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DESIGNING LEARNING SPACES
FOR DIVERSITY, INCLUSION &
PARTICIPATION
ARC LINKAGE PROJECT

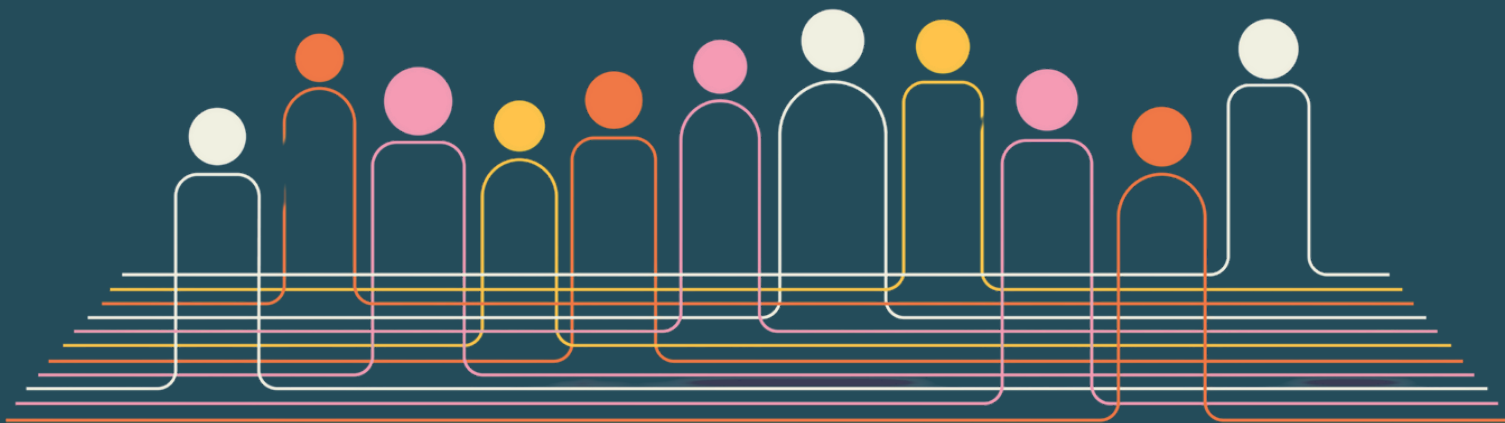
Inclusive learning spaces for students with neurodiversity, disability or requiring adjustments

ANNOTATED BIBLIOGRAPHY OF A SCOPING REVIEW

James Ong, Sarah Backhouse, Benjamin Cleveland, Simon Moore, Richard Austin, Nicole Merrick, Ruth Aston, Janet M. Clinton, Christine Imms, Wesley Imms, Lorraine Graham, Christhina Candido, Kate Tregloan and Paul Loh

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This resource

Introduction

This annotated bibliography summarises the findings of a scoping review that explored what is known about inclusive learning spaces across early years, primary, secondary, and tertiary educational environments. The review was undertaken from the perspective that education is a fundamental human right.

‘Education for all’ calls for equitable access to high-quality education for all students (UNESCO, 1994), regardless of their individual differences or circumstances. Yet, societal and environmental barriers continue to limit students with neurodiversity and/or disability from attending and/or being meaningfully involved in quality educational experiences (Commonwealth of Australia, 2023; United Nations, 2007).

The purpose of the scoping review was to gain an understanding of the role of physical and built environments in education settings in supporting the inclusion and participation of students with neurodiversity and/or disability. The physical environment refers to the natural and artificial surroundings in which people interact (Clark et al., 2007), while the built environment describes structures and spaces created or modified by humans, such as educational facilities and play areas (Müller et al., 2024).

This scoping review offers a cross-disciplinary perspective, drawing from peer-reviewed and grey literature in architecture, education, and health. The findings are expected to guide further research into ways to improve educational environments for students with neurodiversity and/or disability, supporting their inclusion and participation in learning activities and other educational experiences.

Methods

The scoping review was conducted according to a pre-registered review protocol on the Open Science Framework: [OSF Registries | Designing Learning Spaces for Diversity, Inclusion and Participation: Scoping review](#). This annotated bibliography provides readers with a summary of the 129 documents identified in the scoping review. The extracted data provides a valuable, but not extensive, dataset.

After completing a rigorous scoping review process, the SPARK AI platform (University of Melbourne) supported the creation of this annotated bibliography. A CSV file of the scoping review data extraction matrix and a TXT file containing the references formatted in APA 7th edition style were imported into SPARK AI. The Anthropic Claude 3 Haiku large language model (LLM) was then run (at a temperature of 0 to prioritise accuracy of outputs over creativity) to generate an initial summary of the data extracted from each article. This included the article title, citation, a brief overview in sentence format, and key findings in dot-point format. The initial summaries were then imported into a separate thread within the SPARK AI platform, along with the CSV file of the data extraction matrix. The OpenAI GPT-4 mini LLM was then run (at a temperature of 0) to cross-check the initial summaries against the data extraction matrix and make any additions to the summaries where needed. The format of the summaries was preserved in the process. Human reviewers involved in the earlier data extraction then cross-checked the AI-generated summaries alongside the data extraction matrix to confirm that all key information from the data extraction matrix was included in the summary of each article. The prompts used to generate the AI summaries are in Appendix I.

How to use this resource

Altogether, the scoping review includes 129 papers. These papers have been sorted into different groups and sub-groups according to the main topic of the paper. To find papers of a specific topic, look at the table of contents and go to the page containing the topic of interest. The papers in each topic are sorted in reverse chronological order, from newest to oldest. Read through the descriptions of each paper and search for papers that are relevant to you.

Each paper description also has a set of tags that relate to specific disabilities or school levels. To find papers of specific disabilities or school levels across topics, use the find function in your program (Ctrl + F for windows, Cmd + F for Mac), type in the tag (including the square brackets), and press Enter. It will generate a list of search results containing the search term. Alternatively, you can press Enter to scroll through each paper of interest.

Disability: [adhd], [autism], [blind and low vision], [deaf and hard of hearing], [physical disability]

School level: [kindergarten], [primary], [secondary], [special school], [vocational], [university]

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Overarching inclusive learning space design approaches

Overall kindergarten design for disabilities

1. Dancing-bodies-moving-spaces: An ethnography of disabled and non-disabled children's movement in a kindergarten classroom

Citation: McLaren, C. (2015). Dancing-bodies-moving-spaces: An ethnography of disabled and non-disabled children's movement in a kindergarten classroom. Dissertation Abstracts International: Section B: The Sciences and Engineering, 76(4-B(E)). <https://utoronto.scholaris.ca/server/api/core/bitstreams/3a352a57-c811-4f48-b270-21b20ae514a4/content>

Summary: This ethnographic study observed the movement and interactions of students with and without disabilities in a kindergarten classroom. The key findings include:

Key Findings:

- Students used various classroom features, such as furniture and equipment, in creative ways to support their play and movement.
- Flat, smooth surfaces and clear pathways enabled a range of movement activities by both students with and without disabilities (such as walking, rolling in wheelchair, crawling, sitting, kneeling and lying down).
- Even though the pretend centre and personal cubbies were used for privacy and pretend play, fewer students with disability played in these spaces as they had difficulties bumping into things and having to navigate obstacles with their walkers.
- The study highlighted the importance of flexible, adaptable classroom environments that can accommodate diverse student needs and movement patterns.
- Students with disabilities demonstrated unique ways of navigating the classroom, often using furniture for support and stability.
- The findings suggest that inclusive design in classrooms can enhance the engagement and participation of all students, regardless of ability.

Tags: [kindergarten]

2. Children's movement in an integrated kindergarten classroom: Design, methods and preliminary findings

Citation: McLaren, C., Ruddick, S., Edwards, G., Zabjek, K., & McKeever, P. (2012). Children's movement in an integrated kindergarten classroom: Design, methods and preliminary findings. *Children, Youth & Environments*, 22(1), 145-177. <https://doi.org/10.7721/chilyoutenvi.22.1.0145>

Summary: This study observed the movements and interactions of students with and without disabilities in an integrated kindergarten classroom in Canada. The key findings include:

Key Findings:

- Students used a variety of classroom features, such as furniture, equipment, and floor surfaces, in creative ways to support their play and movement.
 - Students moved in various ways on the flat, smooth floor (such as walking, rolling in a wheelchair, crawling, sitting, kneeling and lying down).
 - Students, particularly those with disability, used attached objects to jump up and down on surfaces, stabilising, hiding/crawling/peeking under and navigating in-between spaces.

