

CHAPTER 4

Case Studies

4.1 Chapter of Overview

Case studies are reported in order to confirm the proficiency of the proposed SAOC learning framework. Two case studies are considered here. The first case is about to examine the framework to solve the problem by observing the learning outcome. The second case finds the relationship between the learning style of instructors and students so as to reach learning outcome achievement. The solution methodology as proposed in Chapter 3 will be used in both cases. However, the relationship between the instructor and student learning styles is used for highly improving student learning outcomes. Finally, the second case is also used to verify the influences of the social networks on the improvement of learning process.

4.2 Case 1: Primary alternative SAOC learning framework

4.2.1 Phase 1: Population Survey

The samples with the sample size of 80 are surveyed using personal information questionnaires. The result is shown in Table 4.1.

Table 4.1 Personal Information

Sex		Education				Age			Rank			Corps	
Male	Female	VL	UG	ML	DL	Low	High	Average	Wg.Cdr.	Lt.Col.	Sqn.Ldr.	Science	Other
59	21	19	53	6	2	35	54	44.50	20	1	59	35	45

Remark: VL: Vocational level, UG: Undergraduate,

ML: Master Level, DL: Doctoral Level

Total 80 students are consisting of 59 males and 21 females. The education levels are 19 vocational level, 53 undergraduate, 6 master level, and 2 doctoral level. 35 students

were graduated from science departments and 45 students were from other departments. Moreover, their varieties of ages were from 35 to 54 years. So the age average was 44.5 years. Besides, the varieties of education levels, ages and ranks of positions are obviously different from each other as followings: 20 Wing Commanders, 1 Lieutenant Colonel, and 59 Squadron Leaders.

4.2.2 Phase 2: Experiment Process

It is found that there are four styles of SAOC students as previously described, i.e. diverger, assimilator, converger, and accommodator as shown in Table 4.2 below.

Table 4.2 SAOC Learning Style

Learning Styles	Age Average (Years)	No of student	Education Levels							
			VL	%	UG	%	ML	%	DL.	%
Assimilato	47.71	14	2	14.28	10	71.42	1	7.14	1	7.14
Diverger	47.85	20	5	25	12	60	3	15	0	0
Converger	47.82	29	9	31.03	17	58.62	2	6.9	1	3.44
Accommo	48.64	17	4	23.53	13	76.47	0	0	0	0

Remark: the age average was calculated in decimal point for example 47.72 is 47 years and 8 months (approximation)

The first group is 14 assimilators with the age average was 47.71 years, comprising of 2 VT students, 10 UG students and 1 ML students, 1 DL students. The comparisons of their educations were considered in percentage, where they were 14.28 percent of VL, 71.41 percent of UL, 7.14 percent of ML, 7.14 percent of DL. The second group is 20 divergers, which age average 47.85 years. They comprise of 5 VL students, 12 BL students, and 3 ML students. In terms of education, 25 percent is VL, 60 percent is BL. 15 percent is ML. The third group is 29 convergers which age average 47.82 years, comprises of 9 VL students, 17 BL students, 2 ML students and 1 DL students. With respect to education, the percentage of this group can be divided into 31.03 percent is VL, 58.62 percent is BL, 6.90 percent is ML. 3.44 percent is DL. The last group is 17 accommodators which age average 48.64 years, comprises of 4 VL students and 13 BL students. As far as education is concerned, the percentage of this group can be divide into 23.53 percent is VL, 76.47 percent is BL.

Table 4.2 shows the comparison of four education groups, where the result is given as followings. The Accommodator group was the lowest level of education of the four

groups, whereas the Assimilator group was the youngest, highest level of the education of all groups. For the assimilator and converger, they worked in science field as the doctor of medicine (M.D.), nurse and an engineer. The four groups were taken into SAOC's learning model in phase 2.

All of the students in a course were re-arranged into 8 seminars by using the four learning styles, average age education and corps. The negative reinforcement is an important tool to set in the first four seminars by addressing accommodators to be the leaders of the groups. The data were shown in Table 4.3.

Table 4.3 SAOC Student Learning Style in 8 Seminars

Positions	SEMI 1	SEMI 2	SEMI 3	SEMI 4	SEMI 5	SEMI 6	SEMI 7	SEMI 8
	NO	NO	NO	NO	NO	NO	NO	NO
Leader	77	80	37	8	55	32	38	35
Member	2	30	18	63	62	64	7	73
Member	5	12	1	9	10	6	16	4
Member	11	15	3	17	42	19	25	13
Member	14	20	22	21	50	23	33	26
Member	40	24	54	44	51	45	35	28
Member	52	27	58	48	65	56	36	29
Member	53	39	68	71	67	60	46	31
Member	59	41	76	74	70	69	49	43
Member	61	57	78	75	79	72	66	47

Accommodator

Diverger

Assimilator

Converger

Table 4.3 comprises of the 8-seminar student groups. Their positions and class numbers with distinct four colors are as shown by their learning styles.

Before doing exercises, the students were tested with the process of problem-solving test. The students have been lectured about problem solving process. They were managed to have many various exercise situation in order to keep their scores and use the score to be compared with post-test score average in the Table 4.4.

