

Impact of Sensory Processing Disorders on Learning Outcomes in Inclusive Classrooms

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ABSTRACT:

The aim of inclusive education is to provide equal learning opportunities to all learners and yet, learners with SEN Processing Disorder (SPD) tend to be highly stressed which may hinder their performance in school and capacity to engage in learning. This research examines the differences between learning outcomes of inclusive classrooms with and without SPD with regard to cognitive, behavioral, emotional and social aspects of student development. The study determines the influence of sensory sensitivities, including hypersensitivity and hyposensitivity to environmental stimuli on attention, memory, communication, and general involvement in the learning processes. To overcome these difficulties, the paper suggests a holistic adaptive support system that will be based on the integration of sensory profiling, multisensory teaching

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techniques, environmental adjustments, assistive technologies, and ongoing evaluation systems. This structure is created in the form of a round that enables customization of the learning process and adaptation to the personal sensory needs. Comparison and contrast of the conventional method of teaching and the proposed framework shows a tremendous improvement in the attention span, the number of tasks completed, and conceptual knowledge, behavioral stability, emotional regulation, and social engagement. The results provide the significance of instructional practices in accordance with sensory preferences to minimize cognitive load and maximize learning effectiveness. Technology and inclusive pedagogy also contribute to the accessibility and engagement of the learning experience, and makes the learning environment more responsive and student centered. Although the proposed framework may have certain implementation-related issues, such as resource limitations and teacher training, the proposed framework provides a scalable and comprehensive approach to enhancing the educational results. The research has an impact on the area of inclusive education as it highlights the importance of sensory processing in the process of learning and offers a model to educators and institutions. It concludes that to directly or indirectly support academic success of diverse learners, it is important to address sensory needs to achieve meaningful inclusion.

Keywords: Sensory Processing Disorder (SPD), Inclusive Education, Learning Outcomes, Multisensory Learning, Assistive Technology, Adaptive Learning Framework, Cognitive Development, Educational Accessibility, Special Education, Classroom Environment.

I. Introduction

Inclusive education has been identified as a revolutionary concept that should be used to provide equal learning experience to every student regardless of their physical, cognitive and neurological disabilities. Under this paradigm, more focus is being given to neurodevelopmental conditions which have a great impact on the classroom interaction and academic achievement. A neurological disorder is Sensory Processing Disorder (SPD), where the brain struggles to accept, arrange and react to the sensory input which the environment provides. Even though SPD is not necessarily a distinct diagnosis, its consequences are well-known in the fields of education and therapy, especially when working with diverse learners in the

inclusive classroom where learners with various needs have to be taken into consideration. The way people perceive and interact with the environment is based on sensory processing. There is a great variety of sensory experiences that students are exposed to in a typical classroom setting, such as auditory cues of instructions, visual learning resources, touch, and activities that involve movement. To the majority of learners the brain is able to process the inputs efficiently to enable understanding and reaction. Nevertheless, students with SPD tend to be either hypersensitive or hyposensitive to sensory input and as a result, have some problems like distraction, overstimulation, delayed responses, or avoidance behaviors. These factors may greatly disrupt the learning process in

which a student can participate in the classroom activities and get the targeted learning outcomes. The same trends in sensory and cognitive difficulties have been found in developmental and cognitive disabilities where the usability and accessibility of learning tools are very essential in engagement and participation (Huang et al., 2025).

The relevance of research on SPD in inclusive classrooms is highlighted by the fact that the world is moving towards inclusion of students with various abilities in conventional learning settings. The purpose of inclusive classes is to encourage equal access, social and collaborative learning. Nonetheless, the learners are also diverse, and this comes with complexities on how to design instruction and how to manage the classroom. Sensory processing students may be poorly diagnosed or even misdiagnosed due to the fact that their needs can be confused with some other neurodevelopmental disorders like autism spectrum disorder or other anxiety-related disorders. As an example, problems with emotional regulation and social communication, which are also related to sensory problems, have also been identified in research involving students with autism in special and general schools (Achtayi and Papoudi, 2024; Park et al., 2025).

