

Continuous Improvement in the Retention and Employment Placement – Link Between Both Processes

*Nancy Rodríguez Bello
Master in Manufacturing Competitiveness
Rafael Nieves, Pharm D
Industrial Engineering
Polytechnic University of Puerto Rico*

Abstract — *For the last decade, the social-economic factors as violence, underground economy, the poverty level of living, high unemployment, generations depending on subsidies fund from the United States, has negatively impacted the education, increasing the numbers of dropouts students in Puerto Rico. In addition, regulatory agencies have been increasing their requirements and conditions in order to continue the distributions of federal fund (grants) to the Education Institutions. The non-compliance of the established standard by regulation will affected the surviving of a lot of Institutions of Education in the Island. Based on this situation, the organization are looking for new strategies and techniques to maintain the retention process in control This project has been developed under the Plan-Do-Check-Act, Lean Six Sigma principles and using DMAIC five-step approach, in order to identify opportunities to enable the organization to reduce the overall dropouts students and increase the retention students that link to job placement.*

Key Terms — *DMAIC, Lean Manufacturing, Plan-Do-Check-Act, Retention process, Six Sigma.*

PROJECT STATEMENT

By definition, retention is the state of being retained. Also, retention is the preservation of the after effects of experience and learning that makes recall or the recognition, possible. The placement is the assignment of a person to a suitable place (as a job or a class in school).

The Educational Institution is looking for new strategies and techniques to improve the student's retention and employment placement within the areas of study once they have completed the

requirements for the certification of grade. It is important the number of student keep increasing to link this retention to the placement of the student in the areas of expertise. The development of the research should accomplish new ways to do things to improve procedures and processes of Retention and Placement and make cost efficient and cost effective connection between them for the progress of a Community Educational College complying with the new requirements established by the Federal Law Funds.

Research Description

The research is about the analysis of processes the way they do it now and seeking for alternatives and others options as part of strategies and techniques. In terms of retention applying concepts of Lean Manufacturing where the analysis of customer or client needs and demands are identified first and start molding and adapting the system to what the client really want. "Looking at the whole product delivered through the eyes of the customer. It will take the same process to define its value no matter how is the "product"-service or goodⁱⁱⁱ"-applying other Quality management tools (as Plan-do-check-act) for the development of a continuous improvement process for retention and placement. See flowchart below (Figure 1).

Research Objectives

The objective of the research is to identify strategies and techniques that could increase the retention of student and employment placement of them. Also, the objective of adapting an organizational culture of the maintenance of the continuous improvement of the processes in specific retention and employment placement as

part of keeping an active thinking of innovation within the organization.

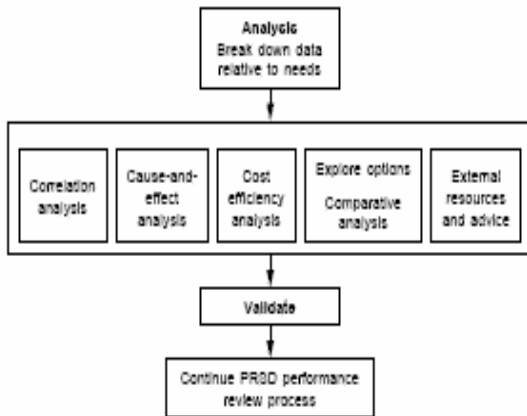


Figure 1
Process Analysis - American Society for Quality (ASQ)

Research Contributions

The main contributions with the research will be obtaining more quality with the product or service (this case is education services) and lean processes with the analysis of the stream value what is need it and expected from customer or client (students) helping with the retention of students and the cost effective result (as new requirement by federal law related to federal funds).

LITERATURE REVIEW

Based on data of the institution, the variable factors that affect the retention and placement of the students are emotional issues and the economical factor could be related or directing or marked to emotional issues for the dropout students.

