

# Assurance of Learning in Marketing Bachelors Program: An Experiment with Before - After Control Design

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**Abstract:** *The aim of this paper is to conduct before-after with control group (BACD) experiment using required measures to study effect of errors, teacher guidance and achieving objectives of assurance of learning (AOL) for select course "Salesmanship & Sales Management, MKT 303" in Marketing bachelor's program. AOL implementation is a systematic scientific process hence teachers and student's cohort were given orientation sessions about the process. Cohort was divided into eight groups with 5 students each, further these groups were segmented as treatment groups - (I, II, III, IV) and control groups - (V, VI, VII, VIII). SRS was used for selection of students into these groups. Communication and co-ordination skills were selected respectively to achieve the learning objectives of AOL process. Case study and group project were used to impart and evaluate these skills. Between pre and post measurement, teacher gave guidance to treatment groups to improve the skill performance. Rubrics were used to measure the performance of students. Sufficient efforts were placed to successfully control the errors, majority of errors were controlled or had positive effect on AOL results, while some errors were unavoidable. Averages and variances indicated student performance improved considerably in post measurement among treatment groups attributed to teacher guidance. There was no post measurement improvement or has negligible improvement in control groups, the obvious reason is absence of treatment.*

**Keywords:** Assurance of learning, AOL, sales course, marketing program, Before after control design, experiments, errors, PLO, CLO, closing the loop, rubrics, learning outcomes

## 1. Introduction

A systematic structured process for assurance of learning (AOL) was adopted into curriculum of bachelor's program at marketing department, college of business administration, King Saud university as part of AACSB accreditation continuous improvement process from academic year 2017-18 to 2020-21. Bachelor program in Marketing developed program learning outcomes (PLO's) in alignment with college goals, in turn courses finalized course learning outcomes (CLO's) in line with PLO's; learning outcomes are designed on par with industry needs as discussed by (Kokku, 2021; Riggio, Mayes, & Schleicher, 2003; Matt, 2009); national and international accreditation learning model (Matt, 2009; Kilpatrick, Dean, & Kilpatrick P, 2008;). Select PLO and CLO considered for this study were achieved through AOL process, Kehal (2020) discusses the aim of AOL process is to achieve learning objectives. French, Lawsom, Taylor, Herbert, Fallshaw, Hall, Kinash, & Summers, (2012) concluded alignment of course objectives with skills to be trained and assessed. AOL implementation at program is designed as discussed by Kokku,(2021). AOL process was divided into two cycles of two years each. Cycle one (2018-19 & 2019-20); cycle two (2020-21 & 2021-22). Select course were assigned to implement and report AOL results. Course titled - Salesmanship & Sales Management - MKT 303 (MKT 303 – Sales) was planned for first semester-second academic year 2018-19 of first cycle. Teacher of this course was given sufficient orientation regarding the process. Co-ordination (Cord skills) and communication skills (Com skills) were assigned to be practiced, tested and reported. PLO related to

coordination and communication skills is - Students will show coordination skills among team members; and students will be able to illustrate required oral and written communication skills. The reason behind considering Com and Cord skills were due to their prominence in qualification framework of many national and international accreditations, as such Riggio et al, (2003) and many other studies had considered these skills as one of the components in their AOL assessment. McConnell, King, & Miller, (2008) reveal course embedded assessment like case studies, presentations, class activities and other are highly helpful in achieving assurance of learning and program learning objectives. CLO for the course - MKT 303 – Sales" is Students will work well within members of group project; and students will demonstrate language skills. PLO and CLO were developed in line with accreditation guidelines as discussed by Kilpatrick et al, (2008). Both Com and Cord skills were practiced by students with two activities; group project and case study discussion, analysis & presentation. Students were arranged for before-after with control group experiment (BACD) as discussed by Kokku, (2021). Teacher and students were given orientation for the experimental behavior to follow the protocol laid down for the experiment without any deviations for achieving standardization. In order to obtain validity, student assessment have to be standardised (Kane, Crooks, & Cohen, 2005). Rubrics developed for this study followed the standards of scale scores, category of score and explanation/justification of each category to measure student performance, refer to attachment A. Reddy (2011) viewed rubrics development should follow a standard student evaluation procedure. Alternately Meuter, Chapman, Toy, Wright, & McGowan,

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(2009) concluded standardized procedure can be used for student learning and assessment experiment, but certain degree of freedom for the teachers in the experiment process can be allowed. Objective of this study is to use BACD for experimenting to achieving AOL objectives in the form of PLO, CLO and student guidance by teacher for MKT 303 – Sales using Com and Cord skills. Also, to study the effect of experimental errors on AOL implementation. Experiment results were compiled. AOL was concluded by highlighting closing the loop and further recommendations for improvement were suggested.

