



Improving the 5S rating of a public high school in Baguio city, Philippines through a university community extension program

Geraldine G. Nerona

Department of Industrial Engineering/Saint Louis University/Philippines

ggnerona@slu.edu.ph

ABSTRACT

5S (SORT, SET, SHINE, STANDARDIZE, SUSTAIN) implementation in a public high school of Baguio City is a community extension program of the Industrial Engineering department of Saint Louis University. The goal of this program is to address the cluttered and unorganized classrooms that also resulted to some safety issues in the school. The role of the faculty of the university was to provide training to the teachers and staff of the high school, develop activities pertinent to each level of the 5S program, guide and monitor the teachers and staff throughout the implementation of the 5S program, make periodic reports and do the impact assessment. Direct assessment was used to measure the 5S ratings of the classrooms before and after the extension program. Qualitative assessment was used to measure the impact of the extension program in increasing knowledge level and applying 5S in the school setting. The paired t-test indicated a significant improvement in the 5S rating of the school from “minimal acceptable level” to “excellent” after implementation of the extension program. The qualitative assessment results indicated that the teachers found the extension program “definitely useful” in meeting their needs for information, “significantly increased their knowledge” about 5S, and that they “definitely plan to adopt/continue with the program” in the future. The experiences shared by the teachers reveal the changes that they have undergone in the way they do things as a result of learning about 5S. Their personal account of the changes they underwent is evidence of shift in behavior as a result of imbibing 5S into their system.

ARTICLE INFO

Received : Oct. 14, 2022

Revised : Dec. 23, 2022

Accepted : Dec. 30, 2022

KEYWORDS

Applied research, Educational research, Industrial engineering, Quality management systems

Suggested Citation (APA Style 7th Edition):

Nerona, G.G. (2022). Improving the 5S rating of a public high school in Baguio city, Philippines through a university community extension program. *International Research Journal of Science, Technology, Education, and Management*, 2(4), 91-103. <https://doi.org/10.5281/zenodo.7559969>

INTRODUCTION

Extension work is one of the tri-fold functions of the faculty in Saint Louis University, first two being teaching and research. Embarking on an extension program is one of the most challenging, “out-of-the-box” activities for both faculty and students in that it involves heaps of creativity, volunteering, and hard work to transform research output to realities that will directly impact the lives of people in a community with identified needs.

The purpose of extension primarily is to bring the expertise of both faculty and students out of the university and into communities to study their current needs, formulate and implement solutions through careful research and partnerships with stakeholders involved (Fletcher, 2006 and SLU, 2018). Although extension work does not grant academic credits, involvement in such work constitutes “education for real life” (Gomes, et al., 2013 and De Leon, 2016), giving both faculty and students the opportunities to reach out and use their expertise to solve real-world problems and initiate change in the chosen communities (Nerona, et al., 2018). In the selection of an extension program, the following identified characteristics must be considered in line with the university Manual of Operating Procedures and Guidelines for Extension or MOPGE (SLU, 2018) namely: the program is discipline-based, research-backed and guided, mission-oriented (focused on benefitting the low-income and vulnerable members of the society), collaborative and participatory (involves faculty, students, the target group, and other agencies), and sustainable, considering the university’s limited resources and available funding. The extension program of the university involves collaborative work between faculty and students, to maximize the learnings and benefits derived from extension work of the faculty, students, and the community (Nerona, 2017).

One of the recently concluded extension programs of Saint Louis University (SLU) is entitled “Developing and Implementing a 5S program at the Happy Hollow National High School (HHNHS)” in Baguio City, Philippines. 5S (sort, set, shine, standardize, sustain) is a lean tool that is known to improve system performance in organizations (Omogbai & Salonitis, 2017). The Department of Education directs public schools, such as Happy Hollow National High School, to establish a holistic school environment to enable the students to optimize their learning (retrieved from: <https://www.deped.gov.ph/about-deped/vision-mission-core-values-and-mandate/>). In addition, school administrators, teachers, parents, the community, and other partners are called to collaborate for developing life-long learners (retrieved from: <https://www.deped.gov.ph/about-deped/vision-mission-core-values-and-mandate/>). Happy Hollow National High School (HHNHS) in Kadaclan, Baguio City is the partner community for this program since it was the school recommended by the Department of Education (DepEd) for this purpose. This school is located around 15 km from the city proper and a good 45-minute hike on a mountain trail after a 20-minute jeepney ride is also needed to get there. The school head and teachers revealed that most of their students belong to the marginalized group in the community. Aside from this, the DepEd revealed that this school lacks many educational tools and facilities because of the difficulty of delivering services and assistance both by public and non-government institutions due to its remote location, mountainous terrain, and undeveloped in-roads for transportation. Parents cannot also afford to sponsor projects for school and facilities improvement because of their low economic status.