A summary of studies done by *Edwin A. Rugg* [1], the dropouts are operationally defined as all students in a first-time freshman class who at some later point in time are not enrolled and have not been graduated previously. The definition failed to described or distinguished between types of enrollment if temporary or permanent, making distinction between students who voluntarily drop out and those who drop out as a result of dismissal from the institution (failed policies and requirements by law or institutional rules). The studies done, showed that minority and nonminority groups were first compared on the two measures of

student retention for the entire 4-year period. Measuring the dropout frequencies for the two groups was compared. Attrition resulting from dismissal and from voluntary discontinuance was examined separately. Differences in dropout rates were also examined after controlling for the effects of scholastic aptitude measured by College Admission Test (ACT) composite scores and academic performance as measured by cumulative grade point average.

The results were focusing in the voluntary discontinuance of enrollment. Finding that 1 in 10 of the minority students had voluntarily dropped out compared to nearly 3 to 10 of the nonminority group. When academic eligibility was maintained, minority students were less likely to drop out than the nonminority students. More nonminority students with cumulative average C (the Grade Point Average, GPA = 1.50-2.49) elected to drop out then those did with A or B (GPA \geq 2.50). Letting the interpretation of the data measure to observe another variable that affected the drop out decision of the student could be the academic average score or GPA status. In comparison of both groups, it was found that nonminority students were more likely to drop out if the academic performance were low while the minority students was relatively unaffected by differences in academic performance. A possible reason for this could be because, the relation of this factor of variable with the emotional issues. For example, the minority groups will try harder than the nonminority groups because they are used to struggle for what they want and life is a little bit harder. And for them it is not easy to quit so fast to prove them self and the sacrifices they are making?

Supporting strategies and techniques about learning process shows in studies like: *Retention, Motivation, and Enjoyment: An Exploratory Evaluation of the Effectiveness of Hands-On Learning* by Christian Grandzol and Pamela Wynn [2], from the Bloomsburg University of Pennsylvania, they developed a learning-centered environments in business courses that included engaging experiences relevant to the subject matter

fostered an interest in the subject and a positive attitude toward the learning experience. In other words, simulations adapted to real business environment in the field of specialty could motivate the interest in the subject and could affect the attitude toward the learning experiences.

Researchers in marketing education found that action-oriented experiences increased intrinsic motivation and self-regulation. These led to deep cognitive and meta-cognitive strategy usage by marketing students. Other researchers [4], found active learning experiences in introduction to business courses led to significant improvements in class-specific outcomes over the traditional method, but did not result in significant differences in the overall mastery of the subject. These findings are not consistent with the findings in marketing education previously mentioned, in that, overall mastery implies deeper learning since students were required to understand applications and extrapolate knowledge. This observation is made as a point of interest, because the methodologies employed in the two studies were not comparable.

Another study, conducted over a six year period at the University of California at Berkeley supports the notion that experiential and affective approaches enable students to develop greater depth and breadth in industry related skills as assessed through self-reflection and industry juries.

In October 12 of 2013, there was a conference by Dr. César Rey (Ex-Director of Department of Education in Puerto Rico [PR]), named "*El Reto Educativo en Puerto Rico en tiempos de violencia*" [5], where he gave important data related to emotional and economics issues related to the impact in the education in PR, in our days. Dr. Rey, emphasized that out of 10 students in the University only 3 graduated. The results of only 30% of the students graduated. He established, based on his studies, the emotional and social issues indicated that the broken social contract is:

- 49% dependency to the Benefactor State,
- 56% minor under 18 year old living under the levels of poverty,
- 39% active labor force,

- 184,000 (approximately) employment of drugs points vs. 190,000 (approximately) government employment,
- 16% unemployment vs. 30% real,
- 30% informal vs. 80% illegal,
- The average of living births per year is 52,000, and the 18% are adolescents,
- The average of deaths per year is 28,677,
- The expecting living age is 77 years old. (74 years for man and 81 years for woman),
- The violence is a social problem where:
 - One suicide occur every 24 hrs.
 - In a weekend, 3 suicides occur in 24 hrs.
 - In the past decade, it had registered more than 1,000 assassinations and suicides per year (average deaths per year in violence).

