy experiential training program. They found attraction to group and group cohesiveness were both related to individual outcomes. Even adults can benefit (Olmstead, 1970) from small group methods by enhancing motivation for learning, developing positive attitudes toward later use of course materials, and improving problem solving skills. However, group methods were no more effective than lectures for transmitting information and concepts.

Joan Bloom (1975) tested the effectiveness of a small-group curriculum designed to teach cooperative work. Trained groups more frequently selected the most cooperative rule options. Choice of rules was unrelated to the sex of the group or the

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type of training. Choice of rules was related to behavioral cohesiveness but unrelated to type of training. Walberg and Wynne (1994) found that learning group effectiveness was hindered by groups' short-lived character. They recommended educators stress group persistence by keeping discrete groups of students and teachers together over longer intervals.

McElhinney and Murk (1994) advocated using small learning groups in graduate education to prepare learners for workplace challenges. They reported the most effective use for small groups was in researching and learning experiences that do not have well-structured processes or only one right answer. While small learning groups appeared to offer advantages, limitations were also cited: unequal contributions of group members, the knowledge levels of group participants, and the difficulty of evaluating performance and assigning grades. They recommended instructors of small groups should assume the role of facilitator, offering help only when group members cannot solve the assigned problems.

More recently, Strom and Strom (2002) introduced the Collaboration-Integration Theory. The theory was based upon their analysis of two limitations associated with group learning: (1) how to evaluate student groupwork skills and (2) how to provide tasks that enable students to practice those skills. Their theory provided suggestions to ensure students move from a passive to an active role in group learning situations. In addition, Draskovic, Holdrinet, Bulte, Bolhuis, and Van Leeuwe (2004) presented findings on the relationship between the variables comprising learning mechanisms in small collaborative groups. Their findings suggested that a large proportion of collaborative sequences in the group, together with a low proportion of dysfunctional behavior and highly facilitative behavior of the tutor, should lead to increased knowledge development.

The literature search revealed no study that directly addresses our research question, namely the correlation between learning and small group development. However, hundreds of peer learning studies have been published. The articles we reviewed were used to justify the three specific null hypotheses used to test group learning by integrating Bloom's taxonomy with Tuckman's stages of group development.

Hypotheses

One-way Multivariate Analysis of Covariance (MANCOVA) was used to test for mean differences among dependent variables and demographic variables (1) gender, (2) declared major, and (3) grade level regarding students' perceptions of dyadic and small group learning on development. The hypotheses were stated as follows:

Hypothesis 1: There is no significant difference between the means of students' gender regarding their perceptions of dyadic and small group learning on development when age and cumulative GPA are used as covariates to partial out the relationship between the covariate and seven factors.

Hypothesis 2: There is no significant difference among the means for students' declared majors and their perceptions of dyadic and small group learning on development when cumulative GPA is used as a covariate to partial out the relationship between the covariate and seven factors.

Hypothesis 3: There is no significant difference among the means for students' grade level and their perceptions of dyadic and small group learning on development when cumulative GPA is used as a covariate to partial out the relationship between the covariate and seven factors.

METHOD

Sample and Procedure: Nine courses were used in the study as a representative sample from a population of approximately 1,000 students in a college of business at a regional public university. Business and non-business majors participated in this study. Non-business majors included students from other colleges on campus. Three hundred thirty students completed a survey. Institutional guidelines on ethical conduct were followed and approval was granted. The GOLDS survey contained 33 items and demographic data. Students responded to a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Three (3) was used as a neutral term. An unrotated principal component factor analysis suggested seven factors be retained that would account for 61 percent of the scale variance. The principal axis factor method with promax oblique rotation method was used (Hatcher, 1994). One-way MANCOVA (using self-reported cumulative GPA as covariate) and analyses were performed to assess significant differences among three independent variables and the seven derived factors. The factors were used as multivariate dependent variables to compare with means of independent demographic variables. The null hypotheses were tested using a .05 significance level.

Descriptive Data: The statistical analyses presented in this study were based on 330 usable surveys. The survey was completed by 164 males and 166 females. Student ages ranged from 17 to 42 years. The modal age was 20. The average cumulative GPA reported was 3.165, skewed high because of MBA students. GPA varied from 1.7 to 4.0, and the modal GPA was 3.0. The sample included 46 freshmen, 61 sophomores, 98 juniors, 96 seniors, and 29 graduates.