- Students used chairs and other rigid objects for pushing, carrying, kneeling, crouching, spinning and swiveling-on, running-with, gliding, and crawling-underneath, balancing-on/ sitting-on/ bending forward/ falling backwards onto walkers.
- Students used large exercise balls for sitting/bouncing-on, body surfing, kneeling and shifting/balancing-on.
- The pretend centre and cubbies provided shelter and enclosed spaces for all students, as well as to play around.
- The study highlighted the importance of flexible, adaptable classroom environments, with a variety of affordances and physical features, that can accommodate diverse student needs and movement patterns.
- The findings suggest that classroom design should prioritize accessibility and flexibility to support the varied movement and interaction needs of all students.

Tags: [kindergarten]

[Go back to TOC](#)

Overall school design for disabilities

3. Architecture's disability problem

Citation: Liebermann, W. K. (2024). Architecture's disability problem. Routledge. <https://doi.org/10.4324/9781003122210>

Summary: This book examines the social, political, and pedagogical dimensions of disability in the context of educational architecture. The key points include:

Key Findings:

- The book presents three case studies of exceptional educational buildings that have been designed with inclusion in mind.
- It also has chapters on policy and inclusion, and on pedagogy and ableism—providing good background information on these dimensions.
- Engaging with the voices of students, families, educators, and disability advocates is essential in the design process.
- The study highlights the importance of inclusive design practices that consider the lived experiences of individuals with disabilities in shaping educational environments.

Tags: N/A

4. Sensemaking: The environmental experiences of children with disabilities in primary school

Citation: McIntosh, J., & Sozinova, A. (2024). Sensemaking: The environmental experiences of children with disabilities in primary school. In K. Bishop & K. Dimoulas (Eds.), *The Routledge Handbook on the Influence of Built Environments on Diverse Childhoods* (pp. 238-254). <https://doi.org/10.4324/9781003284406-20>

Summary: This book chapter reviews research on the environmental experiences of children with disabilities in primary schools. The key points include:

Key Findings:

- Simplicity, reduced sensory "noise", and increased connection to nature are important design considerations for inclusive learning environments.
- Flexible, adaptable spaces that can be customized to individual student needs are essential to accommodate diverse abilities and preferences.
- Engaging students, families, and the broader community in the design process is crucial to creating truly inclusive school environments.

- Administrative barriers—such as regulatory design principles and accessibility standards that meet legal requirements may still in effect be functionally inaccessible to some.
- The findings suggest that thoughtful design can enhance the learning experiences of children with disabilities by providing supportive and engaging environments.
- The research advocates for ongoing collaboration between educators, designers, and the community to ensure that learning spaces are inclusive and accessible.

Tags: [primary]

5. Design guideline for life center unit for inclusive schools in Turkey

Citation: Cordan, O. z., & Gülbahar, S. (2023). Design guideline for life center unit for inclusive schools in Turkey. A|Z: ITU Journal of the Faculty of Architecture, 20(2), 413-427. <https://doi.org/10.58278/0.2023.12>

Summary: This study developed a design guideline for "life center" spaces within inclusive schools in Turkey. The key findings include:

Key Findings:

- The life center spaces should be accessible and provide on-site support services like medical, therapy, recreation, and resources for students with disability.
- The spatial layout, furnishings, and flexibility of the life center spaces are important to encourage accessibility, independence, social interaction, and participation.
- The guidelines were developed through observations of two inclusive school sites and aimed to apply universal design principles.
- The study highlights the need for inclusive design that considers the diverse needs of students with disability in educational settings.
- Recommendations include creating adaptable spaces that can be modified to suit the changing needs of students over time.

Tags: N/A

6. Designing learning spaces for diversity, inclusion and participation – Pilot project

Citation: Cleveland, B., Imms, C., Alterator, S., Imms, W., Clinton, J., Bonyhady, B., Graham, L., Tregloan, K., Candido, C., Loh, P., & Kaushik, S. (2023). Designing learning spaces for diversity, inclusion and participation – Pilot project. University of Melbourne. https://disability.unimelb.edu.au/_data/assets/pdf_file/0006/4815645/Inclusive-Learning-Spaces-Focus-Group-Findings-Summary-Report-5Jan-2023.pdf

Summary: This pilot project explored the knowledge and experiences of students, families, educators, and disability advocates regarding inclusive learning spaces. Three focus groups with different stakeholder groups captured the insights of 35 participants on what works and does not work well in inclusive learning environments.

Key Findings:

- Participants emphasized the need for adaptable, flexible learning environments that offer students choice and can accommodate their diverse needs and preferences.
- Social and physical safety were paramount concerns, as was the alignment of space, resources, attitudes, and knowledge within a whole-of-school approach.
- The study highlighted the importance of centring the voices of students with disabilities in the design process.
- Findings suggest that inclusive design should consider the unique experiences and needs of all students to foster a sense of belonging and participation.
- The research advocates for a collaborative approach to designing learning spaces that involves all stakeholders, including students with disabilities.

Tags: N/A

7. School building conditions' influence on student behaviour in a medium-sized division in Virginia

Citation: El-Nemr, K. W., & Cash, C. S. (2022). School Building Conditions' Influence on Student Behavior in a Medium-Sized Division in Virginia. *Educational Planning*, 29(2), 43-60. <https://files.eric.ed.gov/fulltext/EJ1356892.pdf>

Summary: This study examined the relationship between school building conditions and student behavior, including for students with disabilities. The key findings include:

Key Findings:

- Improved overall building conditions and cosmetic features were associated with reduced disciplinary incidents and chronic absenteeism, particularly for students with disabilities.
- The study used the Commonwealth Assessment of Physical Environment (CAPE) survey to assess the condition of educational facilities.
- The findings suggest the importance of well-maintained, high-quality school buildings in supporting positive student outcomes.
- The research highlights the importance of addressing both structural and cosmetic conditions in schools to enhance the learning environment for all students.
- The study advocates for ongoing assessments of school facilities to ensure they meet the needs of all students, particularly those with disabilities.

Tags: N/A

8. Empathetic programming to foster inclusion

Citation: Puttock, R. Z. (2021). Empathetic programming to foster inclusion. In K. Menezes, P. d. Oliveira-Smith, & A. Woodworth (Eds.), *Programming for Health and Wellbeing in Architecture* (pp. 65-80). <https://doi.org/10.4324/9781003164418-9>

Summary: This chapter proposes a model of "empathic design" to create inclusive school environments, particularly for high-functioning autistic students. The key findings include:

Key Findings:

- The model focuses on three strategies: preventing stress, reducing stress, and relieving built-up stress in the environment.
- Design recommendations include creating clear thresholds, prioritizing spatial sequencing, providing individual control, and offering access to nature and variety throughout the school day.
- The author argues that empathic design principles can benefit all students, not just those with autism.
- The findings emphasise the need for a holistic approach to design that considers the emotional and sensory needs of all students.
- The study highlights the importance of creating environments that foster well-being and support diverse learning needs.

Tags: [autism]

9. How parents, teachers, psychologists, and educational environments influence developmental transitions of preadolescent twice-exceptional students

Citation: Arnstein, K. B. (2021). How parents, teachers, psychologists, and educational environments influence developmental transitions of preadolescent twice-exceptional students. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 82(8-B). <https://digitalcommons.du.edu/etd/1715>

Summary: This case study explored how the physical environment of classrooms and schools influenced the experiences of twice-exceptional (high-ability with a disability) students. The key findings include:

Key Findings:

- Flexible seating, natural lighting, minimal decoration, and access to green spaces were identified as beneficial classroom features.
- The presence of animals and a "walking corridor" within the classroom also supported the attention and regulation of twice-exceptional students.
- Educators played a key role in creating classroom environments that maximized inclusion and participation for these students.
- The findings suggest that thoughtful design can enhance the learning experiences of twice-exceptional students by providing supportive and engaging environments.
- The study highlights the need for ongoing collaboration between educators and designers to create inclusive learning spaces.

Tags: N/A

10. School design guide (SDG-02-04): Primary & post primary school specialist accommodation for pupils with special educational needs

Citation: Department of Education, Government of Ireland. (2021). School design guide (SDG-02-04): Primary & post primary school specialist accommodation for pupils with special educational needs. <https://assets.gov.ie/133140/317eda8c-abc8-4915-8da1-c9c336be82a9.pdf>

Summary: This government guideline from Ireland provides recommendations for designing inclusive primary and post-primary school environments for students with special educational needs.