The correlations to the impact of the social and emotional issues in Puerto Rico, established in the studies by definition that a dropout student is not necessarily a person who lack of his capacities, it's contrary to that, they are capable persons in society. The study specified that at young ages as children they start deciding on how to get money fast and easy without an effort in education. Focusing in fast and easy money, the way of thinking is that education is not an option. Easy for them to decide for the bad behavior for fast money and as consequences they end working for the drugs dealer points (the underground economy). The education is working in our times against this factor and social variables.

The impact of the education in the employability is directly pertinent to: capacity to communicate in at least 3 languages (Spanish, English and a third language); willing, capable and able to work in a team; and employee must be coachable or trainable.

The business is looking for these indicators. In our days, the student have to be capable of continuously updating the professional scope toward what is relevant in business, related to the competitiveness of the areas of work focusing the importance of *An Education Reform* guiding studies to what is pertinent in the real world of work.

The study of Bennet: 2013, from University of Harvard concluded that:

- Half of the enrolled student populations in the Universities in the United States (US), from 2010 to 2011 were unemployed or sub-employed.
- For the 2018, the 14 millions of available jobs will only require High school but not necessarily a Bachelor degree.
- 84 % of the employers in US evaluated the preparation of the Universities students as insufficient or poor in preparation.

METHODOLOGY

This chapter describes the methodology that was used to complete the research. The research was initiated with the review of the literature related to the process and historical data information associated with the activities that could be helpful. The second phase integrated the new techniques and strategies within the compliance of the regulatory requirements behind the process. Once the implementation was in process, it was measured and analyzed to identify if the continuous improvement is taking place. Base on the results the decision for other alternatives should be made and the search for innovation and other ways to do things will continue. Finally, the process was performed following the developed guidelines established as a model which complete the third phase.

Phase I

Perform the review of literature related to strategies and techniques and methodology based on improvement cycles as Plan-Do-Check/Study-Act (PDCA) and problem solving techniques taking in consideration. The search will be concentrated to identify all relevant published evidence, analyze the data obtained, and interpret the findings and provide a summary of the findings.

Phase II

The implementation of changes in work activities processes pursuing new strategies and the

continuous improvement. The basic process improvement model has two parts:

- Steps 1 through 7 represent the process simplification part, in which the team began process improvement activities.
- Depending on the stability and capability of the process, the team may continue on the step 8 or go directly to step 14 which was to determine whether additional process improvement was feasible.

Phase III

For the completion of this phase the proposed guidelines developed in phase II was evaluated. Once the process has been established the data collected is used to evaluate capability and stability of the process which could use the tool of the control charts and the tool of root causes for lack of capability. Also the evaluation of the behavior in the assistance of the students with the scatter graph projection if there is a correlation between variables or there is no significant correlation between them.

RESULTS AND DISCUSSION

This chapter describes the obtained results and the discussion explaining them.

Phase I

After had performed the review of literature related to strategies and techniques and methodology based on improvement cycles as Plan-Do-Check/Study-Act (PDCA) and problem solving techniques were taken in consideration. The search was concentrated to identify all relevant published evidence, analyze the data obtained, and interpret the findings and provide a summary of the findings. The search identified the following data obtained:

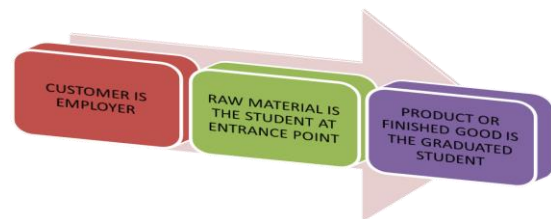


Figure 2
Identification of Customer and Product

By Lean Manufacturing Methodology

In Figure 2: Identification of Customer and Product, looking at the whole product delivered through the eyes of the customer. It will take the same process to define its value no matter how is the “product” - service or good. *Kaikabu* (radical improvement) is needed in the initial rethinking of value. The customer is the external client who will need specific qualifications in order to hire the employee (in this case the graduated student will be the potential employee and, our product or finished good in the Educational Institution). It will require the producer to talk to the customers in new ways and with all the firms that compose the value stream.