The effect of SPD on learning outcome is multidimensional as it affects cognitive, behavioral, emotional, and social learning outcome of a student. Cognitively, issues with sensory processing may be a hindrance to attention, memory, and processing of information, which in turn may influence academic performance. Behaviorally, students can exhibit the disruptive behavior or avoidant behavior as a coping mechanism due to sensory overload. On an emotional level, continuous sensory difficulties may lead to anxiety, stress and a lack of self-confidence. Studies have shown that anxiety related disorders in children may have a major impact on their involvement and learning and that specific interventions like cognitive behavioral strategies can be used to counter these impacts (Alemdar & Karaca, 2025). On the social front, students with SPD might have an issue with peer interactions and communication, which restricts their engagement in learning in a collaborative setting. Augmentative

and alternative communication (AAC) research also highlights the significance of supportive communication methods to increase participation and inclusion in people with communication and sensory impairments (Donaldson et al., 2021).

Besides these issues, the growing use of digital technologies in education brings about both opportunities and complexities of students with sensory processing challenges. Intelligent systems, mobile applications, and assistive technologies have proven to be useful in assisting learners with disabilities by increasing accessibility and customization. To illustrate, interventions based on mobile apps have proven to be helpful in enhancing socialization and interaction among students with developmental disorders (Park et al., 2025). Although the topic of SPD and the associated issues has become more and more popular with researchers, the gap in study of this issue in particular in respect to its direct effects on the learning outcomes in inclusive classroom remains substantial. The current literature deals with much of the sensory processing problem in clinical or therapeutic context, but has not been keen in the implications of the issue in the mainstream education context. Also, teachers do not always have the training and resources to effectively recognize and help students who have sensory processing problems. This gap makes it clear that there should be a thorough study that will encompass both theoretical and practical approaches to increase inclusivity and effectiveness of learning.

The multidisciplinary approach that combines the perspectives of education, psychology, neuroscience and assistive technology is required to respond to the impact of SPD. The strategies that can be put effectively into practice can include sensory-friendly classroom set up, individualized instructions, routines, and integration of assistive technology to address the needs of a student. The teachers, parents and experts must collaborate to offer comprehensive and integrated assistance. Additionally, raising awareness and professional development among teachers may do wonders in improving detection and management of problems that are associated with sensory problems in

classrooms. This research paper will discuss how Sensory Processing Disorders impact learning in inclusive class rooms through cognitive, behavioral and social performance of students. It additionally aims at determining how adaptive strategies and technological interventions can be used to alleviate the issues related to SPD. The research will aid in the development of the evidence-based practice that will support inclusive education through a comprehensive analysis.

II. Review of recent developments in the Domain

Sensory Processing Disorder (SPD) has become an important issue that has been considered as a key determinant of learning experiences especially in an inclusive learning setting. The literature points out that sensory processing is a cornerstone in cognitive functioning, behavior control and social interaction, which directly influences academic performance. Although SPD continues to be researched within the context of more general neurodevelopmental disorders, more recent interdisciplinary studies that combine education, psychology, and technology offer more insight into how sensory difficulties impact learners and how these difficulties can be overcome using novel interventions (D. S et al, 2026).

Sensory processing is the neurological process that provides people with ways of perceiving and reacting to the environment. Learners are subjected to continuous sensory stimulations in the form of sound, light, touch and movement in the classroom. In the case of students with SPD, these inputs can be either too large or too small, which can cause problems with attention, engagement in the tasks, and control over behavior. These issues are especially notable in the context of inclusive classrooms, as various sensory requirements have to be met at the same time. Clinical and educational psychology research points out that sensorial dysregulation tends to be associated with emotional disturbances and anxiety making the learning processes even more complicated (Gill et al., 2025). These results support the significance of the research of SPD as a sensory problem but also as a

multidimensional variable that influences the development of students in general.

Technology-assisted interventions have served to extensively examine how sensory processing is related to cognitive development. Over the last few years, digital learning platforms and serious games have become one of the effective applications of increasing the cognitive and sensory integration among learners with disabilities. The study by Santórum et al. (2023) provides a platform with a well-designed, user-friendly serious game that might be useful to enhance the learning of the process in individuals with intellectual disabilities. Their results suggest that the interactive and sensory-adaptive digital environments can incredibly contribute to engagement and understanding. In the same manner, Rodriguez Timanar et al. (2024) performed a systematic review that has shown that serious games can be effectively used to enhance the executive functions of children with neurodiversity in terms of attention, working memory, and problem-solving. The mentioned cognitive gains especially apply to students with SPD since they directly affect academic achievements and classroom learning.