Scale Development: The GOLDS is composed of 33 scenario statements. Statements 1 through 18 on the GOLDS were infused with what Brown and Weidmaier (2003) call "process verbs." Business teachers use process verbs to write learning objectives to assess the level of a student's intellectual ability within the cognitive domain. The cognitive domain is a hierarchy of behaviors associated with certain types of intellectual abilities, beginning with knowledge and ending with evaluation. In table 1 three process verbs from each of Bloom's (1956) cognitive levels were selected randomly from a table presented in Brown and Weidmaier (2003). These process verbs are used to indicate statement scenarios associated with each level of intellectual ability. For example, "knowledge level mental ability" used three scenario statements with the

process verbs define, recite, or read. Statements 19 through 33 on the GOLDS used language that approximated five stages of small-group developmental processes (Forming, Storming, Norming, Performing, and Adjourning); these statements were derived from Tuckman (1965) and Tuckman and Jensen (1977). Table 1 shows wording similar to language used by Tuckman and Jensen (1965; 1977). The GOLDS instrument was used to integrate Bloom's cognitive domain with Tuckman and Jensen's developmental model to measure our theorized construct (group learning on development). Bell and Quazi (2004) recommended a study be done that would use cumulative GPA as a covariate in a means comparison test. They did not conduct a cause-effect experiment to establish a causal relationship between students' perceptions and their actual learning. They made no attempt to determine predictive influences of independent variables on students' perceptions of their own learning. For this study, the GOLDS was analyzed for its reliability.

Table 1: Cognitive Domain (Level and Process Verbs), Development Stages and Statement Numbers

BLOOM'S PROCESS VERB CATEGORY FOR COGNITIVE DOMAIN	STATEMENT NUMBER
Knowledge (define, recite, read)	S1, S2, S3
Comprehension (interpret, translate, compare)	S4, S5, S6
Application (apply, solve, illustrate)	S7, S8, S9
Analysis (summarize, diagram, differentiate)	S10, S11, S12
Synthesis (formulate, prepare, propose)	S13, S14, S15
Evaluation (test, critique, evaluate)	S16, S17, S18
TUCKMAN & JENSEN'S STAGES OF GROUP DEVELOPMENT	**STATEMENT NUMBER**
Forming (testing members, orientation to leader, interpersonal…)	S19, S20, S21
Storming (hostility, boundaries, tasks, resistance, conflicts…)	S22, S23, S24
Norming (feelings, cohesiveness, realistic standards, etc…)	S25, S26, S27
Performing (accomplishing tasks, flexibility, supportive roles, etc…)	S28, S29, S30
Adjourning (lasting good or bad will, scorn, free rider problem, etc.)	S31, S32, S33

Instrument Reliability: A Cronbach alpha reliability test was performed on the GOLDS instrument. The standardized alpha reliability coefficient for the overall scale was 0.928, which exceeds the Nunnally (1978) criteria of 0.70 for an acceptable alpha. Devellis (1991) writes about scale reliability "between .80 and .90, very good…. " (p. 85). The GOLDS scale is a "very good" measure of students' perceptions of group learning on development. Since no item deleted added a noticeable difference to the scale reliability, all items were retained for analyses. A factor analysis was conducted after determining the instrument reliability.

Factor Analysis: Bell and Quazi (2004) found significant statistical differences between business majors' and non-business majors' perceptions of learning in dyads and small groups. Their first derived factor found business majors perceived dyads and small groups to be the number one factor associated with their own learning. Similar scenario statements relating to dyads were used in the GOLDS. Student responses from the GOLDS survey were first subjected to an unrotated factor solution using principal component analysis and "Scree" test which suggested that seven factors be retained for rotation. The original factors accounted for 60.71 percent of the total scale variance. Promax oblique rotation was used to extract the seven factors, as shown in table 3. The criterion for selecting factor loadings was set at 0.38 (Devellis, 1991; Hatcher, 1994; Kachigan, 1991). Using these criteria, six items were found to load on Factor 1, which was subsequently labeled Norming and Performing. Six items loaded on Factor 2, Knowledge, Comprehension and Application Tasks. Five items loaded on Factor 3, Evaluative Forming. Three items were found to load on Factor 4, Storming. Two items loaded on Factor 5, Bad Will Adjourning. Two items loaded on Factor 6, Analyzing. Four items loaded on Factor 7, Synthesizing with Good Will Adjourning. Scenario statements for Factor 1 are presented in table 2 below.

