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Factors Affecting Team-Based Learning in Industrial Education: Thai Instructors' Perspectives

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ABSTRACT

This study was conducted to explore instructors' perspectives of factors affecting Team-Based Learning (TBL). We administered a likert-style questionnaire with a seven-point rating scale to 153 instructors from six Faculties of Industrial Education throughout Thailand. The questionnaire's content validity was examined by five experts. Its reliability calculated by Cronbach Alpha Coefficient was 0.94. We identified six factors as follows: (1) Knowledge and Comprehension (2) Objectives of Learners' Readiness (3) "Don't Do" Activities (4) Teaching and Learning Activities (5) Roles of Instructor and Learners (6) Principles and Planning of TBL.

In general, our results suggest that TBL requires specific skills such as consensus building. It requires a knowledge base. Therefore, those individuals and institutions interested in promoting TBL will need to invest human and financial resources into ensuring that instructors and learners have the necessary knowledge and skills in order to successfully engage in this new form of learning.

Keywords: Team-Based Learning/Industrial Education/Instructors' Perspectives/Factor Analysis

INTRODUCTION

Team-Based Learning (TBL) is a powerful instructional strategy that can be applied to a variety of disciplines and class sizes. According to Michaelsen (2004), TBL is a one of the few instructional strategies that can be used effectively in large classes as well as in small classes. It transforms how classroom time is used and the roles that students and teachers play in the learning process. In TBL, students start by doing readings that introduce them to course concepts. Students are held accountable for this work through a Readiness Assessment Process (RAP) to ensure that they are ready to work on applications of the concepts when they come to class. In addition, students will be able to change their attitude towards responsibilities, develop human relationships from working as a team, exchange ideas, and apply knowledge to "real life" situations and/or to new problems (Paulson & Faust 2000). Instructors can take full advantage of class time by letting students work in teams on higher-level problems that exercise students' judgment rather than simply their basic knowledge (Hodgson &

Ostafichuk 2005). The organization of the teams is around problem solving (instrumental learning); but specifically, team tasks involve coming to a consensus among several choices regarding the “best” choice. This coming to consensus forces communicative learning. Students must discuss subject matter at depth, promoting their own choice or coming to understand others’ choices. In the process, students are freed of prior misconceptions (Michaelsen 1973).

TBL is particularly important in industrial education because the profession requires that individuals work in teams. Tasks are constructed that require groups to consider different possibilities and then come to a consensus decision about the “right” answer (Slavin 1995). In Asian countries and in Thailand, there is a tradition of working individually and of following the leader (Jamornmarn 1996). TBL in Industrial Education (IE) in Thailand; therefore, presents challenges. Although it is an important area, little is known about TBL in IE in Thailand. The purpose of this paper is to fill this gap in the literature.

OBJECTIVE OF THE STUDY

The objective of this study was to identify and analyse factors affecting TBL in Industrial Education (IE) according to Thai instructors’ perspectives.

OUTCOMES OF THE STUDY

The results of this study will be useful as follows:

1. For IE instructors in terms of providing them with more knowledge of TBL and for innovation in classroom learning as well as knowledge about designing and planning the process of TBL.
2. For policies of Faculties of Industrial Education in terms of supporting TBL and setting conditions for optimal implementation of TBL.
3. For building a theoretical basis for TBL in contexts of IE.

THEORETICAL FRAMEWORK

The theoretical framework used in this study is shown in Figures 1a and 1b (Michaelsen 2002). The figures outline the roles of instructors and learners in TBL.