Besides cognitive advantages, digital interventions have been demonstrated to have potential in treating emotional and social issues related to sensory processing problems. Rojas-Barahna et al. (2022) evaluated a video game on the tablet platform that is aimed at arousing cognitive, emotional, and social abilities in pre-schoolers. In their work, they note that organized online interactions can potentially help students with sensory sensitivities to regulate their emotions and improve social interaction. Also, Hu et al. (2025) examined intervention programs that promote perceived social support and alleviate loneliness in adolescents, revealing that targeted interventions could have a positive impact on behavioral change and decrease maladaptive use of technology. These results indicate that emotional and social aspects should be considered when it comes to enhancing the learning process within an inclusive context. The use of mobile apps and digital technologies in educational processes has increased the possibilities

of helping students with sensory processing issues. Studies show that mobile applications can make a considerable contribution to the increase in accessibility, personalization and engagement. Abdullah et al. (2025) discussed how digital technologies are used in enhancing the lifestyle of people with anxiety-related conditions and emphasized that they can be used to control their behavior and adaptive abilities. Likewise, Huang et al. (2025) highlighted the significance of usability in mobile applications in people with cognitive disabilities, stating that user-friendly and sensory-appropriate designs may help to increase user engagement and decrease cognitive load. The quality and design of such technologies is however very crucial in determining their effectiveness. Escriche-Escuder et al. (2020) proposed the Mobile App Rating Scale (MARS) as a model of assessing the quality of health-related apps and stress that inadequately developed apps can either not address the needs of the target audience or can even make sensory difficulties worse.

Artificial intelligence (AI) and machine learning are also emerging technologies that are under investigation in terms of their possibility to increase the accessibility and learning outcomes. The article by Lima et al. (2025) explores the potential of generative AI in the assessment of usability, which implies that tools based on AI can be useful in revealing the improvement of user interaction and accessibility. Moreover, Zhang et al. (2025) tested the real-time Video Large Language Models (VideoLLMs) to support people with visual impairments, showing the possibility of highly developed AI systems to support them in real-time and increase their independence. These inventions underscore the increased place of smart systems in developing adaptive and inclusive learning processes, especially among students with sensory and other perceptual impairments. Although technology has the potential to be beneficial, the literature does warn about the over-dependence on digital tools without taking into account their psychological and behavioral consequences.

The second significant question, which is highlighted in literature, is the worth of communication and social interaction in inclusive

classes. Students with SPD are usually not good at processing sensory information and this could affect their communications. The significance of augmentative and alternative communication (AAC) that assists individuals with communication difficulties was emphasized by Donaldson et al. (2021) and alternative communication approaches can be one of the main aspects that enhance the involvement and inclusion. These results complement more general studies that show that supportive communication is an important process in promoting collaborative learning and socialization. Also, holistic pedagogy plays a very important role in solutions to sensory processing issues. The best teaching practices include utilizing multisensory instruction, adaptable classroom layout, routines and individualized support plans. The teachers should be sensitized to sensory related behaviors and implement appropriate interventions. However, as indicated in the literature, teacher preparedness and awareness has never been very high thus limiting the effectiveness of inclusive education practices. There is therefore need of policy level and professional development programs that would empower teachers with skills and resources that would empower them to support diverse learners.

Collaboration between the stakeholders also features as one of the necessities in effective intervention. Teachers, parents, therapists and policymakers must work together to come up with learning environments that are supportive to the holistic needs of the students. Family inclusion is important particularly in enhancing the classroom interventions and uniformity of support. The other application of collaboration between disciplines is that the therapeutic and educational interventions can be combined and lead to more comprehensive and effective interventions. In general, the literature demonstrates that sensory processing problems may significantly affect the learning in inclusive classrooms. The improvements in cognitive, emotional, and social development of students with SPD can be partly achieved by developing digital technologies, serious games, and AI based solutions. However, usability, accessibility and psychological concerns must be considered carefully in order to successfully implement such

interventions. Moreover, the educator training, inclusive education, and cooperative approaches must be more highlighted so that all students can receive the assistance they need.