Table 4.4 Scores of Pre and Post-tests

NO	Pre-test	Post-test1	Post-test2	Post-test3	average
8	3	6	3	7	5.33
15	3	4	4	3	3.67
18	4	3	3	4	3.33
21	3	5	3	5	4.33
23	2	3	2	2	2.33
25	2	1	1	3	1.75
29	3	2	2	1	1.67
33	3	1	2	1	1.33
37	1	3	5	1	3
40	1	3	1	1	1.67
47	5	5	6	5	5.33
62	4	3	5	4	4
64	2	2	3	2	2.33
67	3	6	6	7	6.33
68	1	3	3	2	2.67
77	4	4	2	3	3
80	2	2	0	3	1.67
Average	2.71	3.29	3	3.18	3.16

Increase = 58.82 %, Remain the same = 5.80 %, Decrease = 35.29 %

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Table 4.4 illustrates 3 post-test results of students. The results of post test showed that 58.82 percent of the students score higher than the pre-test. The 5.8 percent of them had the same score, where the 35.29 percent of them have lower score than the pre-test scores. However, the four students of experimental group's scores show that two of them obtained higher scores but there were two obtained lower. The leaders were chosen in the last assignment as shown in Table 4.5.

Table 4.5 Performance Scores of the Students

seminar 1		seminar 2		seminar 3		seminar 4		seminar 5		seminar 6		seminar 7		seminar 8			
88.37	Positions	89.11	Positions	90.15	Positions	88.03	Positions	87.23	Positions	86.61	Positions	87.76	Positions	87.44	Positions		
88	LED	89	LED	88	LED	88	LED		LED		LED		LED		LED		
	MEM		MEM	81	MEM		MEM	87	MEM	84	MEM		MEM		MEM		
	MEM		MEM		MEM		MEM		MEM		MEM		MEM		MEM		
	MEM	84	MEM		MEM		MEM		MEM		MEM	83	MEM		MEM		
	MEM		MEM		MEM	85	MEM		MEM	88	MEM	83	MEM		MEM		
83	MEM		MEM		MEM		MEM		MEM		MEM		MEM		MEM		
	MEM		MEM		MEM		MEM		MEM		MEM		MEM	83	MEM		
	MEM		MEM		MEM		MEM	88	MEM		MEM		MEM		MEM		
	MEM		MEM		MEM		MEM		MEM		MEM		MEM		MEM		
	MEM		MEM		MEM		MEM		MEM		MEM		MEM	86	MEM		
Group's score Performance.																	
ACC		ACC		ACC		ACC		DIV		CON		ASS		CON			
88.37		89.11		90.15		88.03		87.23		86.61		87.76		87.44			
Experimental group's Score average						88.92 %						Control group's score average				87.26 %	
Average ACC leader's score						88.25%						Average ACC member's score				84.25%	

While the students were acting as the leaders of the groups, they could assist and made a progress in their groups. The experimental group's score average was higher than the control groups' score average. According to the research study, the four students' of the experimental groups do not only have higher group scores, but the individual scores of them have higher than the same style who were in member positions from the journal writing and presenting. Apart from the higher score groups, they were able to obtain the better individual ranking in class.

4.2.3 Phase 3: Result Analysis

The result of the experiment of case 1 can be analyzed as follows:

1) Most of the accommodator students have higher score in post-test than pre-test. From Kolb learning style, the students who had accommodating style, the learning abilities were concreted experience and active experimentation. To solve the problems in working group assignments, they were relied on people rather than their own technical analysis. They were able to engage in reflection and conversation about the team experiences and knowledge construction, which could make them understand and better achieve in their post-test.

2) In the different position, the score of accommodator students who were the leader of the groups were obtained higher score than the accommodator student scores who were the member of the groups. It means that the different positions

between the leader and member could make an important role both in team acting performance and responsibility. The students were acting as a member, who had less responsibility and concentration in the team, which caused them to get lower scores. To challenge this difficult task, the negative reinforcement could be conducted to solve the problem by setting up the accommodators to be the leaders of team, where in addition the characteristic of leadership could be developed. This method supports them to have more responsibility and lead their team, so they had to encourage themselves and their learning. Undoubtedly, they got higher scores than the other members of the team. Moreover, they can make better team performance than the other learning style leaders.

4.2.4 Phase 4: Model Verifying

The same method was verified to the latter course and the outcome results which were compared with the former course. The results were shown in Table 4.6.

Table 4.6 Status of Students

Sex		Education levels				Age			Rank				Corps	
M	F	VL	LA	ML	DL	Low	High	Aver.	Wg.Cdr.	Lt.Col.	Sqn.Ldr.	Maj.	Science	Other
60	20	23	51	5	1	38	54	46	14	1	64	1	32	48

In phase 1, the verifying experimental group, the survey sample found that a total of 80 students consist of 60 males and 20 females classified by their education levels namely 23 VL students, 51 BL students, 5 ML students and 1 DL students. The 32 students worked in science departments and 48 students were from other departments. Moreover, the age varies from 38 to 54 years, so their average age was 46 years. Besides, the variety of education and ages, the ranks of position were obviously different from each other as follows: 14 Wing Commander, 1 Lieutenant Colonel, 64 Squadron Leader and 1 Major.

All of the students in this course were assessed by Kolb's learning style assessment. There were four styles of SAOC students, diverger, assimilator, converger, and accommodator as shown in Table 4.7.