The physical condition of the school has an effect on both students and teachers. Studies show that poor and unorganized facilities have a negative effect on teaching and learning experiences of both teachers and students. According to Jones et al. (2003), schools with a huge proportion of students belonging to poor families reported to have below standard classroom, furniture, lighting, and temperature. This finding was backed-up by the Department of Education (1999) when they noted that public schools find difficulty in the availability of appropriate and quality school facilities on teaching and learning. The studies on “school facilities and learning” conducted in the past show that poor and unorganized facilities have a negative impact towards the effectiveness and performance of teachers, which in turn negatively impacts the students’ learning (Akomolafe & Adesua, 2016 and Earthman, 2002). Also, a difference of 5%-17% has been found between the achievements of students in sub-standard buildings and those in standard buildings (Earthman, 2002). Another study conducted in selected universities in Kenya found that poor classroom conditions and lacking school facilities affected the participation of students in Science and Technology courses (Wanyama, 2022). The study indicated that these poor conditions also compromised the quality of education. It was demonstrated in these studies that poor facilities have an adverse effect on the quality of teaching and learning.

Cluttered classrooms and workspaces affect students' productivity and satisfaction of the services provided by the school. The impact of 5S practice in an organization is that a clean, clutter-free and organized workplace contributes to improving employee productivity, attaining higher quality of goods and services, while minimizing wastes (Productivity SA, 2022). A study of 5s implementation in classrooms showed that in the same vein, the 5S concept holds advantages when applied to the school environment. These include self-discipline, self-confidence for self-management, and clean classrooms and environment (Productivity SA, 2022). Other studies on 5s implementation in the educational setting had results of decreased wastage, and productivity of teachers and students was improved through organizing the workplace and its environment. These studies proved that effective sustenance of "5S" in the institution reinforced teachers' and students' work ethics, which geared toward increasing team work (Joshi and Shindu, 2018; Wan Asri, et al., 2015). In addition, implementing "5S" has enforced positive changes in the school since students were more motivated to study and teachers were more satisfied with their work (Joshi and Shindu, 2018).

An initial survey conducted at HHNHS revealed that there were safety and ergonomic issues brought about by poor facilities and unorganized classrooms. The purpose of conducting a full-length 5S program is to give a more holistic approach in addressing problems on poor and unorganized facilities of HHNHS. To the school, this was an opportunity for them to accomplish 5S in line with the guidelines on educational facilities mandated by the DepEd (DepEd, 2010). It is necessary for schools to establish their own quality management system for them to continue providing significant value to the community (Ma & Tao, 2022). During the initial meeting with the school representatives, it was revealed that a 5S program was supposed to be implemented in the school as early as 2010, but it has not been implemented because the teachers and staff do not have the proper knowledge, resources, and training on 5S. Another purpose in conducting the extension program is to enable the faculty and students of SLU to provide the necessary training, guidance, some material, and monitoring of activities under each phase of 5S. This is an opportunity for both faculty and students to practice lifelong learning, and do problem-solving in the real-world setting. 5S implementation is also a direct application of a BSIE course Quality Management Systems.

The results of earlier studies have demonstrated that there is an opportunity to drastically improve the organization as well as the overall safety of the school through the design and implementation of 5s principles in the four pilot high school classrooms of HHNHS. Such program can be successfully accomplished through the cooperation and participation of all stakeholders involved.

OBJECTIVES OF THE STUDY

The goals that the study needed to attain are, first- to create a baseline rating for the current 5S practice at HHNHS, to serve as basis for Needs Assessment of the program. Second, to impart knowledge, training and skills to teachers and students, to enable them to practice and sustain 5S methodology in their work areas. Third, to significantly improve the level of 5S practice in the pilot classrooms of HHNHS through implementation of the proposed 5S program. The fourth objective is to do an impact assessment of the extension program, to find out how it has brought about change in the daily activities of the teachers and students in relation to 5S.

The intended outcome of the study is to improve the overall classroom management and safety of the students and teachers by creating an organized work place through 5s. Also, to establish good practices of 5s that can be used in deploying 5s for the entire school and for other schools in Baguio City.