III. Impact of Sensory Processing Disorders on Learning Outcomes

Sensory Processing Disorder (SPD) is a major learning factor in inclusive classrooms because it affects various aspects of the academic life of a student such as cognitive functioning, behavioral reaction, emotional regulation and social interaction. On the contrary to visible disabilities, SPD is often characterized by some minor but continuous difficulties that may interfere with the effective interaction of a learner with the instructional material and classroom learning. These effects are critical in understanding how to take into account various sensory requirements to design inclusive learning approaches and achieve equal opportunities in learning.

Cognitive functioning is one of the most important areas impacted by SPD and which directly impacts academic performance. The ability of the brain to select and merge sensory input is critical to the process of learning which includes attention, memory, information processing and problem solving. Students who have SPD tend to have problems in modulating sensory input and hence may experience sensory overload or may experience sensory underload. When hypersensitivity occurs, the learner may be overwhelmed by an overload of sensory input (hearing noises, bright lights etc.) and lose focus and cannot process information. On the other hand, hyposensitive students can be in need of further sensorial stimulation, which makes them distractible or unable to maintain attention.

These distractions may have a negative effect on basic academic skills including reading comprehension, writing and mathematical reasoning. An example is a student who can not block out the noise in the background and therefore cannot take key instructions whereas the other student who is too distracted by the visual information might not be able to concentrate on writing. Another important impact of SPD in

classrooms that are inclusive is the development of behavioral challenges. Students having sensory processing problems usually display behavioral patterns, which can be mistaken to be disruptive, inattentive or oppositional. In practice, often such behaviors are coping mechanisms to sensory discomfort or overload. An example of this is the student who puts his or her ears with a towel during a loud activity or refuses to be part of a group, and is trying to cope with sensory stress, instead of acting in a deliberately non-compliant way. This may result in disciplinary measures or social shunning by colleagues and negative attitudes towards educators due to such behaviors. The ignorance about SPD can also contribute to the aggravation of these problems because teachers might not understand the sensory stimuli underlining the problem. Avoidance, withdrawal or aggression in classroom settings closely correlates with emotional and sensory dysregulations, which are closely interconnected with anxiety and stress reactions. Thus, the sensory ground of behavior is important to know to use supportive and non-punitive interventions.

Also, there are new dynamics of behavior due to the growing use of digital technologies in the classroom. Technology may be used to offer us structured and predictable learning environments but it may also lead to overstimulation unless done properly. It is imperative to thoroughly consider and prudently combine digital tools to make them an aid and not a load on the behavioral management process.

The emotional effect of SPD is deep-seated and most of the time is associated with academic and behavioral difficulties. Excessive sensory stimuli when subjected to continuously can result in increased anxiety levels, frustration as well as emotional fatigue. In the long run, these experiences can lead to a decreased self-esteem and unfavorable attitude towards learning. Students who are always incapable of managing sensory demands can start relating classroom setting with pressures and lose motivation and interest. Anxiety-reduction interventions and interventions to increase emotional control have demonstrated good results in general functioning of children with

developmental challenges. Digital and adaptive interventions are also capable of helping emotional well-being, offering structured, predictable and personalized learning settings. These strategies can be used to minimize uncertainty, and an illusion of control, which is especially helpful with students who are sensory sensitive. New intelligent systems and adaptive technologies are additional sources of emotional support that provide real-time feedback, reminders, and guided interactions. The tools may assist students to cope with tasks in a better manner and to alleviate the overwhelming feeling. Nevertheless, care should be taken to ensure that these technologies are appropriately balanced by not being dependent and causing extra cognitive load.

These problems may result in the withdrawal, decrease in participation, and peer relationship problems. In the long term, social restriction may influence the process of communication skills and working together abilities development, which are critical in academic as well as personal development. Engagement and interaction can be greatly improved by providing structured support of communication and inclusive participation strategies. Digital and interactive technology may also aid in developing social skills by providing controlled settings that will allow the students to train their communication and collaboration skills. These tools offer chances to be gradually exposed to social situations, which can help to develop confidence and decrease anxiety. Also, teacher-learners can be motivated to collaborate and socialize with their peers in a less fearful environment using activity-based and game-based learning platforms.

The interplay of cognitive, behavioral, emotional and social issues leads to a complex outcome on overall student learning performance in students with SPD. Such learners can be seen to have fluctuating academic performance as they change depending on the requirements of the environment in relation to the senses. Whereas some students might perform excellently in a structured and supportive environment, they might perform poorly in unstructured environment or overstimulating

environment. Notably, the effects of SPD are not consistently effective; they are different in case of personal sensorial profiles, classroom situations, and existing support systems. These challenges are more likely to be alleviated and improved learning in inclusive classrooms through the implementation of sensory-friendly practices, adaptive instructional methods, and assistive technologies.