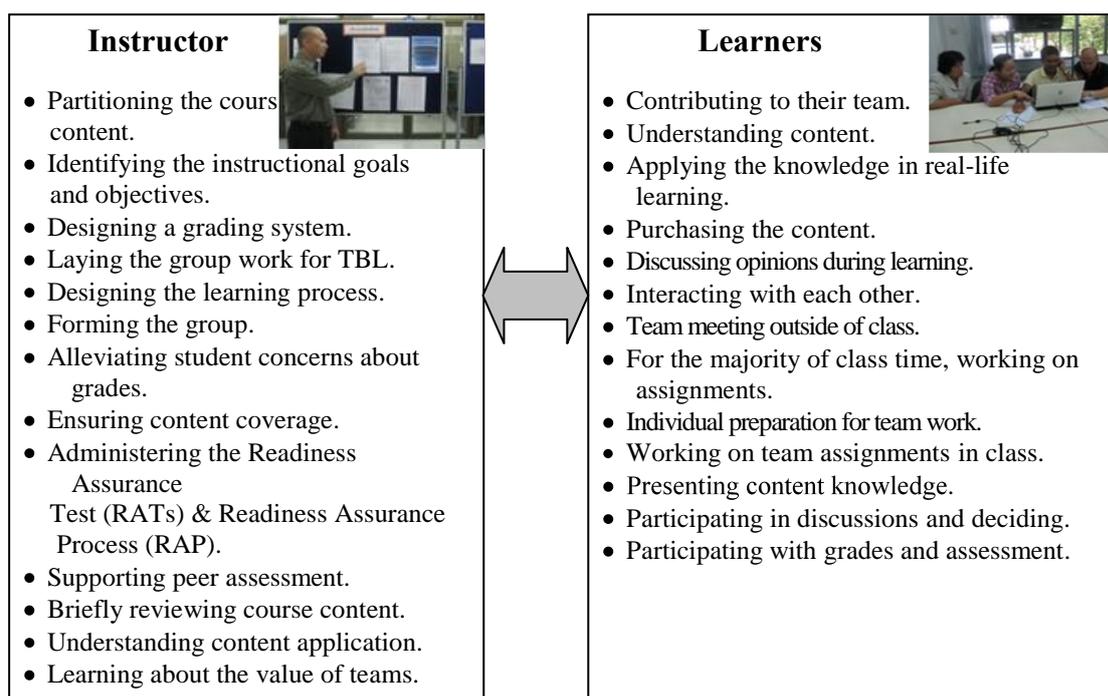


Figure 1a: Instructor

Figure 1b: Learners

Figure 2 outlines the TBL process before, during, and after. This process involves a feedback loop whereby the measurement and evaluation that takes place at the end can subsequently inform future TBL activities.

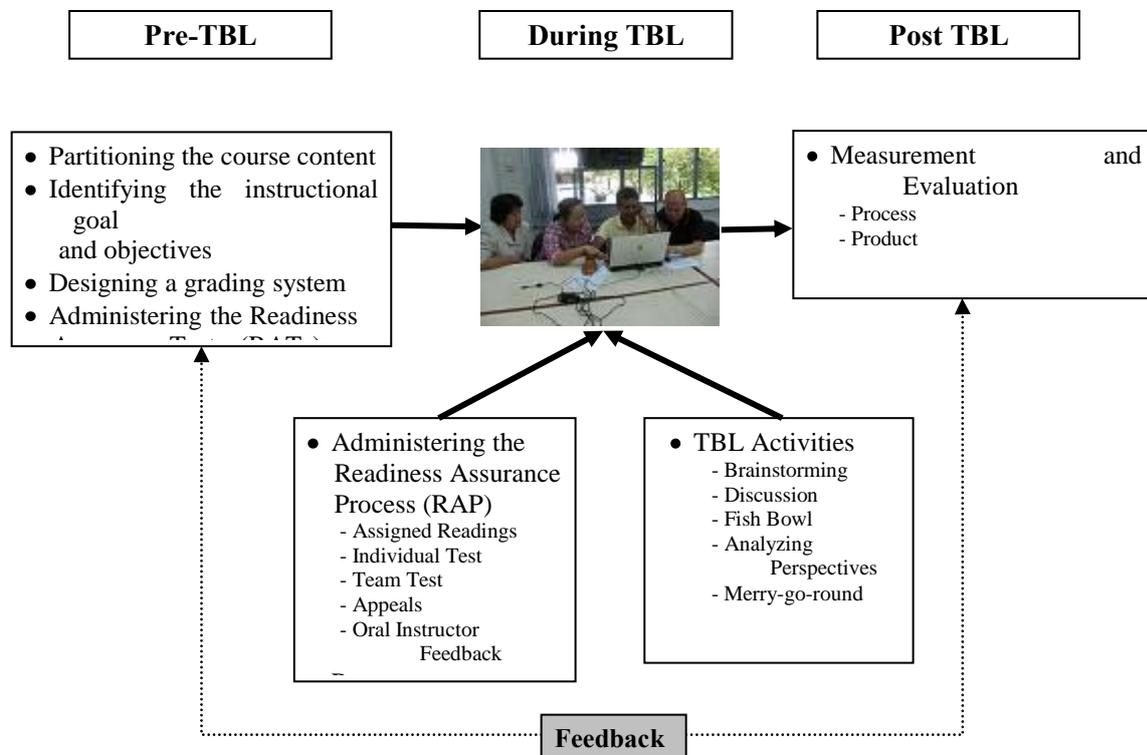


Figure 2: The process of TBL

RESEARCH METHODOLOGY

Data Collection

Permission to conduct the study and recruit participants was obtained from the King Mongkut's University of Technology, Thonburi, King Mongkut's University of Technology, North Bangkok, King Mongkut's Institute of Technology Ladkrabang, Rajamangala University of Technology Krungthep, Rajamangala University of Technology Thanyaburi, Rajamangala University of Technology, Phra Nakhon, Thailand for all six campuses.