MATERIALS AND METHODS

The case study method was used to obtain an extensive analysis and implementation of the 5S program at the Happy Hollow National High School. The Case study method is considered a robust research method that allows a holistic and in-depth investigation in the field of education and community-based problems (Zainal, 2007). In the program implementation, the 5S methodology was used and the materials were contextualized to fit the education setting.

The 5s Methodology in the educational setting:

The 5S concept uses a list of five Japanese words, Seiri, Seiso, Seiton, Seiketsu and Shitsuke. Seiri: Sort or discard – “red-tag” disposable files and collect tagged items and put them in the disposal box. Only needed files in the office are retained. Seiso: set in order- mark areas in different colors or numbers to identify them with ease. Seiton: Shine - create a model workplace and office. Designate areas and assign responsibilities and use check sheets for visual control. Seiketsu: Standardize and simplify – establish standards of practice for all employees in the workplace. Shitsuke: Sustain - recognize and reward maintaining order in the workplace (Productivity SA, 2022). Figure 1 illustrates the 5S framework applied in the classroom setting:



Fig. 1 The 5S Framework. Source: GoLeanSixSigma.com (2016)

The main goal of 5S is to develop and sustain a neat, clean, standardized, and organized work place- where there is “a place for everything, and everything in its place”. 5S is not an end to itself. Many companies embark their journey towards a lean organization with 5S. In addition, 5S is also part of many continuous improvement programs of organizations, as it is the first step to attain order in the work place.

Data-gathering Method

The items of the 5S checklist lifted from the 5S Visual Workplace Handbook (P.A.C., 2019) were modified by the faculty extensionists to fit the classroom setting. The checklist was used in evaluating the 5S practice of the teachers and staff of HHNHS before and after implementation of the 5S program. Content validity of the checklist was measured using the CVI (content validity index), where a CVI of 0.8 and above is desired (Jingcheng et.al., 2012). CVI of the 5S checklist was computed at 1.0 in terms of relevance, and 0.99 in terms of clarity. Reliability of the checklist was computed using the Cronbach Alpha Internal Consistency coefficient, where a coefficient of 0.70 and above is acceptable (Taber, 2017). Reliability analysis was done through Jamovi online data analytics software (2021), and a Cronbach’s alpha of 0.88 was obtained. The 5S checklist is a self-assessment tool. Hence, the teachers and staff of HHNHS included in the program were the ones to accomplish the checklist. The task of the extensionists of SLU is to explain the method of accomplishing the checklists, and guide the participants throughout the implementation of the program. Table 1 summarizes the interpretation guide for mean scores per item in the checklist (P.A.C., 2019).

Table 1. Interpretation Guide for Checklist Item Scoring

Score and Rating per item	MEAN SCORE	Qualitative Interpretation
5 Excellent (E)	4.21 – 5.00	The best practices in organizing and arranging the workplace and other items is incorporated into daily routines. Excellent house-keeping is observed consistently.
4 Very good (VG)	3.41 – 4.20	There are proven practices for organizing and arranging supplies and other items. Housekeeping policies are well developed and systematically followed.
3 Minimum acceptable (MA)	2.61- 3.40	There are work procedures in place, which are generally followed. Housekeeping policies are developed and are generally followed.
2 Marginal (M)	1.81- 2.60	Work procedures are not always followed and there is no documentation of the set of standards required. Inspections are conducted, but with no measurement of progress.
1 Unacceptable (U)	1.00- 1.80	There are a few standards/procedures in place, but not everyone is informed. Minimal attention is given to housekeeping and safety. No inspections are conducted.
0 Poor (P)	0.00- 0.99	Work procedures are non-existent in the institution. No action is taken to maintain the gains of improvement.

As work instruction for each S, a job-aid was given to the 5S team of HHNHS which served as their guides in activities to be accomplished under each S. The job aids are also in the form of checklists and visual guides that the 5S team of HHNHS accomplished after each S. The job aids were also taken from the 5S Visual Workplace handbook (P.A.C., 2019).

Intervention and scope

The program intended to implement 5S in the four pilot classrooms (Grades 7, 8, 9,10) of Happy Hollow National High School (HHNHS) in Baguio City, Philippines- to establish a model for implementing 5S in the entire school. The school was selected based on the recommendation of the Department of Education-Baguio City Division Office. Phase 1 and 2 (NEEDS ASESSMENT, SORT, SET IN ORDER) were implemented on August 2019 through May 2020. Phase 3 and 4 (SHINE, STANDARDIZE, SUSTAIN) were implemented on August 2020 through May 2022. The program was originally intended for two years only, from August 2019 through May 2021. However, restrictions brought about by the pandemic caused substantial delay in the program implementation.

