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# TEACHERS' KNOWLEDGE, SKILLS, AND ATTITUDES ON 5S AND CHALLENGES ON SCHOOL-BASED SOLID WASTE MANAGEMENT

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*Abstract:* Teachers' knowledge, skills, and attitudes on 5S and challenges on school-based solid waste management have been questionable when linked to the effectiveness of waste management practices in schools. This study aimed to determine the Teacher's Knowledge, Skills, and Attitude level on 5S (Sort, Set in order, Shine, Sustain, Standardized) and Challenges of School-Based Solid Waste Management. This study comprehensively analyzes the Villanueva North District for the school year 2023-2024. Specifically, it examined the teachers' level of Knowledge, Skills, and Attitude on 5S; the level of teachers' challenges on School-Based Solid Waste Management in terms of Segregate, Reuse, Reduce, Recycle, and Disposal; and the relationship between the teachers' Knowledge, Skills, and Attitudes on 5S and the Challenges on School-Based Solid Waste Management.

The method used universal sampling which involved two hundred fifteen (215) teachers from Villanueva North District during the School Year 2023-2024. A researcher-made questionnaire was used in the first part of the study. The second part was patterned from RA 9003, also known as the Ecological Solid Waste Management Act of 2000. The data gathered were analyzed using descriptive statistics such as mean, standard deviation, and Pearson correlation coefficient.

Salient findings revealed that the highest mean score for the teachers' level of knowledge, skills, and attitude on 5S is associated with knowledge. On the other hand, considering teachers' challenges on school-based solid waste management, the highest mean is observed in disposal. The results revealed also that teachers' knowledge and attitudes significantly influence most areas of waste management, suggesting that well-informed and positively inclined teachers are better equipped to manage waste effectively. The results concluded that comprehensive professional development programs that enhance teachers' knowledge are important to achieve a more holistic and effective approach to solid waste management in schools and improve waste management practices that will create a healthier and more sustainable educational environment.

Therefore, it is recommended that the Department of Education should provide training programs to develop a positive attitude toward 5S ns solid waste management. School heads should implement activities that emphasize the importance and benefits of reusing materials. Lastly, it is recommended that teachers be given support and enough resources to reinforce their learning and sustain their commitment to 5S principles and solid waste management. These insights are essential for policymakers and educators aiming to foster environmental responsibility and sustainability in educational institutions.

*Keywords* - ***knowledge, skills, and attitudes, 5S, school-based solid waste management***

## I. INTRODUCTION

### *1.1 Background of the Study*

Ensuring environmental sustainability and public health is a worldwide priority that also applies to the Philippines as stipulated by its laws on solid waste management. In educational institutions, it's crucial to maintain proper practices for waste management to promote a healthy learning environment. The objective of this research study focused on evaluating school-based solid waste management and examining how teachers comply with Philippine legal regulations by implementing 5S principles.

The 5S concept is highlighted on standardization and organization in the workplace. It comprises five guiding principles: Sustain, Shine, Standardize, Sort, and Set in Order. Through the creation of a tidy, well-organized, and productive work environment, these principles seek to decrease waste, increase productivity, and improve operational efficiency. 5S may be used in a variety of sectors, such as office settings, healthcare, education, manufacturing, and hospitality, to improve workflow, raise

employee morale, and enhance safety. Sorting unneeded materials, setting up workstations, keeping things tidy, creating standards, and preserving these habits via ongoing efforts at improvement are all part of the process.

Teachers' knowledge, skills, and attitude towards 5S directly impact how effectively they can implement these practices in the classroom and throughout the school. Teachers with a strong understanding of 5S can effectively identify and eliminate unnecessary waste generation and designate specific bins for different waste categories. Maintain cleanliness and proper waste bin upkeep, preventing overflowing and attracting pests. Develop clear procedures for waste disposal, encourage learners' participation, integrate 5S into daily routines, and ensure their long-term participation.

Teachers who possess skills in implementing 5S can lead by example, integrate 5S into lessons, and facilitate learners' participation. Teachers with positive attitudes towards 5S can motivate students to embrace waste reduction and recycling. Inspire a sense of responsibility and environmental stewardship and create a cleaner and healthier learning environment.

Division of Misamis Orientals Division Memo No. 444, s. 2018 states that Education is meant to enrich learners, and part of the experience is ensuring they can learn in a quality environment. A clean and beautiful school is very important.

To maintain cleanliness and to provide a quality learning environment for the learners, the Ecological Solid Waste Management Act of 2000, or Republic Act No. 9003 in the Philippines, establishes a legal structure for managing solid waste and encouraging sustainable practices such as minimizing waste generation, sorting materials properly, recycling whenever possible, and disposing of remaining material in an environmentally acceptable way. It emphasizes schools' responsibility to implement effective measures that support these objectives by expressly including educational institutions within its purview.

Increasing enrolment and diverse school activities has intensified solid waste production in educational institutions. As per RA 9003, schools must initiate measures to limit waste by promoting reduction, reuse, and recycling practices. To achieve compliance with this legislation, utilizing the structured approach provided by applying the five principles of Sort-, Set in order-foundational action on every problem', Standardize-consistency for sustainable success, Sustain-'ongoing improvements to maintain cleanliness' can greatly aid towards successful implementation within an institution, 's policies.

As essential constituents of the educational institution, teachers have a significant responsibility to carry out these lawful requirements. By following 5S principles, they do not just comply with RA 9003 but also cultivate ecological awareness among their colleagues and pupils. Nevertheless, educators must still investigate to what degree incorporate these ideals into their routine operations. By implementing 5S, teachers can address various challenges in school-based solid waste management.

This study evaluates the existing condition of solid waste management in schools, considering the stipulations specified by RA 9003. Additionally, it investigates how much teachers know and implement 5S principles that are compliant with legal regulations governing waste disposal in academic institutions. The conclusions derived from this research will furnish significant perspectives for devising policies and plans that encourage lawful compliance and ecological sustainability across schools in Villanueva North District.

### *1.2 Literature and Related Studies*

In the realm of education, incorporating the 5S principles - Sort, Set in order, Shine, Standardize, and Sustain - alongside effective school-based solid waste management practices is crucial for fostering a clean, organized, and sustainable learning environment. Literature and related studies in this area delve into the significance of integrating these principles into educational settings to promote efficiency, cleanliness, and environmental consciousness among students and staff.

DepEd Order 009, s. 2021 provides all the governance levels in the education department to establish a quality management system consistent with the National Quality Management (NQMS). Further, DM 014, s. 2022 or Procedures and Work Instructions Manual (PAWIM) provides a clear procedural approach to various processes specifically on the conduct of the Management Review.

The Philippine government has endeavoured to improve its management of solid waste through the passage of RA 9003, otherwise known as the Ecological Solid Waste Management Act, which provides for a systematic, comprehensive, and ecological waste management program to ensure the protection of public health and the environment, (DENR, 2019). Also, San Juan (2019) revealed that the participation of community members in a solid waste management program depends on the actions taken by their leaders or officials. More so, Al-Katib et al. (2020) emphasized that solid waste management requires technical, political, legal, socio-cultural, environmental, and economic factors and available resources. The absence of any of the resources will make solid waste management programs fail.

***5S***

Systematic techniques used by manufacturing as well as service organizations."5S" comes from five Japanese words- Seiri (sort), Seiton (set in order), Seiso (shine), Seiketsu (standardize) and Shitsuke (sustain). "5S" was implemented in educational institutes, focusing on the better management of students and teaching and non-teaching members. Conte (2020).

***Knowledge***

Garcia and Martinez (2019), teachers' knowledge of 5S encompasses more than just physical organization within the classroom; it also encompasses the implementation of standardized procedures that play a crucial role in promoting consistency and streamlining classroom management. The successful implementation of 5S in educational settings to enhance the learning environment promotes discipline and student engagement. The level of knowledge among teachers regarding the 5S methodology impacts the effectiveness of its implementation (Kimura and Yamguchi 2020). Moreover, studies have shown that the implementation of 5S in educational settings has led to positive outcomes such as improved academic performance and enhanced pedagogical practices, and the promotion of self-discipline among learners.

Brown and Smith (2020) also state that teachers who implement organizational strategies such as labeling, color-coding, and spatial arrangement significantly enhance the efficiency and clarity of their classroom environments. However, facilitating the creation of a clutter-free and conducive learning environment is a critical aspect of effective teaching (Johnson and Martinez 2021). Teachers in schools who implement systematic and comprehensive training programs tend to demonstrate a deeper understanding and are more consistent in applying the 5S principles in their classroom (Kimura & Yamaguchi, 2020). The

successful integration of 5S has been linked to creating a positive learning atmosphere, encouraging student engagement, and fostering a mutual environment conducive to learning.

***Skills***

Optimizing classroom space supports diverse instructional needs and enhances student learning experiences (Johnson 2021). This involves creating a versatile, inclusive, and engaging environment that meets the diverse instructional needs of both teachers and students. Johnson argues that well-organized classrooms not only facilitate smooth transitions between activities but also create opportunities for differentiated instruction. Moreover, Suzuki et al. 2021 state that the implementation of 5S affects both classroom management and student learning outcomes. Their study highlighted that teachers who are adept at upholding the 5S principles upholding the 5S principles establish classrooms that successfully increase learners' involvement while reducing distractions. Teachers who have comprehensive 5S training programs exhibit greater proficiency in these skills which results in improved classroom management and enhanced learners' learning environment (Yamamoto and Tanaka 2020)

***Attitude***

Teachers have been observed to actively engage in activities that promote 5S for students to follow. Positive attitudes among educators are crucial for fostering a culture of cleanliness and organization within educational institutions. In addition, teachers who perceive 5S as beneficial and necessary are more likely to actively participate in its adoption and maintenance actively, thereby enhancing overall organizational efficiency and effectiveness. (Saclolo and Ricafort 2019). Moreover, the study of Smith and Brown (2023), states that active engagement of learners in the sorting process and providing opportunities for them to contribute ideas to organize the classroom will enhance collaborative and inclusive learning environments. They also found out that when teachers involve their learners in sorting activities and encourage them to propose organizational ideas, it fosters a sense of ownership and responsibility among learners.

Furthermore, Lee and Park (2021) state that teachers' organizational practices are pivotal in promoting learners' responsibility within the classroom. They also emphasize that when educators establish clear expectations for maintaining order and consistently enforce these standards, students develop essential habits of organization and accountability.

In conclusion, the 5S methodology is a discipline that assists organizations in maintaining organized and visually efficient workplaces. In a well-organized learning environment, children become more independent, allowing teachers to focus on their students rather than spending time searching for teaching materials.

***Challenges on School-Based Solid Waste Management***

***Solid Waste Management***

The systematic and organized process of collecting, transporting, processing, and disposing of waste materials within the school environment. This includes various measures to reduce waste generation by encouraging recycling and reuse while ensuring safe disposal methods that are both environmentally friendly and promote public health. The aim is to minimize adverse impacts on the economy, environment & and society caused due to wastage. (RA 9003). Challenges encountered in solid waste management include inadequate resources for effective waste management, poor students' attitudes towards waste management, and lack of education on solid waste management. (Kofi Nkonkonya Mpuangnan, et.al 2023) Additionally, the open burning of rubbish is still frequently practiced in schools, which conflicts with government programs to lower greenhouse gas emissions and waste management policies. Moreover, Catedral Ma. Buena (2016) emphasizes the importance of collaboration between school administrators, teachers, and LGUs to improve waste management practices in schools and transform these practices into opportunities for economic growth and community development.

***Segregate***

Segregation involves sorting waste into categories such as recyclables (including plastic, paper, and metal), organic materials like food scraps and yard waste, and non-recyclable or hazardous items. This process is essential for facilitating the composting of organic matter and ensuring the safe disposal of hazardous materials, rather than mixing them with general waste, to support effective environmental conservation. Implementing educational programs on waste segregation and management in schools can teach students the importance of proper waste handling, influencing their behavior and promoting sustainability within the school community.

However, limited resources can lead to significant inconsistencies in how waste segregation is practiced and enforced within school settings (Garcia and Martinez 2021). These challenges include inadequate infrastructure, insufficient training and awareness, inconsistent enforcement, competing resource allocation priorities, varied access to segregation tools, and differing levels of community support. In addition, Smith and Jones (2020), believe that many educators do not receive sufficient information or guidance on correctly separating different types of waste, such as recyclables, compostables, and non-recyclables. Furthermore, a low level of understanding among teachers about the importance and methods of waste segregation significantly contributes to inconsistent segregation practices within schools (Williams and Thompson 2020).

