5S Implementation in Workplace - a Conducive Environment Enhancing Motivation in Educational Institutions

Ashok G Verghese
Hindustan Institute of Technology and Science
Chennai,Tamilnadu,India
director@hindustanuniv.ac.in

K.Viswanathan
Department of Mechanical Engineering Department
Hindustan Institute of Technology and Science
Chennai,Tamilnadu,India
kviswanathan@hindustanuniv.ac.in

Pon Ramalingam
Hindustan Institute of Technology and Science
Chennai,Tamilnadu,India
registrar@hindustanuniv.ac.in

Abstract

In workplaces that are not well organized, a cluttered environment with a lot of items piling around creates confusion and time delay to execute a work. Valuable space is occupied by items that are either useless or used less. Employees struggle to locate files/documents when required. Loose, sagging electrical cables lead to unsafe environment. Work places are found unclean and not conducive to work effectively. The objective of this article is to examine the impact of the techniques of 5S concepts and its implementation in educational institutions. This work includes five phases namely: Sorting, Set in order, Shine, Standardize and Sustain.. This working model created a conducive environment in the institution which resulted in effective utilization of space and time. This also resulted in a conducive work place, which gives motivation for the stake holders. This enables to attain total organizational cleanliness in alignment with Swachh Bharat Mission (Clean India Mission) initiative of Prime Minister of India. 5S implementation helps the institution to improve the effectiveness of all the processes involved and improve the overall quality of service in such a way that we can meet the requirements of all the stakeholders. Hindustan Institute of Technology & Science is the first educational institution to have obtained the Global Certification for 5S Implementation in India from TuV Rheinland. 5S implementation is done based on the present strength and commitment of students and staff which are very dynamic. Hence challenges are more in sustenance and we hope to overcome this by making 5S practices as a habit through intense training.

Keywords

5S implementation, Educational Institution, Quality Improvement, Stakeholders

1. Introduction

5S is a method to organize the workplace. This technique originated from Japan. Two major frameworks have arisen for understanding and applying 5S to business environments, one was proposed by Hirano and the other by Osada.[1][2]. 5S is the acronym for five Japanese words Seiri, Seiton, Seiso, Seikitshu and Shitshuke, which mean that Sort, Set in order, Shine, Standardize and Sustain respectively. 5S is a continual improvement process which eliminates waste, maintains orderliness and cleanliness. 5S practice is a technique used to establish and maintain quality environment in an organization for improving the effectiveness and the morale of employees [3].

These systems have been widely adopted in all engineering industries like automobile manufacturers. 5S is a proven concept to improve Quality, Safety and Productivity. Effective participation of all stake holders is a key factor in 5S implementation. Zhang et al.[4] explained about ~~the~~ experiences of 5S implementation in the laboratories of educational institutions and reported that there was effective utilization of space in the respective areas and saved a considerable of amount of time.

In many organizations, the aim of implementing the quality management system is to utilize the available resources at the right time at right place to improve the effectiveness of the activity, which results in a smart solution for the challenges. Chi et al. [5] reported adopting of 5S methodology in the laboratories and small scale industries. The author disclose that the students deployed for a specific job has to undergo the training and awareness of 5S in the work place in which he has to work and perform in the organization. This enhanced the student to learn methodologies during the start of the career itself and be able to suggest creative ideas for improvement in the respective places. The author also reported the implementation of 55 activities in a small scale industry, in which the students were given opportunity to implement the methodology and attain better results of enhanced space and time. The 5S methodology is not seen in the same way in all the countries. In this line Kobayashi et al. [6] emphasized the 5S methodology as a strategy for business excellence cum work at institution and home. The author reported that in the countries like UK & US it is implemented as a system for the workplace only and not insisted in other places. Lixia and Bo et al.[7] pointed out the misunderstanding of Chinese and the limitations that they have faced in the implementation of 5S methodology in the manufacturing enterprises and the outcomes after having taken necessary steps in the deployment by the people. Also, several kinds of laboratories (related to mechanical, biological, pharmacy etc.) have implemented this methodology and attained better results [8-12]

The present research work comprises of the implementation of 5S in an educational institution for enhancing the outcome at the optimum level with available resources. This paper describes the various terminologies of 5S in section 2, the methodology adopted for implementation in section 3and the detailed process of implementation in section 4. Results and discussions are given in section 5 and conclusions are given in section 6.