Presented in Table 2 are the summary of activities accomplished under each phase of 5S.

Table 2. Program Logic Model

Objectives	Inputs	Activities	Outputs	Outcomes
Project 1 -Establish the need to implement the extension program.	-Materials for seminar-workshop -checklist -time and participation of faculty and students -budget provided by SLU	-Needs Assessment -Seminar-workshop -extension visit	Needs Assessment Report	Evidence of the need to design and conduct a 5s program
Project 2 -Accomplish the Sort and Set-in-order activities (1S and 2S).	-Materials for webinar -checklist for 1S and 2S activities -time and participation of faculty and students -budget provided by SLU	-Webinar - guiding HHNHS through Sorting (1S) and Set (2S) activities - design, printing and turnover of 2S labels and posters	Accomplished Sort and Shine checklist; analysis of results	A clutter-free and more balanced use of space, reduced or eliminated hazards, a more comfortable and cleaner environment.

Project 3: Accomplish Set (3S) and Standardize (4S)	-Materials for webinar -checklist for 3S and 4S activities -time and participation of faculty and students -budget provided by SLU	-Webinar - guiding the school through Shine (3S) and Standardize (4S) activities - canvassing, purchasing and turnover of Shine (3S) materials -extension visit	Accomplished Set and Standardize checklist; analysis of results	A classroom environment that is organized, ergonomic, clutter-free and can be navigated easily. A new set of standards that make the new model for using the classroom and its facilities.
Project 4: Accomplish “Sustain” (5 th S) and Conduct Impact Assessment of the program	-checklist for 5S activities -materials for impact assessment -time and participation of faculty and students	-guiding HHNHS through the 5 th S (Sustain) activities -extension visit and inspection -materials for 5S activities -Posttest assessment -Impact assessment	Accomplished General 5s checklist, sharing of experiences; Extension Terminal Report	Improved classroom management and safety. Active participation and commitment of teachers and students in sustaining 5s in HHNHS.

Impact assessment

The 5s checklist was used in the Pretest to measure the 5s compliance score of the pilot classrooms before implementation of the 5s program. A total of 116 teachers and students answered the checklist. After the pretest, a “Needs Assessment” was conducted to determine the areas that need improvement. A 5s program was implemented in four phases, to improve the overall safety and classroom management of the school. Two weeks after completing the 5s program, a Posttest was conducted using the same questionnaire in the pretest to determine if there was a significant improvement in the 5s rating of the classrooms. Only 9 teachers were able to answer the checklist because students were not yet allowed in the campus during that time. The paired t-test was used to find significant differences between the “before” and “after” 5S ratings. Aside from the 5S checklist, a qualitative assessment of the program was done through a standardized questionnaire crafted by Saint Louis University Community Extension and Outreach Programs Office (SLU-CEOPO). Mutual sharing of experiences between extensionists and beneficiaries was also be conducted to document all lessons learned.

Sustainability

Maintenance of the 5s program was endorsed to the school for teachers and students to establish ownership of the program. However, the SLU IE department will be conducting a 5s audit yearly for two years after completion of the program to ensure sustainability of the 5s practice in HHNHS. Sharing of further learning and experiences will be conducted once each year in that two-year period to continuously add to the knowledge and skills of the faculty and students in the practice of 5s.

Scholarly connection

5S methodology is part of the problem-solving tools applied by industrial engineers to improve the overall efficiency and effectiveness of work systems, and increase safety and security in the work place. 5S methodology is a key to developing lean systems and establishing total quality in any type of organization. For these reasons, 5S concepts and methodology are part of the syllabi of the IE courses Quality Management Systems and Lean Six-Sigma. The conduct of this extension program gives an opportunity to students as well as the faculty, to exercise the true application of the theories in a real organization. Also, the extension program provides a chance for students and teachers to practice teamwork as well as lifelong learning in a multicultural and multidisciplinary environment.

Ethical considerations

Prior to commencing the extension program, Memorandum of Understanding, Manifestation of Cooperation and Manifestation of Consent were accomplished between the two schools (SLU and HHNHS) to ensure cooperation throughout the program, and identify the extent of sharing information in accordance with the Philippine Data Privacy Act of 2012.