Table 4.7 SAOC'S Learning Style

Learning Style	Age Average (years)	No of students	Education Levels							
			VL	%	UG	%	ML	%	DL	%
Assimilator	46.56	16	5	31.25	9	56.25	1	6.25	1	6.25
Diverger	48.37	19	4	21.05	15	78.95	0	0	0	0
Converger	48.48	16	5	31.25	10	62.5	1	6.25	0	0
Accommoda	48.5	29	9	23.04	17	58.62	3	10.34	0	0

Remark: the age average was calculated in decimal point for example 46.56 is 46 years and 6 months (approximation)

After assessment, from the step 1 in phase 2, the first group is 16 assimilators, which age average 46.56 years, comprises of 5 VL students, 9 UG students, 1 ML students, 1 DL students. To comparing with their education, the data distribution is shown as following, 31.25 percent were VL students, 56.25 percent were UG students, 6.25 percent was ML students, and 6.25 percent was DL students. The second group is 19 diverger, age average is 48.37 years, comprises of 4 VL students and 15 UG students. The education levels were compared, where the percentage of this group can be divided into 21.05 percent and 78.95 percent are VL and UG students respectively. The third group is 16 converger, age average is 48.5 years, comprises of 5 VL students, 10 UG students, and 1 ML students. In terms of education, 31.25 percent is VL, 62.5 percent is UG, and 6.25 percent is ML. The last group is 29 Accommodators, which age average is 48.48 years, comprises of 9 VL students, 17 UG students, and 3 ML students. When we compare to their education levels, the percentage of this group can be divided into 23.04 percent is VL students, where UG and ML students are 58.62 percent and 10.34 percent respectively.

For all the four groups, it can be concluded that the accommodator group was the oldest and had the lowest education levels of the four groups; whereas the assimilator group was the youngest, highest education levels of all that worked in science field as the doctors of medical (M.D.), the nurse and an engineer. While the 4 groups were re-arranged into 8 seminars, step 2 to 3 of research process, the results of their pre-post test was shown in Tables 4.8.

Table 4.8 SAOC Student Learning Style in 8 Seminars

Positions	SEMI 1	SEMI 2	SEMI 3	SEMI 4	SEMI 5	SEMI 6	SEMI 7	SEMI 8
	NO	NO	NO	NO	NO	NO	NO	NO
Leader	42	40	78	38	36	7	34	48
Member	8	1	3	6	12	16	4	2
Member	11	5	20	10	13	37	9	17
Member	18	19	33	26	15	44	14	25
Member	22	21	35	27	23	51	43	28
Member	29	24	41	46	50	52	49	32
Member	30	31	47	58	54	53	57	39
Member	60	55	61	62	56	59	64	45
Member	76	74	65	70	63	68	69	67
Member	79	77	66	73	72	80	71	75

Accommodator

Diverger

Assimilator

Converger

Before doing exercises, the students were tested with the problem-solving test. After that they were lectured about problem solving process. They were managed to do many various exercise situations in order to keep their scores and then average post-test score. The results were shown in Table 4.9

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Table 4.9 Scores of Pre and Post-tests

NO	pre-test	post-test1	pos-test2	Average
1	3	7	6	6.5
4	2	8	9	8.5
5	1	3	7	5
6	3	7	9	8
18	3	6	9	7.5
20	3	7	7	7
21	2	2	5	3.5
22	5	4	8	6
23	3	8	8	8
28	3	7	8	7.5
29	5	4	8	6
32	4	8	7	7.5
38	2	5	8	6.5
39	3	8	5	6.5
40	3	3	4	3.5
42	4	4	6	5
43	4	6	9	7.5
44	2	5	8	6.5
46	1	4	6	5
51	2	3	7	5
53	3	2	7	4.5
57	1	4	3	3.5
60	1	3	8	5.5
64	4	6	7	6.5
65	4	6	7	6.5
69	1	5	6	5.5
72	3	6	9	7.5
78	3	3	6	4.5
80	4	6	8	7
AVERAGE	2.83	5.17	7.07	6.12

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With specialty in accommodator, the results of their pre-post test average score, none of the students had lower score than pre-test. This can explain that when the researcher can handle and control the variation, the negative reinforcement for GBL in individual difference framework is possibly considered as an intelligent method in learning process. The leaders in the last assignment were chosen. The results are shown in Table 4.10.

Table 4.10 Performance Scores of the Students

seminar 1		seminar 2		seminar 3		seminar 4		seminar 5		seminar 6		seminar 7		seminar 8	
87.03	Positions	85.97	Positions	85.65	Positions	86.09	Positions	85.00	Positions	87.67	Positions	84.07	Positions	86.55	Positions
90	LED	87	LED	88	LED	92	LED	90	LED	87	LED	89	LED	93	LED
86	MEM	89	MEM	85	MEM	93	MEM		MEM		MEM		MEM		MEM
	MEM	85	MEM		MEM		MEM		MEM	90	MEM	90	MEM	85	MEM
	MEM		MEM		MEM		MEM		MEM	83	MEM		MEM		MEM
86	MEM	85	MEM	85	MEM		MEM	88	MEM		MEM	88	MEM		MEM
89	MEM		MEM		MEM	85	MEM		MEM	83	MEM		MEM	87	MEM
	MEM		MEM		MEM		MEM	87	MEM		MEM		MEM	90	MEM
86	MEM		MEM		MEM		MEM	87	MEM		MEM	86	MEM	87	MEM
	MEM		MEM	83	MEM		MEM	90	MEM		MEM	86	MEM		MEM
	MEM		MEM		MEM		MEM		MEM	89	MEM	88	MEM	90	MEM
Group's score Performance.															
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	DIV	DIV	DIV	DIV	ASS	ASS	CON	CON
87.03		85.97		85.65		86.09		85.00		87.67		84.07		86.55	
Experimental group's Score average								Control group's score average							
86.18 %								85.65 %							
Average ACC leader's score								Average ACC member's score							
89.29%								87.03%							