Key Findings:

- The guidelines present detailed recommendations for accessibility, acoustics, lighting, ventilation, and other design features of learning spaces.
- Recommended elements include clear wayfinding, adjustable furniture, sensory-friendly materials, mechanical aids, and flexible, adaptable environments.
- The guidelines emphasize the importance of creating safe, supportive, and inclusive spaces that enable participation, independence, and social integration for students with diverse needs.
- The research highlights the need for ongoing assessments of school facilities to ensure they meet the needs of all students, particularly those with disability.
- The study advocates for a holistic approach to school design that prioritises the well-being and comfort of all students.

Tags: [primary] and [secondary]

11. The school building design strategies based on inclusive education in Italy

Citation: Zhang, Y., Chen, Y., & Fianchini, M. (2020). The school building design strategies based on inclusive education in Italy. *New Architecture* (6), 74-78. <https://doi.org/10.12069/j.na.202006074>

Summary: This study examined the design strategies used in Italian primary and secondary schools to support inclusive education. The key findings include:

Key Findings:

- Schools incorporated features like defined zones, movable partitions, and specialized support spaces to meet the needs of students with disabilities.
- Acoustic, lighting, and thermal comfort considerations (such as adequate ventilation and adjustable floor heating) were also important in creating sensory-friendly learning environments.
- Light colours should be used in most parts of the environment, with bright colours only used in doors and windows to help with wayfinding. In contrast, large areas of bright colours can present excessive stimulation for students with disability.
- The study highlights the need to balance standardized accessibility requirements with more nuanced, student-centered design approaches.

- The findings suggest that thoughtful design can enhance the overall learning experience for all students, particularly those with disabilities.

Tags: N/A

12. Management of special-needs education facilities and consideration of influence on aspects of activities by spatial composition

Citation: Koga, M., Hori, H., & Yamada, A. (2019). Management of special-needs education facilities and consideration of influence on aspects of activities by spatial composition. *AIJ Journal of Technology and Design*, 25(61), 1239-1244. <https://doi.org/10.3130/aijt.25.1239>

Summary: This study examined the spatial organization and use of special education schools in Japan. The key findings include:

Key Findings:

- Classrooms were often connected school gardens, playrooms and playgrounds.
- While most activities were done in classrooms, with some joint learning done sometimes, upper-grade students spent time in other spaces like libraries and playrooms.
- A curtained corner acted as a quiet space for students to be alone.
- School staff reported challenges in monitoring and supervising students in the larger, more dispersed school layouts, and also complained of the lack of playrooms.

Tags: N/A

13. School for special needs education in Korea: Architectural planning and operation of advanced cases

Citation: Itoh, S., Park, E. K., Osaki, A., & Mizobuchi, T. (2017). School for special needs education in Korea: Architectural planning and operation of advanced cases. *AIJ Journal of Technology and Design*, 23(54), 631-635. <https://doi.org/10.3130/aijt.23.631>

Summary: This study examined the architectural planning and organization of special education schools in South Korea. The key findings include:

Key Findings:

- Classrooms in the special schools were generally similar in size and layout to mainstream classrooms but had smaller class sizes of 4-7 students.
- The schools focused on vocational training, with advanced facilities and equipment to support this focus.
- The study compared the Korean approach to special education facilities with the Japanese context, highlighting differences in class size management and curriculum emphasis.
- The findings of this study are more focused on school and class organisation than on the learning spaces themselves, and where there is not sufficient space to physically accommodate students with disabilities in specialist settings, accommodations need to be made to support students with disabilities in mainstream settings.

Tags: N/A

14. Tolerable and inclusive learning spaces: an evaluation of policies and specifications for physical environments that promote inclusion in Turkish primary schools

Citation: Erkilic, M., & Durak, S. (2013). Tolerable and inclusive learning spaces: an evaluation of policies and specifications for physical environments that promote inclusion in Turkish Primary Schools. *International Journal of Inclusive Education*, 17(5), 462-479. <https://doi.org/10.1080/13603116.2012.685333>

Summary: This study reviewed Turkish policies and regulations related to inclusive school design.

Key Findings:

- Turkish policies focused more on accessibility modifications rather than identifying the specific environmental needs of students with disabilities.
- Key design principles identified include flexibility/adaptability, simplicity, perceptibility, and accessibility/mobility.
- The study highlights the need to better align policies and regulations with the unique requirements of inclusive learning environments.
- Involving students with disabilities in the design process can ensure that their specific needs are addressed in school environments.
- The findings suggest that a more comprehensive approach to inclusive design is necessary to create truly supportive educational spaces.

Tags: [primary]

15. A collection of exemplary design of school facilities for special needs education

Citation: Ministry of Education, Culture, Sports, Science & Technology - Japan. (2012). A collection of exemplary design of school facilities for special needs education. <https://www.nier.go.jp/shisetsu/pdf/e-sneschool.pdf>

Summary: This report from the Japanese Ministry of Education showcases 10 case study schools that have been designed to support students with special needs. The key features highlighted include:

- Accessible and well-adapted built environments for students with physical disability, including features like appropriate ramp slopes, handrails, edge protection, suitable paving, wide paths, accessible toilets, and clear wayfinding.
- Design elements to support students with sensory needs, such as acoustic treatments, adjustable lighting, and specialized equipment.
- Spaces that promote social integration, community exchange, and vocational training, such as locating coffee shops at school entrances or using the school library as a community facility.
- Flexible and adaptable learning spaces that can be customized to individual student needs.

Key Findings:

- Accessibility design requires more than just ramps, lifts, and wider corridors. The entire school journey, from arrival to departure, must be designed inclusively.
- Specialized sensory design features, like acoustic treatments and adjustable lighting, can benefit all students, not just those with specific needs.
- Flexible and adaptable learning spaces allow for personalization and better support diverse student requirements.
- The report emphasizes the importance of a holistic approach to inclusive design that considers all aspects of the school environment, including outdoor spaces, indoor spaces, information technology and community integration.

Tags: N/A

16. Improving the accessibility of school buildings

Citation: National Disability Authority (Ireland). (2012). Improving the accessibility of school buildings. <https://nda.ie/uploads/publications/Improving-the-Accessibility-of-Schools-Report-pdf.pdf>

Summary: This guideline from the National Disability Authority in Ireland provides recommendations for creating accessible and inclusive primary and post-primary school environments. The key points include:

Key Findings:

- The guidelines adopt a "universal design approach" to ensure schools can be accessed, understood, and used by the widest range of users.
- Recommendations cover external environments, internal circulation, and classroom design, addressing factors like wayfinding, acoustics, lighting, and furniture layout.
- The guidelines bring together Irish legislation and standards, and emphasize the importance of accessibility, safety, and supporting the participation of all students, staff, and visitors.
- The guidelines provide only light detail on what outcomes may result from their implementation.
- Key considerations include ensuring that entrances and routes are welcoming and accessible to people of various abilities, sizes, and ages.
- The report highlights the need for ongoing evaluation and adaptation of school facilities to maintain inclusivity and accessibility.

Tags: N/A

17. The building process as a tool towards an all-inclusive school. A Swedish example focusing on children with defined concentration difficulties such as ADHD, autism and Down's syndrome

Citation: Tufvesson, C., & Tufvesson, J. (2009). The building process as a tool towards an all-inclusive school. A Swedish example focusing on children with defined concentration difficulties such as ADHD, autism and Down's syndrome. *Journal of Housing and the Built Environment*, 24(1), 47-66. <https://doi.org/10.1007/s10901-008-9129-6>

Summary: This study examined how the building process and physical environment can support the inclusion of students with ADHD, autism, and Down's syndrome. The key findings include:

- Factors like background noise, direct sunlight, open classroom layouts, and direct views of the schoolyard were associated with decreased concentration for these students.
- Closed storage systems, limited windows/doors, and quiet environments were identified as enablers that supported students' ability to concentrate.
- Environmental factors need to be addressed at the pre-project decision stage and incorporated into the cyclic building process (a feedback loop that carries knowledge and experience from different participants to implement changes to environmental factors that improve accessibility and inclusiveness of education among students with disability)
- The study highlights the need to consider the specific sensory and environmental needs of students with different disabilities when designing learning spaces.

Tags: N/A

18. Universal design of physical spaces: From principles to practice

Citation: Burgstahler, S. E. (2008). Universal design of physical spaces: From principles to practice. In S. E. Burgstahler & R. C. Cory (Eds.), *Universal Design in Higher Education: From Principles to Practice* (pp. 187-197).

Summary: This book chapter discusses the application of universal design principles to the physical spaces of higher education facilities.

Key Findings:

- Universal design should be a guiding principle in the planning and design of accessible, equitable, and inclusive campus environments.
- Key considerations include accessible entrances and routes, flexible and adjustable furnishings, and the integration of information technology and safety features.
- The chapter outlines a process for designing physical spaces using universal design, involving stakeholder engagement, guideline adoption, and ongoing evaluation.
- Training for staff on universal design principles can enhance the inclusivity of educational environments.
- The findings suggest that applying universal design can benefit all users, not just those with disability.