Recruitment letters along with a questionnaire were sent to one campus while, for the other five campuses, the letters and questionnaire were distributed in person by the researchers.

Questionnaire

The nine-page questionnaire used a seven-point likert scale with 117 variables. The points on the scale ranged from Strongly disagree; Disagree; Somewhat disagree; Neither agree nor disagree; Somewhat agree; Agree; Strongly Agree. The questionnaire took approximately one hour to complete. The questionnaire was examined to find the content validity with the index of consistency (IOC) technique by five experts. Then, the variables were adapted as per the experts' recommendation. Next, the adapted questionnaire was tested with 30 instructors not in the study's sample. Reliability was tested using the Cronbach Alpha Coefficient. The result was 0.94. The questionnaire was sent out to 497 instructors by mail in July, 2008. By September of the same year, 153 instructors had returned completed questionnaires. This equals a response rate of 30.79%.

Data Analysis

Data analysis began by testing the adequacy of the 153 instructors with Kaiser–Meyer–Olkin Measure of Sampling Adequacy (or KMO). The adequacy was 0.891 which means the sample was suitable for Factor Analysis. We used descriptive statistics such as mean (\bar{x}), Standard Deviation (*SD*) of each variable and average score to judge the validation. Pearson’s Product Moment Correlation of each variable was used to show the relation matrix and test significance. Theoretically speaking, in order to analyse the factors of TBL, the factor loadings will not be weighted below 0.40. We then interpreted the factors and labelled them with new variables. This step required experience in labeling and giving a meaningful name to each factor by considering variables for such factors. Those involved in this step were the principal investigator, a co-investigator and one expert.

RESULTS OF THE STUDY

The mean of 117 variables were between 4.535- 6.366 which meant that the range of participating instructors’ agreement on the variables affecting TBL was from ‘somewhat agree’ to ‘agree’ levels. The standard deviation was between 0.873-2.019 which means that the instructors’ agreement was not unanimous.

Instructors identified the most important factors as follows: cultivating learners’ work as a team; learners’ comprehension and understanding; the importance of working as a team; and applying newly received knowledge. They identified the least important factors as follows: reducing instructors’ teaching loads in the classroom; showing conflicts of opinions; and teaching each course rapidly.

Table 1 presents the items for one of the six major factors: Roles of Instructor and Learners consisted of 21 of 55 variables. These 21 variables had factor loadings weighted 0.605-0.822 along with the eigenvalues of 14.472 or 26.313%.

Item #	Variables	Factor’s Loadings
101	Interacting with others	0.822
100	Devoting time and effort	0.813
102	Working in a team to gain high quality	0.793
57	interaction in the team	0.790
107	Participation in thinking, discussion, and decision-making	0.781
99	Preparing for team working	0.779
110	Applying knowledge in the future	0.777
112	Working with other learners	0.763
73	Learning how to work together	0.759
58	Decision-making	0.758
72	Learners know how to behave to be effective and successful.	0.743
109	Active learning	0.731
98	Learners record changes in the team during work.	0.728
63	Learners should understand and know the importance of team-work	0.727
97	Analyzing the obstacles to team success	0.716
27	Learners’ understanding of the subject contents.	0.709
56	Encouragement among peers	0.678
77	Sharing responsibilities among learners	0.674
61	Team performance	0.658
62	Support from each member.	0.651
95	Write or record changes or situations which result in changes.	0.605

Table 1: Factor 1, Roles of Instructor and Learners

Table 2 presents Factor 2: Teaching and Learning Activities. This factor consisted of 10 to 55 variables with factor loadings weighted 0.581 – 0.762 along with the eigenvalues of 6.402 or 11.639%.

Item #	Variables	Factor's Loadings
74	Building enthusiasm	0.762
76	Not worrying about being accepted by others.	0.737
68	Tolerance for minorities, races and disabilities.	0.699
75	Evaluation method is suitable.	0.693
66	Learners should understand and know the importance of team working.	0.649
116	Answering questions or problems in series.	0.638
115	Understanding knowledge in terms of the contents taught.	0.638
113	Many situations are used to present the contents in front of the classroom.	0.626
111	Responsibilities in searching for contents of the subject	0.602
64	Scores from five (Readiness Assurance Tests) RATs are shown to each team	0.581

Table 2: Factor 2, Teaching and Learning Activities

Table 3 presents Factor 3: Knowledge and Comprehension. This factor consisted of 10 from 55 variables with factor loadings weighted 0.622 – 0.901 along with the eigenvalues of 6.363 or 11.569%.