RESULTS AND DISCUSSION

On December 2, 2019, Needs Assessment activity was done to establish baseline information on 5S knowledge and application of Happy Hollow National High School teachers, staff and students before implementing the extension program. The developed 5S checklist was used for this purpose, which also served as pretest. The 5S checklist was accomplished by 116 students, faculty and staff combined, according to their knowledge and practice 5S concepts before the extension program. The ratings were summarized in Table 3.

From the results of the checklist, most items evaluated fall under the “Minimum Acceptable” level of 5S implementation. This is from the perspective of the users of the classrooms (students and teachers).

1S: Sort

From initial pictures taken, the classrooms have a lot of clutter and unnecessary items, like old posters and projects. There are some broken tables, chairs, cabinets and shelves. The overall mean for Sort were rated as “Minimum Acceptable”. This means that the workplace has some clutter and unneeded items, some items like documents are stored at hard-to-reach places such as at the top of cabinets. Some needed supplies are not available.

2S: Set in order

The mean score for Set is at the “Minimum Acceptable” level, meaning that the workplace is organized. With a few exceptions, most supplies have a designated storage space, and documents and supplies are arranged in cabinets and drawers. However, proper labelling and designation of storage areas are not practiced.

3S: Shine

The mean score for Shine was rated at “Minimum Acceptable”, meaning that most items in the area are clean and functional. Floors are presentable and whiteboards/ blackboards are cleaned daily. Garbage bins are cleared daily. However, some electrical wires are exposed. There were identified holes on the walls and ceilings. The entire ceiling of the high school building is dilapidated and therefore needed replacement. There were also some broken chairs which were not in use anymore.

4S: Standardize

All items under this category were rated as “Minimum Acceptable”, with a mean of 2.85 which means that there are work procedures in place which are generally followed. However, the set of standards required are not documented.

5S: Sustain

All items under this category were rated as “Minimum Acceptable”, with a mean of 3.12 which means that housekeeping policies are developed and are generally followed since there are assigned cleaners every day, and a general cleaning is held during the “Brigada Eskwela” before the start of each school year. Inspections are conducted usually by the faculty adviser and the principal.

Overall mean for 5S rating is at 2.88, also interpreted as “Minimum Acceptable” level. This means that in general, the current 5S rating of the school is at the minimum allowable compliance level. There are work procedures in place which are generally followed. Housekeeping policies are developed and are generally followed. However, standards and documentation procedures are not yet in place. The results indicate that there is a need to improve the 5S ratings by developing and implementing a 5S program for the school.

Program Implementation

From the results of the Needs Assessment, it was determined to develop and implement a 5S program for Happy Hollow National High School as an extension program of the Industrial Engineering Department of Saint Louis University from January 2020 through May 2022.

Impact assessment of the program

Impact assessment of the 5S extension program was measured in two ways- first is through direct assessment. This involved administering the 5S checklist to the teachers of Happy Hollow National High School after program implementation (May 2022) and served as the post test. The second method was through a qualitative assessment taken from a standardized questionnaire by the Community Extension and Outreach Programs Office of Saint Louis University.

Direct assessment:

The results of the post test conducted during the impact assessment are compared with the results of the Pretest for the 5S checklist given to 116 students, faculty, staff and parents of the HHNHS in 2019. For the post test, only 9 teachers were able to respond since there were no students in the campus as of this time. Table 4 summarizes the results.

Table 3. Pre-test vs. Post-test Scores- 5S Checklist Summary

Category	Item	Before Program		After Program		Remarks
		Mean	Interpretation	Mean	Interpretation	
Sort (Organization)	Distinguish between what is needed and not needed.	2.76	MA	4.74	E	
	No unneeded furniture (desks, chairs, shelves, etc.)	2.67	MA	4.67	E	
	No unneeded supplies (excess paper, pencil, paint, etc.)	2.90	MA	4.75	E	
	No unneeded items on walls, bulletin boards, and so on	2.97	MA	4.78	E	
	No clutter present in classrooms, stairways, hallways, and so on	2.68	MA	4.78	E	
	No old paperwork, old announcements, out dated posters, and the like	2.57	M	4.78	E	
	No personal things on scattered on the floor, table, and so on	2.73	MA	4.67	E	
Set-in-Order (Orderliness)	There is a designated place to keep all required items.	2.96	MA	4.46	E	
	Drawers, cabinets, desks, and lockers are clearly marked and labelled.	2.58	M			Cabinets/lockers not allowed anymore
	Office supplies and other items are placed in uniform containers. All items have specific locations.	3.19	MA			No office supplies inside the rooms.