## 2. Literature Review

### 2.1 Group project, case study and teacher/student guidance

Direct measurement tools are given more weightage in assurance of learning (Alstete and Beutell, 2019; French et al. 2012; Messick, 1994), group learning helps students to be motivated and enhance performance (Ravenscroft, Buckless, McCombs, & Zuckerman, 1995); similarly Sigfredo (2002) found results of students team learning to be positive in Marketing course; Campbell (2006) describes group learning and analysis meets the standards of quality assurance of academic practice. Cannon, Lohtia, & Paulich, (2021); Scouller (1998) found the deep learning activities like case studies have greater level impact on assurance of learning. Sigfredo (2002) concludes students get monotony for class lectures, hence group activities to be used to charge up student motivation for assurance of learning. Young and Murphy, (2003) suggest Marketing curriculum throughout should include communication skills as a part of creating marketable products. Karns (2005) suggests marketing program having case studies, co-op training leading to experiential learning for students. Han and Ellis (2021) suggest to involve students for collaborative learning and assessment; explain students benefits of such learning. Involving them in group portfolio activities and group presentations. Alternately Alstete and Beutell, (2019) concludes simulation method can be used for achieving AOL instead of other direct methods. Baker, Ni, & Monty, (2012) argues in-direct measurements such as student surveys give more accurate results of performance measurement (Han and Ellis, 2021). Hence for AOL implementation for the sales course, group project report (GP) and case study discussion, analysis & presentation (CS) were selected to practice communication and coordination skills for the present experimental investigation study.

Male student groups were arranged using systematic random sampling method (SRS). Student roll sheet was used so as order of students have very less probability of friends in sequence and also to avoid extreme performing students within the same group. Campbell (2006) found student assessment to be done in groups and not in teams; he views a team is at the disposable of organization, a group works independently leaving scope to assess individual performance which is important in academic evaluation. SRS and roll sheet were used to give real time corporate working environment

where students are expected to work with randomly chosen individuals in groups. For coordination skills students were given orientation on role of co-ordination skills and how groups have to organize the project work. Contents and structure of group project report were standardized and explained to students in advance following students submitted group project report for evaluation. For communication skill practice, two case studies were read by students as part of homework. In-class case study discussion was initiated with students highlighting the learnings from the case, SWOT, problem identification and workable solutions. Following student individually gave presentation in a specified format where communication skill was evaluated. Case study experience was good from reading, discussion, analysis and presentation aspects. Teacher guidance was used as treatment variable. Guidance was given to students of treatment groups by teacher after MB1.

### 2.2 Before-after with control design (BACD) - experiment

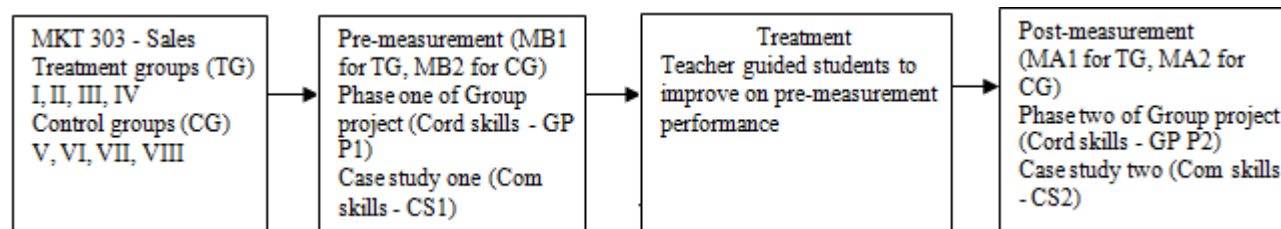
Pretest-Posttest with control group design as discussed by Malhotra (2010); otherwise referred as before-after with control design (BACD) for AOL as discussed by Kokku, (2021) was used to investigate effectiveness of teacher guidance of students for effective coordination and communications skills to achieve assurance of learning. Students of “MKT 303 – Sales” were divided into eight groups, each group consisted of five students. Group one to four (I, II, III, IV) were assigned as treatment groups (TG); group five to eight (V, VI, VII, VIII) were assigned as control groups (CG). Before-measurement-MB1 (from treatment group), MB2 (from control group) was taken on coordination and communication skills using phase one work of group project and discussion & presentation of first case study respectively. Treatment groups were given office hours to attend teacher guidance. During guidance students were explained about their performance, improvement areas and strategies to improve. After-measurement MA1 (from treatment group), MA2 (from control group) was taken using phase two work of group project and discussion and presentation of case study two. Peck (2020) explains multi-stage experimental designs, a randomly selected group is given treatment, upon observation of results further treatment options are selected for further investigation. For all AOL experiments, closing of loop cannot be achieved in one cycle, it needs to be continued to further cycles. BACD will help in controlling the effect of many extraneous variables on experiment results (Malhotra, 2010; Ryals and Wilson, 2005), hence this design is suitable for laboratory experiments like AOL experiments in classroom. See figure 1 for the AOL experiment design for this study.