Primarily awareness on 5S has been made for the involved people through displays and training programs. Secondly to measure the understanding, a test was conducted with multiple choice questions with the minimum score of 75% as eligible criteria, thirdly with the observations from the test results one more awareness program was organized and feedback was received before the start of implementation of the methodology. The fourth and fifth steps of this work comprise of implementing the 1S, 2S and 3S in detail to achieve the expected outcome in the respective areas.

2.Terminology

Table 1 Meaning of 5S

1S	Sort	Segregate items as required and not required in work place. Keep items that are required and in working condition. Other items are to be either serviced or disposed.
2S	Set in order	Keep items in designated locations and labelled such that retrieval is easy
3S	Shine	Clean periodically so that any abnormalities can be easily identified
4S	Standardize	Procedures are made so that uniformity in implementation is achieved in all the work places
5S	Sustain	Make 5S practices a habit and is done as a part of routine work

Table 1 gives the meaning of 5S. The following are the explanations for various terms used.
Workplace: All area within the campus like Class rooms, Laboratories, Staff room, Stores, Rest rooms, Canteen, Hostels, Corridor open space within the building and outside the building, and garden area.
Stakeholders: Management, teaching and non-teaching staff, students, service agencies like vendors, contractors. -

3.Methodology

Methodology adopted in 5S implementation is Sort, Set in order, Shine, Standardize and Sustain as shown in Figure 1. Entire University Campus was divided into 21 zones. Each zone is nominated with 5S Champion and Department 5S Coordinators to implement 5S activities step by step as in Figure2. Faculty Development Training Program was conducted for all the teaching and non-teaching staff, to bring awareness on 5S concepts and the methodology to implement in the workplaces. Core team and Steering Committee Team on 5S were formed. Workshop on 5S was conducted for Students, Security team, vendors and sub-contractors by core team members.. The details of the steps involved in Figure 1 are given in Table 2.

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The outcome of the training program was measured by testing the attendees by answering multiple choice questions in the stipulated time. In this test all the involved people were asked to undergo a test for 1 hour and to answer 60 questions that are randomly generated, using software. The outcome of this test was taken as the input to decide the staff who require some more training

program on the 5S methodology. Then another awareness program was conducted with the feedback from the participants. With this preparedness the start of the implementation of 5S activities was undertaken in a systematic manner.