***Reuse***

Encouraging reuse is integral to reducing waste and upholding sustainability. By repurposing items that would otherwise be disposed of, their lifespan can be prolonged while simultaneously decreasing demand for fresh resources. There are multiple strategies schools could adopt within their waste management programs to stimulate the practice of reusing materials. School waste management initiatives incorporating reuse practices result in a significant reduction of waste generation, conservation of resources, cost savings, and promotion of environmentally conscious habits amongst the students and staff. Furthermore (G. Harman & N. Yenikalayci 2022), in their journal about the Determination of Science Student's Awareness of Waste Management, states that to promote the practice of reuse among students and staff, special projects or activities like swap days, collecting used items for charity, and using reusables in art programs can be incorporated into schools. This fosters a culture of sustainability within educational institutions.

However, Lee and Park (2020) state that one of the primary challenges teachers encountered is the lack of adequate resources and materials for effective reuse programs. Schools often do not have the necessary facilities, such as storage space for reusable items or equipment for repurposing materials. Garcia and Hernandez 2021 found out that the frequent use of single-use items, such as plastic utensils, bottles, and packaging, is deeply ingrained in school routines. In addition, Tan et al. (2022) and

Wang et al. (2021), highlight the importance of fostering creativity and innovation in waste management practices. They suggest that providing teachers with professional development opportunities and resources can enhance their ability to develop and implement practical reuse strategies within their schools and communities.

***Reduce***

Ugwu C. et al. (2021) state that the waste is reduced at the point of generation or before final disposal. The proactive strategy centers on minimizing the quantity of garbage generated initially, effectively lessening ecological effects and advocating for sustainability. Educating and encouraging learners and teachers to use reusable items like plastic bottles, utensils, and containers can help reduce waste production and promote a safe and conducive place for learning. To lessen the amount of Solid Waste, one can purchase items with minimal packaging or large quantities to limit packaging materials. Choosing reusable goods like handkerchiefs instead of tissues and refillable pens are also viable options. Additionally, utilizing textile bags for shopping over plastic ones and repairing possessions such as clothes and furniture rather than purchasing replacements would contribute to this effort. (C.G Ozoegwu, P.An Ozor 2020)

However, Martinez and Cruz (2020) state that teachers face some challenges in implementing school-based solid waste management strategies for waste reduction. Schools that lack clear policies and administrative backing for sustainability initiatives often struggle to implement effective waste reduction programs. Moreover, teachers' participation is a critical factor in the success of school waste reduction initiatives (Smith and Brown 2021). Furthermore, Jones and Smith (2020) argue that a curriculum that lacks comprehensive waste reduction content fails to provide students with the essential knowledge and skills necessary for engaging in sustainable practices. They emphasize that educational systems are pivotal in shaping students' understanding of environmental issues.

Integrating reuse practices into educational activities presents substantial logistical complexities that educators often encounter (Brown et al. 2020). They emphasize that several issues contribute to these challenges, ultimately impacting efforts to promote environmental stewardship among students.

***Recycle***

To ensure environmental sustainability, reduce waste, and conserve resources in educational institutions. The process includes gathering and treating recyclable materials like paper, plastic, glass, or metal for reuse when making new products. Implementing recycling programs in schools presents significant educational opportunities for pupils to acquire knowledge on environmental stewardship, sustainability, and the significance of waste management practices. Young learners can actively engage in recycling efforts by creating awareness about its benefits while jointly cultivating a sense of accountability toward safeguarding our environment.

However, Brown and Lee (2020) state that inconsistent participation and commitment from teachers present a significant challenge in establishing a cohesive and effective recycling culture within schools. It highlights that varying levels of engagement among educators hinder the sustainability and success of recycling efforts. In addition, insufficient education and awareness about recycling principles significantly hinder teachers' ability to confidently incorporate recycling into their educational practices Brown and Smith (2020). Furthermore, the absence or insufficient number of recycling bins within schools represents a significant obstacle that impedes teachers' efforts to effectively incorporate recycling into their educational activities (Smith et al. 2021)

***Disposal***

The ultimate step in managing waste is to dispose of or process the waste materials to mitigate their adverse effects on the environment. Adopting appropriate disposal techniques for reducing pollution, health hazards, and environmental deterioration is crucial. Reyes and Madrigal (2020) added that school learners dispose of solid waste through various methods such as using standard bins, cardboard boxes, plastic bags, and old desks as receptacles for waste disposal.

However, Littering and improper waste disposal within schools are frequently attributed to insufficient awareness and inadequate enforcement of waste management policies (Smith and Jones 2020). In addition, Garcia and Lee (2021) state that the availability and accessibility of waste bins and disposal facilities are pivotal factors influencing the effective management of waste within educational settings. Their study highlights that insufficient infrastructure, such as a limited number of waste bins, poses significant challenges for teachers striving to maintain cleanliness and hygiene within school premises. Furthermore, teachers' primary challenges in school-based solid waste management revolve around the absence of clear guidelines and adequate resources for proper waste disposal practices (Johnson and Garcia 2021).

The effectiveness of school-based solid waste management programs is influenced by teachers' knowledge, skills, and attitudes toward the 5S methodology (Reyes and Martinez, 2020). Lee and Kim (2019) highlighted the importance of teachers' skills in applying 5S principles to address solid waste management challenges in educational settings. They highlighted that teachers with higher proficiency in these skills could better engage students in waste management activities, fostering a culture of environmental responsibility.

### *1.3 Objectives*

The primary objective of this study was to assess the level of teachers' knowledge, skills, and attitudes regarding 5S, as well as the challenges they face in school-based solid waste management in Villanueva North District, Division of Misamis Oriental, for the School Year 2023 – 2024. Specifically, the study aims to evaluate the teachers' knowledge, skills, and attitudes related to 5S, examine the challenges they encounter in managing solid waste within schools, and determine the significant relationship between these factors and the challenges of school-based solid waste management.

### *1.4 Theoretical Framework*

This study was anchored on Benjamin Bloom's KSA (Knowledge, Skills, Attitude) model. This framework explores the relationship between teachers' knowledge, skills, and attitudes on 5S and the challenges of school-based solid waste management. The cognitive domain (Bloom, 1956) involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills.

First, knowledge is the foundation upon which attitudes and skills are built. A thorough understanding of 5S principles (Sort, Set in order, Shine, Standardize, Sustain) enables teachers to comprehend its relevance and its application in the school context. Greater knowledge enables teachers to make informed decisions about solid waste management and educate students effectively.

Second, the psychomotor domain (Simpson, 1972) includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. Skills represent the capacity to apply knowledge in a practical and tangible way. Teachers with well-developed skills are better equipped to overcome challenges and execute effective solid waste management practices.

Lastly, the affective domain (Krathwohl, Bloom, Masia, 1973) includes the way we deal with things emotionally, such as feelings, values, appreciation, enthusiasm, motivations, and attitudes. Attitude influences the commitment and enthusiasm of how teachers approach the challenges of school-based solid waste management. Positive attitudes can drive the consistent application of 5S practices, while negative attitudes may hinder effective implementation.

### *1.5 Conceptual Framework*

Solid waste management is a critical issue globally, and the Philippines is no exception. In educational institutions, effective waste management practices are vital for environmental sustainability and for instilling responsible citizenship among students. This conceptual framework aims to explore the role of teachers in implementing the 5S principles (Sort, Set in order, Shine, Standardize, and Sustain) within the school environment and assessing school-based solid waste management (SBSWM) initiatives. Furthermore, it integrates legal provisions in the Philippines to ensure compliance and sustainability.

Deped Memorandum No. 014, s. 2022 is the National Quality Management System emphasizing the inclusion of International Standardization on ISO where 5S is essentially required in the workplace.

This study is also anchored on Republic Act No. 9003 or the Ecological Solid Waste Management Act of 2000, also known as "Ecological Solid Waste Management Act 2000," which serves as the primary legal framework for solid waste management in this study. This policy declares implementing a systematic, comprehensive, and environmentally friendly approach toward managing solid waste. The legal foundation for solid waste management practices in Philippine educational institutions is centered on the Ecological Solid Waste Management Act of 2000 (RA 9003). This law provides clear guidelines and regulations regarding handling various types of solid waste, including household and commercial refuse, industrial waste, street sweepings, construction debris, agricultural byproducts, and other non-toxic disposable materials. RA 9003 stresses that it's crucial to manage every aspect related to garbage disposal, such as its generation control or prevention storage methods prior to collection transfer processing, treatment, recycling, reusing, upcycling, recovery, energy production, final disposal, or landfilling while keeping public health principles, engineering standards, financial feasibility conservation ecology aesthetics environmental issues among others into consideration.

Compliance with RA 9003 mandates educational establishments to incorporate solid waste management principles into their operations, resulting in a responsible approach toward handling environmental concerns by both students and educators. This legislative framework facilitates adherence to ecological regulations and fosters an environment of conscious waste disposal culture. Implementing the provisions of RA 9003 within academic settings contributes significantly towards establishing cleaner and healthier learning spaces while concurrently instilling values promoting sustainability and eco-consciousness amongst all school community members.

Integrating RA 9003 guidelines into educational institutions plays a vital role in promoting sustainable waste management practices. Republic Act No. 9003, also known as the Ecological Solid Waste Management Act of 2000, provides a comprehensive framework for managing solid waste in an environmentally sound manner. By incorporating the guidelines outlined in RA 9003 into academic curricula and institutional practices, educational institutions can contribute to sustainable waste management efforts. Academic curricula that include topics on ecological solid waste management and resource conservation effectively educate students about the significance of reducing waste, recycling properly, and adopting appropriate disposal practices.

The investigation into teacher's knowledge, skills, and attitude on 5S, focusing on classroom organization, cleanliness, and waste management, reveals a structured approach to creating an optimal learning environment. The 5S consists of Sort, Set in Order, Shine, Standardize, and Sustain and is applied in schools to enhance productivity, safety, and efficiency.

By implementing the 5S, teachers enhance classroom organization and cleanliness and promote student focus, independence, and safety. The systematic waste management and organization approach contributes to a positive learning environment where students can thrive academically, and teachers can effectively engage with learners.

Ensuring that waste management practices comply with established standards requires adherence to environmental laws and regulations, such as the Ecological Solid Waste Management Act of 2000 (RA 9003) in the Philippines will be used as guidelines for trash processing, disposal, and recycling are provided by environmental regulations to safeguard the environment and public health from potential risks related to inappropriate waste management.

RA 9512, also known as "An Act to Promote Environmental Awareness through Environmental Education," was approved on December 12, 2008. This legislation focuses on promoting environmental awareness through environmental education practices. It aims to enhance ecological consciousness and education initiatives to address environmental issues and promote sustainable practices in the Philippines.

### *1.6 Statement of the Problem*

This study aimed to determine the level of Teachers' Knowledge, Skills, and Attitudes on 5S (Sort, Set, Shine, Sustain, Standardize) and Challenges on School-Based Solid Waste Management in Villanueva North District for School Year 2023-2024.

Specifically, this study sought to answer the following questions:

1. What is the teachers' knowledge, skills, and attitude level on 5S?
2. What are teachers' challenges on school-based solid waste management in terms of segregate, reuse, reduce, recycle, and disposal?
3. Is there a significant relationship between the teachers' Knowledge, Skills, and Attitudes on 5S and the Challenges on School-Based Solid Waste Management?

***Hypothesis***

Problems 1 and 2 are hypotheses-free, while problem 3 would be tested at 0.5 significance level.

There is no significant relationship between teachers' knowledge, skills, and attitudes toward 5S and school-based solid waste management challenges.

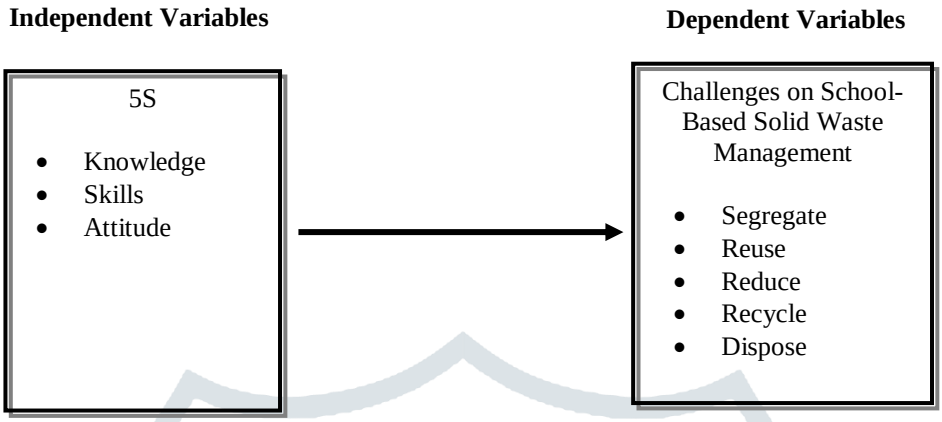


***Figure 1****. Schematic Presentation Showing the Interplay of Independent and Dependent Variables*

***1.7 Significance of the Study***

The significance of the study on teachers' knowledge, skills, and attitudes on 5S and challenges in school-based solid waste management is its potential to bring to the surface significant relationships between teachers' knowledge, skills, and attitude on 5S and their contribution to school-based solid waste management.