### 2.3 Teacher (Faculty member) and student orientation on AOL

Assurance of learning (AOL) is teacher and student driven. Kehal (2020) concludes teachers and students are the key stakeholder of AOL process. Scouller (1998) report teachers create opportunities for students to achieve assurance of

learning. LaFleur, Babin, & Lopez, (2009) found involvement is key to achieve assurance of learning. AOL is a systematic process; hence teacher and students need to understand it

fully. For the sales course in this study course teacher was given three orientation sessions of one hour each to implement AOL.



**Figure 1:** AOL experiment – Marketing program

These sessions discussed AOL process, objectives, PLO's and CLO's, teaching methods, evaluation methods, rubrics, recording results, student guidance, and preparation/submission of AOL report. Borin and Metcalf, (2010) found marketing teachers need to be provided with sufficient materials to gain knowledge of AOL process. Young and Murphy, (2003) found teachers have a great role in achieving assurance of learning goals for the program. Similarly, Karns (2005) concludes in marketing program it is the teacher's knowledge, ability to guide students towards improvement and documenting the assurance of learning results drive the AOL process. Alternately LaFleur et al, (2009) found marketing teachers face many challenges during AOL process, majorly arousal of fatigue within a tight semester schedule. Kehal (2020) concludes teachers to be given professional training for AOL implementation. Students were also given one hour orientation session on their role in the process. Cannon et al, (2021) found student training on assurance of learning and assessment process lead to better participation and improves data accuracy in Marketing bachelor level program.

## 2.4 Error controlling

In the process of AOL experiment, errors are expected to influence pre and post-performance of students, while the goal was to establish teacher guidance for students as independent and standalone variable effecting student performance (dependent variable). As it was outlined by Kokku, (2021) BACD in AOL experiments control sizeable number of errors.

AOL is a unique area of experimentation in which outcomes drive the errors to affect the dependent variable in four different ways helpful in achieving closing the loop, summary of error control status in the study is presented in table 1. Even with best practices in place for conduct of experimentation, some errors cannot be controlled and some leave negative effect on dependent variable (Kokku, 2021), saying this it would be preferable sufficient efforts are put-up by experimenter in controlling the errors. As discussed by Kokku (2021) the behaviour of experimental errors in AOL for marketing program from this study are presented herewith

## 2.5 Following errors are effectively controlled by BACD AOL experiment

Surrogate information error (SIE) was addressed by collecting pre and post student performance to address the objective of this study for assurance of learning by capturing the effect of independent variable (teacher guidance to students) on dependent variable (measurement of student performance on coordination and communication skills).

Population specific error (PSE)- A cohort of 40 students were finalized. This cohort included all student population of - MKT 303 – Sales course. As the measurement was aimed at bachelor's program in Marketing, students from this course were right choice to represent this program, hence population specific error was addressed.

Sampling frame error (SFE) – Systematic random sampling was used for selecting sample elements (students) for the experiment groups enabling each element being selected with equal probability into a particular group. MKT 303 – Sales, one of the compulsory specialisation courses need to be taken by students of bachelors' program in marketing. This course is not offered as optional course to students from other departments; hence all the students are from marketing leading to successfully addressing this error.

Non-response error (NRE) – All sample elements(students) were well informed in advance before the start of the experiment. Students were sent reminders and motivated to actively participate. All the questions related to measuring the effect of dependent variable were included in the investigation. During the experiment participation of elements (students) was under close supervision, hence 100% response was recorded avoiding non-response from samples hence controlled this error.

## 2.6 Following errors had positive effect on dependent variable in AOL experiment

Pre-measurement error (PME), it improved the post-performance of students, the reasons are every student naturally have the objective of scoring higher in second attempt of a test compared to first, MKT 303 – Sales, is a level three course, students have already gone through similar test

in the courses from level one and two and pressure from peers, parents and job market hence they perform to their fullest. PME effecting post-performance will alter the experiment results, but in AOL terms this error is beneficial as it improves the student performance curve helping closing loop.