Table 2: Scenario Statements Norming (S25, S26, S27) and Performing (S28, S29, S30) for Factor 1

Factor One: Norming and Performing
S27. My experience with small groups has shown me that I learned better when members were allowed to adopt new roles and their personal opinions could be expressed freely.
S26. My experience with small groups has shown me that I learned better when members were open minded enough to allow realistic new standards to evolve from honest feedback.
S28. My experience with small groups has shown me that I learned better when members could use the strengths of their interpersonal relationships to accomplish specific tasks.
S30. My experience with small groups has shown me that I learned better when members became supportive of task performance and highly committed to achieving goals.
S29. My experience with small groups has shown me that I learned better when my functional role was flexible and the group's energy could be channeled into completing tasks.
S25. My experience with small groups has shown me that I learned better when members developed true feelings towards each other and could work cohesively on goals.

To ascertain if there were any significant differences in students' perceptions among the demographic variables (gender, declared major, and grade level), data were further analyzed using inferential statistics to test the null hypotheses. Table 3 shows new factors and item descriptions of the extracted factors.

Table 3: Promax (Oblique) Rotations with Seven Factors and Communalities*

Statement #	Factor Loadings							
	1	2	3	4	5	6	7	Communalities
Q27	.861	-.095	.000	.016	.003	.125	-.113	.717
Q26	.763	.138	.055	-.063	.019	-.015	-.110	.669
Q28	.745	.002	-.125	-.043	-.090	.049	.093	.633
Q30	.714	-.002	.050	-.167	.037	-.030	.152	.684
Q29	.658	-.040	-.136	-.138	.080	-.063	.297	.649
Q25	.505	-.080	.069	.154	.067	-.012	.050	.477
Q20	.363	-.047	.284	.152	-.034	-.131	.126	.490
Q2	-.120	.866	.123	-.171	-.041	-.062	.025	.692
Q1	-.125	.838	.109	-.006	.040	-.075	-.136	.644
Q4	.154	.803	-.121	.090	-.030	-.041	-.145	.654
Q5	.214	.687	-.035	.015	-.020	.061	-.116	.629
Q3	-.131	.614	.094	-.036	-.043	-.099	.203	.550
Q9	-.012	.406	-.036	.007	-.011	.325	.092	.591
Q8	.078	.360	-.068	.102	.109	-.028	.291	.514
Q16	-.091	.052	.749	-.113	-.086	.051	.056	.651
Q18	-.131	.080	.691	.000	.129	.045	-.038	.634
Q17	-.037	-.023	.617	-.092	.086	.119	.197	.646
Q21	.236	-.005	.454	.246	-.055	-.027	-.119	.560
Q19	.149	.040	.420	.257	-.011	-.112	.043	.541
Q24	-.180	-.058	-.116	.826	-.046	-.073	.118	.699
Q23	.017	.004	.054	.617	-.007	.053	-.142	.580
Q22	-.102	.056	.144	.529	.076	.047	.110	.599
Q32	.024	.078	-.030	-.005	.856	-.059	-.047	.758
Q33	.055	-.147	.062	-.029	.657	.068	-.052	.749
Q10	.009	-.055	.082	-.040	-.010	.908	-.138	.726
Q11	-.027	.218	-.013	.051	.073	.382	.145	.523
Q6	.195	.227	.041	.031	-.024	.290	.054	.054
Q13	.152	-.066	.091	.012	-.062	-.071	.601	.600
Q14	.079	-.038	.338	-.050	-.097	.001	.444	.548
Q31	.236	.103	.019	-.019	.102	-.186	.399	.544
Q7	.156	.323	-.151	.078	-.050	.031	.381	.600
Q12	.006	.129	.002	.135	.012	.228	.334	.334
Q15	.097	.140	.217	-.023	-.063	.042	.279	.279

*Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.
A Rotation converged in 7 iterations.