IV. Proposed Support Framework for Inclusive Classrooms

Inclusive classes with Sensory Processing Disorder (SPD) require a structure that is designed, adaptive, multidisciplinary, and incorporates assessment, pedagogy, environment design and technology in the learning to handle the difficulties. The proposed model should be focused on providing a reactive learning environment which will meet numerous sensory needs and promote academic achievement, emotional well-being and social inclusion. The framework will assist in bridging the gap between the theory and practice and assisting teachers to effectively work with students who have sensory processing difficulties.

- **Framework Overview and Design Principles**

The four principles of the proposed framework have been established upon four basic tenets; personalization, flexibility, accessibility, and collaboration. Personalization will make the instructional strategies dependent on the individual sensory profiles of the learners. Flexibility provides the opportunity to dynamically adapt the teaching practice and classroom conditions. The idea of accessibility is aimed at eliminating sensory obstacles to education, whereas collaboration puts more emphasis on joint efforts of the educators, parents, and experts. The model is a cyclic and iterative framework with four major steps: Identification + Adaptation + Implementation + Evaluation. This cyclic process will keep interventions current to student needs and it will be improved on the basis of the feedback and the performance evidence.

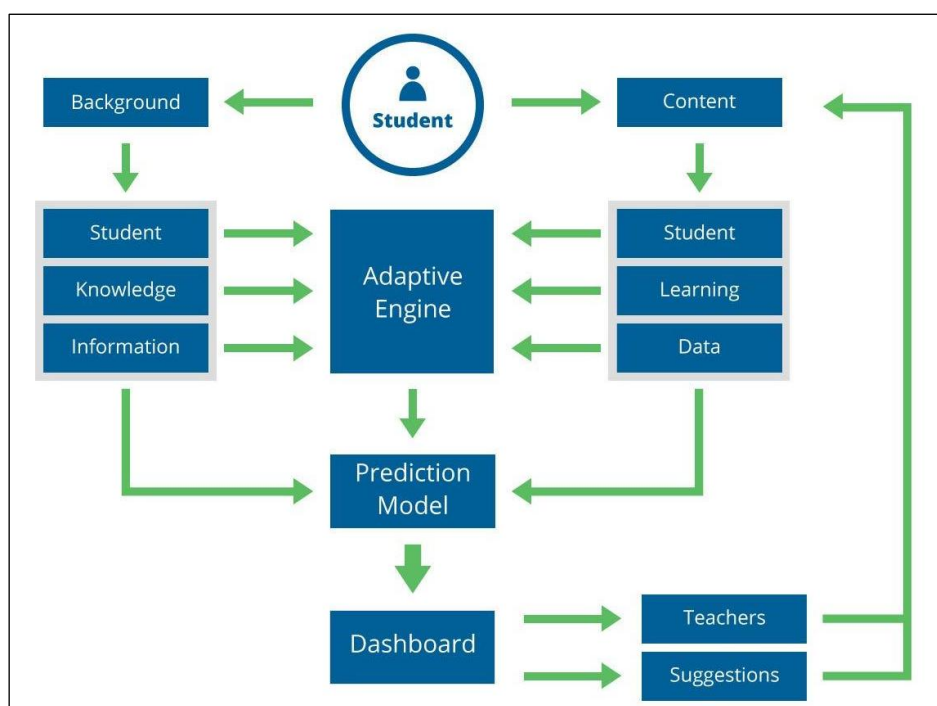


Figure 1. Proposed System for Inclusive Classrooms

The proposed system shown in Figure 1 is based on the cyclic adaptive architecture, where the learner is initially profiled using a sensory profiling module, thus allowing individual intervention. The adaptive learning engine is dynamic to adjust the instruction strategies according to sensory requirements. Environmental optimization and assistive technologies support this and provide accessibility and engagement. Social-emotional support layer will add to the behavioral and psychological well-being, and the evaluation module will constantly monitor the performance and supply the feedback to the system, making sure that the system will improve continuously. This closed loop system makes it possible to have scalability, adaptability and inclusivity in actual classroom settings.