Interaction error (IE), this error improved the post-performance of students, after first assessment, students had interacted among their peer to discuss the results, they tried to imitate the efforts of better performing students and in post-measurement they improved their performance. Additionally, guidance of parents, elder siblings at home also effected post-measurement. Interaction with extraneous variables lead to improvement is assurance of learning of students.

Maturation error (MAE) – this error improved the post-performance of students, students have certain level of target GPA for better job prospects, higher education pursuit, as a proof of abilities and improving personal image. The results of first assessment influenced the students' performance ambitions, they had compared these results with expectations. Both low and high performers have put up higher effort to improve the performance in post-measurement.

Reactive error (RE) – The objective of AOL process is to improve the student learning curve and performance on skills. Before the experiment, a scheduled orientation was given to both students and teachers on AOL process. They understood the expectations of program from AOL process through this course. Both teachers and students gave conscious reaction to pre and post-measurement and treatment hence effecting the dependent variable.

Instrumentation error (INE) – Teacher guidance of students in-between pre and post-measurement had influenced towards higher performance, additionally courses from the previous levels which had similar performance measurement cycle also had influenced to perform better.

### 2.7 Following errors had negative effect on dependent variable in AOL experiment

History error (HE) – issues like availability of sufficient information related to skills; coordination (group project topic) and communication (case related). MKT 303 – Sales, students interacted with students from other specialisation courses, interaction with them caused de-motivation due to difficulty level within this course.

Selection error (SE) – as reported, systematic random sampling with class roll list was used. Eight groups were used in the AOL experiment. Performance of members was different within each group consisting of five members each. Some groups reported students are highly focused on GPA, self-motivated and able to give more time for the preparation, this created performance gaps among groups effecting the post-measurement of dependent variable.

Mortality error (MOE) – The general average range of cohort members mortality is between 5 to 15 percentage in the program. In MKT 303 – Sales, six students planned to exit before post-measurement, the reasons of exit with regard to this course were; difficult level of performance assessment, timing of classes and lack of minimum class attendance percentage. This effected the performance level of some groups in post-measurement. To reduce the effect for mortality error, students were given personal guidance during office hours to continue the course, overall three students exited from treatment and control groups, other three students were successfully retained.

Measurement Timing error (MTE) – In this experiment, pre-measurement timing was fine, but post-measurement timing coincided with Ramadan fasting days. During fasting days student exhaustion levels were higher due to increased summer temperatures. Students reported this factor effected their motivation to perform to the expected levels. Controlling this error was difficult, but to some extent it was reduced by scheduling the timing of the post-measurement during late evenings.

### 2.8 Following error is not possible to addressed by AOL experiment

Measurement error (ME) – Information sought from the experiment was the effect of guidance given by teachers to students between pre- and post-measurement to study the effectiveness of communication and coordination skills in closing the learning loop. Factors which were difficult to control and had affected experiment results were, students' prior exposure to similar guidance treatments in other courses, interaction with students from other courses within and outside marketing department during experiment, insufficient information availability to perform the skill to a standard level and others. Leisa (2007) in their study reported the difference of performance among students who are exposed to oral and written communication skills in course of past semesters will affect the results of courses considered in future experiments.

**Table 1:** Error control status in BACD experiment – AOL in MKT 303 Sales course

Experimental Errors ↓	Experiment : Before After with Control Design (BACD) Error status↓
SIE	This error is addressed
ME	This error is not possible to address
PSE	This error is addressed
SFE	This error is addressed
NRE	This error is addressed
PME	This error has positive effect on AOL results
IE	This error has positive effect on AOL results
MAE	This error has positive effect on AOL results
HE	This error has negative effect on AOL results
INE	This error has positive effect on AOL results
SE	This error has negative effect on AOL results
MOE	This error has negative effect on AOL results
RE	This error has positive effect on AOL results
MTE	This error has negative effect on AOL results

3. Results and Discussion

Results are presented in a sequence with pre-and post-measurement scores of treatment groups followed by scores of control groups for both communication (Com skill) and co-ordination skills (Cord skill). A similar pattern is followed to present averages and variances of pre and post-measurement of both treatment and control groups for both skills. As said earlier rubrics were used for measuring the Com and Cord skills. Rubrics categorised student performance to excellent

range between 4 to 5 points, good range between 2 to 3 and poor range between 0 to 1. Rubrics used five components for Com skill and four components for Cord skill. Corresponding to each particular performance category and rubric component, sufficient description is given for better clarity to students in understanding performance measurement scale to avoid confusion and conflict. See figure 2 for summary of results of AOL experiment for this study.