The findings of the study provide valuable insights for the Department of Education in developing guidelines and training programs aimed at improving school-based solid waste management and promoting the implementation of the 5S principle among teachers. The Department of Education can tailor policies and initiatives to enhance environmental sustainability and promote a conducive and organized learning environment by understanding the current practices and challenges in waste management and workplace organization.

The study's outcomes directly benefit teachers by raising awareness of the importance of the 5S principle in the workplace and its impact on school-based solid waste management. The research findings can inform professional development programs to equip teachers with the knowledge and skills necessary to implement effective 5S practices, leading to improved work efficiency and a cleaner, more organized workplace.

Students are the ultimate beneficiaries of a cleaner and more organized school environment resulting from the effective implementation of the 5S principle and improved solid waste management. A cleaner environment can improve students' overall well-being, health, and productivity, fostering a positive learning atmosphere. Additionally, the study can raise students' awareness of environmental sustainability and waste reduction, fostering a sense of responsibility and environmental stewardship.

Parents serve as the model for the outcomes through the potential improvement in their children's learning environment and overall well-being. A cleaner and organized school environment can positively impact students' health and safety, providing parents with confidence in the school's commitment to maintaining a conducive learning environment. Furthermore, the study can raise awareness among parents about the importance of waste management and sustainable practices, encouraging environmentally conscious behaviors at home and in the community.

The study has a positive impact on the school community by promoting a culture of cleanliness, organization, and environmental responsibility. Effective implementation of the 5S principle and improved waste management can contribute to a healthier and more aesthetically pleasing school environment, fostering a sense of pride and ownership among students, teachers, and staff. The study can also prompt the school community to engage in collective efforts toward environmental sustainability, waste segregating, reusing, reducing, recycling, and disposing of community cleanliness.

The significance of the study extends to various stakeholders, including the Department of Education, teachers, students, parents, and the school community, by promoting a cleaner, organized, and environmentally sustainable school environment.

***1.8 Scope and Limitation***

This study focuses on assessing teachers' knowledge, skills, and attitudes regarding the 5S methodology, as well as identifying the challenges they face in implementing school-based solid waste management within the Villanueva North District during the school year 2023-2024. The research specifically targets two hundred fifteen (215) respondents, composed of teachers from various schools within the district. The study aims to explore how well teachers understand and apply the principles of 5S (Sort, Set in order, Shine, Sustain, Standardize) in solid waste management and identify the obstacles they encounter in effectively managing waste in their school environments.

The scope of the study is limited to the Villanueva North District and does not include teachers from other districts or regions. The research is also confined to the specific timeframe of the 2023-2024 school year. The findings may not generalize to other districts, schools, or school years due to context, policies, and resource differences.

Additionally, the study relies on self-reported data, which may be subject to bias or inaccuracies in the respondents' perceptions and reporting. The research is further limited by the respondents' willingness and ability to participate, which could affect the completeness and reliability of the data collected. Despite these limitations, the study seeks to provide valuable insights into the current state of teachers' knowledge, skills, and attitudes toward 5S and the challenges they face in implementing effective solid waste management in schools.

### *1.9 Definition of Terms*

The following terminologies are operationally defined for the purpose of this study:

***5S***. This refers to the systematic approach to workplace organization and waste management to improve efficiency, safety, and cleanliness within the school environment.

***Attitude.*** This refers to the specific observable behaviors, perceptions, and dispositions that reflect their mindset, beliefs, and approach toward implementing and sustaining 5S within the educational setting.

***Knowledge.*** This refers to the specific criteria and actions that can be observed or measured to assess the level of understanding an awareness teachers have regarding the principles, concepts, and techniques of 5S.

***Skills.*** This refers to the practical ability of teachers to implement 5S principles effectively in school settings, including organizing spaces, maintaining cleanliness, and standardizing waste management practices.

***Disposal.*** This refers to the ultimate step in waste management, which involves permanently eliminating solid waste from its surroundings. The safe elimination of collected, treated, and processed trash is essential to avert any environmental disturbance or health risk associated with irresponsible handling measures that can lead to disease transmission.

***Recycle.*** This refers to the process of converting waste materials into new products, reducing the need for raw materials and the volume of waste going to landfills.

***Reduce.*** This refers to reducing waste production by implementing measures that aim to prevent the creation of waste, which is referred to as waste minimization.

***Reuse.*** This refers to the practice of using an item more than once, either for its original purpose or for a different one, before disposing of it.

***Segregate.*** This refers to the process of separating waste into different categories, such as recyclables, compostables, and non-recyclables, to facilitate proper disposal and recycling.

***Set in Order.*** This refers to logically and organizing essential items and materials logically and efficiently to minimize the waste of time and resources and facilitate easy access and retrieval.

***Shine.*** This refers to regularly cleaning and maintaining school facilities, classrooms, and common areas to ensure a clean and hygienic environment conducive to teaching and learning.

***Sort.*** This refers to the process of identifying and organizing items within school premises to determine what is necessary for educational activities and what constitutes waste or unnecessary clutter.

***Sustain.*** This refers to the ongoing commitment to sustaining the 5S principles through continuous improvement efforts, employee training, regular monitoring, and evaluation, and fostering a culture of cleanliness, organization, and waste reduction within the school community.

***Standardize.*** This refers to establishing standardized procedures and protocols for maintaining the gains achieved through sorting, setting in order, and shining and sustaining cleanliness and orderliness over time.

## II. METHODOLOGY

This section presents the research design, study setting, research respondents, sampling technique, research instrument, systems of scoring, data gathering, statistical treatment of data, and ethical considerations of the study.

### *2.1 Research Design*

This study utilized a descriptive correlation method. Initially, the researcher will gather and evaluate quantitative data related to various aspects such as respondents' characteristics, teacher's practices in 5S principles in the workplace, and assessment of school-based solid waste management. This approach facilitates using numbers to comprehend a situation before exploring it further through qualitative means driven by respondent experiences/opinions that help explain the numerical outcomes in greater detail (Creswell, 2017).

The hypotheses are tested, and properties are examined in this quantitative research approach. It involves analyzing numerical data to determine larger populations' trends, correlations, and generalizations. Statistical analysis enhances the process of interpreting data and recognizing patterns; therefore, it holds significant benefits for predicting future outcomes, testing relationships between variables, as well as generating results that can be applied on a broader scale (Mohajan, 2020). Respondents' knowledge, skills, and attitudes on 5S and challenges in school-based solid waste management will be tested as variables.

### *2.2 Study Setting*

The study was conducted in the Municipality of Villanueva, specifically focusing on Villanueva North District within the province of Misamis Oriental. Villanueva North District comprises four (4) Elementary schools, namely, Vicente N. Chaves Memorial Central School, Looc Elementary School, Villanueva National High School, Nangka Elementary School, Kalingagan Elementary School, and two (2) high schools, Villanueva National High School and Kalingagan National High School. These

schools are essential for the comprehensive growth of the local student population, offering various educational possibilities and experiences.

As an educational entity under the Department of Education (DepEd), Villanueva North District is vital. The supervision and administration of educational establishments falling under the jurisdiction of this district are of the utmost importance.

Villanueva North District is home to a dynamic and selfless two hundred fifteen (215) educators. These educators are responsible for not just teaching knowledge and skills but also fostering their students' intellectual and personal development. Within the Villanueva North Districts' dynamic educational landscape, these teachers have a crucial role in influencing the development of the upcoming generation, transforming it into a thriving center of learning and educational superiority in the Misamis Oriental region.

In educational aspects, the Municipality of Villanueva was divided into two Districts. The Villanueva Norh and South. Villanueva North is composed of six (6) schools mentioned above as the focus of this study, while Villanueva South is composed of the following schools: San Martin Integrated School, the heart of Villanueva South, Balacanas Elementary School, Balacanas National High School, Kirahon Elementary School, Kimaya Integrated School, Dayawan Elementary School, Lukong Integrated School, and Don Fernando Jacinto Elementary School. The Municipality of Villanueva is home to dedicated, selfless, and compassionate teachers who tirelessly give their best in molding the future generation of the municipality.

### *2.3 Research Respondents*

This study explores teachers' knowledge, skills, and attitudes on 5S and challenges in School-Based Solid Waste Management through a total enumeration of two hundred fifteen (215) teachers from Villanueva North District.

The schools in the Villanueva North district represent various teaching environments, grade levels, and student demographics. This selection of institutions forms part of this study's goal to provide an all-encompassing view of educational practices, challenges, and perspectives within the district. By including teachers from these diverse backgrounds, valuable insights be obtained, resulting in high-quality findings for this research project.

### *2.4 Sampling Technique*

To ensure a comprehensive and meaningful analysis, universal sampling/non-probability sampling involves analyzing the entire population of two hundred fifteen (215) respondents without random selection. This method, known as a census, eliminates the need for traditional samples to estimate parameters from incomplete data sets. The benefits of this approach were most effective when dealing with smaller populations, such as in this case study, where every individual can be accounted for, ensuring accurate and unbiased results that reflect an understanding of the whole group being studied rather than just a sample subset susceptible to error or bias during normal surveying techniques.

Afterward, the researcher analyzed the collected data from these teachers to draw significant conclusions from the research objectives. It was emphasized that the precise results depend on population data quality and the assumption of uniformity among district teachers' characteristics.

### *2.5 Research Instrument*

The research questionnaire was designed to gather valuable insights into teachers' knowledge, skills, and attitudes on 5S and challenges in School-Based Solid Waste Management. The questionnaire is divided into two sections:

The first part of the questionnaire dealt with the teachers' knowledge, skills, and attitude on 5S using a scale that includes options such as "At all Times," "Most of the Time," "Sometimes," and "Never."

The second part of the questionnaire is patterned from RA 9003, underwent validation for the test, and piloted to thirty (30) teachers who are not part of the final or actual respondents. The questionnaire assesses the level of challenges the respondents encounter in school-based solid waste management. It used the descriptions "Strongly Agree," "Agree," "Disagree," and "Strongly Disagree."

### *2.6 Validity and Reliability*

The first part of the questionnaire is researcher-made. The second part was patterned from Republic Act No. 9003, also known as the Ecological Solid Waste Management Act of 2000. The research instrument was meticulously reviewed and validated by one (1) District Research Coordinator, nine Master Teachers, a School Head, a Public School District Supervisor, and one (1) research adviser who confirmed that it comprehensively covers all the relevant indicators that were fitted for the study, after which they confirmed ready to for pilot testing.

A trial with thirty (30) participants who were not part of the primary study was conducted to assess the validity of the self-made survey last April 4, 2024. The researcher examined the reliability coefficients (Cronbach's Alpha) for the different subscales. Results for the reliability test ranged from values 0.823 to 0.931. The Cronbach's Alpha value interpretation of these results places them in the "Good" to "Excellent" range, suggesting that the instrument's reliability was strong to satisfactory.

### *2.7 System of Scoring*

This study used the Likert scoring system to measure the respondents' profile and characteristics, level of 5S principles in the workplace, and level of school-based solid waste management.

***PART I. Teachers' Knowledge, Skills, and Attitude on 5S***

| Scale | Range | Description | Interpretation |
|---|---|---|---|
| 4 | 3.26 – 4.00 | At All Times | Very High |
| 3 | 2.51 – 3.25 | Most of the Time | High |
| 2 | 1.76 – 2.50 | Sometimes | Low |
| 1 | 1.00 – 1.75 | Never | Very Low |

***PART II. Challenges on School-Based Solid Waste Management***

| Scale | Range | Description | Interpretation |
|---|---|---|---|
| 4 | 3.26 – 4.00 | Strongly Agree | Highly Challenged |
| 3 | 2.51 – 3.25 | Agree | Challenged |
| 2 | 1.76 – 2.50 | Disagree | Moderately Challenged |
| 1 | 1.00 – 1.75 | Strongly Disagree | Not Challenged |

### *2.8 Data Gathering Procedure*

The researcher followed the proper protocol: a reference letter from the Dean of PHINMA-Cagayan de Oro College's School of Graduates and Professional Studies was secured to get consent to administer the questionnaire in Villanueva North District. A letter from the researcher and her adviser was forwarded to the Schools Division Superintendent of Misamis Oriental Division. This was approved last June 3, 2024.

The permit was given to the school heads as part of the protocol. The online survey was sent to teachers and the administrators of the school. The researcher provided the link to the school's ICT coordinators so they may forward it to their group chat as part of the collecting procedure after receiving consent from the school officials. The link to the questionnaire was sent last June 04, 2024, and the results were retrieved last June 16, 2024.

In addition to their voluntary engagement, the researcher assured the respondents that their answers remain anonymous. As well, clear instructions were provided on how to complete the survey questionnaires.