In our Institution “*Program Advisory Committee*” (PAC) is the customer voice (Employers). The product specifications are equivalents to the soft-skills need it for the graduated student to be elected for placement by the Employer (customer). Some of the soft-skills (product specs) listed are: capable, willing and able to complete jobs duties; know how to work as a team, coachable or trainable. Then Kaizen (continuous improvement) is used thereafter.

The plan specified, identified the retention process as the process to be improved and the scope of the education process directly involved in the work and rework to impact the retention process. Therefore, the data obtained, measures and analysis are based in the scope identified. Other processes involved are taken on consideration as well as departments of support in the line process. In other words, all department and processes are important as services suppliers of the organization to internal client and external client as well as part of it.

The step 1 was the process selection and established the process improvement objective which was 10% of improvement in retention from the first measure term to the second measure term. Each term unit is 30 days of classes (“*bloque*” = Term or Semester) counting only week days which it became 2 months each term.

The step 2 was organized the team. The team effort of the organization is directed by the Executive Director, Retention Coordinator, Placement Coordinator, Project Leader, and professors and all the personnel within the organization has an important role that impact the student retention. The organization notified the initiative thru Education meetings and explained the initiative and project goal and oriented the personnel for good customer services practices. In order to give everybody accountability and responsibility to turn the organization culture toward pursue of the objectives and goals.

The following Table 1: PLAN: PROJECT CHARTER, gives details of the plan established for the completion of the investigation and the objective and goals expected to achieved by the end of the Project, this is only the beginning of the initiative of continual improvement for the organization to be better and do better every year. The efforts will continue to achieve different and improved results.

Table 1
PLAN: PROJECT CHARTER

Project Name		Continuous Improvement in the Retention and Employment Placement – Link Between Both Processes		
Project Leader		Nancy Rodriguez	Project Sponsor	Pharm D. Rafael Nieves
Start Date		8-1-2013	Target Completion Date	December 19, 2013
Project Description		<ul style="list-style-type: none"> Establish new strategies and techniques that increase the retention of student and employment placement of them. Adapt an organizational culture of the maintenance of the continuous improvement of the processes 		
Scope		Retention within the Education Process and Placement Process Base line by Accreditation Agency: 55% Retention		
Project Goal & Measure		Increase the retention of student by 10% and seeking to increase employment placement Goal by organization: More than 65% Retention		
Expected Business Results		<ul style="list-style-type: none"> Reduce Cost by reducing waste and rework. Provide a competitive advantage by reducing drop outs. Increase predictability in the process. Increase revenues through retention of students 		
Team Members		<ul style="list-style-type: none"> Project by: Nancy Rodriguez Bello Executive Director / Director of Education Retention Coordinator Placement Coordinator All personal working within the Education Process 		
Support Required		All support necessary to complete the project within the Institution.		
Expected Customer Benefits		<ul style="list-style-type: none"> More stable product (student) quality. Increase product availability by reducing drop outs. 		
Schedule	PLAN	Milestone / Duration	Phase	Target Date
		D- Define / 1 week	D - Completion	8-1-2013
	DO	M- Measure / 4 months (2 terms)	M - Completion	12-19-2013
	CHECK	A- Analyze / 3 weeks	A - Completion	Jan 7, 2014
		I- Improve / 2 months	I - Completion	August 1 st to Dec 19, 2013 and on going
	ACT	C- Control / 2 months	C - Completion	On going
		Summited Report Completion	Project Completion	End of terms of March 05, 2014