Tags: N/A

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Overall university design for disabilities

19. Architectures with no designs! Special education practice and vocational schools in Turkey

Citation: Çalıkoğlu, B., Yaman Gülmez, H., & Tepe, S. (2023). Architectures with no designs! Special education practice and vocational schools in Turkey. *MANAS Sosyal Araştırmalar Dergisi*, 12(1), 89-106. <https://doi.org/10.33206/mjss.1145172>

Summary: This study evaluated the accessibility and inclusiveness of special education and vocational schools in Turkey. The researchers used a 65-item observation checklist to assess the architectural features of 22 special education schools. The key findings include:

Key Findings:

- The findings highlighted both positive features, such as internal and external accessibility and innovative design elements, as well as barriers to inclusion, such as lack of dedicated spaces for students with disability.
- Inclusion elements of well-maintained accessible gardens and integration with the surrounding city were found to be important external factors.
- The study emphasized the importance of accessibility, safety, independence, and social integration in the design of special education facilities.
- The results underscore the need for comprehensive design strategies that prioritize the needs of students with disability to foster an inclusive educational environment.

Tags: [university]

20. Designing beyond the Americans With Disabilities Act (ADA): Creating an autism-friendly vocational center

Citation: Clouse, J. R., Wood-Nartker, J., & Rice, F. A. (2020). Designing beyond the Americans With Disabilities Act (ADA): Creating an autism-friendly vocational center. *Health Environments Research & Design Journal*, 13(3), 215EP-229. <https://doi.org/10.1177/1937586719888502>

Summary: This study compared two design solutions for a vocational center, one adhering to ADA guidelines and one incorporating the Autism ASPECTSS Design Index. The key findings include:

Key Findings:

- The ASPECTSS design criteria, which focus on sensory, spatial, and safety considerations, provided a more comprehensive approach to creating an autism-friendly environment compared to just meeting ADA accessibility standards.

- Incorporating ASPECTSS design principles benefited all users, not just those with autism, by enhancing accessibility, safety, independence, and inclusion.
- The study highlighted the importance of considering the unique sensory needs of autistic individuals in the design process.
- The findings suggest that environments designed with ASPECTSS principles can lead to improved outcomes for all students, including better engagement and participation.
- The research advocates for a shift in focus from merely meeting legal standards to creating truly inclusive environments that cater to the diverse needs of all users.

Tags: [vocational], [autism]

21. Is the university an accessible environment? Life stories of students with disabilities

Citation: Fernández, A. C. (2019). 21. Is the university an accessible environment? Life stories of students with disabilities. *Revista Fuentes*, 21(1), 85-101.

<https://revistascientificas.us.es/index.php/fuentes/article/view/8436>

Summary: This study explored the experiences of two university students with disabilities in Spain through in-depth life story interviews. The key findings include:

Key Findings:

- Students faced significant physical accessibility barriers, such as stairs, small lifts, narrow doorways (narrow and do not stay open), and non-flexible furniture (e.g., a bench instead of a portable table), that hindered their participation.
- On the other hand, signposting of stairs and doors (such as stickers on doors and painted steps), reserved seats in lecture hall and library for students with disability, and supportive staff to implement accessibility and inclusion measures, are enablers for the learning of students with disability.
- The accounts of two students contrast with each other. While one student is experiencing barriers that result in them feeling inferior and having a non-optimal learning experience, the other student felt supported in university.

Tags: [university]

22. University surroundings and infrastructures that are accessible and inclusive for all: Listening to students with disabilities

Citation: Moriña, A., & Morgado, B. (2018). University surroundings and infrastructures that are accessible and inclusive for all: Listening to students with disabilities. *Journal of Further and Higher Education*, 42(1), 13-23. <https://doi.org/10.1080/0309877X.2016.1188900>

Summary: This study explored the experiences of university students with disabilities in Spain regarding the accessibility and inclusiveness of the campus environment. The key findings include:

Key Findings:

- Students reported significant physical barriers, such as stairs, narrow doorways, and inadequate furniture, that hindered their ability to fully participate.
- Other challenges included poor acoustics, lighting, and signage that made it difficult for students to navigate and engage with the university.
- The study emphasized the need for more inclusive policies and practices to create truly accessible university environments.
- Engaging students with disabilities in the design and evaluation of campus facilities can lead to more effective solutions.
- The findings suggest that addressing physical barriers is essential for promoting inclusion and participation among students with disabilities.

Tags: [university]

23. A study on the convenient facilities for accessibility to disabled student of 4-year university campus in Jeollabukdo

Citation: Jang, M.-H., Jung, S.-H., Lee, M.-G., & Bae, S.-Y. (2016). A study on the convenient facilities for accessibility to disabled student of 4-year university campus in Jeollabukdo. *Journal of the Korea Academia-Industrial cooperation Society*, 17(4), 283-295. <https://doi.org/10.5762/kais.2016.17.4.283>

Summary: This study evaluated the accessibility of facilities at six universities in South Korea for students with disabilities. The universities were evaluated against the South Korean government's Act on the Guarantee of Convenience Promotion of Persons with Disabilities, Senior Citizens, Pregnant Women and Nursing Mothers. The key findings include:

Key Findings:

- Many universities lacked adequate disabled parking, wide entrances, and accessible teaching and learning spaces.
- There were not enough seating and resting areas in the school yards for students with disabilities.
- Entrances were often too narrow and doors did not fully open, making them inaccessible for students using wheelchairs.
- The study highlights the importance of adhering to universal design principles to create truly accessible and inclusive educational environments for all students.

Tags: [university]

24. Hidden voices in higher education: Inclusive policies and practices in social science and law classrooms

Citation: López Gavira, R., & Moriña, A. (2015). Hidden voices in higher education: Inclusive policies and practices in social science and law classrooms. *International Journal of Inclusive Education*, 19(4), 365-378. <https://doi.org/10.1080/13603116.2014.935812>

Summary: This study explored the experiences of university students with disabilities in social science and law classrooms. The key findings include:

Key Findings:

- Students reported barriers such as not enough ramps, inappropriate/inadequate furniture, inappropriate/inadequate signage, poor acoustics and lighting, and cramped classroom layout that hindered their participation.
- Dedicated spaces for students with disabilities to interact with each other were seen as an important enabler.
- The study highlighted the need for more inclusive policies and practices to support the full participation of students with disabilities in higher education.
- The findings suggest that addressing physical barriers is essential for creating an inclusive learning environment for all students.
- The research advocates for ongoing assessments of classroom environments to ensure they meet the needs of all students.

Tags: [university]

25. Inclusive university settings? An analysis from the perspective of students with disabilities

Citation: Moriña, A. (2015). Inclusive university settings? An analysis from the perspective of students with disabilities. *Cultura y Educacion*, 27(3), 669-694. <https://doi.org/10.1080/11356405.2015.1072361>

Summary: This study explored the experiences of university students with disabilities in Spain. The key findings include:

Key Findings:

- Students reported significant physical accessibility barriers, such as stairs, narrow doorways, and inadequate furniture, that hindered their participation.
- On the other hand, enablers include visual tools/signs to facilitate movement of people, adequate lighting, acoustics and temperature and appropriate access (such as ramps and wide corridors)
- The findings suggest that addressing physical barriers is essential for creating an inclusive learning environment for all students.
- The study highlights the importance of ongoing assessments of university facilities to ensure they meet the needs of students with disabilities.

Tags: [university]

26. A study on the evaluation and improvement of student convenient facilities at university campuses, based on universal design concept

Citation: Kim, W. P. (2014). A study on the evaluation and improvement of student convenient facilities at university campuses, based on universal design concept. *The Journal of Korean Institute of Educational Facilities*, 21(3), 19-28. <https://doi.org/10.7859/kief.2014.21.3.019>

Summary: This study evaluated the accessibility of student facilities at four universities in Texas, USA using universal design principles, encapsulated in the checklist “Evaluation Index of Universal Design for Student Hall/Wellbeing Facilities”. The key findings include:

Key Findings:

- Wheelchair-accessible pathways, ramps, stairways, elevators and lifts were often lacking or in poor condition.
- Main entrances and corridors were wide. The disabled parking space was spacious but far from student buildings.
- The study highlights the importance of adhering to universal design principles to create truly accessible and inclusive educational environments for all students.