### *2.9 Statistical Treatment of Data*

The study utilized descriptive statistics to concisely describe the sample and measurements, which form an essential foundation for nearly all quantitative data analyses. Additionally, a straightforward graphical examination complemented these statistics. The responders' categorization among various factors used frequency and percentage measures. For measuring central tendency about the respondent's knowledge, skills, and attitude, the mean value was employed while standard deviation determined data distribution. To assess the correlation between respondents' knowledge, skills, and attitude and challenges in school-based solid waste management, significance level measurement by Pearson-r coefficient was applied.

### *3.10 Ethical Considerations*

The researcher has undergone an ethical review at the COC PHINMA Graduate School Dean's Office for the study before receiving the request letter to conduct a study, which was subjected to a review and approval process by the Office of Schools Division Superintendent in Misamis Oriental before beginning research. It is important to note that participants were chosen voluntarily, without any coercion or intimidation, and they have the right not to answer questions if they're uncomfortable with them.

Informative letters were sent to all participants, providing them with necessary details about the study and its purpose. The communications clearly stated that all information collected during research would remain anonymous without any reference to individual names. Participants would also have to sign a consent form acknowledging their voluntary participation in the study.

At the end of the study, all participants received access to the research findings. The completed questionnaires were safely stored with limited data accessibility reserved for only the researcher and their advisor. It is critical to emphasize that no physical, emotional, or mental harm shall come upon any participant during this investigation. Thus, this study underwent an ethics review and earned clearance from the office of the graduate school office before its conduct.

## III. RESULTS AND DISCUSSIONS

This chapter presents the results, discussions, conclusions, and recommendations of the teachers' knowledge, skills, and attitude on 5S and challenges in school-based solid waste management with its interpretation and analysis from the findings of the study.

### *3.1 Results*

**Problem 1. What is the teachers' level of knowledge, skills, and attitude on 5S?**

**Table 1**
**Distribution of Teachers' Level of Knowledge on 5S**

| Indicators<br>As a teacher… | Mean | SD | Description |
|---|---|---|---|
| I differentiate between essential items that should be kept and non-essential items that can be removed. | 3.45 | 0.56 | At all Times |
| I facilitate the creation of a clutter-free and conducive learning environment. | 2.78 | 0.62 | Most of the Time |
| I set things in order by labeling, color-coding, and spatial arrangement to establish clear and efficient storage solutions for classroom materials and resources. | 3.57 | 0.71 | At all Times |
| I arrange furniture, equipment, and teaching aids to facilitate smooth traffic flow, minimize clutter, and enhance the learning environment. | 3.48 | 0.53 | At all Times |

| | | | |
|---|---|---|---|
| I shine my classroom by using various techniques and best practices for maintaining cleanliness in the classroom. | 3.29 | 0.55 | At all Times |
| I am aware of the importance of maintaining a clean and hygienic environment to promote learners' health and well-being. | 3.53 | 0.59 | At all Times |
| I understand that continuous improvement on 5S can lead to a better learning environment for the learners. | 3.40 | 0.63 | At all Times |
| I sustain 5S by integrating lessons or activities that reinforce the importance of maintaining an organized, clean, and efficient learning environment. | 3.32 | 0.68 | At all Times |
| I follow standard guidelines and protocols on sorting, setting in order, shining, and sustaining practices within the classroom. | 3.21 | 0.73 | Most of the Time |
| I ensure that all classroom activities and processes adhere to standardized procedures. | 3.24 | 0.67 | Most of the Time |
| **Overall** | **3.33** | **0.63** | **At all Times** |

***Legend:*** 3.26-4.00 At all Times / Very High 1.76-2.50 Sometimes/Low
2.51-3.25 Most of the Time/High 1.00-1.75 Never/ Very Low

Table 1 presents the distribution of teachers' level of **knowledge** on 5S with the overall mean of 3.33 (SD = 0.63), described as At all Times and interpreted as **Very High.** It means that most teachers have a robust understanding of the 5S principles. The very high level of knowledge indicates that teachers are well-equipped to implement and sustain the 5S methodology, which involves sort, set in order, shine, standardize, and sustain, within their educational environment. This strong foundation can significantly contribute to the creation of an organized, efficient, and productive teaching and learning atmosphere. As observed, the high level of knowledge among teachers about 5S can foster a culture of continuous improvement within schools. This cultural shift can lead to better resource management, improved safety, and heightened awareness of maintaining a clean and organized work environment, which are all key aspects of the 5S methodology.

According to Kimura and Yamaguchi (2020), the level of knowledge among teachers regarding the 5S methodology significantly impacts the effectiveness of its implementation in educational settings. Their research highlights that teachers with a higher understanding of the 5S principles—sort, set in order, shine, standardize, and sustain—are better equipped to integrate these practices into their classrooms, leading to more organized and efficient learning environments. Kimura and Yamaguchi found that teachers' knowledge levels about 5S vary widely, often depending on the extent of their training and professional development opportunities. In schools where systematic and comprehensive 5S training programs are implemented, teachers tend to demonstrate a deeper understanding and more consistent application of the principles. These training programs typically include workshops, seminars, and hands-on sessions that provide teachers with practical knowledge and skills to implement 5S effectively (Kimura & Yamaguchi, 2020).

In line with this, the indicator **As a teacher, I set things in order by labeling, color-coding, and spatial arrangement to establish clear and efficient storage solutions for classroom materials and resources,** got the highest mean of 3.57 (SD = 0.71), described as **At all Times** and interpreted as **Very High**. **It means that** teachers prioritize organization and efficiency in their classrooms. The highest mean score shows that teachers consistently use labeling, color coding, and spatial arrangement to create clear and efficient storage solutions. This practice ensures that both teachers and students can easily locate and access materials, contributing to a smoother and more productive classroom environment. **As observed,** teachers' consistent use of labeling, color coding, and spatial arrangement likely contributes to a more engaging and accessible learning environment. By making materials and resources easily identifiable and accessible, teachers can foster greater independence and responsibility among students, encouraging them to take an active role in maintaining the classroom's organization.

According to Brown and Smith (2020), teachers who implement organizational strategies such as labeling, color coding, and spatial arrangement significantly enhance the efficiency and clarity of their classroom environments. Their research emphasizes that these methods help create systematic storage solutions, making it easier for both teachers and students to access and manage classroom materials and resources.

On the other hand, the indicator **As a teacher, I facilitate the creation of a clutter-free and conducive learning environment,** got the lowest mean of 2.78 (SD = 0.62), described as **Most of the Time** and interpreted as **High**. It means that while teachers generally recognize the importance of maintaining a clutter-free and conducive learning environment, there may be challenges or limitations that prevent them from achieving this goal consistently. The mean score suggests that there is room for improvement in this area. As perceived, the lower mean score in this area might reflect the complex and dynamic nature of classroom environments, where the constant influx of materials, projects, and daily activities can quickly lead to clutter. Teachers may prioritize other tasks or face competing demands that make it challenging to maintain a consistently clutter-free space.

According to Johnson and Martinez (2021), facilitating the creation of a clutter-free and conducive learning environment is a critical aspect of effective teaching. Their research highlights that teachers who prioritize organization and minimize clutter in their classrooms significantly enhance the learning experience and academic performance of their students. The study also emphasizes that a well-organized classroom environment supports better behavior management. Teachers who maintain an orderly space are better able to set clear expectations and routines, which helps students understand and follow classroom rules more effectively. This organization not only reduces the time spent on managing behavior but also increases the time available for instruction and learning activities.

**Table 2**
**Distribution of Teachers' Level of Skills on 5S**

| Indicators | Mean | SD | Description |
|---|---|---|---|
| As a teacher… | | | |
| I categorize classroom materials based on their necessity, frequency of use, and relevance to the instructional goals. | 3.31 | .95 | At all Times |
| I implement various sorting strategies to declutter and organize the classroom effectively. | 2.99 | 0.79 | Most of the Time |
| I set things in order and implemented an effective organizational system to maintain order and structure in the classroom. | 3.40 | 0.96 | At all Times |
| I set things in order and efficiently utilize classroom space to optimize functionality and accessibility. | 3.52 | 0.98 | At all Times |
| I shine my classroom by developing schedules for daily, monthly, weekly, and monthly tasks and assigning responsibilities to the learners. | 3.34 | 0.94 | At all Times |
| I implement cleaning routines to ensure that the classroom remains clean, inviting, and conducive to learning. | 3.48 | 0.95 | At all Times |
| I possess skills in maintaining 5S by regularly monitoring the effectiveness of organizational systems and cleanliness within the classroom. | 2.98 | 0.73 | Most of the Time |
| I sustain 5S by integrating 5S practices into classroom culture and fostering a sense of ownership and responsibility among learners to maintain a clean and organized learning environment. | 3.01 | 0.81 | Most of the Time |
| I develop standardized and concise standard operating procedures for classroom organization and management. | 3 .13 | 0.87 | Most of the Time |
| I implement standardized practices and routines based on established standards. | 2.99 | 0.82 | Most of the Time |
| **Overall** | **3.22** | **0.88** | **Most of the Time** |

***Legend:*** 3.26-4.00 At all Times / Very High 1.76-2.50 Sometimes/Low
2.51-3.25 Most of the Time/High 1.00-1.75 Never/ Very Low

Table 2 presents the distribution of teachers' level of **skills** on 5S with an overall mean of 3.22 (SD = 0.88), described as **Most of the Time** and interpreted as **High.** It means that teachers generally possess a solid set of skills in implementing the 5S methodology. This suggests that teachers are frequently able to apply the principles of 5S—sort, set in order, shine, standardize, and sustain—effectively in their classrooms, contributing to an organized and efficient learning environment. It indicates that there is a general proficiency in 5S skills among teachers, but also room for improvement and more uniform application of these skills. The high interpretation of the mean score reflects that most teachers are capable of utilizing 5S principles effectively, yet the variability in skill levels points to potential areas where additional training or support might be beneficial. **b** teachers are likely able to implement 5S practices such as sorting materials, setting them in order, and maintaining cleanliness and organization in their classrooms most of the time. This level of skill contributes to a more structured and efficient learning environment, which can enhance both teaching and learning experiences.

According to Yamamoto and Tanaka (2020), the distribution of teachers' level of skills in 5S (sort, set in order, shine, standardize, and sustain) varies significantly depending on their training and experience. Their research indicates that teachers who have undergone comprehensive 5S training programs demonstrate higher proficiency in these skills, which in turn positively impacts classroom management and student learning environments.

In line with this, the indicator **As a teacher, I set things in order and efficiently utilize classroom space to optimize functionality and accessibility,** got the highest mean of 3.52 (SD = 0.98), described as **At all Times** and interpreted as **Very High.** It means that teachers are highly adept at organizing their classroom spaces to enhance functionality and accessibility. The highest mean score indicates that teachers frequently prioritize setting things in order and making the best use of available space. This practice is crucial for creating an effective learning environment where both teachers and students can easily access materials and resources. As observed, the effective use of classroom space can lead to significant improvements in both teaching and learning experiences. Organized and well-utilized spaces can reduce clutter, minimize distractions, and facilitate smoother transitions between different activities. This organizational competence likely contributes to a more focused and productive classroom atmosphere.

According to Johnson (2021), optimizing classroom space is crucial for supporting diverse instructional needs and enhancing student learning experiences. Johnson argues that well-organized classrooms not only facilitate smooth transitions between activities but also create opportunities for differentiated instruction. By carefully planning and effectively utilizing space, teachers can better accommodate the varied learning styles and needs of their students, thereby fostering inclusive learning environments.

On the other hand, the indicator **As a teacher, I possess skills in maintaining 5S by regularly monitor the effectiveness of organizational systems and cleanliness within the classroom,** got the lowest mean of 2.98 (SD = 0.73), described as **Most of the Time** and interpreted as **High**. This means that while teachers acknowledge the importance of regularly monitoring and

maintaining organizational systems and cleanliness in the classroom, there may be challenges or gaps in consistently executing these practices. The indicator received a mean score suggesting that while efforts are made, there is room for improvement in this specific aspect of 5S implementation**.** As observed, teachers' ability to regularly monitor and maintain 5S practices may be influenced by factors such as time constraints, competing priorities, or the need for clearer guidelines on effective monitoring strategies. These factors can impact the consistency and effectiveness of maintaining organizational systems and cleanliness within the classroom.

According to Suzuki et al. (2021), the implementation of 5S practices in classrooms has a significant impact on both classroom management and student learning outcomes. Suzuki et al. found that teachers who are proficient in maintaining 5S principles create environments that effectively promote student engagement while minimizing distractions. By systematically organizing classroom materials, ensuring cleanliness, and establishing standardized procedures, these teachers facilitate smoother transitions between activities and optimize instructional time.