Seeing data in Table 4.10, the accommodators obtain higher in both group and individual score. However, the leaders of the groups, they were able to get higher score than the same style who played in different positions. During learning process, the evaluation 'Five Point Reflection Scale' was considered to be a descriptive model to help students learning outcome development. The reflective action was extended learning into level 4 which was in the Reasoning of Depth.

In order to ensure that the efficiency of SAOC Learning Framework is reliable, where the verified experiment learning outcome performance is done and confirmed, the supported data shown in the initial experiment. It means that the students can relate the theory and practice in the same depth.

For level 5: Reconstructing, it will take a long time to generalize the student's idea. However, in the future, when they have gained more knowledge of assigned topics, they can apply the learning base on their reflection and the researcher that can increase the student learning values.

For further-learning process outcomes of the two courses, the researcher compared the different scores of initial and the verified experiments, where the results are shown in Table 4.11.

Table 4.11 Comparison of the Tests

Experiments	Average Score		Diff. (%)
	Pre-test	Post-test	
Initial	2.71	3.16	16.6
Verifying	2.83	6.12	116.25

As far as accommodators were concerned, the results of the initial's pre-post test average score, where most of the students had higher score than pre-test. The variety of their average score is 16.60 percent and the difference of the verified experiment score average is 116.26 percent. While the leaders of the groups can assist and made a progress in their groups as shown in Tables 4.12- 4.13

Table 4.12 Score Performance of the Initial Group

Seminar	LS	Performance	Positions	
		Group Score	Leader	Member (ACC)
1	ACC	88.37	88	83
2	ACC	89.11	89	84
3	ACC	90.15	88	81
4	ACC	88.03	88	85
5	DIV	87.23	87	87.5
6	CON	86.61	86	86
7	ASS	87.76	89	83
8	CON	87.44	86	84.5
Average experiment group's score			88.92 %	
Average control group's score			87.26 %	
Average ACC leader's score			88.25 %	
Average ACC member's score			84.25 %	

Table 4.13 Score Performance of the Verified Group

Seminar	LS	Performance	Positions	
		Group Score	Leader	Member (ACC)
1	ACC	87.03	90	86.75
2	ACC	85.97	87	86.33
3	ACC	85.65	88	84.33
4	ACC	86.09	92	89
5	DIV	85	90	88
6	DIV	87.67	87	86.25
7	ASS	84.07	89	87.6
8	CON	86.55	93	87.8
Average experiment group's score			86.18 %	
Average control group's score			85.82 %	
Average ACC leader's score			89.25 %	
Average ACC member's score			87.00 %	

It is apparent that the experiment group's score average is higher than the others. According to the research study, the four students of the experiment groups do not only have higher group scores, but they also have higher individual scores than the same style who were in different positions. Apart from getting higher score groups, they are able to get better individual ranking as well as the verified experiment. This means that the different positions between the leader and member are presented an important role both in team acting performance and responsibility. When they act as the member, they have less responsibility and concentration in the team, which causes them to get lower scores.

Table 4.14 Comparison of the Performance Group Scores

Experiments	Aver. Group's Score		Aver. ACC's Score	
	Experiment	Control	Leader	Member
Initial	88.92	87.26	88.25	84.25
Verifying	86.18	85.82	89.25	87

Considering the two tables, the active plan using constructive learning was used as a device to help the student's learning efficiency. This is the primary message of constructivism; "students who are engaged in active learning are making their own meaning and constructing their own knowledge in the process" like Fosnot (1996).

From the experiment data and results of case 1, we can conclude that the negative reinforcement for GBL in individual difference framework is the suitable tool for the individual difference knowledge worker.

4.3 Case 2: Matching and Mismatching of Learning Styles between Instructors and Students

The first objective of this case is to investigate the relationship between the learning styles of the instructor and the student. The second objective is to investigate which instructor learning style results in higher the student learning outcome improvements. The third objective is to confirm the potential of network as a tool to get more multiple learning outcome improvements.

This investigation extends from the original believe that student would learn well when they study from the instructor with the preferred teaching styles. However, the teaching/instructional styles are product of many factors, which was mentioned in chapter 2. For an example, the teaching/instructional style is a reflection of the effective learning of the instructor herself/ himself in the past. Hence, in this research, the Kolb's learning style Inventory Model is also used to assess the learning style of the SAOC

instructors. The investigation on the learning outcomes from the relationship between learning styles of the instructors and students can be conducted.