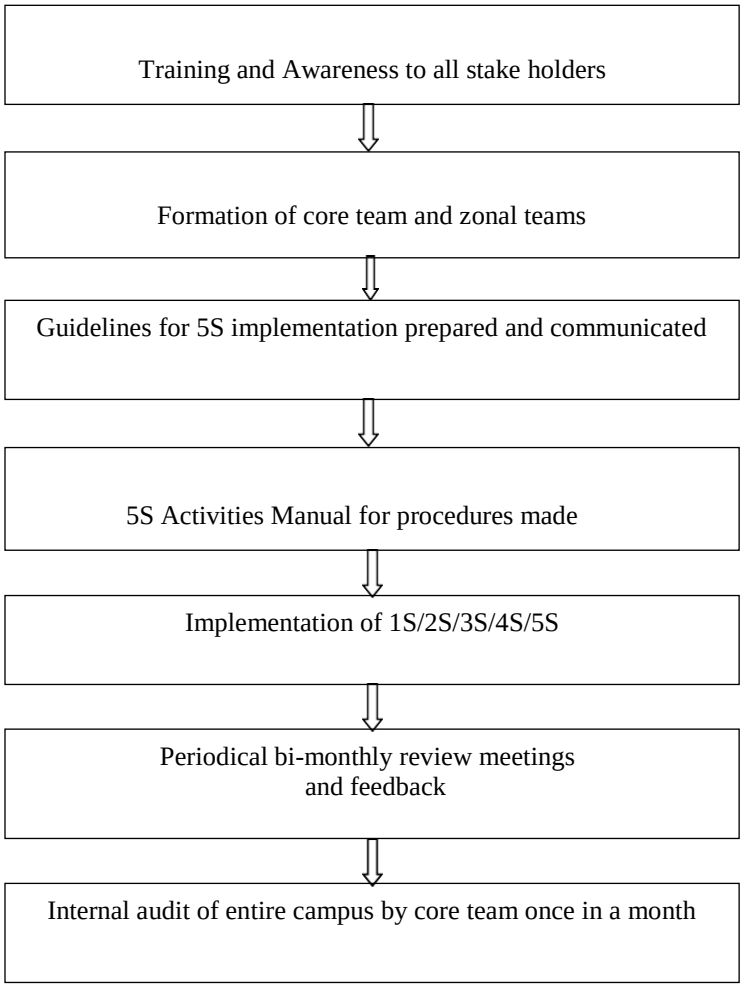


Figure2. Flow chart of Activities

Figure 1 5S Methodology

Table 2 Actions and Recommendations

Stage	Actions	Recommendations
1	Training and Awareness to all stake holders	• Training of 5S concepts to few selected staff/lab technicians by TUV India Pvt., Ltd., • Awareness program to all (staff/students/vendors/sub-contractors) by 5S Core team members • Display of posters on 5S in the campus (open area / canteens / departments/hostels) • Objective type test on 5S to all staff and students Orientation program to newly joined staff / students
2	Formation of core team and zonal teams	• Core team is formed • Entire campus is divided into 21 zones • Nominated Champions, department coordinators, students volunteers to each zones • 5S organization chart prepared • Responsibilities and authorities of Facilitator, coordinator, zonal champions, department coordinators are defined and communicated
3.	5S implementation - Guidelines prepared and communicated	• 5S Coordinator is responsible for overall implementation across the University • Core Team members are responsible for training, building awareness,

		periodic monitor through audits and to ensure effective implementation Deans/HODs are responsible for the effective implementation and sustenance of 5S activities with respect to their schools/departments. • Ensure awareness of 5S methodology among the entire team around you Conduct meeting with team members to initiate implementation and ensure every one participates • Conduct periodical meetings twice a month and to review the progress Report periodical meetings and progress to the Coordinator and maintain all documents
4.	1S Implementation	• Classify all items around your workplace wherever cluttered as needed, rarely needed , not needed and cannot be used • Store needed items at the point of use, rarely needed to be stored far away and both not needed items and cannot be used items to be red tagged Prepare the list of red tag items and move to Red Tag Area • Items under Red tag area need to be disposed with proper approval Take pictures before and after sorting and document • Conduct periodical review, take corrective actions if required and document progress
5.	2S Implementation	• Focus on items that are needed and rarely needed around your workplace Keep needed items at the point of use and rarely needed items away from the point of use in a defined location • All needed items and rarely needed items are to be properly labelled and stored in order in the defined location • Avoid stacking any items on the floor. • Ensure direction indications for various workplaces around you are clearly indicated • Use color codes for easy identification • Take pictures before and after and document • Conduct periodical internal audit in your department to ensure a place for everything and everything is in its place
6.	3S Implementation	• Keep everything around you, every day, swept and clean. • Keep everything around you in a condition ready to use whenever needed • Fix periodicity of cleaning and ensure it happens • Document the schedule of cleaning • Identify contamination sources and clear it out • Focus where safety is a concern and fix imperfections. Do random audit to confirm adherence • Take corrective actions if required and make improvements
7.	4S Implementation	• Develop procedure to implement 1S, 2S, 3S • Develop procedure for disposal red tag items • Prepare Standard Operating Procedure for equipment. • Prepare and maintain cleaning schedules. • Conduct periodical audit using checklists • Brainstorm ideas for continuous improvement. • Update Document • Make sure all stakeholders are aware of new standards
8.	5S Implementation	• Display photos before and after implementation • Inculcate good habits • Ensure clean Environment, Health and Safety • Involve the whole workforce • Develop and keep good habits • Review procedures and regulations • Promote visual management systems • 5S audits conducted periodically to ensure effectiveness of implementation • Use Trend charts to show performance • Recognize and reward best efforts

4.Implementation

During the implementation process each of the tabulated steps was implemented in various stages. Feedback from each stage was evaluated by audit and necessary corrective actions were taken to improve further upon. . This results in continual improvement to attain the required level for each step. Table 3 shows the statistics of Training program and the results of on-line tests conducted. Table 4,5,and 6 provide checklist for audit and evaluation.