**Table 3**
**Distribution of Teachers' Level of Attitude on 5S**

| Indicators<br>As a teacher… | Mean | SD | Description |
|---|---|---|---|
| I consistently model a positive attitude towards sorting to maintain a clutter-free learning environment and encourage learners to do the same. | 2.90 | 0.76 | Most of the Time |
| I actively engage the learners in the sorting process and provide opportunities for them to contribute ideas for organizing the classroom, promoting a collaborative and inclusive learning environment. | 3.56 | 0.96 | At all Times |
| I consistently prioritize a well-organized classroom by ensuring that all materials, supplies, and resources are promptly returned to their designated places after use, fostering a sense of responsibility and discipline among learners. | 2.87 | 0.78 | Most of the Time |
| I proactively encourage every learner to participate in setting things in order, fostering a collaborative approach to maintaining a tidy and functional classroom, which enhances learners' engagement and promotes a sense of ownership and responsibility. | 2.96 | 0.81 | Most of the Time |
| I consistently maintain a tidy and well-maintained classroom by regularly cleaning surfaces, ensuring that all materials and resources are free from dust and dirt, and promoting a clean and healthy environment for the learners. | 3.02 | 0.80 | Most of the Time |
| I emphasize the importance of maintaining a clean and orderly learning environment by empowering them to take responsibility for their own space, encouraging them to wipe their desk, organize and tidy up shared spaces, and fostering a sense of ownership and discipline. | 3.16 | 0.86 | Most of the Time |
| I empower learners to take ownership of sustainability initiatives within the classroom, fostering a sense of responsibility and environmental stewardship among learners. | 3.46 | 0.91 | At all Times |
| I cultivate a sense of responsibility among learners, encouraging their active participation in contributing to the long-term sustainability of 5S within the classroom. | 3.21 | 0.67 | Most of the Time |
| I ensure that all tasks and activities are carried out in accordance with established protocols, promoting consistency and efficiency in classroom operations in the classroom while also providing opportunities for learners to develop a sense of discipline and order. | 2.99 | 0.79 | Most of the Time |
| I effectively communicate the importance of adhering to established guidelines, providing clear instructions, and consistently reinforcing the benefits of consistency and organization, fostering a well-managed and orderly learning environment. | 3.12 | 0.92 | Most of the Time |
| **Overall** | **3.13** | **0.83** | **Most of the Time** |

***Legend:*** 3.26-4.00 At all Times / Very High 1.76-2.50 Sometimes/Low
2.51-3.25 Most of the Time/High 1.00-1.75 Never/ Very Low

Table 3 presents the distribution of teachers' **level of attitude** on 5S with an overall mean of 3.13 (SD = 0.83), described as **Most of the Time** and interpreted as **High.** It means that teachers generally hold a positive attitude towards the 5S methodology. This suggests that teachers frequently value and endorse the principles of Sort, Set in order, Shine, Standardize, and Sustain in their professional practices. It indicates that there is a strong alignment between teachers' attitudes and the principles of 5S. The high interpretation underscores that teachers view 5S as valuable and relevant to their roles, reflecting a commitment to maintaining high standards of organization and cleanliness in their classrooms. As observed, teachers' positive attitudes towards 5S are likely manifested in their behaviors and practices within the classroom. This could include proactive efforts to sort and organize materials, maintain cleanliness, and establish standardized procedures that support a conducive learning environment.

According, Jiang and Ren (2021) consistently implementing organizational practices like 5S in classrooms improves student behavior and academic performance. Additionally, Lee et al. (2020) emphasized the importance of teachers modeling these practices to encourage student participation and create a more structured learning environment. These studies highlight the importance of consistency in applying 5S to achieve its full benefits.

In line with this, the indicator **As a teacher, I actively engage the learners in the sorting process and provide opportunities for them to contribute ideas for organizing the classroom and promoting a collaborative and inclusive learning environment** got the highest mean of 3.56 (SD = 0.96), described as **At all Times** and interpreted as **Very High**. It means that teachers highly value and actively involve students in the organizational aspects of their learning environment. This suggests that teachers consistently prioritize engaging students in the sorting process and fostering their involvement in classroom organization. This approach indicates a commitment to creating a collaborative and inclusive learning environment. As observed, teachers' active engagement of learners in sorting processes likely results in a more organized and cohesive classroom environment. Students are encouraged to take ownership of their learning space, leading to increased motivation, accountability, and a sense of pride in their surroundings. This participatory approach fosters a positive classroom culture where students feel valued and respected for their contributions.

According to Smith and Brown (2023), actively engaging learners in the sorting process and providing opportunities for them to contribute ideas to organize the classroom has been shown to significantly enhance collaborative and inclusive learning environments. Smith and Brown conducted a study to investigate how student involvement in classroom organization influences learning outcomes. They found compelling evidence that when teachers actively involve students in sorting activities and encourage them to propose organizational ideas, it fosters a sense of ownership and responsibility among learners.

On the other hand, the indicator **As a teacher, I consistently prioritize a well-organized classroom by ensuring that all materials, supplies, and resources are promptly returned to their designated places after use, fostering a sense of responsibility and discipline among learners,** got the lowest mean of 2.87 (SD = 0.78), described as **Most of the Time** and interpreted as **High**. It means that while teachers recognize the importance of maintaining a well-organized classroom, there may be challenges or inconsistencies in consistently enforcing this practice. This suggests that while efforts are made to prioritize an organization, there is room for improvement in maintaining consistency. As perceived, it indicates that while teachers value and promote organizational discipline among learners, there may be challenges in achieving and maintaining these standards consistently. This aspect of classroom management requires clear expectations, consistent reinforcement, and support from both teachers and students.

According to Lee and Park (2021), teachers' organizational practices play a pivotal role in promoting student responsibility within the classroom. Lee and Park emphasize that when educators establish clear expectations for maintaining order and consistently enforce these standards, students develop essential habits of organization and accountability. By ensuring that materials, supplies, and resources are promptly returned to their designated places after use, teachers cultivate values of respect for shared resources among students.

**Table 4**
**Summary of Teachers' Level of Knowledge, Skills, and Attitude on 5S**

| Variables | Mean | SD | Interpretation |
|---|---|---|---|
| Knowledge | 3.33 | 0.63 | Very High |
| Skills | 3.22 | 0.88 | High |
| Attitude | 3.13 | 0.83 | High |
| **Overall** | **3.23** | **0.78** | **High** |
| ***Legend:*** | 3.26-4.00 At all Times / Very High 1.76-2.50 Sometimes/Low<br>2.51-3.25 Most of the Time/High 1.00-1.75 Never/ Very Low | | |

Table 4 shows the summary of teachers' **level of knowledge, skills, and attitude** on 5S with an overall mean of 3.23 (SD = 0.78), interpreted as **High**. It means that teachers possess a commendable level of knowledge, skills, and attitude regarding the 5S methodology, as indicated by the overall mean score. This suggests that teachers generally have a solid understanding of 5S principles, demonstrate proficiency in implementing related skills, and hold positive attitudes toward its application in educational settings. As observed, teachers' high level of knowledge, skills, and attitude towards 5S likely translates into well-organized classrooms characterized by efficiency, cleanliness, and a structured approach to teaching and learning. This observable outcome reflects the positive impact of 5S competencies on overall classroom dynamics and educational outcomes.

According to Yamamoto and Tanaka (2020), teachers' proficiency in 5S practices, which includes their knowledge, skills, and attitudes, plays a crucial role in shaping effective classroom organization and management. Teachers who possess comprehensive knowledge of 5S principles are better equipped to implement these practices in a manner that enhances efficiency and productivity within educational settings. They understand the sequential steps of the 5S framework—sorting, setting in order,

shining, standardizing, and sustaining—and recognize how each phase contributes to creating and maintaining an organized learning environment.

In line with this, the variable **Knowledge** got the highest mean of 3.33 (SD = 0.63), interpreted as **Very High**. It means that teachers possess a strong and comprehensive understanding of the 5S methodology, encompassing sorting, setting in order, shining, standardizing, and sustaining practices. This suggests that teachers have acquired substantial knowledge about the theoretical foundations and practical applications of 5S within educational settings. This deep understanding implies that teachers are well-prepared to implement and advocate for 5S principles effectively. As observed, teachers' high level of knowledge of 5S is likely manifested in observable practices such as well-organized classrooms, systematic management of resources, and adherence to cleanliness standards. Their informed approach to 5S principles supports efficient classroom operations and enhances the overall learning experience by minimizing distractions and optimizing instructional spaces.

According to Garcia and Martinez (2019), teachers' knowledge of 5S encompasses more than just physical organization within the classroom; it also encompasses the implementation of standardized procedures that play a crucial role in promoting consistency and streamlining classroom management. This understanding goes beyond merely arranging materials in a tidy manner; it involves establishing systematic routines and protocols that govern how classroom resources are utilized, maintained, and accessed by both teachers and students.

On the other hand, the variable **Attitude** got the lowest mean of 3.13 (SD = 0.83), interpreted as **High**. It means that while teachers generally hold positive attitudes towards the 5S methodology, there may be some variability or room for improvement in the consistency and depth of these attitudes. This suggests that while overall attitudes are positive, there may be aspects of 5S implementation where attitudes could be further strengthened or more consistently applied. As observed, teachers' attitudes towards 5S likely influence their behaviors and practices within the classroom. While the overall attitude is positive, variations in attitude may impact the extent to which teachers prioritize and integrate 5S principles into their daily routines and instructional strategies. Consistently reinforcing positive attitudes can lead to more sustained and effective implementation of 5S practices.

According to Saclolo and Ricafort (2019), teachers' attitudes towards 5S (sort, set in order, shine, standardize, sustain) in the workplace significantly impact its implementation and effectiveness. They emphasize that positive attitudes among educators are crucial for fostering a culture of cleanliness and organization within educational institutions. Saclolo and Ricafort further argue that when teachers perceive 5S as beneficial and necessary, they are more likely to actively participate in its adoption and maintenance, thereby enhancing overall organizational efficiency and effectiveness.

**Problem 2. What are teachers' challenges in School-Based Solid Waste Management regarding segregation, reusing, reducing, recycling, and disposal?**

**Table 5**
**Distribution of Teachers' Challenges on School-Based Solid Waste Management in terms of Segregation**

| Indicators | Mean | SD | Description |
|---|---|---|---|
| As a teacher… | | | |
| I have limited knowledge in segregating bins such as recyclables mixed with non-recyclables or organic waste, indicating a lack of proper segregation practices among learners and staff. | 2.96 | 0.75 | Agree |
| I have difficulty segregating waste due to the limited availability of separate bins for different waste streams. | 2.97 | 0.77 | Agree |
| I do not understand the importance and methods of waste segregation, resulting in inconsistent segregation practices. | 2.76 | 0.69 | Agree |
| I have limited awareness campaigns that cause resistance to adopting proper segregation practices. | 2.93 | 0.80 | Agree |
| I have difficulty in effectively monitoring waste segregation practices due to limited resources leading to inconsistent enforcement of segregation guidelines and practices. | 3.01 | 0.83 | Agree |
| **Overall** | **2.93** | **0.77** | **Agree** |

***Legend:*** 3.26-4.00 Strongly Agree / Highly Challenged; 2.51-3.25 Agree / Challenged; 1.76-2.50 Disagree / Moderately Challenged; 1.00-1.75 Strongly Disagree / Not Challenged

Table 5 presents the distribution of teachers' challenges on school-based solid waste management in terms of **segregation** with an overall mean of 2.93 (SD = 0.77), described as **Agree** and interpreted as **Challenged**. It means that teachers find the segregation of solid waste within schools to be a significant challenge. This indicates that effectively separating different types of waste is a problematic aspect of school-based solid waste management. It suggests that there are likely systemic issues or deficiencies in the current waste segregation processes. This might include inadequate training for teachers and students on proper waste segregation, insufficient infrastructure to support segregation efforts, or a lack of clear guidelines and policies. As observed, challenges in waste segregation can lead to mixed waste streams, which reduce the effectiveness of recycling programs and increase the volume of waste sent to landfills. This observation highlights the need for better systems and support for waste segregation.

According to Smith and Jones (2020), a significant barrier to effective waste segregation in schools is the lack of proper training and education for teachers. Their research highlights that many educators do not receive sufficient information or guidance on how to correctly separate different types of waste, such as recyclables, compostables, and non-recyclables. This knowledge gap can lead to improper segregation practices, which in turn reduces the effectiveness of recycling programs and increases contamination rates in recyclable materials.

In line with this, the indicator **As a teacher, I have difficulty in effectively monitoring waste segregation practices due to limited resources leading to inconsistent enforcement of segregation guidelines and practices,** got the highest mean of 3.01 (SD = 0.83), described as **Agree** and interpreted as **Challenged**. It means that one of the most significant challenges teachers face in school-based solid waste management is the effective monitoring of waste segregation practices. This indicates that limited resources severely hinder the consistent enforcement of segregation guidelines and practices. It suggests that there is a critical need for increased resources and support to improve the monitoring and enforcement of waste segregation. This could include more staff, better training, and adequate infrastructure to support effective segregation practices. As perceived, improving resource allocation for monitoring waste segregation is crucial for achieving consistent and effective waste management practices. Perceptions of the school's commitment to environmental sustainability and proper waste management are likely to improve with better monitoring and enforcement.