	Tables, chairs, and other learning tools are arranged properly.	3.04	MA	4.67	E	
	Announcements and classroom rules are clearly displayed.	3.03	MA	4.25	E	
	Cleaning and looking for ways to keep it clean and organized.	2.73	MA	4.34	E	
Shine (Cleanliness)	_____ are free of dirt	2.85	MA	4	VG	Floor is newly-tiled.
	a. Floors			4	VG	Newly-refurbished
	b. Walls			4.67	E	Newly-refurbished
	c. Surfaces			N/a		Cabinets are not allowed
	d. Cabinets					No cleaning materials inside the rooms
	Cleaning materials are easily accessible	2.70	MA			No cleaning materials inside the rooms
	No broken equipment or furniture.	2.51	M	4.67	E	Most chairs were replaced.
	Blackboards/whiteboards are cleaned and maintained regularly	2.96	MA	4.67	E	Blackboards were replaced.
	Garbage bins are cleared daily	2.65	MA	4.13	VG	
	Tasks and jobs to be done are well-defines.	2.85	MA	3.97	VG	
Standardize	Procedures for cleaning and organizing were developed and people were assigned for the given tasks.	3.09	MA	4	VG	To be implemented next AY
	5s procedures are incorporated in normal- day routines.	2.72	MA	3.89	VG	
	5s standards are clearly displayed.	2.65	MA	4.22	E	
	Checklists and other visual management tools are used to identify if the work is complete.	2.94	MA	3.78	VG	
Sustain	Practices are maintained and regularly evaluated, improved, and updated	2.88	MA	4.67	E	
	Staff are well informed of standards and are willing to implement it.	2.95	MA	4.67	E	
	Ample time is given for the needed changes to be adopted and implemented in the school environment.	3.07	MA	4.67	E	
	Everyone exerts effort in following set standards and in incorporating them in routine.	3.33	MA	4.67	E	
OVERALL		2.88	MA	4.44	E	
	Statistical analysis Paired t-test, 0.05 level of significance, 2-tailed		P-value < 0.001 (1.48x10 ⁻¹²)	Significant		5S practice changed significantly

This checklist is the direct assessment part of 5S accomplishment in the school. The summarized ratings in Table 3 indicate a significant improvement in 5S practice in the classrooms of HHNHS. From a *Minimum Acceptable* level of 2.88 in the pre-test, the level of 5S practice jumped to an *Excellent* level of 4.44 in the post test. An “Excellent” remark means that the classroom is clutter-free, incredibly clean and well-organized, housekeeping practices are maintained, documented and regularly updated. All teachers and students are informed and involved in 5S practice.

From here, it is proven that the outcomes of the program have been achieved. Visibly, it can also be seen that the classrooms had a total makeover- all ceilings and walls were replaced, the dilapidated blackboards have been replaced with new whiteboards and the floors were installed with new tiles. Also, all posters and labels were in place, a standard arrangement of classroom furniture and fixtures was also made. Aside from this, all changes and standardized forms/procedures are now documented and stored permanently in electronic files. 5S Sustain activities are also posted in the classroom for ease of implementation even after the program is terminated. In addition, teachers now have a conscious effort to practice 5S in their classrooms.

The qualitative assessment of the program

The qualitative assessment of the extension program was based on the Extension Program Assessment or Evaluation Form developed by the SLU Community Extension and Outreach Programs Office (FM-CEO-013). A total of 9 teachers answered the assessment form. Only teachers were able to answer the questionnaire at that time since pandemic protocols were still in place. The summary of results is shown as follows:

Section 1 asked teachers to measure their level of knowledge on 5S concepts after and before participating in the extension program.

Table 4. Level of Knowledge

Item Number	After the program		Before the program		Outcome
	Mean	Interpretation	Mean	Interpretation	
Topic #1 – 1S (Sort)	4.11	Above average	2.00	Below average	Increased
Topic #2- 2S (Set-in-order)	4.11	Above average	1.89	Below average	Increased
Topic #3- 3S (Shine)	3.44	Above average	1.67	Low	Increased
Topic #4- 4S (Standardize)	4.11	Above average	2.00	Below average	Increased
Topic #5- 5S (Sustain)	4.00	Above average	1.89	Below average	Increased
Overall	3.96	Above average	1.89	Below average	Increased

It is evident from the results that the level of knowledge of the teachers on 5S has increased from below average before the program, to above average after the program. This shows that the program was effective in building the knowledge of teachers on 5S principles, methodology, and practice.