Tags: [university]

27. Lights and shadows in higher education from the perspective of students with disability in the area of health sciences

Citation: Vega, M. D. C., & Morriña-Díez, A. (2014). Lights and shadows in higher education from the perspective of students with disability in the area of health sciences. *Revista de Investigacion en Educacion*, 12(2), 164-175. <https://revistas.uvigo.es/index.php/reined/article/view/2001>

Summary: This study explored the experiences of university students with disabilities in health science programs in Spain through interviews. Participants included insights from eight students and significant others in their learning experiences, such as teachers and support workers, providing a 360-degree view.

Key Findings:

- Students reported barriers related to the physical environment that hindered their ability to participate in learning activities, such as inaccessible furniture, poor acoustics, and inadequate lighting or places to rest or retreat.
- Students emphasized the need for more inclusive design, accommodations, and support to enable their success in higher education.
- The findings suggest that addressing physical barriers is crucial for creating an inclusive learning environment for all students.
- The study highlights the importance of ongoing assessments of university facilities to ensure they meet the needs of students with disabilities.

Tags: [university]

28. Does place really matter to students with learning disabilities? A study of three university campuses

Citation: Whitmer, S. (2009). Does place really matter to students with learning disabilities? A study of three university campuses. *Open House International*, 34(1), 75-81. <https://doi.org/10.1108/ohi-01-2009-b0009>

Summary: This study examined the experiences of university students with learning disabilities across three campuses.

Key Findings:

- Factors like wayfinding, safety, comfort, and access to support services were important in enabling students with learning disabilities to engage with the campus environment.
- Adequate lighting, ventilation, and comfortable, adaptable furniture were identified as important physical environment features.
- Architects and disability service staff noted the need for better collaboration and representation of disability perspectives in the design process.
- The findings suggest that inclusive design should consider the unique experiences of students with learning disabilities to create supportive environments.
- The study highlights the importance of addressing both physical and social barriers to enhance the university experience for students with disabilities.

Tags: [university]

29. Applications of universal design to higher education facilities

Citation: Goldstein, E. (2008). Applications of universal design to higher education facilities. In S. E. Burgstahler & R. C. Cory (Eds.), *Universal Design in Higher Education: From Principles to Practice* (pp. 199-212).

Summary: This book chapter discusses the application of universal design principles to higher education facilities. The key findings include:

Key Findings:

- Wheelchair-accessible building entrances, clear circulation paths, flexible/mobile and adjustable furniture, and appropriate lighting and acoustics are important universal design considerations.
- In contrast, stairs can be accessibility barriers to people using crutches, pushing strollers or moving equipment or luggage. Fixed seats facing in one direction can also be a barrier to engagement for students with disability.
- Welcoming and barrier-free campus environments can positively influence student interaction, learning, and well-being in university.
- In contrast, accessible entrances that are far away from a main entrance may make students with disability feel inferior to other students.
- Universal design should be a guiding principle in the planning and design of higher education facilities.
- The chapter emphasizes the need for inclusive design practices that consider the diverse needs of all students, enhancing their educational experience.

Tags: [university]

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Autism-specific school design

30. Examining of interior design approaches in special education buildings for people with autism

Citation: Yanılmaz, Z. (2024). Examining of interior design approaches in special education buildings for people with autism. Ankara University Faculty of Educational Sciences Journal of Special Education. <https://doi.org/10.21565/ozelegitimdergisi.1146305>

Summary: This study reviewed the interior design approaches used in special education schools for autistic students. The key findings include:

Key Findings:

- Recommended design features include natural daylight, neutral color schemes, defined circulation paths, and rooms arranged from higher sensory to lower sensory areas.
- Specific elements like gull-wing roofs, horizontal windows, and varied floor surfaces were proposed to support the needs of autistic students.
- While natural daylight could support the learning of students with disability, fluorescent light could be discomforting to autistic students.
- However, the study did not provide empirical evidence on the effectiveness of these design approaches.
- The findings suggest that thoughtful interior design can enhance the learning experiences of autistic students by creating supportive and engaging environments.
- The study highlights the need for further research to validate the proposed design features and their impact on student outcomes.

Tags: [autism]

31. Architecture for autism: Therapeutic and educational centre for children in Zamosc, Poland

Citation: Anna, M., & Wiktoria, M. (2023). Architecture for autism: Therapeutic and educational centre for children in Zamosc, Poland. Journal of Civil Engineering, Environment and Architecture, 70(0), 79-90. <https://doi.org/10.7862/rb.2023.7>

Summary: This study proposed the design of a therapeutic and educational center for autistic students in Poland. The key features include:

Key Findings:

- The design incorporated spaces for occupational therapy, adaptive activities, relaxation zones, accessible toilets, indoor and outdoor sensory areas, and appropriately sized doors and corridors.
- The design aimed to create an inclusive environment that supports social integration, skill development, sensory needs, safety, and therapeutic considerations for autistic students.
- The proposed design was based on a review of guidelines and recommendations for autism-friendly environments but was not tested in an actual built project.
- The study emphasizes the need for thoughtful design that addresses the diverse needs of autistic students, promoting their well-being and development.

Tags: [autism]

32. Spatial organisation of 'therapeutic' spaces for autistic children in special schools: Lessons learnt from the United Kingdom experience

Citation: Shimokura, R., Yanagiawa, K., & Sasaki, S. (2023). Spatial organisation of "therapeutic" spaces for autistic children in special schools: lessons learnt from the United Kingdom experience. *Journal of Asian Architecture and Building Engineering*, 22(2), 620-634. <https://doi.org/10.1080/13467581.2022.2047982>

Summary: This study examined the spatial organization of "therapeutic" spaces, like calm rooms and sensory rooms, within special education schools in the UK. The key findings include:

Key Findings:

- Schools had a variety of therapeutic spaces with different levels of sensory stimulation and activity, ranging from quiet calm rooms to more dynamic sensory and play spaces.
- The study highlighted how the design and organization of these spaces varied based on the age and needs of the student population. This ranged:
 - From playgrounds being directly connected to classrooms in early years
 - To terraces splitting the classroom and playground in primary school
 - To limited stimulation-type spaces appearing in the school classroom in secondary school, and
 - Dedicated therapeutic spaces being absent in post-16 schools (with students expected to behave independently and find an appropriate place to calm down).
- The arrangement and sequence of these therapeutic spaces in relation to the classrooms was important to support students in regulating their emotions and behaviors.
- Effective transitions between classrooms and therapeutic spaces can enhance students' ability to manage their sensory needs and emotional regulation.

Tags: [autism], [special school]

33. The impact of ASPECTSS-based design intervention in autism school design: A case study

Citation: Mostafa, M., Sotelo, M., Honsberger, T., Honsberger, C., Lozott, E. B., & Shanok, N. (2023). The impact of ASPECTSS-based design intervention in autism school design: A case study. *Archnet-IJAR: International Journal of Architectural Research*, 18(2), 318-339. <https://doi.org/10.1108/ARCH-11-2022-0258>

Summary: This case study evaluated the impact of implementing design interventions based on the ASPECTSS framework in an autism-specific school. The key findings include:

Key Findings:

- Interventions like color-coded wayfinding, acoustic treatments, transition alcoves, classroom zones, and dedicated sensory and escape spaces were associated with improved student engagement and behavior management.
- Teachers reported that the ASPECTSS-aligned design changes supported the learning and well-being of autistic students. In contrast, teachers reported that students in control classrooms were distracted (less likely to pay attention to the teacher) and to have a meltdown due to the absence of escape spaces.
- The study demonstrates the practical application and benefits of using the ASPECTSS framework to guide the design of inclusive learning environments.
- Regular assessments and feedback from teachers and students can help refine and improve the design interventions over time.
- The findings suggest that thoughtful design can significantly enhance the educational experience for students with autism.

Tags: [autism]

34. The autism friendly university design guide

Citation: Mostafa, M. (2021). The autism friendly university design guide. https://issuu.com/magdamostafa/docs/the_autism_friendly_design_guide

Summary: This guide provides recommendations for creating an "autism-friendly" university environment. It starts with first principles, looks at the design and practicalities of stakeholder engagement, assesses spaces, develops guidelines, and applies these in a test case study. The key points include:

- The guide was developed through focus groups, design workshops, and audits involving autistic students, university staff, and other stakeholders.
- Design strategies focus on reducing sensory overload, providing quiet and transitional spaces, improving wayfinding, and increasing flexibility and control for autistic students.
- The ASPECTSS Design Assessment Tool is presented as a framework for evaluating and improving the autism-friendliness of university facilities.
- Test cases were used to analyse and apply the results of surveys undertaken.
- Engaging autistic students in the design process ensures that their needs and preferences are prioritized in the development of university spaces.
- Regular feedback and evaluation of the implemented design features can help maintain an inclusive environment for all students.