According to Garcia and Martinez (2021), limited resources can lead to significant inconsistencies in how waste segregation is practiced and enforced within school settings. This issue primarily arises when schools do not have enough bins designated for different types of waste, such as recyclables, compostables, and general waste. Without these essential infrastructure elements, students and staff often resort to disposing of all waste in a single bin, effectively undermining segregation efforts and the school's broader waste management strategy.

On the other hand, the indicator **As a teacher, I have a low level of understanding about the importance and methods of waste segregation resulting in inconsistent segregation practices,** got the lowest mean of 2.76 (SD = 0.69), described as **Agree** and interpreted as **Challenged**. It means that one of the less critical but still significant challenges in school-based solid waste management is the teachers' understanding of waste segregation. This indicates that while this issue is acknowledged, it is not perceived as the most pressing challenge**.** It suggests that there is a need for enhanced education and training programs focused on the importance and methods of waste segregation. Improving teachers' knowledge in this area can lead to more consistent and effective segregation practices. As observed, when teachers have a low level of understanding about waste segregation, it affects their ability to implement and enforce proper segregation practices. This observation highlights the need for ongoing professional development and support in waste management.

According to Williams and Thompson (2020), a low level of understanding among teachers about the importance and methods of waste segregation significantly contributes to inconsistent segregation practices within schools. Their research underscores that many educators lack comprehensive training and knowledge regarding effective waste management techniques, which is crucial for implementing consistent and effective waste segregation.

**Table 6**
**Distribution of Teachers' Challenges on School-Based Solid Waste Management in Terms of Reuse**

| Indicators<br>As a teacher… | Mean | SD | Description |
|---|---|---|---|
| I lack access to the availability of reusable alternatives to single-use items within the school, such as reusable water bottles, lunch containers, or stationery, contributing to increased waste generation. | 2.69 | 0.69 | Agree |
| I have a high prevalence of disposable products and packaging materials being used and discarded within the school, reflecting a culture of convenience and short-term consumption habits. | 2.97 | 0.77 | Agree |
| I lack on adopting reusable alternatives and to embrace behavior changes that prioritize reuse over single-use items due to perceived inconvenience. | 2.94 | 0.73 | Agree |
| I lack innovative ideas and solutions for reusing waste materials, limiting the potential for developing practical reuse strategies within the school and community. | 2.14 | 0.67 | Disagree |
| I am challenged in reusing waste materials due to poor quality, contamination, and degradation, which limit their sustainability for reusing. | 2.57 | 0.71 | Agree |
| **Overall** | **2.66** | **0.71** | **Agree** |

***Legend:*** 3.26-4.00 Strongly Agree / Highly Challenged; 2.51-3.25 Agree / Challenged; 1.76-2.50 Disagree / Moderately Challenged; 1.00-1.75 Strongly Disagree / Not Challenged

Table 6 presents the distribution of teachers' challenges on school-based solid waste management in terms of **reuse** with an overall mean of 2.66 (SD = 0.71), described as **Agree** and interpreted as **Challenged**. It means that teachers face notable challenges in implementing effective reuse strategies as part of school-based solid waste management. This indicates that teachers

recognize difficulties in promoting and integrating reuse practices within the school environment. It suggests that there are specific barriers or limitations that hinder teachers from fully embracing and executing reuse initiatives. These challenges could stem from a lack of resources, inadequate infrastructure, insufficient training, or a lack of student engagement and awareness regarding the importance of reuse in waste management. As observed, the challenges related to reuse might be reflected in the inconsistent or limited application of reuse practices within schools. This could manifest in less frequent use of reusable materials, difficulties in setting up effective reuse systems, or a general lack of integration of reuse principles into everyday school activities.

According to Lee and Park (2020), teachers face significant challenges in implementing school-based solid waste management practices, particularly in the area of reuse. Their research identifies several barriers that hinder effective reuse strategies within schools, emphasizing the need for comprehensive support and resources to overcome these challenges. Lee and Park found that one of the primary challenges teachers encounter is the lack of adequate resources and materials needed for effective reuse programs. Schools often do not have the necessary facilities, such as storage space for reusable items or equipment for repurposing materials. This lack of infrastructure makes it difficult for teachers to organize and manage reuse initiatives, leading to less effective implementation.

In line with this, the indicator **As a teacher, I have high prevalence of disposable products and packaging materials being used and discarded within the school, reflecting a culture of convenience and short-term consumption habits,** got the highest mean of 2.97 (SD = 0.77), described as **Agree** and interpreted as **Challenged**. It means that the widespread use and disposal of single-use products and packaging materials within the school environment is a significant challenge for teachers. This suggests that teachers frequently encounter and struggle with the dominance of disposable items, which reflects a broader issue of convenience-driven consumption habits. It indicates that efforts to shift towards more sustainable practices are hindered by the habitual use of disposables. The agreement among teachers about the prevalence of disposable products suggests that changing these consumption habits will require targeted interventions, such as increased awareness, education, and the provision of reusable alternatives. As observed, the frequent use and disposal of single-use items are likely evident in the waste generated within the school. This observation underscores the need for a cultural shift towards sustainability, where both teachers and students actively reduce reliance on disposable products and embrace reusable alternatives.

According to Garcia and Hernandez (2021), the prevalence of disposable products and packaging materials in schools is a significant indicator of a culture of convenience and short-term consumption habits. Their research indicates that such practices are pervasive in educational institutions, reflecting broader societal trends towards disposal and convenience. Garcia and Hernandez found that the frequent use of single-use items, such as plastic utensils, bottles, and packaging, is deeply ingrained in school routines. This prevalence is partly driven by the convenience these products offer, making them a popular choice among students, teachers, and school administrators. However, this reliance on disposable items contributes to substantial waste generation within the school environment, posing significant challenges for waste management and sustainability efforts.

On the other hand, the indicator **As a teacher, I lack innovative ideas and solutions for reusing waste materials, limiting the potential for developing practical reuse strategies within the school and community,** got the lowest mean of 2.14 (SD = 0.67), described as **Agree** and interpreted as **Challenged**. It suggests that professional development and targeted support are needed to equip teachers with the necessary skills and knowledge to innovate in the area of waste reuse. This could include training programs, workshops, and the sharing of best practices to inspire and empower teachers to develop effective reuse strategies. It indicates that the current focus on reuse within school-based solid waste management may be hindered by a lack of innovative thinking and resourcefulness among educators. This limitation could prevent the successful implementation of reuse initiatives and reduce the overall effectiveness of the school's waste management efforts. As observed, the limited innovation in reusing waste materials might lead to a reliance on traditional waste disposal methods, reducing the potential environmental benefits that could be achieved through creative reuse. This observation highlights the need to shift towards more inventive and sustainable waste management practices.

According to Tan et al. (2022), integrating creative education into waste management can significantly improve the effectiveness of sustainability initiatives in schools. Their research suggests that when teachers are trained to think creatively about waste management, they are more likely to develop innovative solutions that engage students and promote sustainable practices. Wang et al. (2021) also emphasize the importance of creative education in fostering sustainable waste management practices. They highlight that training programs that encourage innovative thinking can lead to the development of practical and effective reuse strategies, ultimately contributing to a culture of sustainability within schools and communities.

**Table 7**
**Distribution of Teachers' Challenges on School-Based Solid Waste Management in terms of Reduce**

| Indicators | Mean | SD | Description |
|---|---|---|---|
| As a teacher… | | | |
| I have limited utilization of one-time-use items, such as plastic bottles that are disposable, straws, and food packaging on school grounds, resulting in a surge of waste production. | 2.78 | 0.81 | Agree |
| I have low utilization of reusable alternatives to single-use items, such as refillable water bottles, lunch containers, and cloth bags, indicating a lack of commitment to waste generation. | 2.73 | 0.76 | Agree |
| I have insufficient incorporation of waste reduction concepts and principles into the school curriculum, leading to a lack of awareness and understanding among learners about the importance of waste reduction and sustainable consumption. | 2.63 | 0.71 | Agree |
| I lack participation in waste reduction initiatives which hinder the effectiveness of efforts to reduce waste generation. | 2.97 | 0.78 | Agree |
| I lack of comprehensive waste reduction initiatives and programs such as recycling programs, composting facilities, and waste minimization campaigns. | 2.93 | 0.72 | Agree |
| **Overall** | **2.81** | **0.76** | **Agree** |

***Legend:*** 3.26-4.00 Strongly Agree / Highly Challenged 1.76-2.50 Disagree / Moderately Challenged
2.51-3.25 Agree / Challenged 1.00-1.75 Strongly Disagree / Not Challenged

Table 7 presents the distribution of teachers' challenges on school-based solid waste management in terms of **reduce** with the overall mean of 2.81 (SD = 0.76), described as **Agree** and interpreted as **Challenged**. It means that although teachers are aware of the importance of reducing waste, the actual application of reduction strategies is hindered by various obstacles. The agreement on this challenge highlights the need for more comprehensive approaches to support waste reduction, including policy changes, resource allocation, and educational initiatives. It suggests that there are systemic or practical barriers preventing teachers from effectively reducing waste within the school environment. This observation points to the need for more effective strategies and programs that target the root causes of waste generation and promote sustainable consumption behaviors.

According to Martinez and Cruz (2020), teachers face significant challenges in implementing school-based solid waste management strategies focused on waste reduction. Their research identifies several key obstacles that educators encounter, which hinder their ability to effectively reduce waste within the school environment. Martinez and Cruz emphasize the role of school policies and administrative support in facilitating waste reduction efforts. Schools that lack clear policies and administrative backing for sustainability initiatives often struggle to implement effective waste reduction programs. Teachers need the support of school leaders to prioritize and institutionalize waste reduction practices, including the provision of necessary resources and the establishment of school-wide policies that promote sustainability.

In line with this, the indicator **As a teacher, I lack participation in waste reduction initiatives which hinder the effectiveness of efforts to reduce waste generation** got the highest mean of 2.97 (SD = 0.78), described as **Agree** and interpreted as **Challenged**. It means that increasing teacher participation in waste reduction initiatives could substantially improve the effectiveness of these efforts. The agreement on this challenge underscores the need for strategies that actively involve teachers in planning, implementing, and sustaining waste reduction activities. It suggests that there are underlying reasons why teachers may not be participating in waste reduction initiatives. These reasons could include a lack of awareness, insufficient time, inadequate support from the school administration, or a perceived lack of impact from their individual actions. Addressing these underlying issues could enhance teacher engagement in waste reduction efforts. As observed, the low level of teacher participation may lead to less effective waste reduction initiatives, as teachers play a crucial role in modeling and promoting sustainable behaviors among students. Without their active involvement, it is challenging to create a school-wide culture of sustainability.

According to a study by Smith and Brown (2021), teacher participation is a critical factor in the success of waste reduction initiatives within schools. Their research indicates that a lack of teacher involvement significantly hampers the effectiveness of efforts to minimize waste generation. The study explores various reasons for this lack of participation and its impact on the overall sustainability efforts in educational settings. The study also highlights the importance of institutional support in fostering teacher participation. Schools that do not prioritize sustainability or fail to provide the necessary resources and encouragement for waste reduction initiatives create an environment where teachers feel unsupported and less motivated to participate. Conversely, schools with strong leadership and a clear commitment to sustainability are more likely to see higher levels of teacher involvement in waste reduction efforts.

On the other hand, the indicator **As a teacher, I have insufficient incorporation of waste reduction concepts and principles into the school curriculum, leading to a lack of awareness and understanding among learners about the importance of waste reduction and sustainable consumption,** got the lowest mean of 2.63 (SD = 0.71), described as **Agree** and interpreted as **Challenged**. It means that there is a need for curriculum reform or enhancement to prioritize waste reduction and sustainable consumption education. This highlights the importance of revisiting educational strategies to ensure that students are adequately informed and engaged in environmental stewardship. It suggests that insufficient incorporation of waste reduction concepts into the curriculum may lead to a lack of awareness and understanding among students about the importance of waste

reduction and sustainable consumption. This gap in education can hinder efforts to foster a culture of sustainability within the school environment. As observed, the lack of emphasis on waste reduction concepts in the curriculum may result in missed opportunities to instill values of environmental responsibility and sustainable practices among students. This observation underscores the potential impact of educational reforms in shaping future generations' attitudes towards waste management.

According to Jones and Smith (2020), a curriculum that lacks comprehensive waste reduction content fails to provide students with the essential knowledge and skills necessary for engaging in sustainable practices. They argue that integrating waste reduction into educational frameworks is crucial not only for enhancing environmental literacy but also for fostering the development of responsible global citizens. Jones and Smith highlight that educational systems play a pivotal role in shaping students' understanding of environmental issues. By embedding waste reduction concepts into curricula, schools can effectively educate students about the impacts of waste on the environment and society. This education goes beyond mere awareness by equipping students with practical strategies and critical thinking skills needed to address environmental challenges proactively.