The focus of this case study is on the older generation of military officers. By placing this older generation of military officers as the leader of the group, it can maximize the performance of the leader and team member in contrary to the existing the negative reinforcement for GBL in individual difference framework. More specifically, this proposed learning framework is tested by two SAOC courses, with 160 students.

4.3.1 Phase 1: Population Survey

The result of the personal information, the student learning styles, the age average, the education level and corps are the same direction as the first case. In this second case, the student learning outcomes are interested by the relationship between the instructors and students learning outcomes. Moreover, the relationship between the instructor learning styles and instructor facilitating styles is investigated. The results are shown in the Table 4.15, where the most of students are male, the education levels are undergraduate and vocational students, age average is 48 years, which most of ranks are Sqn.Ldr. and science corps is less than the others.

Table 4.15 Status of Students

Sex		Education				Age			Rank			Corps	
Male	Female	VL	UG	ML	DL	Low	High	Average	Wg.Cdr.	Lt.Col.	Sqn.Ldr.	Science	Other
56	24	11	61	6	2	35	54	44.50	14	2	64	22	58

4.3.2 Phase 2: Experiment Process

In Table 4.16, the students learning styles are diverger, accommodator, assimilator and converger are shown respectively.

Table 4.16 The SAOC's Learning Style

Learning Styles	Age Average (Years)	No of students	Education Levels							
			VL	%	UG	%	ML	%	DL	%
Assimilator	48.3	20	2	10	16	80	1	5	1	5
Diverger	49.09	26	3	11.54	22	84.61	1	3.84	0	0
Converger	47.73	11	2	18.19	8	72.72	1	9.09	0	0
Accommodator	49.34	23	4	17.39	15	65.27	3	13.04	1	4.34

Remark: the age average was calculated in decimal point for example 46.56 is 46 years and 6 months (approximation)

The accommodator age average is the oldest one, where the diverger is the second oldest, which is less than the accommodator, where the assimilator is older than the converger but less than the accommodator and diverger.

In this case, the learning style relationship between the instructors and the students is considered, in which the instructor learning styles were assessed by Kolb learning style inventory and matched by the instructor. The result is shown in Table 4.17.

Table 4.17 Instructor's Information and Data

Instructors' Learning Style	Sex	Education Level	Age (Years)	Rank
Accommodator	Male	UG	58	Gp.Capt.
Accommodator	Female	ML	48	Wg.Cdr.
Diverger	Female	UG	58	Gp.Capt.
Diverger	Male	ML	55	Gp.Capt.
Accommodator	Female	ML	56	Gp.Capt.
Converger	Female	ML	54	Wg.Cdr.
Accommodator	Female	ML	53	Wg.Cdr.
Assimilator	Female	ML	51	Wg.Cdr.

In Table 4.17, there are four styles of the instructors, where they are composed of 6 females and 2 males. The oldest instructor is 58 years old. The accommodator learning style is the youngest one, which is 48 years old, where 4 of them are the Gp.Capt. rank,

the other 4 are Wg.Cdr. rank. The students were arranged into the seminar groups in next step, where the result is shown in Table 4.18.

Table 4.18 SAOC Student Learning Styles in 8 Seminars

Positions	SEMI 1	SEMI 2	SEMI 3	SEMI 4	SEMI 5	SEMI 6	SEMI 7	SEMI 8
	NO	NO	NO	NO	NO	NO	NO	NO
Leader	66	68	69	13	46	28	27	4
Member	6	30	25	78	26	42	2	10
Member	5	11	14	76	22	3	1	16
Member	7	15	37	17	38	8	9	21
Member	34	20	40	24	41	18	12	31
Member	39	36	45	32	44	29	19	33
Member	57	62	50	43	49	48	23	47
Member	59	64	65	54	73	52	35	56
Member	63	61	70	55	75	53	51	67
Member	80	77	71	58	79	72	60	74

Accommodator

Diverger

Assimilator

Converger

Each seminar contains the different learning style students, where the leaders were assigned by the instructor. Before the lecture, the students were tested by pre-test, where the post-test was tested after lecture and exercise. The results are shown in Table 4.19.

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Table 4.19 Scores of Pre and Post-tests

NO	Pre-test	Post-test1	Post-test2	Average
1	3	6	8	5.67
2	3	8	9	6.67
5	2	7	9	6.00
7	4	8	9	7.00
11	3	7	8	6.00
13	3	8	9	6.67
14	2	7	9	6.00
22	1	7	9	5.67
24	3	7	8	6.00
29	4	8	10	7.33
30	2	8	9	6.33
33	3	7	8	6.00
42	2	7	9	6.00
47	3	6	9	6.00
48	2	8	9	6.33
51	2	7	8	5.67
66	1	8	9	6.00
68	2	7	9	6.00
69	1	8	9	6.00
74	3	8	8	6.33
76	3	6	9	6.00
78	4	7	9	6.67
79	2	8	9	6.33
Average	2.75	7.33	8.75	6.28

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In Table 4.19, all of 23 accommodator students obtain the higher post –test score than pre-test, there is only one student which get the highest score. The students who were assigned as the leaders obtain the score improvement. After the group participation, the group and individual scores are shown in Table 4.20.