Tags: [autism], [university]

35. Architecture for autism: Built environment performance in accordance to the autism ASPECTSS design index

Citation: Mostafa, M. (2020). Architecture for autism: Built environment performance in accordance to the autism ASPECTSS design index. In U. Das, N. Papanephytous, & T. El-Kour (Eds.), *Autism 360* (pp. 479-500). Academic Press. <https://doi.org/10.18848/1833-1874/cgp/v08/38300>

Summary: This book chapter describes the application of the Autism ASPECTSS Design Index to evaluate the built environment of mainstream and special schools serving autistic students through a survey and case studies in Australia, the UK and Aby Dhabi. The survey tool can be found at www.surveymonkey.com/s/Autism-ASPECTSS-Built-Environment-Assessment. The key findings include:

Key Findings:

- The ASPECTSS Design Index assesses the criteria of acoustics, spatial sequencing, escape space, compartmentalisation, transition space, sensory zoning, and safety.
- The index was used to conduct a post-occupancy evaluation of the schools, involving surveys and interviews with education leaders, architects, and other stakeholders.
- The Design Index was effective in identifying areas for improvement in the school environments.
- The findings highlighted the importance of design features like transition spaces, compartmentalized zones, and access to outdoor areas in supporting the needs of autistic students.
- The study demonstrates the practical application of the ASPECTSS framework in designing and evaluating inclusive learning environments for autistic individuals.

Tags: [autism]

36. Designing for autism: An ASPECTSS post-occupancy evaluation of learning environments

Citation: Mostafa, M. (2018). Designing for autism: An ASPECTSS post-occupancy evaluation of learning environments. *Archnet-IJAR: International Journal of Architectural Research*, 12(3), 308-326. <https://doi.org/10.26687/archnet-ijar.v12i3.1589>

Summary: This study used the Autism ASPECTSS Design Index to evaluate the built environment of an autism-specific school. They organised focus groups, interviews surveys with parents, school leaders and staff and Foundation staff to collect this information.

Key Findings:

- The ASPECTSS framework was effective in assessing the school's performance across criteria like spatial sequencing, escape spaces, compartmentalization, and sensory zoning.
- Acoustic treatments (e.g., the use of soft furnishings) and the provision of sensory escape spaces within classrooms were identified as positive design features. In addition, dedicated zones for different learning activities, and logically ordered rooms and outdoor areas are positive design features.
- Challenges included lack of clearly defined transition spaces between different areas of the school and echoing in hallways as people travel between rooms.
- The study highlighted shortcomings with existing ADA guidelines and emphasised the benefits of using a framework such as ASPECTSS when designing learning environments.
- The study found that well-designed environments significantly improved the learning experiences and well-being of autistic students.
- The findings emphasise the need for ongoing evaluation and adaptation of learning environments to meet the evolving needs of students with autism.

Tags: [autism]

37. Architecture for autism: Built environment performance in accordance to the autism ASPECTSS design index

Citation: Mostafa, M. (2015). Architecture for autism: Built environment performance in accordance to the autism ASPECTSS design index. *Design Principles and Practices*, 8, 55-71. <https://doi.org/10.18848/1833-1874/cqp/v08/38300>

Summary: This study used the Autism ASPECTSS Design Index to evaluate the built environment of five schools for autistic students via a survey (accessible at www.surveymonkey.com/s/Autism-ASPECTSS-Built-Environment-Assessment). The key findings include:

Key Findings:

- The ASPECTSS Design Index was effective in assessing the inclusivity of the school environments for autistic students across seven key design criteria (Acoustics, Spatial sequencing, Escape space, Compartmentalization, Transition spaces, Sensory zoning and Safety).
- The index identified areas for improvement, such as enhancing acoustic conditions, providing sensory escape spaces, and improving spatial sequencing and zoning (by splitting zones into low, medium and high stimulation).
- The findings suggest the ASPECTSS Design Index can be a useful tool for designing and evaluating autism-friendly built environments.
- The study underscores the importance of using structured design frameworks to create supportive learning environments for autistic students.

Tags: [autism]

38. Using evidence based research method to design inclusive learning environment for autism

Citation: Khare, R., Mullick, A., & Khare, A. (2011). Using evidence based research method to design inclusive learning environment for autism. In T. Marek, W. Karwowski, & V. Rice (Eds.), *Advances in Understanding Human Performance: Neuroergonomics, Human Factors Design, and Special Populations* (pp. 792-802). <https://doi.org/10.1201/ebk1439835012-82>

Summary: This study developed a framework of design parameters for creating inclusive learning environments for autistic students. The key findings include:

Key Findings:

- The framework identified 18 design parameters, such as providing physical structure, maximizing visual structure, minimizing sensory distractions, and providing withdrawal and sensory spaces.

- Experts rated these design parameters as important for both autistic and non-autistic students, suggesting they have broader benefits.
- The study used a multi-phase approach to empirically validate the framework through surveys and observations.
- Involving experts in the design process can enhance the effectiveness of learning environments for all students, not just those with autism.
- The findings indicate that a well-structured environment can significantly improve the learning experiences of students with diverse needs.

Tags: [autism]

39. Incorporating the behavioral dimension in designing inclusive learning environment for autism

Citation: Khare, R., & Mullick, A. (2009). Incorporating the behavioral dimension in designing inclusive learning environment for autism. *Archnet-IJAR: International Journal of Architectural Research*, 3(3), 45-64. https://www.researchgate.net/publication/41668001_Incorporating_the_Behavioral_Dimension_in_Designing_Inclusive_Learning_Environment_for_Autism

Summary: This study developed a framework of design parameters for creating inclusive learning environments for autistic students. The key findings include:

Key Findings:

- The framework identified 18 design parameters, such as providing physical structure, maximizing visual structure, and minimizing sensory distractions.
- Experts rated these design parameters as important for both autistic and non-autistic students, suggesting they have broader benefits.
- The study used a multi-phase approach to empirically validate the framework through surveys and observations.
- The findings suggest that inclusive design should consider the unique experiences of students with autism to create supportive environments.
- The research advocates for a comprehensive understanding of the diverse needs of students in the design of educational spaces.

Tags: [autism]

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Inclusive design for specific space types

Classrooms and general-purpose learning areas

40. Examining inclusivity in flexible learning spaces: Expectations, comfort, and distractions

Citation: Zipf, S. T., Li, L., Oaxaca, G. C., & Ramsay, C. M. (2024). Examining inclusivity in flexible learning spaces: Expectations, comfort, and distractions. *Innovative Higher Education*, 50, 1-25.
<https://doi.org/10.1007/s10755-024-09730-8>

Summary: This study explored university students' experiences and perceptions of flexible learning spaces. The key findings include:

Key Findings:

- Students had preconceived expectations about how a classroom "should" look and function.
- Factors like sightlines, noise, visual distractions, and disorganized environments were identified as distractions that hindered students' ability to focus and learn.
- Students expressed a preference for familiar, moveable, comfortable seating options that allowed them to maintain their usual routines and social norms and sit in their usual location each week.
- Also, even though students were aware of the advantages of moveable furniture and chairs, cultural norms and expectations limited their willingness to move or choose equipment or furniture. In these cases, they defer their personalisation needs to the instructor (such as asking for permission).
- The findings suggest that flexibility in learning spaces should be balanced with students' comfort and familiarity to enhance engagement and learning outcomes.
- The study highlights the importance of considering students' perspectives in the design of flexible learning environments.

Tags: [university]

41. Psychological safety in innovative learning environments: Planning for inclusive spaces

Citation: Charteris, J., Anderson, J., & Page, A. (2024). Psychological safety in innovative learning environments: Planning for inclusive spaces. *International Journal of Inclusive Education*, 27(14), 688-704.
<https://doi.org/10.1080/13603116.2021.1974108>

Summary: This study examined the impact of innovative learning environments on the psychological safety and inclusion of students with high support needs, particularly those with autism. The key findings include:

Key Findings:

- Factors like excessive transparency, lack of private spaces, and congested circulation negatively affected students' sense of psychological safety.
- Providing dedicated "reset rooms" and reducing visual and auditory stimuli were important in creating more supportive environments.
- The study highlights the need to consider the psychological needs of students with disabilities when designing innovative learning spaces.
- The findings suggest that environments designed with psychological safety in mind can enhance the overall learning experience for all students.
- The research advocates for a holistic approach to school design that prioritises the well-being and comfort of all students, particularly those with high support needs.