3.1 (A) Treatment Groups scores

Table 2: Pre-measurement scores of treatment groups

MB1	Communication skills - Case study one (Com skill - CS1) scores	Co-ordination - Group project work phase one (Cord skill – GP P1 ) scores	MB1	Communication skills - Case study one (Com skill - CS1) scores	Co-ordination - Group project work phase one (Cord skill – GP P1 ) scores
Group I			Group III		
1	2.5	3.7	1	2.4	2.6
2	3.7	2.2	2	3.1	2.1
3	1.8	3.4	3	2.0	2.8
4	3.0	3.5	4	1.8	2.5
5	3.2	2.1	5	2.6	2.6
Group II			Group IV		
1	4.0	3.5	1	2.6	2.6
2	2.7	3.3	2	3.4	3.3
3	2.1	2.6	3	3.7	2.8
4	3.4	3.8	4	1.9	2.7
5	4.1	3.9	5	3.1	2.6

Table 3: Average and variance of Pre-measurement from treatment groups

MB1	Com skill - CS1 scores			
Group	Average (s)	Variance (s)	Average (P)	Variance (P)
1	2.84	0.523	2.856	0.534
2	3.26	0.733		
3	2.38	0.262		
4	2.94	0.503		

s-within group; P-all groups combined

Table 4: Average and variance of Pre-measurement from treatment groups

MB1	Cord skill – GP P1 scores		
Group	Average (s)	Average (P)	Variance (P)
1	3.2	2.975	0.1625
2	3.4		
3	2.5		
4	2.8		

s-within group; P-all groups combined

Table 5: Post-measurement scores of treatment groups

MA1 scores	Communication skills - Case study two (Com skill – CS2) scores	Co-ordination - Group project work phase two (Cord skill – GP P2 ) scores	MA1 scores	Communication skills - Case study two (Com skill – CS2) scores	Co-ordination - Group project work phase two (Cord skill – GP P2 ) scores
Group I			Group III		
1	3.6	(3.4)*	1	3.7	4.1
2	3.9	4.5	2	3.8	(1.9)*
3	2.8	4.2	3	2.9	2.9
4	3.9	4.3	4	3.1	3.4
5	3.8	4.1	5	(1.8)*	3.6
Group II			Group IV		
1	4.4	(3.2)*	1	3.2	2.9
2	3.5	4.5	2	(3.0)*	3.8
3	E**	E**	3	4.5	2.9

4	4.2	4.6	4	2.3	3.6
5	(3.6)*	(3.7)*	5	3.6	4.2

\*Students who's post measurement score is less than pre measurement,

\*\*Students who exited the experiment before post measurement

In treatment groups, pre-measurement scores for Com skill were recorded for case study one and group project phase one work for Cord skill see table 2. Average score of 2.856 for Com skill see table 3 is 57.12% of scale, which is considered less as the minimum percentage to complete a skill is 60%. Variance of .534 is 50% of the established threshold  $CV < 1$ , and variance is 18.69% of the mean, lower the variance better student cluster with higher similarity in performance. Average score of 2.975 for Cord skill see table 4 is 59.5% of scale, which is also less than 60%. Variance of .1625 is 16.25% of the threshold  $CV < 1$ , and it is 5.46% of the mean, this looks brighter from the point of similarity in student performance.

**Table 6:** Average and variance of post-measurement from treatment groups

MA1	Com skill – CS2 scores			
Group	Average (s)	Variance (s)	Average (P)	Variance (P)
1	3.6	0.215	3.476	0.991
2	3.9	0.195		
3	3.0	0.643		
4	3.3	0.657		

s-within group; P-all groups combined

In treatment groups, post-measurement scores for Com skill were recorded for case study two and group project phase two

work for Cord skill see table 5. Between pre- and post-measurement, feedback on performance was provided to students along with improvement points and strategies to improve. Average score of 3.476 for Com skill see table 6 is 69.52% of scale, which is considered as good in comparison with the requirement level of 60% to complete the skill. Variance of .991 is 99.1% of the established threshold of  $CV < 1$ , and variance is 28.5% of the mean, higher variance is not a good indication as it demonstrates student cluster with lower similarity in performance. Average score of 3.5 for Cord skill see table 7 is 70% of scale, which is higher than 60%. Variance of .18 is 16.25% of the threshold  $CV < 1$ , and it is 5.14% of the mean, this looks higher similarity in student performance.