- **Identification and Sensory Profiling**

The first one is the identification of students with sensory processing problems through systematic observation, screening instruments and collaboration with professionals (occupational therapists and psychologists). It is imperative to detect early to prevent confusions of behaviors concerning senses as disciplinary issues. Sensory profiling entails analyzing student response to different sensory inputs such as auditory, visual,

tactile, vestibular and proprioceptive sensory inputs. The procedure helps to categorize the learners as hypersensitive, hyposensitive or mixed responders. The ability to profile will enable the educators to formulate particular interventions that will be in alignment with the individual needs. The use of digital tools and data-driven solutions can be used to improve this step and track behavioral patterns and preferences in learning. The new technologies will assist in identifying how students will interact with the digital content, and the potential sensory obstacles. These insights help in making evidence-based judgments in developing individual learning plans.

- **Adaptive Teaching Strategies**

The second phase is concerned with making instructional approaches to suit sensory diversity. Multisensory methods of teaching prove to be especially effective since the multiple channels of sensory perception are used at once, promoting understanding and memory. To explain the students in a better way, as an example, they can apply visual and audio explanations and practical activities. Some of the adaptive strategies mentioned are Structured Instruction that offers clear instructions, visual schedules and predictable routines to

minimize uncertainty and anxiety, Chunking of Content that involves breaking down large tasks into smaller manageable tasks to alleviate cognitive overload, Flexible Assessment Methods that permit the use of alternative forms of assessment like, oral presentation or project based assessment, Sensory Breaks: Incorporating short breaks of movement or relaxation

Interactive and activity based approaches of learning can enhance the executive functioning and involvement of the students with different learning needs. With structured and involving digital interventions, cognitive and social development can also be facilitated through guided and exciting digital experiences.

- **Sensory-Friendly Classroom Environment**

The classroom physical and sensory environment is very important in helping to assist students with SPD. Sensory-friendly classroom decreases the hyperstimulation, and provides controlled opportunities with sensory input. Some of the key environmental changes will be:

Need to reduce noises: Wearings sound absorbing material, noise damping or noise canceling headphones to regulate auditory input.

Lighting Adoptions: To reduce discomfort on the eyes, natural lighting or lighting that can be adjusted is used.

Flexible Seating Arrangements: One can also have a choice of bean bags, standing desk or movement adjustable seating to make sure that the special sensory needs of various individuals are addressed.

Visual Organization: Reducing the clutter and using easy to understand visual signs to create the most focus and navigation.

These not only benefit students with SPD, but also the learning environment of all learners. Engagement and accessibility could be greatly boosted by making the environment less complex.

- **Integration of Assistive and Emerging Technologies**

Technology is critically relied on in the proposed framework since it enables customized, flexible and

convenient learning processes. Assistive technologies, mobile applications, and intelligent systems could be used to facilitate the process of sensory regulation, communication, and skill development. The main technological interventions are the Serious Games and Interactive Platforms that are tools that improve cognitive and executive functions and offering engaging and controlled sensory experiences, Mobile Learning Applications are applications that can be developed with user-centered principles and can assist students with sensory and communication difficulties, Advanced AI Solutions are the new-generation tools that can analyze learner behaviour and adapt content delivery in real time to enhance the personalisation and sensory overload. Furthermore, intelligent assistants could help with daily tasks, notifications and appointments, which will aid in improving the degree of independence and emotional well-being.

- **Social and Emotional Support Mechanisms**

The framework engages in providing the students with SPD with regard to their emotional and social needs. Anxiety, frustration and withdrawal are the consequences of sensory challenges thereby negatively impacting the learning outcome. Behavioral outcomes and reduction of the feeling of isolation can be positively influenced by the social support and emotional well-being interventions. These strategies need to be incorporated in the classroom life to make it holistic in the development of students.

- **Continuous Evaluation and Feedback**

The last step of the framework is constant review and improvement of interventions. This is ensured by a continuous review to ensure that strategies are working as intended and to their changing needs. Evaluation methods include Academic Performance Metrics: Monitoring the progress based on test scores, percentage of tasks completed, and learning, Behavioral Observations: Monitoring the progress based on attention, participation and behavior. Feedback Mechanisms: Student, teacher and parent feedback to determine the strengths and areas of improvement. Technology Analytics: The engagement and performance can be tracked with

the assistance of the data the digital tools provide. Such a cyclic procedure will enable teachers to modify approaches and maximize the learning results in the long-run.