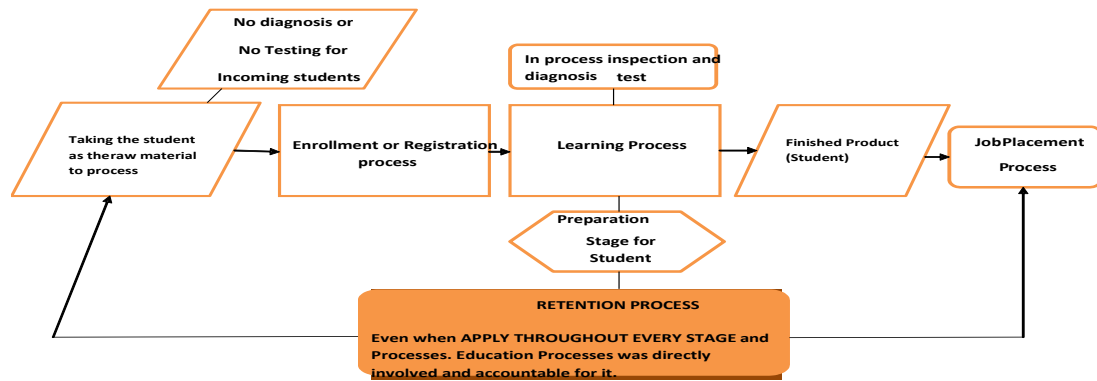


Figure 3
Current Retention Process

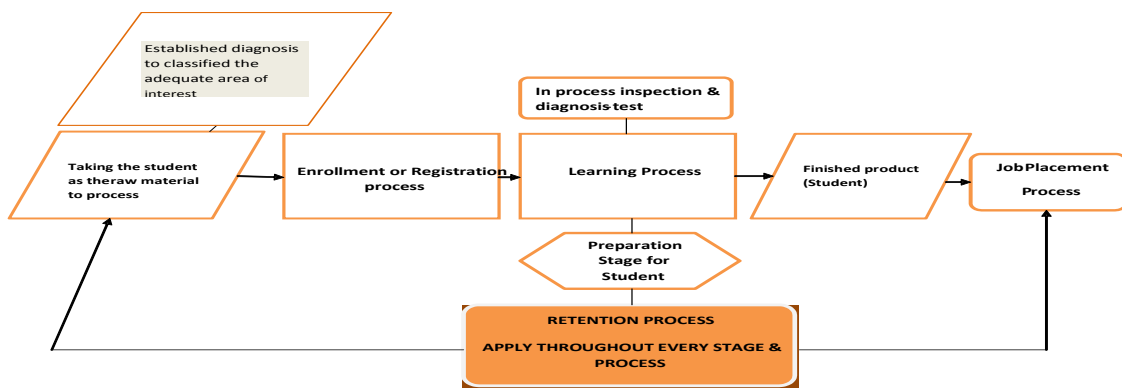


Figure 4
Simplified Retention Process and Changes

The step 3 is the flowchart of the current process. How the organization did it before the Project? The Figure 3: Current Retention Process, show the current processes starting with the entrance of student for enrollment where during this phase of information exchange there is no test or diagnosis for incoming process. Becoming an in process inspection and diagnosis during the learning process. Where the detection of capability of student is tested after the enrollment without knowing if the program selected fix his capability and could be rejected later on by the grades and performances evaluations during courses if the student doesn't comply with the requirements of the program selected could be a voluntary drop out or not. Once, the student is enrolled in a program the number start counting with retention and with drop outs decreasing the number to comply with the specifications regulations by Accreditation Agencies. When there is a drop out, as a result

shows the student is using grant from Federal government to study without completing the program affecting at long terms funds given for the organization by Federal Government.

The organization in the current procedures for the retention process established the education department or process accountable and responsible for the retention process where the professors and personnel directly of this area manage the follow up of the assistance of student and gave customer service as a mediator between the student and organization to retain and maintain the assistance and motivation to complete the program. The job placement was completely done by student.

The step 4 is the flowchart with changes to the process (view Figure 4: Simplified Retention Process and Changes). How does the organization simplify the process and make changes?