**Table 7:** Average and variance of post-measurement from treatment groups

MA1	Cord skill – GP P2 scores		
Group	Average (s)	Average (P)	Variance (P)
1	4.1	3.5	0.18
2	3.2		
3	3.2		
4	3.5		

s-within group; P-all groups combined

### 3.2 (B) Control Groups scores

**Table 8:** Pre-measurement scores of control groups

MB2 scores	Communication skills - Case study one (Com skill - CS1) scores	Co-ordination - Group project work phase one (Cord skill – GP P1 ) scores	MB2 scores	Communication skills - Case study one (Com skill - CS1) scores	Co-ordination - Group project work phase one (Cord skill – GP P1 ) scores
Group V			Group VII		
1	3.1	2.9	1	3.7	1.8
2	2.8	2.6	2	2.2	1.6
3	3.2	2.6	3	3.7	1.6
4	1.7	2.9	4	2.6	1.1
5	1.8	2.6	5	1.5	1.9
Group VI			Group VIII		
1	2.6	3.8	1	3.1	2.5
2	3.4	3.9	2	2.5	3.2
3	2.9	3.4	3	2.8	2.6
4	1.4	4.6	4	2.9	4.1
5	2.1	4.8	5	3.7	4.6

**Table 9:** Average and variance of Pre-measurement from control groups

MB2	Com skill - CS1 scores			
Group	Average (s)	Variance (s)	Average (P)	Variance (P)
5	2.52	0.517	2.685	0.488
6	2.48	0.587		
7	2.74	0.923		
8	3.00	0.200		

s-within group; P-all groups combined

**Table 10:** Average and variance of Pre-measurement from control groups

MB2	Cord skill – GP P1 scores		
Group	Average (s)	Average (P)	Variance (P)
5	2.7	2.95	1.136
6	4.1		
7	1.6		
8	3.4		

s-within group; P-all groups combined

In control groups, pre-measurement scores for Com skill were recorded for case study one and group project phase one work for Cord skill see table 8. Average score of 2.685 for Com skill see table 9 is 53.7% of scale, which is considered less as the minimum percentage to complete a skill is 60%. Variance of .488 is near to 50% of the established threshold of  $CV < 1$ , and variance is 18.17% of the mean, lower the variance better

student cluster with higher similarity in performance. Average score of 2.95 for Cord skill see table 10 is 59% of scale, which is also less than 60%. Variance of 1.136 is 113.6% of the threshold  $CV < 1$ , and it is 38.5% of the mean, this looks very gloomy from the point of similarity in student performance.

**Table 11:** Post-measurement scores of control groups

MA2 scores	Communication skills - Case study two (Com skill – CS2) scores	Co-ordination - Group project work phase two (Cord skill – GP P2 ) scores	MA2 scores	Communication skills - Case study two (Com skill – CS2) scores	Co-ordination - Group project work phase two (Cord skill – GP P2 ) scores
Group V			Group VII		
1	3.3	3.1	1	E**	E**
2	(2.5)	(2.4)*	2	2.6	2.4
3	3.2	2.7	3	(3.1)*	(1.4)*
4	(1.4)*	2.8	4	2.9	2.8
5	2.1	3.1	5	2.1	(1.4)*
Group VI			Group VIII		
1	(2.2)*	(3.2)*	1	3.4	4.6
2	(3.2)*	(3.2)*	2	E**	E**
3	3.0	(2.8)*	3	2.9	(2.5)*
4	1.6	(4.2)*	4	(2.7)*	(3.8)*
5	2.1	(4.1)*	5	3.7	(4.1)*

\*students who's post measurement score is less than pre measurement,

\*\*students who exited the experiment after pre measurement

**Table 12:** Average and variance of Post-measurement from control groups

MA1	Com skill – CS2 scores			
	Average (s)	Variance (s)	Average (P)	Variance (P)
5	2.50	0.625	2.692	0.987
6	2.42	0.625		
7	2.68	0.189		
8	3.18	0.209		

s-within group; P-all groups combined

**Table 13:** Average and variance of Post-measurement from control groups

MA2	Cord skill – GP P2 scores		
	Average (s)	Average (P)	Variance (P)
5	2.8	2.72	0.649
6	3.5		
7	1.6		
8	3.0		

s-within group; P-all groups combined

In control groups, post-measurement scores for Com skill were recorded for case study two and group project phase two work for Cord skill see table 11. Average score of 2.692 for Com skill see table 12 is 53.84% of scale, which is considered less as the minimum percentage to complete a skill is 60%. Variance of .987 is near to 98.7% of the established threshold of  $CV < 1$ , and variance is 33.64% of the mean, lower the variance better student cluster with higher similarity in performance. Average score of 2.72 for Cord skill see table 13 is 54.4% of scale, which is also less than 60%. Variance of .649 is 64.9% of the threshold  $CV < 1$ , and it is 23.86% of the

mean, this looks very gloomy from the point of similarity in student performance.