**Table 8**
**Distribution of Teachers' Challenges on School-Based Solid Waste Management in terms of Recycle**

| Indicators<br>As a teacher… | Mean | SD | Description |
|---|---|---|---|
| I have limited availability of recycling bins or containers within the school premises, leading to a lack of convenient options for integrating. | 3.23 | 0.82 | Agree |
| I lack an understanding of the importance of recycling and the proper methods of sorting and disposing of recyclable materials. | 2.75 | 0.69 | Agree |
| I have limited access to recycling facilities or collection services within the local community, hindering efforts to recycle materials generated within the school. | 2.89 | 0.73 | Agree |
| I lack a recycling facility for processing recyclable materials. | 3.01 | 0.77 | Agree |
| I struggle with the contamination of recycling bins with non-recyclable materials such as food waste, liquids, and hazardous items, making recycling difficult to process. | 3.00 | 0.86 | Agree |
| **Overall** | **2.98** | **0.77** | **Agree** |

***Legend:*** 3.26-4.00 Strongly Agree / Highly Challenged 1.76-2.50 Disagree / Moderately Challenged
2.51-3.25 Agree / Challenged 1.00-1.75 Strongly Disagree / Not Challenged

Table 8 presents the distribution of teachers' challenges on school-based solid waste management in terms of **recycle** with an overall mean of 2.98 (SD = 0.77), described as **Agree** and interpreted as **Challenged.** It means that teachers face significant challenges in implementing recycling initiatives within school-based solid waste management. It implies that there are recognized difficulties in effectively managing and promoting recycling practices among educators. It suggests that there may be systemic barriers hindering the successful implementation of recycling programs in schools. These barriers could include logistical issues such as inadequate infrastructure for sorting and processing recyclables, lack of clear guidelines or support from school administration, and insufficient awareness or motivation among teachers and students. As observed, the challenges related to recycling may manifest in inconsistencies or inefficiencies in waste management practices within schools. This observation highlights the potential impact on environmental sustainability goals and the need for improved systems and support mechanisms to streamline recycling processes.

According to Brown and Lee (2020), inconsistent participation and commitment from teachers present a significant challenge in establishing a cohesive and effective recycling culture within schools. Their research emphasizes that varying levels of engagement among educators hinder the sustainability and success of recycling efforts.

In line with this, the indicator **As a teacher, I have limited availability of recycling bins or containers within the school premises, leading to a lack of convenient options for integrating,** got the highest mean of 3.23 (SD = 0.82), described as **Agree** and interpreted as **Challenged**. It means that the availability of recycling bins or containers within school premises is insufficient, posing a significant obstacle to effective recycling efforts among teachers. The highest mean score suggests that teachers perceive a lack of convenient options for integrating recycling into their daily practices. It indicates that the current lack of recycling bins within school premises is hindering efforts to promote sustainable waste management practices. The agreement on this challenge underscores the importance of investing in infrastructure that supports environmentally responsible behaviors and initiatives. As observed, the limited availability of recycling bins may result in mixed waste streams, where recyclable materials are disposed of as general waste due to the absence of proper disposal options. This observation highlights the potential impact of inadequate infrastructure on recycling rates and waste diversion efforts.

According to Smith et al. (2021), the absence or insufficient number of recycling bins within schools represents a significant obstacle that impedes teachers' efforts to effectively incorporate recycling into their educational activities. They argue that easy access to recycling containers is not merely convenient but crucial for seamlessly integrating sustainable practices into daily routines and educational lessons, thereby fostering environmental awareness among students.

On the other hand, the indicator **As a teacher, I lack understanding about the importance of recycling and the proper methods of sorting and disposing recyclable materials,** got the lowest mean of 2.75 (SD = 0.69), described as **Agree** and

interpreted as **Challenged**. It means that there is a gap in teachers' knowledge and awareness regarding the importance of recycling and the proper methods of sorting and disposing recyclable materials. This suggests that teachers acknowledge a need for improvement in their understanding of these critical aspects of waste management. It indicates that there is a potential disconnect between the importance of recycling and teachers' current knowledge and practices. The agreement on this challenge highlights the need for educational initiatives that prioritize environmental literacy and equip educators with the skills and information necessary to promote sustainable behaviors among students. As observed, the lack of understanding about recycling among teachers may impact the implementation and effectiveness of recycling programs within schools. Teachers play a crucial role in modeling behaviors and educating students about environmental stewardship, making their knowledge and engagement essential for successful waste management initiatives.

According to Brown and Smith (2020), insufficient education and awareness about recycling principles significantly hinder teachers' ability to confidently incorporate recycling into their educational practices.

**Table 9**
**Distribution of Teachers' Challenges on School-Based Solid Waste Management in terms of Disposal**

| Indicators<br>As a teacher… | Mean | SD | Description |
|---|---|---|---|
| I am challenged with littering, illegal dumping, or throwing waste into inappropriate areas within school premises. | 3.48 | 0.93 | Strongly Agree |
| I have insufficient waste disposal infrastructure, such as waste bins, containers, or disposal facilities, resulting in difficulties in managing and containing waste properly. | 2.96 | 0.74 | Agree |
| I am challenged by irregular waste collection services within the school, leading to the accumulation of waste and overflowing bins, creating sanitation and hygiene concerns. | 3.25 | 0.91 | Agree |
| I am challenged by the difficulty in disposing of hazardous waste materials generated within the school, such as broken window glasses and facemasks. | 3.47 | 0.95 | Strongly Agree |
| I am challenged on the presence of environmental pollution and health risks associated with improper waste disposal practices, such as contamination of soil, water bodies, or air quality, posing a risk to human health and ecosystem integrity. | 3.01 | 0.83 | Agree |
| **Overall** | **3.23** | **0.87** | **Agree** |

***Legend:*** 3.26-4.00 Strongly Agree / Highly Challenged; 2.51-3.25 Agree / Challenged; 1.76-2.50 Disagree / Moderately Challenged; 1.00-1.75 Strongly Disagree / Not Challenged

Table 9 presents the distribution of teachers' challenges on school-based solid waste management in terms of **disposal** with an overall mean of 3.23 (SD = 0.87), described as **Agree** and interpreted as **Challenged.** It means that teachers perceive significant challenges in managing school-based solid waste disposal effectively. The overall mean suggests that there are acknowledged difficulties in handling waste disposal practices within school premises. It indicates that while there is recognition of the importance of proper waste disposal, the practical implementation of disposal practices within schools is challenging. The agreement on this challenge underscores the need for targeted interventions and improvements to enhance waste management strategies. As observed, challenges in waste disposal may manifest in practices within the school, such as improper segregation of waste streams, overflowing bins, inadequate waste storage facilities, or delays in waste collection. These observations highlight areas where improvements can be made to ensure safe, sanitary, and environmentally responsible waste disposal practices.

According to Johnson and Garcia (2021), one of the primary challenges teachers encounter in school-based solid waste management revolves around the absence of clear guidelines and adequate resources for proper waste disposal practices. They argue that the lack of comprehensive support and training on disposal methods significantly impedes educators' ability to manage and dispose of waste effectively within school premises, thereby raising concerns related to both environmental impact and public health.

In line with this, the indicator **As a teacher, I am challenged on the littering, illegal dumping, or throwing waste into inappropriate areas within school premises** got the highest mean of 3.48 (SD = 0.93), described as **Strongly Agree** and interpreted as **Highly Challenged**. It means that there is a significant issue with littering, illegal dumping, or improper waste disposal practices within school premises, as perceived by teachers. The highest mean indicates that teachers identify this behavior as a prevalent and serious challenge. It suggests that there may be a need for stricter enforcement of waste management policies and regulations within the school environment. The high level of agreement among teachers implies that current measures to prevent littering and illegal dumping may be insufficient or inconsistently enforced. As observed, littering, illegal dumping, or improper waste disposal practices may manifest in visible signs of environmental degradation within the school premises. These observations highlight the impact of such behaviors on the aesthetics, cleanliness, and overall well-being of the school community.

According to Smith and Jones (2020), littering and improper waste disposal within schools are frequently attributed to a combination of insufficient awareness and inadequate enforcement of waste management policies. Their research underscores that in the absence of clear guidelines and consistent monitoring, both students and staff may engage in behaviors that compromise efforts to uphold a clean and environmentally responsible school environment.

On the other hand, the indicator **As a teacher, I have insufficient waste disposal infrastructure, such as waste bins, containers, or disposal facilities resulting to difficulties in managing and containing waste properly,** got the lowest mean of 2.96 (SD = 0.74), described as **Agree** and interpreted as **Challenged**. It means that there is a recognized deficiency in waste disposal infrastructure within the school environment. This suggests that teachers perceive insufficient waste bins, containers, or disposal facilities as a significant issue affecting waste management practices. It indicates that the lack of sufficient waste disposal infrastructure hinders the school's ability to maintain a clean, organized, and hygienic environment. Addressing this challenge is essential for enhancing the overall cleanliness and functionality of the school premises. As observed, inadequate waste disposal infrastructure may manifest in overflowing bins, improper waste storage, or limited options for waste segregation. These observations underscore the practical challenges faced by teachers and staff in managing waste effectively within the school setting.

According to Garcia and Lee (2021), the availability and accessibility of waste bins and disposal facilities are pivotal factors influencing the effective management of waste within educational settings. Their research underscores that insufficient infrastructure, such as a limited number of waste bins or poorly placed disposal facilities, poses significant challenges for teachers striving to maintain cleanliness and hygiene within school premises. The researchers also emphasize the broader implications of inadequate waste infrastructure on school operations and sustainability initiatives. They suggest that without proper disposal facilities, educational institutions may struggle to comply with waste management regulations and sustainability goals set by local authorities or educational policies. This can hinder efforts to educate students about environmental responsibility and sustainability practices, which are essential to modern education.

**Table 10**
**Summary of Teachers' Challenges on School-Based Solid Waste Management**

| Variables | Mean | SD | Interpretation |
|---|---|---|---|
| Segregate | 2.93 | 0.77 | Challenged |
| Reuse | 2.66 | 0.71 | Challenged |
| Reduce | 2.81 | 0.76 | Challenged |
| Recycle | 2.98 | 0.77 | Challenged |
| Disposal | 3.23 | 0.87 | Challenged |
| **Overall** | **2.92** | **0.78** | **Challenged** |

***Legend:*** 3.26-4.00 Strongly Agree / Highly Challenged 1.76-2.50 Disagree / Moderately Challenged
2.51-3.25 Agree / Challenged 1.00-1.75 Strongly Disagree / Not Challenged

Table 10 shows the summary of **teachers' challenges on school-based solid waste management** with an overall mean of 2.92 (SD = 0.78), interpreted as **Challenged**. It means that teachers perceive significant challenges in managing school-based solid waste effectively. This suggests that there are acknowledged difficulties and obstacles in the current practices and policies related to solid waste management within schools. It indicates that the effectiveness of current waste management practices in schools may be limited, contributing to environmental, health, and operational concerns. The acknowledgment of challenges underscores the urgency of implementing sustainable and efficient waste management solutions. As observed, challenges in school-based solid waste management may manifest in various ways, such as inadequate infrastructure, improper waste disposal practices, insufficient recycling initiatives, or difficulties in promoting responsible waste behaviors among students and staff.

According to Garcia and Johnson (2019), teachers' challenges in school-based solid waste management have significant educational and environmental implications, primarily stemming from limited training and professional development opportunities in waste management topics. Their research underscores that when educators lack sufficient knowledge and skills in waste reduction, recycling, and environmental stewardship, they may struggle to convey these critical concepts to students effectively.

In line with this, the variable **Disposal** got the highest mean of 3.23 (SD = 0.87), interpreted as **Challenged.** It means that teachers face significant challenges specifically related to solid waste disposal within school premises. This suggests that disposal practices are particularly problematic and require urgent attention and improvement. It indicates that the effectiveness of waste disposal practices in schools may be compromised, leading to potential environmental, health, and operational impacts. The recognition of disposal challenges underscores the need for strategic interventions and improvements to enhance waste management efficiency and sustainability. As observed, challenges in waste disposal may manifest in various ways, such as overflowing bins, improper waste segregation, limited waste collection schedules, or inadequate disposal facilities. These observations highlight operational deficiencies that contribute to a less hygienic and organized school environment.

According to Lee and Smith (2020), teachers face significant complexities when managing the disposal of solid waste within school premises, primarily due to logistical challenges related to inadequate disposal infrastructure. Their research underscores that insufficient waste bins and inconsistent waste collection schedules pose substantial obstacles for educators in effectively handling and disposing of various types of waste.