Table 3 Training and Awareness Details

Category	Number of Participants	Scored 75% and Above	Scored less than 75%	Pass Percent (%)	Cumulative Pass Percent (%)	Remarks
Teaching Staff First attempt	320	214	106	67	67	Those scored less than minimum marks are suggested to attend the retest after one more awareness program.
Second attempt		106	98	92	97.5	Results after Second attempt
Non-Teaching Staff	110	64	46	58	58	First attempt
second attempt		46	37	80	92	Those scored less than minimum marks are suggested to attend the retest after one more awareness program
Rest of the staff						Scored the minimum pass percentage in the third attempt

Table 4 Audit Check List on 1S

SORT Sort out items that are required and not required. The items not required and not being used should be removed from all work places	Unacceptable	Poor	Good	Excellent	World Class
1. Items/supplies on surfaces in office /staff rooms have been sorted, as needed and not needed	1	2	3	4	5
	Details:				
2. Items/supplies in bookcases or on shelves have been sorted, as needed and notneeded.	1	2	3	4	5
	Details:				
3. Items in cupboards, drawers , desk and file drawers have been sorted, as needed and not needed	1	2	3	4	5
	Details:				
4. Items on floors have been sorted, as needed and not needed.	1	2	3	4	5
	Details:				
5. Items required frequently are placed close to workplace for better ergonomics.	1	2	3	4	5
	Details:				
6. Unwanted items have been removed from the work place.	1	2	3	4	5
	Details:				
7. Work agreements for the above are documented and all staff know where to find the agreements.	1	2	3	4	5
	Details				

Legends:
Unacceptable**:** No Evidence shown
Poor Quality: Evidence at random
Good**:** Applied and mostly evident
Excellent**:** Thoroughly evident and fully applied
World class**:** Continuously looking for ways to make more improvements

Table 5 Audit Check List on 2S

SET IN ORDER A place for everything and everything in its place so it should be easy to find	Unacceptable	Poor	Good	Excellent	World Class
1. List of items required at the workplace with location and quantity are available.	1	2	3	4	5
	Details:				
2. Items needed are labeled and are kept in identified locations	1	2	3	4	5
	Details:				
3. Frequently used items are kept very close to the work place and items required rarely are kept away.	1	2	3	4	5
	Details:				
4. Visual controls and indicators are established (Floor marking tapes, name boards, direction signs, safety signs etc.,)	1	2	3	4	5
	Details:				
5. System to ensure reorder level on critical items	1	2	3	4	5
	Details:				
6. Contents of drawers and cupboards are labelled and indexed	1	2	3	4	5
	Details:				

Table 6 Audit Check List on 3S

	SHINE All work places should be cleaned regularly and maintained in ready to use condition.	Unacceptable	Poor	Good	Excellent	World Class
1.	Work areas and equipment are cleaned and organized consistently as per schedules.	1	2	3	4	5
		Details:				
2.	All team members ensure maintenance	1	2	3	4	5
		Details:				
3.	Any deviation from schedule are to be documented for analysis and corrective action	1	2	3	4	5
		Details:				
4.	Surfaces of all equipment and work places are cleaned without debris and dusts.	1	2	3	4	5
		Details:				
5.	Monitor activities of ongoing Shine duties as in Check lists and update the status.	1	2	3	4	5
		Details:				

5. Results and Discussions

5.1 Sort (1S): All items in work places are sorted as:

1. Damaged and cannot be used
2. Items that are working but not required at the work place
3. Items that are working but not required at the work place
4. Items that are working and needed at the workplace

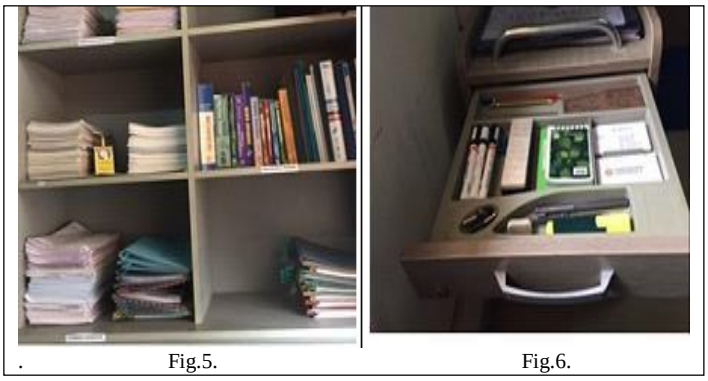
Pictures before and after Sort are taken (Figure 3)

Before After

Figure.3. Sorting

The objective is elimination of items that are not required at the workplace. Items mentioned under 5.1 1), 2), and 3) are pinned with "Red tag" **(**Figure 4). These items stored in a local Red Tag Area for a specific period of time and disposal actions are initiated as per Disposal Procedure. Outcome of sort action is gain in space.