Results of treatment groups for post-measurement of Cord skills through group project phase two are higher than pre-measurement phase one, this increase can be attributed to guidance given by teacher as treatment between pre and post measurement. variance value between pre and post measurement are similar, indicating the distance between average score and each individual student's performance is similar between pre and post measurement, this also signals effectiveness of treatment.

Results of treatment groups for post-measurement of Com skills through case study two are higher than pre-measurement case study one, this increase can be attributed to guidance given by teacher as treatment between pre and post measurement. Important observation for Com skills is the variance of post measurement higher than pre, which is an issue of concern and further probe have to be done with other select courses in a different time period and cohort.

Results of control groups for post-measurement of Cord skills through group project phase two is slightly lower than pre-measurement phase one, this decrease can be attributed to absence of guidance by teachers between pre and post measurement. Variance value of pre-measurement is above  $CV < 1$ , indicating very high distance between average score and each individual student's performance. Results of control groups for post-measurement of Com skills through case study two is slightly higher than pre-measurement case study one, this increase can be attributed to factors such as students

existing skill level, student interaction with similar skills from courses of other departments. Similar to treatment groups, control groups for Com skills are the variance of post measurement is near to  $CV < 1$ , which is a direct indication of absence of treatment.

A comparison between treatment groups and control groups reveals increase in average scores for TG due to the effect of treatment and no improvement in average scores for CG confirms the importance of treatment in achieving student learning effectiveness. Observation of variances for TG gives a slightly different perspective to keep them lower to cluster the student performance around average.

Effect of mortality on experimental results was acceptable. In post-measurement of Com skills and Cord skills from four treatment groups via I, II, III and IV out of total 20 students from pre-measurement, one student left the experiment, which is 5%. In post-measurement of Com skills and Cord skills from four control groups via I, II, III and IV out of total 20 students from pre-measurement, two students left the experiment, which is 10%. In comparison to select courses from other departments which were part of AOL process, the

average mortality rate was between 10 to 25 %, hence mortality rate in the “MKT 303 sales” course is acceptable. Ravenscroft et al, (1995) found that in group-based student learning experiments the drop rates are very lower. All the courses selected for AOL implementation, cohort involved total number of students enrolled, hence use of t-test to signify mortality was not necessary. The total cohort involved in the experiment was  $N = 20$  for treatment groups and another  $N = 20$  for control groups, hence validation methods like CFA was not used; Jackson, McWhorter, Lirely, & Doty, (2014) applied CFA for validating the results of AOL for a sample of more than 200, many studies reported running CFA needs a minimum sample size of 150. Baker et al. (2012) confirms qualitative measurement allows only a cohort of few students to involve in experiments, but this cohort will act as a single unit of population resulting in easy and accurate measurement of performance. Moore, Dana, & Hair, (2021) reports cohort size can be small when population considered for the study is small; this is more practical for group-based investigation like the present study. Alternatively Han and Ellis (2021) use bigger sample of 193 and in-direct measurement using a questionnaire.

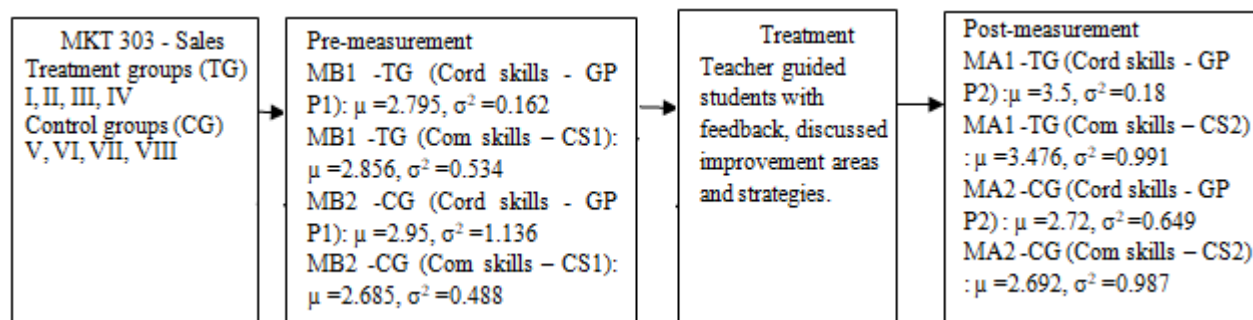


Figure 2: AOL experiment – Summary of results Marketing program

#### 4. Conclusion and future research direction

For coordination skills (Cord skills) closing of loop is achieved. Regard to communication skills – (Com skills) teacher guidance (treatment) was effective in increasing the average performance from pre to post measurement, but post measurement variance is near to the threshold  $CV < 1$ , hence closing of loop need to be continued for Com skills to further semesters, LaFleur et al, (2009) similarly found closing of loop need to continue in preceding semesters if unachieved in the present semester; Mcconnell et al, (2008) also conclude closing of loop can be achieved by continuing across semesters within an academic year. For control groups closing of loop for Cord skills is not achieved and for Com skills absence of treatment effected both average performance and variance too, which informs the important role of teacher guidance between pre and post measurement. Meuter et al, (2009) in their study found that students who were exposed to treatment via certain concepts in marketing performed better in evaluation than students where not given treatment. Alternately LaFleur et al, (2009) found no difference between various groups of students in terms of assessment results in