Table 4.20 Performance Scores of the Students

seminar 1		seminar 2		seminar 3		seminar 4		seminar 5		seminar 6		seminar 7		seminar 8			
85.20	Positions	84.80	Positions	84.00	Positions	83.90	Positions	82.10	Positions	81.70	Positions	80.40	Positions	79.00	Positions		
89	LED	89	LED	88	LED	88	LED	87	LED	86	LED	86	LED	82	LED		
	MEM	87	MEM		MEM	86	MEM	84	MEM	83	MEM	81	MEM		MEM		
86	MEM	86	MEM	87	MEM		MEM	85	MEM		MEM	82	MEM		MEM		
86	MEM		MEM		MEM		MEM		MEM		MEM		MEM		MEM		
	MEM		MEM		MEM	86	MEM		MEM	84	MEM		MEM		MEM		
	MEM		MEM		MEM		MEM		MEM	85	MEM		MEM		MEM		
	MEM		MEM		MEM		MEM		MEM		MEM		MEM	79	MEM		
	MEM		MEM		MEM		MEM		MEM		MEM		MEM	80	MEM		
	MEM		MEM		MEM		MEM		MEM		MEM	80	MEM		MEM		
	MEM		MEM		MEM		MEM	84	MEM		MEM		MEM	80	MEM		
Group's score Performance.																	
ACC		ACC		ACC		ACC		DIV		CON		ASS		CON			
85.20		84.80		84.00		83.90		82.10		81.70		80.40		79.00			
Experimental group's Score average						84.48 %						Control group's score average				80.80 %	
Average ACC leader's score						88.50%						Average ACC member's score				83.95%	

4.3.3 Phase 3: Result Analysis

In Table 4.20, the results show the experimental group's score average which is higher than the control group score average. The average individual score of the accommodator leader is higher than the average individual score of the other leader styles. For the individual score, the average individual score of the leader score is higher than the average individual score of the accommodator member score. The performance group scores of the relationship between the instructors and students learning are shown in Table 4.21.

Table 4.21 Performance Scores of the First Course

Instructors' Learning Style	Students' Learning Style	Team's score				Individual's score			
		Score (%)	PR	TS	Grade	Score (%)	PR	TS	Grade
Accommodator	Accommodator	85.2	87.5	61	A	89	87.5	61	A
Accommodator	Accommodator	84.8	87.5	61	A	89	87.5	61	A
Diverger	Accommodator	84	62.5	53	B+	88	62.5	53	B+
Diverger	Accommodator	83.9	62.5	53	B+	88	62.5	53	B+
Accommodator	Diverger	82.1	37.5	46	B	87	43.75	48	B+
Converger	Converger	81.7	37.5	46	B	86	25	43	B
Accommodator	Assimilator	80.4	18.75	41	B	86	25	43	B
Assimilator	Converger	79	6.25	34	C+	82	6.25	34	C+

In Table 4.21, the findings suggest that the instructor learning styles and students are the same. In this case the accommodator style, the individual and team's score performances of the students are highest comparing to converger. Moreover, the results have shown that the matching between the instructor and student with both the assimilator and converger style leads to the lowest scores. Besides, the matching instructor and student with the same learning style results the highest performance score. More specifically, the findings suggest that the matching between accommodator instructor's style and diverger student's learning style produces the same learning outcomes, similarly, the matching between diverger instructor's style and accommodator student's learning style. Both matching learning styles show the same good learning outcomes.

From the above data, it can be explained that when students learning preferences match well with their instructor's learning styles, the student motivation and achievement usually be improved according to Kolb's. The results have shown that students are interested in a subject when the learning style of the instructor matches with their style. On the other hand, when matching either instructors or students with assimilator learning style and converger learning style, the learning outcome indicates the lowest performance. When investigating in more details into the characteristics of their learning style, it can be explained that there is an opposite learning styles, where the inductive and deductive learning styles are conducted by assimilator and converger respectively. Apart from this, converger prefer to deal with objects rather than people, and are often considered unemotionally. As a consequence, they are not suitable for group learning activity. For diverger and accommodator, both instructor and student learning styles are rather in the similar direction, and related to the SAOC's assignment then their learning outcomes are achieved.

After that the framework was confirmed by the verified experiment, the learning outcomes are same direction with the former course. For networking, the alumni are constructed to have high confidence to be the best practitioners by giving the knowledge to the community and using the face-book, which comprises of the instructor and the students in SAOC course (See appendix E).

4.3.4 Phase 4: Model Verifying

The proposed model will be verified to affirm the importance of the model in taking into account the influences of matching and mismatching of learning styles between instructors and students. In Table 4.22, the most of students are males, the education levels are undergraduate and vocational students, which there are 9 master levels, age average is 48 years, where the most of ranks are Sqn.Ldr. and science corps., which is less than the others. The student learning styles are shown in Table 4.23.