Item #	Variables	Factor's Loadings
48	Individual Test' RATs are used to evaluate the reading materials or assignments.	0.901
47	Reading task' Learners read materials and exercises which must be finished outside class.	0.878
38	To give instruction in shorter time.	0.838
37	To reduce wasted time of instructors.	0.801
49	Team testing is evaluated repeatedly and the same questions as in individual test are used.	0.788
78	Contents of the subject are limited when there are assignments about team work in classroom.	0.700
80	Instructors must explain how to work as a team so that learners understand the system of team-work.	0.698
79	Instructors must reserve time for solving disagreements in teams.	0.697
103	Gaining scores from Readiness Assurance Tests (RATs).	0.632
60	Individual performance.	0.622

Table 3: Factor 3, Knowledge and Comprehension of TBL

Table 4 presents Factor 4: Principles and Planning. This factor consisted of 7 from 55 variables with factor loadings weighted 0.622 – 0.791 along with the eigenvalues of 5.144 or 9.352%.

Item #	Factor's Variables	Factor's Loadings
8	Books chosen as reading material outside class are related to the main	0.791

	ideas of the subject taught.	
7	The contents are divided into units consisting of 2-4 lessons.	0.782
9	Study time is scheduled in terms of weeks.	0.742
4	There are 5-7 members in a team.	0.711
10	There is tracking on activities inside and outside class.	0.709
5	There is variety in concept and imagination.	0.677
2	Obstacles to team strength are reduced.	0.622

Table 4: Factor 4, Principle and Planning of TBL

Table 5 presents Factor 5: “Don’t Do” Activities. This factor consisted of 4 from 55 variables with factor loadings weighted 0.719 – 0.868 along with the eigenvalues of 3.261 or 5.930%.

Item #	Variables	Factor’s Loadings
88	No suggestions on dividing task to each member.	0.868
87	Depending on competent members only.	0.842
86	Expressing dispute.	0.720
89	Smaller groups inside the team.	0.719

Table 5: Factor 5, “Don’t Do Activities”

Table 6 presents Factor 6: Objectives of Learners’ Readiness. This factor consisted of 3 from 55 variables with factor loadings weighted 0.761-0.782 along with the eigenvalues of 2.880 or 5.237%.

Item #	Variables	Factor’s Loadings
42	To gain higher motivation in interaction.	0.782
41	To pay more attention to team goals.	0.777
40	To have interaction with others in a fast and informal way	0.761

Table 6: Factor 6, The Objectives of Students’ Readiness

These six factors found in this study that affected TBL could be explained as 70.040 % of the total variance. The Correlation Coefficient between six factors that affected TBL was 0.529 – 0.698, which was at high level because in order to separate factors of TBL, the factor loadings will not be weighted below 0.40. However, the Correlation Coefficient within the six internal factors was 0.001–0.100, which was at low level. This is shown in Figure 3.

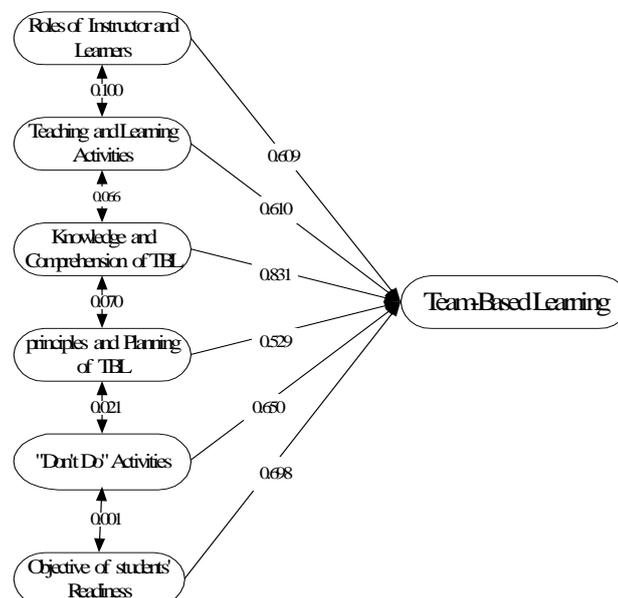


Figure 3: Confirmatory model showing correlation coefficient within six internal factors affecting TBL in industrial education according to Thai instructors' perspectives