Tags: N/A

42. The physical classroom environment: Crafting universal learning spaces

Citation: National Council for Special Education. (2024). The physical classroom environment: Crafting universal learning spaces. <https://ncse.ie/wp-content/uploads/2024/10/NCSE-Physical-Classroom-Environment.pdf>

Summary: This guideline from the National Council for Special Education in Ireland provides recommendations for creating inclusive and sensory-friendly classroom environments. The key points include:

Key Findings:

- The guidelines emphasize the importance of sensory-friendly design, organized and predictable layouts, and flexible, adaptable spaces.
- Recommended features include acoustic treatments, adjustable lighting, defined zones, and storage solutions to minimize visual clutter.
- The guidelines highlight the value of engaging students in the design and setup of their learning spaces.
- Regular assessments of classroom environments can help ensure they meet the evolving needs of all students.
- Training for educators on sensory-friendly practices can enhance the effectiveness of classroom modifications.

Tags: N/A

43. Development of special needs classroom prototypes to respond to the sensory needs of students with exceptionalities

Citation: Patel, T., Dorff, J., & Baker, A. (2022). Development of special needs classroom prototypes to respond to the sensory needs of students with exceptionalities. *Archnet-IJAR: International Journal of Architectural Research*, 16(2), 339-358. <https://doi.org/10.1108/ARCH-07-2021-0196>

Summary: This study involved developing an inclusive design checklist, then prototyping virtual classroom based on design guidelines co-created with expert special education teachers.

Key Findings:

- The design guidelines emphasized features like defined zones, flexible furniture, tactile elements, natural lighting, and muted colours to support the sensory needs of students with autism, intellectual disabilities, and emotional disturbances.
- The virtual prototypes demonstrated how the design principles could be applied to create sensory-friendly learning environments.
- The experts felt these guidelines would benefit all students, not just those with special needs.
- The study highlights the importance of involving educators in the design process to ensure that classrooms meet the diverse needs of all students.
- The findings suggest that thoughtful design can enhance the learning experiences of students with exceptionalities by providing supportive and engaging environments.

Tags: N/A

44. Qualitative needs analysis for future school classroom planning for a special class - Focusing on deriving spatial scenarios

Citation: Hyun, E., Kim, Y., & Choi, S. L. (2022). Qualitative needs analysis for future school classroom planning for a special class - Focusing on deriving spatial scenarios. *Journal of the Architectural Institute of Korea*, 38(12), 149-157. <https://doi.org/10.5659/JAIK.2022.38.12.149>

Summary: This study explored design considerations for future "digital classrooms" that would support students with diverse disability.

Key Findings:

- Recommended features include flexible spaces, quiet zones, consulting spaces, functional spaces, touch-enabled displays, and outdoor circulation areas to accommodate the needs of students with various disabilities.
- The study emphasized the importance of involving students in the co-design process to ensure the learning environments meet their diverse needs and preferences.
- The findings suggest that thoughtful design can enhance the learning experiences of students with disability by providing supportive and engaging environments.
- The research advocates for ongoing collaboration between educators and designers to create inclusive learning spaces that cater to the needs of all students.
- The study highlights the need for flexibility and adaptability in classroom design to accommodate the changing needs of students over time.

Tags: N/A

45. Analysis of ASD classrooms: Specialised open classrooms in the community of Madrid

Citation: Vela Llauradó, E., Martín Martínez, L., & Martín Cruz, I. (2020). Analysis of ASD classrooms: Specialised open classrooms in the community of Madrid. *Sustainability*, 12(18), 7342. <https://doi.org/10.3390/su12187342>

Summary: This study examined the design features of classrooms (mostly pre-primary and primary) for autistic students in Madrid, Spain by distributing a survey to school staff and leaders. The key findings include:

Key Findings:

- 94.3% of autism classrooms were organized into distinct zones for different activities, such as individual work, group work, and quiet areas. These areas were highlighted by visual aids such as pictograms.
- 82.9% of autism classrooms changed their layout each year to adapt to the students' needs, while 80% were adapted to suit the students' specific requirements.
- The use of visual aids, defined zones, and adaptable layouts were seen as important features to support autistic students.
- The study highlights the effectiveness of flexible classroom designs that can be tailored to the changing needs of autistic students, promoting engagement and learning.

Tags: [autism]

46. New generation learning environments: Are students with hearing difficulties included? A multiple case study of students with suboptimal hearing abilities

Citation: Munro, L. R. (2016). New generation learning environments: Are students with hearing difficulties included? A multiple case study of students with suboptimal hearing abilities. University of Melbourne. <https://hdl.handle.net/11343/112438>

Summary: This study examined the inclusion of students with hearing difficulties in innovative learning environments. The key findings include:

Key Findings:

- The open, collaborative learning spaces had high noise levels and reverberation times (due sound being allowed to bounce around) that made it difficult for students with hearing difficulties to hear the teacher or chat with other people.
- Students preferred to use the quieter, acoustically treated breakout spaces, which allowed them to better hear their teacher, participate and concentrate.
- The study emphasizes the importance of considering acoustic performance when designing inclusive innovative learning environments.

- The findings suggest that effective acoustic design can significantly enhance the learning experiences of students with hearing difficulties.
- The research advocates for the integration of acoustic considerations into the design of learning spaces to support all students' communication and engagement.

Tags: [deaf and hard of hearing]

47. A design model: The Autism Spectrum Disorder Classroom Design Kit

Citation: McAllister, K., & Maguire, B. (2012a). A design model: the Autism Spectrum Disorder Classroom Design Kit. *British Journal of Special Education*, 39(4), 201-208. <https://doi.org/10.1111/1467-8578.12006>

Summary: This study describes the development of the Autism Spectrum Disorder (ASD) Classroom Design Kit, a tool that allows teachers to model the layout of their classrooms to better support students with autism. The key findings are:

Key Findings:

- Classroom layouts can be varied and optimised to support the needs of autistic students - Teaching zones can be placed on one side of the classroom, with dedicated areas surrounding the teaching zone. Alternatively, teaching zones can be placed in the middle of the classroom, with other areas surrounding them.
- The ASD Classroom Design Kit allows teachers to model the layout of their classrooms to better support students with autism, and to talk through their thoughts with the architects.
- The study emphasizes the importance of collaboration between teachers and architects in creating effective classroom designs that cater to the unique needs of autistic students.

Tags: [autism]

48. Design considerations for the autism spectrum disorder-friendly Key Stage 1 classroom

Citation: McAllister, K., & Maguire, B. (2012b). Design considerations for the autism spectrum disorder-friendly Key Stage 1 classroom. *Support for Learning*, 27(3), 103-112. <https://doi.org/10.1111/j.1467-9604.2012.01525.x>

Summary: This study developed design guidelines for creating autism-friendly classrooms for students aged 5-8 years old. The key findings include:

Key Findings:

- Recommended design features include visual timetables, access to secure outdoor play areas, transition buffers, adequate storage, clear sightlines, and dedicated quiet/sensory spaces.
- The placement of teaching zones, dedicated areas, transition zones, and the overall classroom layout can be optimized to support the needs of students with autism.
- The researchers worked collaboratively with teachers to design and evaluate the ideal ASD-friendly classroom layout.
- The findings emphasise the importance of creating structured and predictable environments that reduce anxiety and support learning for autistic students.
- The study suggests that involving teachers in the design process can lead to more effective and practical solutions for accommodating students with autism.

Tags: [autism], [primary]

49. Adequacy of the regular early education classroom environment for students with visual impairment

Citation: Brown, C. M., Packer, T. L., & Passmore, A. (2011). Adequacy of the regular early education classroom environment for students with visual impairment. *The Journal of Special Education*, 46(4), 223-232. <https://doi.org/10.1177/0022466910397374>

Summary: This study examined the adequacy of the physical environment in mainstream early education classrooms for students with visual impairments. The key findings include:

Key Findings:

- The proportion of early education programs with a good overall physical environment level increased from 65% to 95% over the school year.
- Improvements were seen in the QIEM Accessibility and Adequacy of the Physical Environment scale, though the changes were only moderately significant ($p = 0.03$), and only when looking at the same 18 teachers.
- The physical environment was generally found to be adequate for students with visual impairments in most classrooms.
- The study suggests that ongoing assessments and improvements are necessary to ensure that classroom environments meet the needs of students with visual impairments effectively.