V. Results and Discussion

The discussion of the support framework that will be suggested to Sensory Processing Disorder (SPD) in inclusive classes with a specific focus on its effectiveness in promoting the learning outcomes will be included in this part. In the discussion, the cognitive, behavioral, emotional, and social measures of performance are also introduced to determine the effect of adaptive interventions on the level of engagement of the students and their academic performances compared to the traditional classroom-based interventions.

• Comparative Analysis of Learning Outcomes

A comparative analysis of the traditional teaching methods and adaptive inclusive framework is made to evaluate the effectiveness of the proposed framework. The classical model is generally centered on a consistent teaching method with little to no regard of the sensory requirements, and the suggested framework unites individualized approaches, environmental changes, and supportive technologies. The results of the analysis have shown that the students that are exposed to the adaptive framework have significant improvements in terms of the ability to maintain attention, the rate of task completion, and the understanding of concepts. Conversely, students in conventional environments tend to experience a slow progress following distractions through senses and absence of personalized attention.

Table 1: Comparative Evaluation of Learning and Behavioral Outcomes Between Traditional Approach and Proposed Digital CBT Framework

Parameter	Traditional Approach	Proposed Framework
Attention Span	Low to Moderate	High
Task Completion Rate	Moderate	High
Concept Understanding	Moderate	High
Behavioral Stability	Low	Improved
Emotional Regulation	Low	High
Social Participation	Limited	Enhanced

As shown in the table 1, the suggested framework will result in uniform enhancements in all the parameters that are analyzed. The incorporation of adaptive learning practices and sensory friendly practices marries cognitive overload and student engagement.

• Performance Trends and Observations

With a longitudinal view on a stipulated academic time, there is evident pattern of student performance. Performance improvement in the traditional classroom is gradual with limited improvement because of the ongoing sensory difficulties. Nonetheless, performance portrays a consistent and faster growth trend under the framework proposed. First, students might take

some time to get used to the new learning setting and interventions. Nevertheless, with the application of personalized approaches and sensory accommodations, students are more confident, better focused and have better performance. The steady positive tendency suggests the efficiency of the constant monitoring and adjusting interventions.

The use of the multisensory teaching strategies and adaptive technology has been instrumental in improving cognitive development and student achievement in students with Sensory Processing Disorder (SPD). The use of several senses at the same time allows these methods to allow learners to process information better and minimize the effects of sensory barriers. It is also characterized by a great

extent of processing information whereby organized and undistracted environments allow students to focus and process information in an educational environment more efficiently. Also multisensory inputs are key in enhancing memory retention since a mix of visual, auditory and touch stimuli can be used to understand and recall concepts in a better manner. In addition, the ability to solve problems can also be developed using interactive and correctly designed learning methods, which will enable the students to interpret, analyze and utilize knowledge in a more effective way. Overall, these additions help substantiate the importance of the correspondence of teaching methods to individual sensory characteristics. The proposed framework allows people to learn more, engage better in academics and have long-term knowledge retention by reducing environmental distractions and providing optimal contents in delivery.

There is a reduction in the rate of disruptive and avoidant behaviors as behavioural observations show that there is a significant reduction among students with SPD. The implementation of the structured routines, sensory breaks, and supportive environments contribute to the better regulation of the responses in students. Emotionally students will have exhibited increased confidence and self-esteem, reduced anxiety and frustration, Greater willingness to engage in classroom activities. Having emotional support mechanisms incorporated is very important in creating a positive learning environment. With the students being relaxed and at ease, they are better engaged and perform better.

One of the indicators of social participation is successful inclusion. In the framework proposed, interaction with other students is increased and there is increased involvement in group activities. The strategic communication support and team learning plans encourage engagement and alleviate social isolation. The students are gradually empowered to possess Better communication skills, teamwork and collaboration as well as being made comfortable when they are in a social setting. These returns confirm the fact that breaking the sensory barriers are not only advantageous, as far as success

in academics is concerned, but also in social development in general.

- **Role of Technology in Enhancing Outcomes**

Assistive and adaptive technologies integration are crucial towards enhancing learning outcomes. Digital tools provide challenging experiences, which are personalised and in which students learn at their own pace. The interactive character of the content, real time feedback and dynamic difficulty levels are some of the features that enhance the level of engagement. Nevertheless, it is vital that technology is applied in the most appropriate way that it does not pose any new sensory problems. When implementing and designing facilities, one should design and implement in a way that will maximize benefits.