Figure.4.Red Tag



. Fig.5. Fig.6.

Fig 5&6. Set in order

5.2 Set in order (2S):

Items under category 4 are the needed items in the workplace. These items are labelled and stocked under marked locations (Fig 5&6). List of these items with locations are documented such that they are easy to locate for usage. Every item in a work place are provided with a specified location, thereby retrieval of any item is made easy. While arranging, care is to be taken to keep items frequently used at the point of use and rarely used items shall be kept off the work place. Mark locations by creating addresses. Applying label, with quantity. Use color codes where required (Fig 7). Setting in Order is important because it enhances the required activities in day to day operations and also saves time. Photos are taken before and after implementation. By set in order, retrieval time is faster which results in improving efficiency and effectiveness of individual and the system as a whole.

Figure 7 Switches in the class room labeled for identification

5.3 Shine (3S):

The objective of shine is to keep entire workplace neat and clean. The working environment should be a clean and bright place which is a motivation factor for everyone to enjoy his work. Practice of cleaning should become a part of daily work habits, so that work areas, equipment, and tools are ready for use at all the times. .By systematic cleaning and inspection, one can easily identify inconsistencies, problems and opportunity for improvement in the system.[5] Representation of Laboratory floor with floor mark to ensure free aisle space is shown in Fig 8(a) &8(b). Fig 9 shows visual representation of unsafe area (back side of door opening). Fig 10 shows motivational slogans on staircases to inspire the minds of everyone in the workplace. Fig 11(a) shows unsafe area with electrical wires hanging and to ensure safety, corrective action is shown in Fig. 11(b). 5S Corner in working area is provided to create awareness and used as a communication board to display the progress.

(a) Before (b) After

Figure.8. Shine with visual management

Figure.9 Safety sign indicating unsafe area

Figure.10 Staircase steps showing the slogans

Figure 11 Safety a concern (Before & After)

5.4 Standardize (4S):

The objective of Standardization is to ensure a clutter free, clean and organized workplace through integration of the first three activities namely sort, set in order and shine. This is accomplished by assigning responsibilities for various 5S activities. Standard operating procedures for equipment, checklists for various activities, templates are developed. In order to make this implementation effective, weekly, monthly, half yearly, annual events are scheduled in addition to daily 5S Tasks. Periodical audits are planned to monitor the effectiveness of implementation. During this phase, team identifies ways to establish the improved workplace practice like visual management. List of standard color codes and safety signs are given in Table 7 as per IS 9457/2005 standard [13]

5.5 Sustain (5S)

Self-discipline and training are the two important factors to sustain the 5S implementation. Internal and external audits are scheduled periodically to monitor the system effectiveness and continuous improvement. Periodical walk around the campus are made to ensure litter free campus and to observe any deficiency/scope for improvement. Good efforts taken to sustain 5S implementation are recognized and rewarded. 5S initiative is a part of orientation program to both newly recruited staff and newly joined students

Table 7 Standard Codes

Sample color codes			Sample Safety Signs	
	Yellow	Walk path, Work Cell	Prohibited Area	
	Red	Scrap, Defects	Speed Breaker	
	Red stripe with white background	Unsafe zone / Area To keep hazardous items	Danger High Voltage	
	Black stripe with yellow back ground	Caution Zone (Speed Breaker)		

Tables 8, 9 and 10 show the results of implementation of 5S campus wide

Table 8 Details of Suggestions from Stakeholders

S.No.	No. of zones	No.of suggestions	No.of suggestions shortlisted	Short term	Long term	Remarks
1	21	80	20	16	4	All short term goals are completed. Long term goals are in progress