the experiment. Cai, Mainhood, Groome, Laverty, & McLean, (2020) in their physics laboratory study concluded that students if given freedom to perform on their own will produce better results than students who are guided by teachers.

Experimentation in higher educational courses is done in a controlled academic environment. Most of the experimentation is done on learning effectiveness/assurance of learning, student participation is mandatory, unlike experiments done for marketing purpose hire the cohort. Student participate in experiments in certain strict rules and regulations, to some extent their natural behavior is suppressed, where as in marketing experiments the control on cohort is minimal leading to natural behavior. In either of the case effect of errors is common. Mortality in experiments is a serious issue in validating the results, student participation is important for himself to completed the academics hence in this study mortality among cohort was very less and acceptable. Before after with control design (BACD) was useful in investigating teacher guidance as independent



variable to improve student performance between pre and post-measurement for Com and Cord skills.

This study gave important insights for using experimental design to measure assurance of learning among students and universalise the independent variable; a similar observation was done by Kokku, (2021); Jackson et al, (2014); Kane et al, (2005); Messick (1994) to validate and generalise the AOL results. It also helped in understanding errors which can be addressed and which cannot be; and those which imprint positive or negative effect on assurance of learning AOL results, table 1 presents error control status of this study. Positive effect of errors is not acceptable in general, but the ultimate goal of AOL is student learning, hence they are acceptable.

Higher education institutions particularly business schools while implementing AOL and concluding achievement of closing of loop, need to adopt experimentation process to generalised the independent variable through results of skills across the school. Further such generalised results will give direction to schools in judging outcomes of skills and their implications for closing of loops in future course of time;

French et al. (2012) also concluded future teaching agenda should be driven by results of student learning outcomes assessment. Harper and Harder (2009) goes a step further and inform the role of closing of loops and its influence on curriculum changes (Kokku, 2021). Closing of loops helped Marketing program to bring in several changes in the curriculum, important being to shift - Principles of Marketing, course from 4<sup>th</sup> semester to 5<sup>th</sup> semester due to prospects of better understanding and learning of marketing concepts and theories by students in 5<sup>th</sup> semester compared to 4<sup>th</sup> semester. Closing of loops process will also help schools to understand the areas of improvement in cases of unachieved loops.

For future research, gender criteria can be considered. Population and sample can include both male and female students in the experiment to investigate the assurance of learning difference between genders. A study done by Leisa (2007) found a significant effect of gender on learning assurance; more importantly with regard to communication skills.

**Attachment A: Rubrics used in the experiment**

**Individual member presentation rubric for evaluating communication skills**

Rubric	Excellent (4-5 points)	Good ( 2-3 points)	Poor (0-1 points)	Score
Organisation and communication of Ideas (AOL)	Presenter follows sequence and gives elaborated explanation	Presenter follows sequence but fails to give elaborated explanation	Presenter misses sequence also fails in explanation	
Effectiveness of Delivery	Presenter speaks clearly understandable and matches the frequency of the audience	Presenter speech not understandable at some times and does not matches the frequency of the audience	Presenter speech not understandable and he is not able to present	
Conclusion	Effectively provides a sense of closure	Closure is little unclear	Closure is completely confused	
Q & A's	Listens to the audience questions carefully and Addresses all questions with satisfactory answers	Addresses all questions with only some satisfactory answers	Does not Address all questions	
Time	Completes on time	Completes in time	Does not complete	
Average				

**Group project work rubric for evaluating coordination skills among group members**

Rubric	Excellent (4-5 points)	Good ( 2-3 points)	Poor (0-1 points)	Score
Common objective	All group members work effectively for achieving group objective	Only few members work effectively for achieving group objective	Only one member works effectively for achieving group objective	
Effectiveness communications	All group members communicate regularly and actively within	All the group members communicate randomly and less actively within	All the group members communicate occasionally with no interest	
Contribution	All the group members contribute equally	Few members contribute more	one member contributes major work	
Lead role	Group has a clear lead role	Group is lead by more than one	Everyone leads the group	
Average				

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