Table 4.22 Status of Students

Sex		Education			Age			Rank				Corps	
Male	Female	VL	UG	ML	Low	High	Average	Wg.Cdr.	Lt.Col.	Sqn.Ldr.	Cdr.	Science	Other
52	28	17	54	9	35	54	44.50	11	1	57	1	21	59

Table 4.23 SAOC's Learning Style

Learning Styles	Age Average (Years)	No of students	Education Levels					
			VL	%	UG	%	ML	%
Assimilator	22.50	18	2	11.11	13	72.22	3	16.67
Diverger	22.50	18	4	22.22	12	66.67	2	11.11
Converger	18.75	15	5	33.33	9	60.00	1	6.67
Accommodator	36.25	29	6	20.69	20	68.97	3	10.34

Remark: the age average was calculated in decimal point for example 46.56 is 46 years and 6 months (approximation)

In Table 4.23, the accommodator is oldest and the converger is the youngest as the former studies, the accommodator is the most number of students which has vocational education level more than any other groups but has the 3 master education levels, which is the same as the assimilator. For the instructor assessments, the results are shown in Table 4.24.

Table 4.24 Instructor's Information and Data

Instructors' Learning Style	Sex	Education Level	Age (Years)	Rank
Accommodator	Male	UG	58	Gp.Capt.
Accommodator	Female	ML	48	Wg.Cdr.
Accommodator	Female	UG	56	Gp.Capt.
Accommodator	Female	ML	53	Wg.Cdr.
Accommodator	Female	ML	54	Wg.Cdr.
Diverger	Male	ML	56	Gp.Capt.
Assimilator	Female	ML	51	Wg.Cdr.
Converger	Female	ML	54	Wg.Cdr.

In table 4.24, there are four styles of the instructors, which are composed of 6 females and 2 males, the oldest instructor is 58 years old, where they are in the accommodator learning styles and undergraduate education levels, the youngest is 48 years old, where they are in the accommodator learning style and master education levels, 3 of them are Gp. Capt. rank, the other 5 are Wg. Cdr. ranks. The students were arranged in the 8 seminars, the results are shown in Table 4.25.

Table 4.25 SAOC Student Learning Style in 8 Seminars

Positions	SEMI 1	SEMI 2	SEMI 3	SEMI 4	SEMI 5	SEMI 6	SEMI 7	SEMI 8
	NO	NO	NO	NO	NO	NO	NO	NO
Leader	31	44	34	46	5	48	25	62
Member	69	19	9	1	4	8	13	3
Member	2	6	14	17	11	16	10	22
Member	7	24	15	42	23	20	18	30
Member	12	32	26	54	29	21	33	37
Member	40	35	28	57	36	27	38	47
Member	68	51	39	60	41	45	52	55
Member	73	64	43	70	49	50	53	59
Member	76	74	56	72	58	61	63	66
Member	79	77	80	78	65	71	75	67

Accommodator

Assimilator

Diverger

Converger

Each seminar contains four learning style students, where the leaders were assigned by the instructor. Before the lecture, the students were tested by pre-test, where the post-test was tested after lecture and exercise. The results are shown in Table 4.26.

Table 4.26 Shows the Scores of Pre-post Tests

NO	Pre-test	Post-test1	Post-test2	Average
1	4	8	10	7.33
3	3	7	9	6.33
11	2	6	9	5.67
15	3	5	8	5.33
16	3	7	8	6.00
17	3	7	9	6.33
20	2	6	9	5.67
29	3	7	8	6.00
30	2	7	9	6.00
31	1	8	10	6.33
32	3	8	9	6.67
33	2	7	9	6.00
34	2	8	10	6.67
35	2	8	9	6.33
41	3	7	9	6.33
43	2	8	9	6.33
44	2	8	10	6.67
45	2	7	9	6.00
47	3	6	9	6.00
53	3	7	9	6.33
57	2	7	9	6.00
63	3	6	9	6.00
65	2	7	9	6.00
67	3	7	9	6.33
68	3	7	10	6.67
69	3	6	10	6.33
75	2	8	9	6.33
76	2	8	9	6.33
80	3	8	10	7.00
Average	2.53	7.07	9.00	6.20

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In Table 4.26, all of 29 accommodator students obtain the higher post –test score than pre-test, there are 7 students obtained the highest score, where 3 of them are the accommodator leaders. The group and individual scores after the group participation are shown in Table 4.27.

Table 4.27 Performance Scores of the Students

seminar 1		seminar 2		seminar 3		seminar 4		seminar 5		seminar 6		seminar 7		seminar 8	
89.48	Positions	87.96	Positions	87.05	Positions	86.8	Positions	85.54	Positions	82.87	Positions	81.90	Positions	82.42	Positions
93.00	LED	92.00	LED	92.50	LED	87.00	LED	88.00	LED	88.50	LED	87.00	LED	86.00	LED
89	MEM		MEM		MEM	87	MEM		MEM		MEM		MEM	85	MEM
	MEM		MEM		MEM	86	MEM		MEM	86	MEM		MEM	84	MEM
	MEM		MEM	90	MEM		MEM		MEM	85	MEM		MEM		MEM
	MEM	88	MEM		MEM		MEM	88	MEM		MEM		MEM		MEM
	MEM	89	MEM		MEM	86	MEM		MEM		MEM	85	MEM	84	MEM
88	MEM		MEM		MEM		MEM	87	MEM	87	MEM		MEM		MEM
	MEM		MEM	89	MEM		MEM		MEM		MEM	84	MEM		MEM
88	MEM		MEM		MEM		MEM		MEM		MEM	87	MEM		MEM
	MEM		MEM	89	MEM		MEM	85	MEM		MEM	83	MEM	83	MEM
Group's score Performance.															
ACC		ACC		ACC		ASS		CON		DIV		CON		ASS	
89.48		87.96		87.05		86.68		85.54		82.87		81.90		82.42	
Experimental group's Score average						Control group's score average						83.88%			
Average ACC leader's score				92.50%		Average ACC member's score						86.48			

In Table 4.27, the results show the experimental group's score average, which is higher than the score average of control group. The average individual score of the accommodator leader is higher than the average individual score of the other leader styles. The average individual score of the leaders who are the accommodator learning style is higher than the average the average individual score of the accommodator member score. The relationship of performance group scores between the instructors and students learning are shown in Table 4.28.