In the new flowchart of processes, the first change was implement a diagnosis test to classified

the student by area of interest and capability. Where the in process inspections and evaluation continues with less risk of lack of capability to impact the retention process. Also, during the whole process from enrollment to the job placement the implement of all personnel involvement in retention process and not only education department. Where, everybody is accountable and responsible for customer services good practices in order to impact the retention process. The Retention coordinator and Placement Coordinator work hand to hand to support the education department to achieve the goals and objective to continuously improve the retention numbers and comply with the job placement specs and regulations established by Federal funds government. See SIPOC table below in Figure 5.

SIPOC				
Suppliers	Inputs	Process	Outputs	Customers
owner-President	Information	Retention Process	Graduated student	Employers
Consumer	Resources		Drop Out student	Students
Costomer	Computers		Non-graduated student	Educational Institutions
Book Distributors	Books & Materials			
External Resources	Specs			
Enrollment Team	Information for placement			
Student	Student			
Professors	Education			
Support Teams				
Student information of interest & capability	Enrollment Support	Learning process & student preparation Support	Graduated student Support	Job Placement Support

Figure 5
SIPOC table for Retention Process

In step 5-7 shows the development of the data collection plan, the stability and capability of the process. See the measures taking places established to obtain the assistance numbers or retention numbers in Figure 6 and 7 and graphics Figure 8 and 9. The measures were taken by random sampling of organization student population.

Assistances Term August - October 2013					
Weeks	Day 1	Day 2	Day 3	Day 4	Total (%)
Week 1		8	13	4	66%
Week 2	12	12	12	13	88%
Week 3	10	11	11	10	75%
Week 4	11	11	6	9	66%
Week 5	8	11	13	8	71%
Week 6	5	8	8	8	52%
Week 7	6	10	7	9	57%
Week 8	9	8	9		46%
					65%

Figure 6
Measures from August to October 2013 – One Term

Assistances Term October - December 2013						
Weeks	Day 1	Day 2	Day 3	Day 4	Day 5	Total (%)
Week 1	11	12	10	10		83%
Week 2	10	13	12	10		87%
Week 3		12	12	10	9	83%
Week 4	11	6	11	8		69%
Week 5	13	10	9	Thanksgiving		82%
Week 6	12	9	10	10		79%
Week 7	10	7	11	9		71%
Week 8	10	8	10			72%
					78%	Average Retention