Table 4: Multivariate Tests for Pillai's Trace and Roy's Largest Root

Pillai's Trace	Gender	Grade level	Declared Major	Roy's Largest Root	Gender	Grade level	Declared Major
Value	.047	.079	.208	Value	.049	.032	.069
F	2.250	.921	1.228	F	2.250	1.467	2.750
Hypothesis df	7	28	56	Hypothesis df	7	7	8
Error df	320	1284	2240	Error df	320	321	320
Sig.	**.030***	.585	.121	Sig.	**.030***	.178	**.006****
Partial Eta Squared	.047	.020	.030	Partial Eta Squared	.047	.031	.064

* represents p<.05 and ** represents p<.01

Findings: To test the three null hypotheses, responses from 330 surveys were used. Multivariate tests for Pillai's Trace and Roy's Largest Root are presented in table 4 for the three null hypotheses tested at a significance level of .05. A significant difference was found between the means of students' gender regarding their perceptions of dyadic and small group learning

on development when age and cumulative GPA were used to partial out the relationship between the covariates and seven factors; therefore, hypothesis 1 was rejected.

A significant difference was found among the means of students' declared majors and their perceptions of dyadic and small group learning on development when cumulative GPA was used to partial out the relationship between the covariate and seven factors; therefore, hypothesis 2 was rejected. No significant difference was found in students' grade level and their perceptions of dyadic and small group learning on development when cumulative GPA was used as a covariate to partial out the relationship between the covariate and seven factors; therefore, hypothesis 3 was not rejected. The next section offers conclusions and recommendations that should be helpful for professors of business using methods of group learning.

Table 5: Tukey's Post Hoc Procedures of Paired Majors on Each Factor

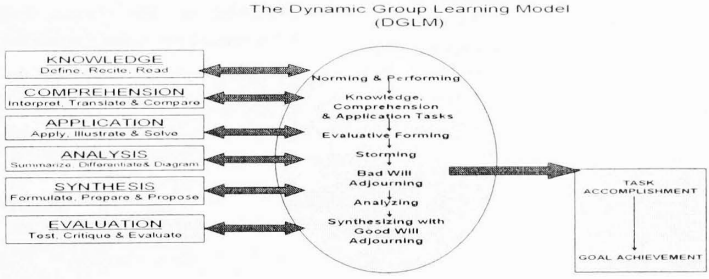
MAJOR	ACCT	BUSC	LEAD	MGMT	MRKT	FINA	MIS	DOUB	OTHER
ACCT		F1=.024*		F4=.003**			F4=.010**		
BUSC				F7=.040*	F2=.012*				
LEAD							F5=.045*		
MGMT							F3=.023* F6=.009**		F6=.012*
MRKT		F2=.012*				F2=.022* F3=.006**	F2=.013*	F2=.011*	F2=.008** F3=.027*
FINA									
MIS	F4=.010**		F5=.045*	F4=.003**	F4=.003**				F4=.035*
DOUB									
OTHER				F7=.015*	F7=.040*				

Table 5 shows significant results of the Tukey's post hoc procedure for comparing each major and each factor. All seven factors had at least one major that differed from another major.

Conclusions

Based upon the factor analysis of the GOLDS 33 item scenario statements, the seven derived factors contribute to understanding of how dynamic group learning relates to stages of small group development. The seven derived factors were used to justify the creation of a Dynamic Group Learning Model (DGLM) as presented in figure 1. Bloom's cognitive domain (knowledge, comprehension, application, analysis, synthesis, and evaluation) is represented by randomly selected process verbs used in each scenario statement representing the appropriate level of mental ability in the cognitive domain (Bloom et al., 1956). Three randomly selected process verbs represented an appropriate level of cognition (Brown and Weidmaier, 2003). Students responded to GOLDS items S19 through S33 that represented five stages of group development (Tuckman and Jensen, 1977). The responses were subjected to factor analysis, resulting in seven derived factors. The derived factors are construed as separate dimensions of the DGLM construct.