The regression or predicting equation of factors affecting TBL was:

$$Y = .699(\text{Roles_Of_Instructor_and_Learners}) + .610(\text{Teaching_and_Learning_Activities}) + .831(\text{Knowledge_and_Comprehension_of_TBL}) + .529(\text{Principles_and_Planning_of_TBL}) + .650(\text{"Don't_Do"_Activities}) + .698(\text{Objectives_of_Learners'_Readiness})$$

The prediction equation had the power of prediction 50% and error of prediction was 16.667%. When we rank the factors in terms of importance for instructors, we have the following order: (1) Knowledge and Comprehension (2) Objectives of Learners' Readiness (3) "Don't Do Activities (4) Teaching and Learning Activities (5) Roles of Instructor and Learners as well as (6) Principles and Planning of TBL.

DISCUSSION AND CONCLUSIONS

This study was conducted to explore instructors' perspectives on factors affecting Team-Based Learning (TBL). The sample was 153 instructors from six Faculties of Industrial Education throughout Thailand in 2008. The instrument used for data collection was a likert-style questionnaire with seven rating scales. Content validity was examined by five experts. The reliability of the instrument calculated by Cronbach Alpha Coefficient was 0.94. The results identified six factors as in: (1) Knowledge and Comprehension (2) Objectives of Students' Readiness (3) "Don't Do" Activities (4) Teaching and Learning Activities (5) Roles of Instructor and Learners as well as (6) Principles and Planning of TBL. The reason why 'Knowledge and Comprehension' play the most important role affecting TBL to be effective and efficient is that TBL is quite new for Thais. If both instructors and learners do not understand the procedure and the objectives of TBL, the instruction will fail. Moreover, instructors also perceived that student readiness was the second most important factor for the success of TBL. This means that learners should prepare and read contents before each class. However, instructors never know whether learners read their assignment or not. Therefore, instructors should give a test for each person and for the team in order to know the readiness of learners based on their scores. As for 'Teaching and Learning Activities,' they play an important role because these must be done by learners and instructors who work as facilitators. TBL is useful due to the fact that each person must work in teams and that the teams always encounter the occasion when they must reach a consensus by deciding one "right" answer out of different possibilities (Slavin 1995). Learners in Industrial Education must undergo the procedure of depriving misunderstandings by discussing the subject matters at depth in order to achieve the consensus through communicative learning (Michaelson 1973). However, 'Principles and Planning' of TBL play the least important role because instructors must have planned before the semester starts; thus, this procedure is not that complicated.

Moreover, if the questionnaire had been administered with learners, 'Knowledge and Comprehension' may not have ranked as highly. The first two factors related to the success of TBL places on learners in terms of the knowledge base and preparedness. The factors directly related to the instructor are ranked after factors related to learners. This suggests that instructors perceive learners' role in the success of TBL as being very important.

LIMITATIONS AND IMPLICATIONS

This paper was limited to one country and one university only. Results may have been different if the study had been administered in a different university, country or faculty. It is possible that TBL is more important in certain disciplines than in others. Researchers may wish to replicate this study in other contexts to determine if results might be similar or different. Also, the study investigated instructors' perspectives only and not those of learners. It would be interesting to compare the factors that learners consider important with those considered important by instructors. The response rate for the questionnaire was low at approximately 30%. It is possible that only those instructors who

consider TBL important responded. A larger response rate may have yielded different results. The response rate may have been affected by the fact that the questionnaire was nine pages long. A shorter questionnaire might yield a higher response rate. The study focused only on instructors' perspectives. There was no observation of their practice. Therefore, we do not know if, in fact, their perceptions would actually translate into classroom behaviours.

In terms of implications for practice, since instructors consider knowledge of TBL to be of prime importance, they will need to ensure that their students have this knowledge of TBL. If it is important that learners be able to build consensus, engage in critical thinking and apply knowledge rather than simply gain knowledge, then they will need education or training in these areas. We cannot assume for example that learners will be able to build consensus without having been given some specific techniques for doing this. In terms of policy, it is important that institutions ensure that instructors have the requisite knowledge about TBL. This may require special training or professional development opportunities.

In terms of future research, it would be of use to study the factors that learners consider important. In general, our results suggest that TBL requires specific skills such as consensus building. It also requires a knowledge base. Therefore, those individuals and institutions interested in promoting TBL will need to invest human and financial resources to ensure that instructors and learners have the necessary knowledge and skills in order to successfully engage in this new form of learning.

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