Section 2 asked the teachers to measure their skill level on 5S after and before the extension program.

Table 5 Skill Rating on 5S:

Item No.	After the program		Before the program		Outcome
	Mean	Interpretation	Mean	Interpretation	
Skill #1: Practice 5s in my work area	4.00	Above average	1.89	Below Average	Increase
Skill #2: Communicate issues/problems that arise in relation to 5s	3.89	Above average	1.78	Low	Increase
Skill #3: Teamwork in accomplishing 5s activities	4.22	High	1.89	Below Average	Increase
Overall	4.04	Above average	1.85	Below Average	Increase

The results show that the skill level of the teachers on the practice of 5S has increased from below average before the program, to above average after the program. This shows that the program was effective in improving the skills of teachers on the practice of 5S principles, methodology in their work areas. After the program, the teachers were able to do the 5S activities with ease.

Section 3 asked the teachers to choose their level of agreement or disagreement with the statements in relation to the extension program.

Table 6. Level of Agreement/Disagreement with The Statements

Item no.	Mean	Interpretation	Explanation
The 5S program addressed a need that I have.	3.67	Strongly agree	The program strongly addressed a felt need.
The 5S program was a quality program.	3.78	Strongly agree	The extension program was of high quality.
Materials were well-demonstrated.	3.89	Strongly agree	Demonstration of materials were done very well.
The materials I received are useful for my future tasks.	3.89	Strongly agree	The materials received were relevant and useful.
I am happy to be involved in the 5S program.	3.89	Strongly agree	The teachers are glad that they participated in the 5S program.
OVERALL	3.82	Strongly agree	The teachers are glad that they participated in the program, for it has enabled them to practice 5S properly even in the future.

The results show that indeed, the teachers are very glad that they have participated in the 5S extension program. Through their experiences, they were able to increase their knowledge, skills and application of the program significantly in the classrooms and in their offices as well. As of this time, the faculty and staff are already transferring their learning on 5S in fixing their Supply room. Next, they said, they will apply 5S also in their faculty room.

The following photos show how the classroom environment has drastically changed from “minimum acceptable” to “excellent” as a consequence of implementing 5S.



Figure 2. Visual Comparison of one pilot classroom “before” and “after” 5S implementation

CONCLUSION AND RECOMMENDATION

The purpose of the extension program was to design and implement a 5S program for Happy Hollow National High School. This is in line with the recommendations of BSIE 4 research in 2018 that proposes to conduct a 5S program for the school, to enhance the teaching and learning environment of teachers and students, as well as to improve the overall safety of the school.

Before commencing the program in 2019, the level of 5S awareness and practice of the HHNHS was at the *minimum acceptable* level only. After the program, the level of 5S awareness and practice of the school increased significantly to the *excellent* level.

In terms of knowledge and skills in 5S methodology and practice, the level of the school increased significantly from *below average* to *above average* after the program. Also, the teachers strongly agreed that the extension program truly addressed a need that they had, it was a quality program and that they plan to continue implementing the program in the future. According to the teachers of the HHNHS, the most commendable thing about the program is the continuous and sustained support, guidance and inputs by the SLU-IE extension team all throughout the program, even during the time of pandemic.

For the faculty and students of the IE Department who participated in the program, it was a fulfilling, learning experience for them. The participants were glad that they were able to share their time and expertise to the community, and at the same time experience how to apply the theories they learn from school to the real world.

It is recommended to replicate this program in other public schools in need of assistance in implementing a 5S program. For the next school in line, it is recommended to elicit more participation from the students in the new normal set-up of the education system.

Also, it is recommended to make a yearly visit/audit to the HHNHS in line with the Sustain phase of the program.