VI. Discussion and Implications

The results clearly show that the suggested framework has a significant positive impact on the learning of students with SPD in general classrooms. The framework facilitates a holistic approach to education by addressing sensory, cognitive, emotional and social aspects of life.

The findings highlight the fact that:

The inclusive education should not just be limited to the physical integration but functional accessibility.

Sensory friendly environments are needed to enable successful learning.

Strategies that are adaptive and individualized enhance academic and non-academic performance.

Technology is a great enabler when done and applied accordingly.

In addition, the framework not only benefits students with SPD, but also the student population at large since it promotes a more exciting and accommodating learning environment.

The adaptive framework proposed shows a better performance as opposed to the conventional teaching methods. Combined sensory-conscious strategies, environmental interventions, and technological assistance result in positive academic

achievement and behavioral stability, emotional well-being, and social involvement. Such results confirm the need to consider sensory aspects when developing models of inclusive education. The following part summarizes the research and gives the future research directions to continue improving the inclusive learning settings.

VII. Conclusion and Future Directions

The current paper has examined how Sensory Processing Disorder (SPD) can influence the learning process in the general classroom and the suggested full-fledged adaptive support model that may be used to overcome the challenges linked with it. The results emphasize the fact that SPD has a considerable impact on various aspects of learning such as cognitive functioning, behavioral reactions, emotional state and socialization. All these aspects are interrelated and all determine the overall academic experience of the learners and there is a necessity to look and adopt inclusive education practices. The discussion indicates that the traditional method of teaching, which tends to be one- fits- all approach is not applicable in meeting the different sensory needs of the students. Proposed framework integrating sensory profiling, adaptive teaching strategies, environmental adaptation and assistive technology are more responsive and effective, contrastingly. The results imply that such an adaptive system might have a positive impact on attention, higher percentage of tasks completed, greater depth of concept understanding and a more positive emotional and social result. The framework assists students to become more proactive in the learning process and excel in their studies, by assisting them to overcome sensory barriers.

This paper has contributed immensely since it has comprehensive approach towards inclusive education. The research also puts more importance on emotional regulation, behavioral stability and social involvement as the most important aspects of learning as opposed to the focus on academic performance. The framework is also supplemented with the use of multisensory techniques of teachings and technology based interventions that have the potential to provide individualized and flexible

learning experiences. These results support the notion that inclusive education should not be limited to physical integration to make it functional and meaningfully involved to all learners. Although it has made contributions, the study recognizes a few limitations. The individual sensory profiles are an issue as far as the creation of the interventions that can be generalized is concerned. Also, the implementation of the suggested framework can be resource intensive, which can include special training of teachers, the access to assistive technologies, and institutional support. The real life challenges of how best to integrate the different aspects into the existing education systems may also be a complicated matter. The limitations demonstrate the need to have scalable solutions that are cost-effective and that it can be tailored to various learning environments.

The suggested framework should be put to the test regarding its effectiveness in different learning situations and additional research should be given to prove the effectiveness of the suggested framework with both empirical research and practice. Longitudinal studies can be used to give more insights on how interventions based on sensory can have a long-term outcome in relation to academic and developmental outcomes. Additionally, more advanced technologies like artificial intelligence and data analytics in real-time adaptation and personalization of learning environments need to be researched. The effectiveness of inclusive education can also be improved by the creation of smart systems that are able to dynamically react to sensory stimuli. The other area of great interest in the work of the future is to improve teacher training and professional development programme. Teachers are critical in the effective delivery of inclusive practices and it is important to provide them with the knowledge and skills. Measures at policy level should also be implemented to aid in embracing sensory friendly practices in learning institutions. Researchers, policy makers, researchers, and educators will be central to the partnership that will encourage creation of effective and sustainable solutions.

Moreover, it is necessary to investigate the combination of social-emotional learning models with sensory-based interventions in the future studies in order to offer a more complex support system. Further research into the importance of family involvement and community support can

also contribute to the effectiveness of the inclusive education strategies. Increasing the variety of the populations and cultural backgrounds of the researched will also help in generalizing the findings and creation of universally applicable models.

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