Table 9 List of Short Term Goals and the Status

S.No.	Description of Suggestion	Before	After	Remarks
1,	Dust bins required for nearest points	One / floor	One/class room	Completed
2.	Comfortable place to keep duster/marker of white board	Contents falling down often	Redesigned as box structure	Completed
3.	Window lock get stuck often	---	Suitable locks provided in respective places	Completed
4.	Direction boards availability	At few places	At all the blocks and floors	Completed
5.	Damaged electrical switches	At a few damaged locations	Damaged ones replaced and the switches upgraded	Completed
6.	Mix up of components at various places	-	Sorting done as per red tag procedure	Completed
7.	Fire extinguishers operating procedure	Not known to All	Training provided	Completed
8.	Water stagnation in kitchen areas	Found	Rectified	Completed
9.	Damaged tiles at few locations	Found	Replaced	Completed
10.	Loose wires, extra wires in various locations	Found	Rectified	Completed
11.	Wash room cleaning	Not effective	Deep cleaning done & frequency increased	Completed
12.	File management	Retrieval time more	Training provided. Retrieval time significantly reduced	Completed
13.	Open area	Found with litter	Students are trained and campus made litter free	Completed
14.	Cub boards and shelves	Not labeled	Labeled and indexed	Completed
15.	Emergency Exit preparedness	Not significant	Procedure made available at all locations	Completed
16.	Visual management	Not significant	Color coding procedure made as per standards	Completed

Table 10 List of long term goals and the status

S.No.	Description	Before	After	Remarks
1.	Proper Painting for the respective places	Same kind of paint was used in all the areas	Washable distemper paint recommended	On going
2	Respective labs and amenities in same block to minimize motion	Same lab used in common	Planned to have facility school wise	On going
3.	Walking space for pedestrians	No demarcation for pedestrians	Demarcation made completed	Separate platform in future
4.	Leaky floors during heavy rains	Inadequate Weathering course	Updated weathering course in progress	On going

6. Conclusions

Creating awareness and training of all stake holders is a critical step in 5S implementation. All stakeholders Management, Staff, Students, service agencies have equal participation and contribution to make the system efficient and effective. The outcome of 5S implementation has created a clean and orderly environment. Self- discipline of Staff and students have improved considerably. Hindustan Institute of Technology & Science is the first educational institution in India to receive global certification from TuV Rheinland for 5S implementation. This has inspired the minds of all Management staff, Faculty members and Students to excel in a clean, safe and thought- nurturing environment. In future various non -value added activities in the system shall be identified for necessary corrective actions. Also, the monitoring of time management for various activities shall be made which can improve the overall efficiency further.

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Biographies

MrAshok G. Verghese, is the Director of Hindustan Group of Institutions, Chennai that includes several premier institutes of Higher Education. He completed his graduation in Mechanical Engineering &MBA from Madras University. To further hone his managerial skills he pursued an Executive Management Program at Michigan University, USA. He is a member of several Professional organisations namely MMA, IE, IEEE, SAE, ACM, American Institute of Aeronautics- (AIAA) to name a few. He has several accolades to his credit including the IEEE Award for Outstanding Achievements. He has initiated the establishment of 14 Centres of Excellence to promote research across the Hindustan Group of Institutions.

Mr. K.Viswanathan has experience in Manufacturing Industries like shock absorbers, signage industries, Bi-metal bearings for more than 25 years and now he is an Associate Professor with School of Mechanical Science, Hindustan University, Chennai. He completed his graduation in Mechanical Engineering &M.E.(Engineering Design) from Madras University. He coordinates 5S implementation activities in Hindustan University and obtained 5S Certification from TuV Rheinland, India. He is currently pursuing his Ph.D degree on Condition Monitoring of Machines. He also coordinates Student Chapter Activities of Condition Monitoring Society of India.

Dr Pon Ramalingam is currently working as Registrar in Hindustan University, Chennai. He has done M com., M.Phil, MBA, and PhD. He has published over 10 research papers in the National and International Journals. He has guided over 250 industry sponsored MBA projects. His research area of interest is Application of E commerce in companies. He has served as Managing Committee Member in the Madras Management Association for two years. He was member in the Board of Studies for MBA in University of Madras. He has been instrumental for the MBA program of Hindustan University to secure 'A' Grade in the AIMA – BUSINESS STANDARD Survey.