Figure 7
Measures from October to December 2013-Second Term

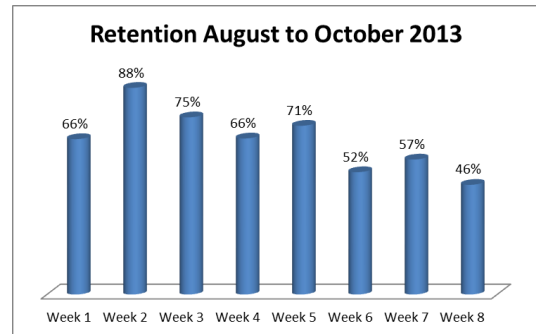


Figure 8
Histogram of Retention for Term August to October 2013

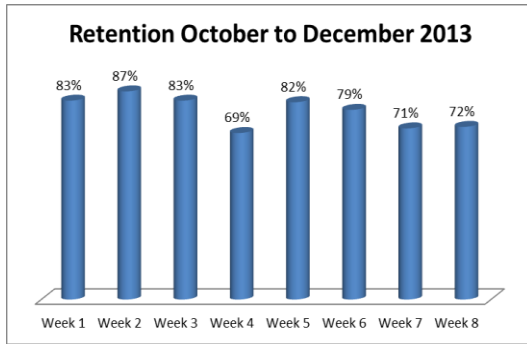


Figure 9

Histogram of Retention for Term October to December 2013

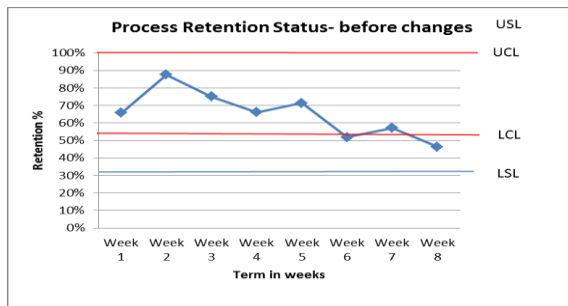


Figure 10

Process Retention Status - Before Changes

Phase II: Continuous Improvement

The Term of August to October 2013, before implementing the proposed changes (Figure 10), shows the Retention Process as capable but not in control. The organization follow the plan to implement changes to achieve the goal of continuous improvement thru the process. The proposed and recommended changes were:

- Establish a test of diagnosis to chanel the enrolled student to the proper interest within their level of capability.
- Establish metrics for measures in each class room were the professor will count the assistance every day and obtain and report the percent number to the retention coordinator to maintain the control of the process and have a clear understanding of the status of retention.
- Establish training and orientation to the whole staff about good practices of customer services and make the whole organization accountable in an effort to change the organization culture.
- Established the curriculum revision following the advised of the Program Advisory

Committee (PAC) to update and maintain the actual specifications and requirements of the employers.

- Assesst and research the equipment, material and external resources to maintain the facilities in shape and good conditions. Including, the research of new programs and online tools for the improvement of the class contents and the training of the education department professionals.

This changes were placed to start at the beginning of the Term of August 2013. After one term had past, the process results measures are showed in Figure 9 for Term October to December 2013. See Figure 11 for chart.

Phase III: Control and Capability of the Retention Process

Based on the measures and analysis of the retention percentages in the second Term October to December 2013 (see Figure 7 and Figure 9), the results show the process is in control and the process is capable. The results by random sampling established the percentages distributions are within the upper levels and lower levels. See Figure 11 chart.

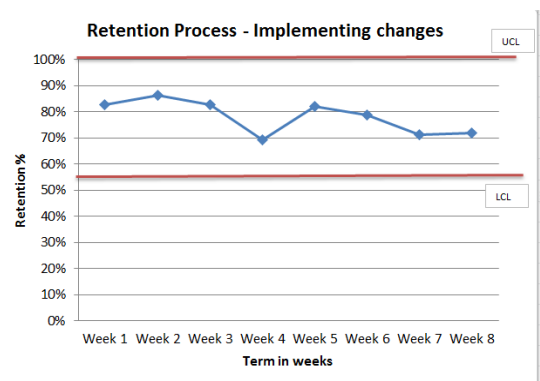


Figure 11

Retention Process Status-implementing changes

CONCLUSIONS

The analysis based on a sample of the population demonstrates a 13% of improvement in the averages retention percentages (see Figure 6 and 7) from one term to the other. The objectives

for continual improvement were at least 10%. The objective was achieved.

The organization knows that some of this changes are short term objectives and other long term objectives. It is up to the whole organization to maintain the continual improvement and it will take time and effort to implement new changes, maintain the system measure the system and analyze it for the control.

REFERENCES

- [1] Rugg, Edwin A. (1982). *A Longitudinal Comparison of Minority and Nonminority College Dropouts: Implications for Retention Improvement Programs*.
 - [2] Grandzol, Christian, and Wynn, Pamela. (2011). *Retention, Motivation, and Enjoyment: An Exploratory Evaluation of the Effectiveness of Hands-On Learning*. Bloomsburg University of Pennsylvania.
 - [3] Foss, Mary L., Stubbs, James R., and Jones, Gayle. (2011). *Integrating Quality, Education, Lean, and Performance Management into a culture of continuous improvement*.
 - [4] Bauer, John E., Duffy, Grace L., and Westcott, Russell T. (2006). *The Quality Improvement Handbook*. American Society for Quality.
 - [5] Rey, César Dr. (10 de 12 de 2013). *El Reto Educativo en Puerto Rico en tiempos de violencia*. Conference.
-