On the other hand, the variable **Reuse** got the highest mean of 2.66 (SD = 0.71), interpreted as **Challenged**. It means that teachers perceive significant challenges in implementing reuse practices within school-based solid waste management. This indicates that reusing materials and resources effectively is particularly difficult and presents obstacles in current waste management practices. It suggests that there is a need for strategies to enhance and promote reuse initiatives within schools. The high agreement on this challenge suggests that existing efforts to encourage reuse may be insufficient or not effectively implemented, leading to missed opportunities for waste reduction and resource conservation. As observed, challenges in

implementing reuse practices may manifest in various ways, such as limited availability of reuse programs, lack of awareness among students and staff about reuse benefits, or logistical difficulties in storing and repurposing materials.

According to Brown et al. (2020), integrating reuse practices into educational activities presents substantial logistical complexities that educators often encounter. Their research underscores several key issues that contribute to these challenges, ultimately impacting efforts to promote environmental stewardship among students.

**Problem 3. Is there a significant relationship between the teachers' knowledge, skills, and attitudes on 5s and the challenges of School-Based Solid Waste Management?**

**Table 11**
**Result of the Test on Relationship between the Teachers' Knowledge, Skills, and Attitudes on 5S and the Challenges on School-Based Solid Waste Management**

| 5S | Challenges on School-Based Solid Waste Management | | | | | |
|---|---|---|---|---|---|---|
| | Segregate<br>r-value<br>p-value | Reuse<br>r-value<br>p-value | Reduce<br>r-value<br>p-value | Recycle<br>r-value<br>p-value | Disposal<br>r-value<br>p-value | **Overall**<br>r-value<br>p-value |
| Knowledge | 0.63<br>0.0243*<br>S | 0.43<br>0.0469*<br>S | 0.87<br>0.0164*<br>S | 0.19<br>0.0480*<br>S | 0.83<br>0.0205*<br>S | 0.59<br>0.0312*<br>S |
| Skills | 0.32<br>0.0689<br>NS | 0.57<br>0.0597<br>NS | 0.43<br>0.0286*<br>S | 0.76<br>0.0476*<br>S | 0.77<br>0.0186*<br>S | 0.57<br>0.0447*<br>S |
| Attitude | 0.60<br>0.0156*<br>S | 0.54<br>0.0196*<br>S | 0.67<br>0.0134*<br>S | 0.61<br>0.0151*<br>S | 0.64<br>0.0176*<br>S | 0.61<br>0.0163*<br>S |
| **Overall** | **0.52**<br>**0.0363***<br>**S** | **0.51**<br>**0.0421***<br>**S** | **0.66**<br>**0.0195***<br>**S** | **0.52**<br>**0.0369***<br>**S** | **0.75**<br>**0.0189***<br>**S** | **0.59**<br>**0.0307***<br>**S** |

Legend: S- Significant NS-Not Significant

Table 11 provides an analysis of the relationship between teachers' Knowledge, Skills, and Attitudes on 5S and the various **challenges associated with school-based solid waste management**. The data, presented through correlation coefficients (r-values) and p-values, indicates the significance of these relationships. A significant relationship is denoted when the p-value is less than 0.05, indicated as "S" in the table, while a p-value greater than 0.05 is marked as not significant (NS). As observed**,** when the p-values are greater than 0.05, marked as not significant (NS), it means there is no statistically significant relationship between certain KSA aspects and the challenges in solid waste management. This could imply that for those specific areas, other factors might be more influential in addressing waste management challenges, and thus, focusing solely on improving KSA in these aspects may not yield significant improvements.

The table reveals that teachers' knowledge has a significant impact on several aspects of solid waste management in schools. Specifically, knowledge significantly affects segregation, reuse, reduce, recycling and disposal, and overall waste management challenges with p-values of 0.0243, 0.0469, 0.0480, 0.0205, and 0.0312, respectively. Knowledge of 5S has a significant relationship with segregation, implying that applying 5S principles in schools can create a well-organized and efficient waste segregation system that promotes sustainability, reduces waste, and ensures the schools' compliance with environmental regulations.

Knowledge on 5S towards reuse promotes an organized classhome which makes it easier to identify items that can be reuse. When unnecessary clutter is minimized, it allows us to have a clearer view of available resources that could be repurposed instead of discarded, and it also encourages teachers to think creatively about how to utilize existing materials. Teachers' knowledge of 5S towards reduction suggests that a structured approach of 5S in reducing waste enhances efficiency and productivity while fostering a sustainable educational environment. Knowledge of 5S towards recycling indicates that by implementing a structured recycling system, schools can effectively minimize overall waste and promote environmental stewardship among learners. Teachers' knowledge of 5S towards disposal suggests that teachers who are well-versed in 5S are more likely to understand and value the importance of efficient disposal practices.

Overall, a significant relationship between teachers' knowledge of 5S and the challenges of school-based solid waste management suggests that teachers' knowledge of 5S is vital for addressing challenges in school-based solid waste management, which leads to effective segregation, streamlined processes, maintenance of cleanliness, educational opportunities, resource efficiency, and leadership in promoting sustainability.

On the other hand, skills show a significant relationship with reduction, recycling, disposal, and overall challenges, indicated by p-values of 0.0286, 0.0476, 0.0186, and 0.0447, respectively. Teacher's skills on 5S significantly impact the reduction of waste in school-based solid waste management by promoting awareness and education, efficient use of resources, and sustainable practices. On the other hand, teachers' skills in 5S show a significant relationship with recycling, indicating that strong 5S skills among teachers can create and maintain effective recycling systems. Teachers' ability to implement and maintain standardized

recycling procedures ensures consistent and correct recycling practices. Lastly, a significant relationship between 5S and disposal indicates that teachers skilled in 5S are more likely to implement more effective disposal practices.

However, skills do not significantly impact segregation and reuse, with p-values of 0.0689 and 0.0597. This indicates the absence of a significant relationship between the teachers' 5S skills and the practices of segregation and reuse, highlighting the need for a more holistic approach to waste management in schools. It implies that while 5S provides a strong foundation for organizing and maintaining a clean environment, it should be supplemented with targeted training, additional support, and infrastructural improvement to meet the specific challenges of segregation and reuse effectively. As observed**,** the significant p-values for reduction, recycling, disposal, and overall challenges highlight that teachers' skills are a critical factor in managing these aspects of solid waste. However, the non-significant p-values for segregation and reuse suggest that skill development alone may not be enough, and a more integrated approach might be necessary.

Attitudes exhibit a strong and significant relationship across all areas, including segregation, reuse, reduction, recycling, disposal, and overall challenges, with p-values ranging from 0.0134 to 0.0198. This highlights the critical role that teachers' attitudes play in managing school-based solid waste effectively. Teachers with a positive attitude towards 5S principles are more likely to implement and sustain effective school waste management practices. It implies that fostering positive attitudes towards 5S principles among teachers is essential for effective solid waste management in schools. Teachers who embrace these principles are more likely to engage in and promote sustainable waste management practices**.** As observed**,** the significant p-values across all areas of waste management suggest that teachers with positive attitudes are better equipped to handle the complexities of solid waste management. This highlights the need for interventions that target and improve attitudes towards 5S principles.

The overall result shows a significant relationship between teachers' knowledge, skills, and attitude on 5S and the challenges on school-based solid waste management lies in their ability to design, implement, and sustain effective waste management. Teachers' knowledge provides a foundation that helps them minimize waste, ensure proper waste segregation, and encourage recycling and reuse within the school. Teachers' skills on 5S which develop through training directly impact on how waste is managed on a day-to-day basis. Teachers' ability to organize resources and processes ensures that waste segregation bins are properly set up and disposal processes are efficient. Their attitudes towards 5S play a crucial role in shaping the schools' culture around waste management. It shows that when teachers are committed to 5S principles and exhibit a positive attitude towards segregating, reusing, reducing, recycling, and disposal can inspire similar attitudes among students and staff. These elements enable schools to address the complexities of waste management more effectively and foster a culture of sustainability within the school community.

According to Reyes and Martinez (2020), the effectiveness of school-based solid waste management programs is significantly influenced by teachers' knowledge, skills, and attitudes toward the 5S methodology. Their study found that teachers who possessed a thorough understanding of the 5S principles—Sort, Set in order, Shine, Standardize, and Sustain—were more successful in implementing sustainable waste management practices in schools. This comprehensive knowledge enabled teachers to effectively design and manage waste reduction initiatives, leading to cleaner and more organized school environments.

In another study, Lee and Kim (2019) emphasized the importance of teachers' skills in applying 5S principles to address the challenges of solid waste management in educational settings. They highlighted that teachers with higher proficiency in these skills could better engage students in waste management activities, fostering a culture of environmental responsibility. The study also noted that practical training and continuous professional development are crucial for enhancing teachers' capabilities in this area.

## IV. DISCUSSIONS

The findings indicate that teachers' knowledge of 5S principles significantly impacts several areas of waste management. Specifically, knowledge shows a strong positive correlation with segregation, reuse, recycling, disposal, and overall waste management challenges. This suggests that teachers who are well-informed about the principles of 5S are better equipped to implement and manage effective waste segregation, encourage reuse, and promote recycling practices within the school environment. The significant p-values (less than 0.05) for these areas underscore the importance of educational programs that enhance teachers' understanding of 5S principles, as this knowledge translates into practical and effective waste management strategies.

Skills also play a crucial role in addressing waste management challenges, particularly in the areas of reduction, recycling, disposal, and overall management. The significant relationships observed in these areas (p-values less than 0.05) highlight that teachers with well-developed skills can effectively reduce waste generation, recycle materials efficiently, and manage waste disposal processes. However, it is notable that skills did not significantly impact segregation and reuse, indicating that while practical skills are essential, they may not alone suffice to address all aspects of waste management. This finding suggests that a combination of skills enhancement and knowledge dissemination is necessary to tackle the full spectrum of waste management challenges in schools.

Attitudes towards 5S principles emerged as a critical factor influencing all areas of school-based waste management. The consistent significant correlations across segregation, reuse, reduction, recycling, disposal, and overall challenges (with p-values all below 0.05) indicate that teachers' attitudes play a pivotal role in the successful implementation of waste management practices. Positive attitudes towards waste management are likely to foster a proactive approach to waste segregation, encourage innovative reuse practices, and support the maintenance of a clean and sustainable school environment. This underscores the need for initiatives that not only educate but also positively shape teachers' attitudes toward waste management.

According to the study of Limpot Nelma 2022, school officials and LGUs should conduct training and seminar workshops to strengthen the capability of of teachers to execute solid waste management programs. Training and workshops conducted by school officials and LGUs are essential in equipping teachers with the knowledge, skills, and attitudes needed to implement and sustain solid waste management programs effectively. This collaboration enhances the school environment and contributes to broader community efforts towards environmental sustainability.

In conclusion, the study highlights the importance of enhancing teachers' knowledge, skills, and attitudes toward 5S principles to effectively address school-based waste management challenges in the Villanueva North District. While knowledge and attitudes show a broad and significant impact across all areas, skills are particularly crucial for specific aspects such as waste reduction and recycling. Therefore, professional development programs should adopt a holistic approach integrating knowledge enhancement, skills training, and attitude building to promote sustainable school waste management practices. These findings provide a roadmap for educational policymakers and school administrators aiming to foster an environmentally conscious and responsible school community.

## V. CONCLUSIONS

Based on the result of the study, it is concluded that knowledge of 5S got the highest mean, which was interpreted as Very High. On the other hand, disposal has the highest mean, which was interpreted as Challenge. In this study, teachers' knowledge, skills, and attitudes have a strong and significant relationship with the challenges of School-Based Solid Waste management.

Thus, a strong relationship between knowledge and disposal highlights the importance of targeted educational programs that enhance teachers' understanding of effective waste management techniques. Such programs should focus on providing comprehensive training on the principles and applications of 5S, enabling teachers to integrate these practices into their daily routines. This, in turn, can lead to improved waste disposal outcomes and a cleaner, more organized school environment.

Therefore, professional development programs should focus on enhancing teachers' knowledge to achieve a more holistic and effective approach to solid waste management in schools. This will improve waste management practices and also contribute to the creation of a healthier and more sustainable educational environment.

## VI. RECOMMENDATIONS

Based on the conclusion drawn from the study, the following recommendations are provided:

1. The DepEd Officials should conduct training programs that focus on developing positive attitudes towards 5S principles, which is essential. Workshops, seminars, and motivational sessions should be conducted to foster a more positive mindset among teachers regarding 5S principles.
2. The school head should implement practical activities highlighting the importance and benefits of reusing materials. This could include setting up reuse stations, creating projects from reusable materials, and incorporating reuse concepts into the curriculum to ensure that both teachers and students understand and engage in reuse practices ith the help of parents and the community.
3. Teachers should be given support and resources to reinforce their learning and sustain their commitment to 5S principles as well as in solid waste management.
4. Further research should be conducted to enhance the implementation of 5S and solid waste management at the school and division level in order to develop a learning environment conducive to learning and for the improvement of school performance.

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