Figure 1



As shown in figure 1, the DGLM presupposes individual learning to be intellectually hierarchical, consistent with Bloom et al. (1956); moreover, the directional flow of cognitive learning is indicated with arrows moving from knowledge down to evaluation. Of special importance is the two-way flow between an individual group member's cognitive abilities and the seven derived factors. We propose that small group learning occurs as a result of intervening variables, combined with small group learning processes that help shape necessary tasks leading to communal goal achievement(s). This research showed scenario statements (S27, S26, S28, S30, S29, S25) representing Norming and Performing loaded on Factor 1 and accounted for 31.50 percent of the scale variance. Respondents perceived small group learning was more influenced by Forming and Storming stages of development than by lower level cognitive abilities. The DGLM shows a flow of small group learning processes from the Norming and Performing to Synthesizing with Good Will Adjourning. Norming and Performing has more weight in the DGLM than the lower level intellectual abilities in Factor 2, which is composed of

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Knowledge, Comprehension and Application Tasks (Bloom et al., 1956).

We surmise from the DGLM students may perceive that small groups that progress beyond Forming and Storming may be better positioned to engage in meaningful learning tasks related to achieving communal goal(s). Factor 1, Norming and Performing, accounts for more than five times the variance of Factor 7, Synthesizing with Good Will Adjourning. The one-way arrow beginning with Factor 1 flows toward task accomplishment. The DGLM reflects a large number of learning and developmental processes which occur simultaneously and show an inevitable flow towards goal achievement. Therefore, small group learning on development might be construed as a dynamic process that facilitates task accomplishments which lead to goal achievements. Students also appear to perceive higher level cognitive abilities but at a lesser rate on the group development processes, including Evaluative Forming, Storming, Bad Will Adjourning, Analyzing, and Synthesizing with Good Will Adjourning.

The researchers were intrigued that evaluation and synthesis, higher learning abilities, were present at a group's formation and adjournment. More advanced cognitive ability was associated with adjournment with bad will or good will. Higher level learning appears to take place in the formation of the small group and at its adjournment. Perhaps students form precepts about future relations because they dread or favor having an encounter with the same personality type or persons in a future peer learning context. Nevertheless, adjournment issues appear to be moderately important factors in dynamic group learning on development. More importantly, students perceive lower level intellectual abilities to be associated with the stages of development that Tuckman and Jensen (1977) associated with task accomplishment and goal achievement. As illustrated in Figure 1, the DGLM shows one arrow flowing from task accomplishment to goal achievement representing the endpoint for small group learning on development. The arrow between task accomplishments and goal achievement is unidirectional because task accomplishments are necessary for goal achievement. The following recommendations are offered to business educators.

Recommendations

Recommendation One: Business professors at the regional university where the investigation was conducted (using peer-learning as a teaching tool) should write clear and precise instructions for small groups. Instructions should be written in directive, outcomes-based language at the appropriate lower levels of intellectual abilities (knowledge, comprehension and application) using specific process verbs.

Recommendation Two: Business professors should assist students to progress beyond what Tuckman (1965, 1977) refers to as stages one and two of small group development: forming and storming. Teachers can do so by randomly assigning students to groups and requiring them to assign formal roles, such as a president and a secretary. Small groups need help getting beyond the forming and storming stages quickly in order to facilitate progress toward the first stage in the DGLM—Norming and Performing. Recall those two stages comprise Factor 1, which students perceive to be associated with group learning on development. To facilitate learning, professors can (1) assign leadership roles, (2) give groups the ability to select leaders and ways to change or adopt new leaders, (3) give groups the ability to terminate the membership of non-productive members through agreement, (4) give a number of tasks weighted by importance, and (5) write out the goal or goals the group is to achieve with a time schedule.

Recommendation Three: Professors' written instructions should pertain to the knowledge, comprehension and application levels that comprised DGLM Factor 2. Learning objectives using the process verbs define, recite, read, interpret, translate, compare, apply, illustrate, and solve should be written out in advance of small group formation. As noted in Figure 1, although analyzing and evaluating were factors, it appears lower level cognitive processes have more influence on small group learning tasks once the group has progressed beyond Norming and Performing stages. This study will enhance the thinking and practice in business education. Small groups will benefit from improved written instructions tailored to the lower levels of cognition, and small groups will develop quickly beyond forming and storming with assistance of business professors.

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