REFERENCES

- Akomolafe, C.O. & Adesua, V. O. (2016). The impact of physical facilities of students' level of motivation and academic performance in senior secondary schools in south west Nigeria. *Journal of Education and Practice*, 7(4), 38-42. <http://files.eric.ed.gov>
- Cheryan, S., Ziegler, S., Plaut, V., & Meltzoff, A. (2014). Designing Classrooms to Maximize Student Achievement. *Behavioral and Brain Sciences*, 1(1), 4-12.
- De León, A. (2016). Research in and outside the classroom: training engineers without borders. *World Transactions on Engineering and Technology Education*, 14(1), 113-117.
- DepEd (2010). *2010 Educational Facilities Manual*, p. 112-113. <https://depedaklan.online/documents/2010-educational-facilities-manual-11192019131909.pdf>
- Earthman, G. (2002). School Facility Conditions and Student Academic Achievement. Williams Watch Series: Investigating the Claims of Williams v. State of California, Los Angeles, CA: UCLA's Institute for Democracy, Education, and Access. <http://www.escholarship.org/uc/item/5sw56439>
- Education for All 2015 National Review (2015, May 22). <http://unesdoc.unesco.org/images/0023/002303/230331e.pdf>
- Fletcher, R. (2006). What is an extension program? OSU Extension Service https://agsci.oregonstate.edu/sites/agsci/files/main/What_is_Ext_pgm.pdf
- Gomes, V., Vargas A., and Ferreira E. (2013). The academic dimension of university extension programs. *Braz. oral res.* 27(5), Sao Paulo, <http://dx.doi.org/10.1590/S1806-83242013000500001>
- Graves, A (2012). 5S: Sort, Set, Shine, Standardize, Sustain. <https://www.sixsigmadaily.com/5s-sort-set-shine-standardize-sustain/> , retrieved June 10, 2019

- Jingcheng, S. et. Al. (2012). Content Validity Index in Scale Development, Pubmed Advanced, National Library of Medicine, pubmed.ncbi.nlm.gov
- Jones, S.E., Brener, N.D., & McManus, T. (2003). Prevalence of school policies, programs, and facilities that promote a healthy physical school environment. *American Journal of Public Health*, 93, 1570-1575. doi:10.2105/AJPH.93.9.1570
- Joshi, A.S. & Shinde, R.A. (2018). A study of implementation of 5s in educational institute, *Abhinav National Monthly Refereed Journal of Research in Commerce & Management*, 7(1), 146-157, Abhinav Pub.
- Ma, F. & Tao, G. (2022). Quality assurance in selected medical schools in Metro Manila Philippines: Current practices and future directions. *International Research Journal of Science, Technology, Education and Management*, 2(2), 91-100. <https://doi.org/10.5281/zenodo.6975661>
- National Productivity Corporation (2005) the 5s handbook: step by step implementation. <http://www.ipbl.edu.my/intra/sistem/5s/5s.pdf>
- Nerona, G.G. (2017) Enhancing students' achievement and self-assessed learning outcomes through collaborative learning strategies in various engineering courses. *Global J. of Engng. Educ.*, 19(3), 231-236 (2017).
- Nerona, G.G., Park, J., Bogbog, K.T., Tamondong, M.C. (2018). Improving the food storage and inventory management of a military cadet institution: boosting students' problem-solving skills through collaborative applied research, *Global J. of Engng. Educ.*, 20, (3), 201-206.
- Omogbai, O. & Salonitis, K. (2017) The implementation of 5s lean tool using systems dynamics approach. *Procedia CIRP*, 60, 380-385. Elsevier Journals
- Production Automation Corporation (n.d.) 5S / Visual Workplace Handbook, Building the foundation for continuous improvement <https://www.gotopac.com/media/pdf/articles/5S-Handbook.pdf>
- Productivity SA (2022). Time to use 5s in schools. <https://productivitysa.co.za/article/time-to-use-5s-concept-in-schools/23>
- Saint Louis University Extension: Manual of Operating Procedures and Guidelines for Extension. (2018) <http://extension.slu.edu.ph/index.php/mopg>
- Suleman, Q. et. al (2014). Effects of Classroom Physical Environment on the Academic Achievement Scores of Secondary School Students in Kohat Division, Pakistan. *International Journal of Learning & Development*.
- Taber, K. (2017). The use of Cronbach's Alpha when developing and reporting research instruments in science education, *Research in Education*, 48, 1273-1296. Springer Link
- The jamovi project (2021). *Jamovi*. (Version 2.0) [Computer Software]. <https://www.jamovi.org>.
- Wan Asri, W.A., Nurlidaini, J., & Azman C.M. (2015). Implementation of 5s practices at 3k elite schools in Terengganu, *Academia Journal*, 4(1), 62-67, UiTMT
- Wanyama, B.W. (2022). Physical facilities on students' participation in science and technology programmes in public universities in Kenya. *International Research Journal of Science, Technology, Education, and Management*, 2(1), 217-231. <https://doi.org/10.5281/zenodo.6496878>
- Zainal, Z. (2007) Case study as a research method. *Journal of Kemanusiaan* (9), researchgate.net. https://www.researchgate.net/publication/41822817_Case_study_as_a_research_method