Table 4.28 Performance Score of the Second Course

Instructors'Facilitator Style	Instructors' Learning Style	Students' Learning Style	Team's score		Individual's score	
			Score (%)	Grade	Score (%)	Grade
Democratic	Accommodator	Accommodator	89.48	A	93.00	A
Democratic	Accommodator	Accommodator	87.86	B ⁺	92.00	B ⁺
Democratic	Accommodator	Accommodator	87.05	B ⁺	92.50	A
Democratic	Accommodator	Assimilator	86.80	B ⁺	87.00	B
Democratic	Accommodator	Converger	85.54	B	88.00	B ⁺
Democratic	Diverger	Diverger	82.87	B	88.50	B ⁺
Authoritarian	Assimilator	Converger	81.91	C ⁺	87.00	B
Laisser-faire	Converger	Assimilator	82.42	C ⁺	86.00	C ⁺

In Table 4.28, the same findings in matching instructor's learning style and student's learning style were concluded that the assimilator learning style or converger learning style, the matching either instructors or students the learning outcome is remained minimum in all groups because there were remarkable contrasted in their learning styles. Nevertheless, the assignment was not appropriate neither in assimilator or converger. Moreover, the instructor who had the assimilator learning style was the facilitator authoritarian style. When she/he approaches the converger students, he gives objective, arranges and controls everything without discussion, follows up students. If the student disagreements can impose his/her approaching, the procedures and prohibits of any deviation are commanded. For the group relations, group members focus on the facilitator which is a one-way communication. In group participation, the facilitators direct everything. There is no sense of initiative creation. However, the students may be in good learning outcome but they obtained less learning outcome because the instructional tool (group learning) was not suitable for converger and assimilator students.

To confirm the studying and qualifying students' professional development, the alumni's commander and alumni would be interviewed in the next six months after the course (See Appendix F and G). The interview results found that they were satisfied with the alumni's working, which are shown in the Tables 4.29 - 4.30.

Table 4.29 Result Summary of the Survey

The below table shows the result summary of the survey from the student officers who graduated from SAOC batch NO. 1 - 3

No.	Aspect	Student Officer batch No. 1	Student Officer batch No. 2	Student Officer batch No. 3	Average of 3 batches	Processed Result
1	Effectiveness to perform tasks and	4.01	4.03	4.22	4.09	Good
2	Personality	4.17	4.28	4.43	4.29	Good
3	Attitude towards being military officer	4.12	4.03	3.96	4.04	Good
4	Attitude towards the course	3.86	3.95	3.83	3.88	Good

Processed result : 5.00 – 5.50 = Very Good, 4.49 - 3.50 = Good, 2.49 – 1.40 = Should be improved, 1.49 – 1.00 = Must be improved

Table 4.30 Result Summary of the Survey

The below table shows the result summary of the survey from the commanders of the student officers who graduated from SAOC batc NO. 1-3

No.	Aspect	Student Officer batch No. 1	Student Officer batch No. 2	Student Officer batch No. 3	Average of 3 batches	Processed Result
1	Effectiveness to perform tasks and assigned job	4.15	4.02	4.12	4.1	Good
2	Personality	4.15	4.2	4.22	4.26	Good

Processed result : 5.00 – 5.50 = Very Good, 4.49 - 3.50 = Good, 2.49 – 1.40 = Should be improved, 1.49 – 1.00 = Must be improved

In conclusion of the second case study, the results are shown that the matching and mismatching of learning styles between instructors and students influence the student learning outcomes. The instructor and the student who is the same learning style, the accommodator and diverger can make the proficient learning outcomes in the negative reinforcement for GBL in individual difference framework more than the instructor and student, which is the contrast style; the assimilator and converger. Furthermore, the instructor learning style that gets the students learning outcomes more achievement is the accommodator learning style, where she/he is a democratic instructor facilitating style. The networking; face-book can be the multiple tool to get the students proficient learning outcome and the alumni be confidential to give the knowledge in community of practice, so they can be the best practitioner.

4.4 Implications of the New negative reinforcement for GBL in individual difference framework

The proposed of the negative reinforcement for GBL in individual difference framework shows significance contribution to the improvement of the learning process. The learning framework is highly effective for the case of individuals with different learning styles. In addition, the relationship between learning styles between instructors and students are used for improving the learning process. Most importantly, the social networks are found to play an important role for creating learning organizations. The knowledge sharing becomes instrumentally and powerfully realized.

Furthermore, the result from this has indirectly contributed to an improvement in learning atmosphere among the instructor groups. To be specific, the instructors were more interested in the new method of learning and were more well - prepared for approaching the students. More importantly, they were looking forward to seeing the learning progress of their students.



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