Tags: [blind and low vision]. [kindergarten]

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Circulation spaces

50. Influence of the area ratio of the skin glass and the outer wall position of a side corridor alongside an external passage on psychological quantities of students with hearing impairment

Citation: Miura, T., Satake, H., Yamawaki, H., & Imai, H. (2020). Influence of the area ratio of the skin glass and the outer wall position of a side corridor alongside an external passage on psychological quantities of students with hearing impairment. *Journal of Environmental Engineering (Japan)*, 85(778), 935-942. <https://doi.org/10.3130/AIJE.85.935>

Summary: This study examined the impact of corridor design on the perceptions and experiences of university students with hearing impairments. The key findings include:

Key Findings:

- Reducing the glass area ratio in corridors decreased students' sense of openness and security, particularly for those with hearing impairments, due to reduced lighting and visibility and narrowing the field of vision.
- Faculty staff tended to give more extreme ratings on the acoustic and thermal conditions of the corridors compared to the student responses which tended to fall in the middle of the range.
- Students with hearing impairments reported more dissatisfaction with corridors on higher floors, where there was more noise and thermal discomfort (due to extremes in temperature).
- The findings highlight the need for thoughtful corridor design that considers the sensory and psychological needs of students with disabilities.
- The study advocates for ongoing assessments of corridor designs to ensure they meet the needs of all students.

Tags: [deaf and hard of hearing], [university]

51. The chance for sociability. How participation and interaction structures of adolescents with brain injury on an institutional corridor inform smart learning ecosystems

Citation: Krummheuer, A., Rehm, M., Lund, M. K. L., & Nielsen, K. N. (2018). The chance for sociability. How participation and interaction structures of adolescents with brain injury on an institutional corridor inform smart learning ecosystems. *Interaction and Design Architectures* (39), 78-95. https://vbn.aau.dk/ws/files/308459430/39_4.pdf

Summary: This study examined how adolescents with brain injuries used and interacted within the corridors of an institutional learning environment. The key findings include:

- The corridor was used by students as a space to seek out social contact and activity, rather than just for transit.
- The presence of furniture and sensory elements in the corridor influenced the types of interactions and activities that occurred.
- The study highlights the potential of corridors to serve as important spaces for learning and social engagement, beyond just circulation.
- Designing corridors with interactive elements can enhance social interactions among students with acquired brain injury or congenital brain injury, promoting a sense of community.
- The findings suggest that corridors should be considered as integral parts of the learning environment that can facilitate both movement and socialization.

Tags: N/A

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Playgrounds, school yards and outdoor areas

52. A gap in perceived accessibility to play spaces for physical activity in Arizona elementary schools

Citation: Schulke, M., Wilson, K., Ramella, K., Kulinna, P. H., & Poulos, A. (2024). A gap in perceived accessibility to play spaces for physical activity in Arizona elementary schools. *Disability and Health Journal*, 17(3), 101595. <https://doi.org/10.1016/j.dhjo.2024.101595>

Summary: This study examined the perceived accessibility of play spaces for physical activity among students with and without disability in Arizona elementary schools. The key findings include:

Key Findings:

- They used the School Physical Activity Policy Assessment (S-PAPA) to look at the availability of facilities to promote physical activity in their school, and how accessible they are for students with disability.
- Without accounting for school income, teacher-perceived inaccessibility of play fields and playgrounds were 3-fold higher for students with disability compared to students without disability.
- When accounting for school income, teacher-perceived inaccessibility of play fields was 7-fold higher for students with disability in low-income schools compared to students without disability (but not high-income schools).
- For playgrounds, inaccessibility was 3-fold higher for students with disability in low-income schools compared to those without disability (but only 1.6-fold higher in high-income schools).
- The findings underscore the need for targeted interventions to improve access to play spaces, particularly in low-income schools, to ensure equitable opportunities for physical activity for all students.

Tags: [primary]

53. A novel data-driven approach to examine children's movements and social behaviour in schoolyard environments

Citation: Nasri, M., Tsou, Y.-T., Koutamanis, A., Baratchi, M., Giest, S., Reidsma, D., & Rieffe, C. (2022). A novel data-driven approach to examine children's movements and social behaviour in schoolyard environments. *Children*, 9(8), 1177. <https://doi.org/10.3390/children9081177>

Summary: This study used sensor data and behavioral mapping to examine how the physical affordances of schoolyard environments influenced the play and social interactions of students with and without disability. The key findings include:

Key Findings:

- Physical affordances like equipment, furniture, and layout influenced the types of activities and social interactions that occurred in the schoolyard, as well as how much attention was paid towards specific pieces of equipment.
- Social affordances: Crowded areas could push some students away from them, while areas with benches and other social furniture facilitated more interactions.
- Cultural affordances: Rules and restrictions on where certain activities could take place also restricted the movement of students to specific areas (e.g., wheeled toys were restricted to a specific area where a supervisor was in charge).
- The findings suggest that thoughtful design of schoolyard environments can enhance social interactions and physical activity among all students, particularly those with disabilities.

Tags: N/A

54. Architecture for autism: A reflection of the design of learning environments

Citation: Castañeda-Sifuentes, L., Maya- López, M., & Leyva-Picazo, V. (2022). Architecture for autism: A reflection of the design of learning environments. *Legado de Arquitectura y Diseño*, 17(31), 105-114. <https://doi.org/10.36677/legado.v17i31.16453>

Summary: This study explored parents' perspective on the learning environments of their primary school-aged autistic children through a survey of 15 parents, with five parents responding to questions about space and learning. The key findings include:

Key Findings:

- Enablers of participation included spaces and places that allow children to explore, help with orientation, and diverse sensations, grab things and investigate.
- Disorientating spaces were a barrier to participation.
- Enabling design characteristics included sensory furniture, access to slides, swings, wading pools, rotating games, outdoor play possibilities, the ability to look at the sky and enclosed spaces with a pleasant temperature.
- The children's needs were so diverse that it was not possible to generalise.

Tags: [autism], [primary]

55. Inclusive learning school farm environment

Citation: Farag, A. A., & Hamza, I. S. (2021). Inclusive learning school farm environment. In A. A. Farag, S. Badawi, G. Lalli, & M. Kamareddine (Eds.), *School Farms* (pp. 249-273). <https://doi.org/10.4324/9781003176558-19>

Summary: This book chapter developed design guidelines for creating inclusive school farm environments. The key findings include:

Key Findings:

- The guidelines cover spatial experience (move around and participate in activities), sensorial experience (sensory stimulation), social integration experience (social spaces) and nature interaction experience (natural environment) within the school farm setting.
- Recommended features include accessible pathways, clear signage, varied sensory elements, and spaces that facilitate social interaction.
- The guidelines were developed through a Delphi survey process involving experts in landscape design, inclusive education, and school farming.
- The findings suggest that inclusive design in school farms can enhance the educational experience for all students, particularly those with disabilities.
- The study highlights the importance of creating environments that promote engagement and interaction with nature for all students.

Tags: N/A

56. Creating play opportunities on the school playground: Educator experiences of the Sydney playground project

Citation: Serman, J., Villeneuve, M., Spencer, G., Wyver, S., Beetham, K. S., Naughton, G., Tranter, P., Ragen, J., & Bundy, A. (2020). Creating play opportunities on the school playground: Educator experiences of the Sydney playground project. *Australian Occupational Therapy Journal*, 67(1), 62EP-73. <https://doi.org/10.1111/1440-1630.12624>

Summary: This study examined the experiences of educators in implementing a playground intervention that introduced loose, recycled materials to encourage imaginative play. Four specialist schools and one mainstream school with three specialist support classes participated. The key findings include:

Key Findings:

- Educators were initially sceptical about the value of the loose materials, but after a risk-reframing session, they were more likely to step back and allow students to play independently.
- The loose materials sparked students' interest and imagination, leading to increased cooperative play and risk-taking.
- Educators had to balance their duty of care with allowing students the freedom to explore and negotiate the loose materials.
- The introduction of loose materials led to a significant increase in student engagement and creativity during playtime.
- Educators reported that the use of loose materials facilitated social interactions among students, promoting teamwork and communication skills.
- The project highlighted the importance of providing a safe environment where students could take risks and learn through play.

Tags: N/A

57. Design across the spectrum: Play spaces

Citation: Owen, C. (2016). Design across the spectrum: Play spaces. School of Architecture & Design, University of Tasmania. https://www.utas.edu.au/_data/assets/pdf_file/0006/930246/UTAN-Playspaces.pdf

Summary: This guideline provides design recommendations for creating inclusive play spaces for students with autism. The key points include:

Key Findings:

- The guidelines are split into seven sections: Structuring the unstructured; Crossing the threshold; Spaces within spaces; Active engagement; Visual cues; Sensory diversity; Stepping stones to social interaction; and Props to release the imagination.
- Play spaces should have clearly defined areas, transition spaces, and clear boundaries to support students' sensory needs and wayfinding.

- On the other hand, large expansive playgrounds with no structure to play, signs that are abstract and ambiguous and intense colours and stimuli can hinder interactions with autistic students.
- Incorporating a variety of sensory experiences, textures, and props can encourage participation and imaginative play.
- Neutral colors and low-stimulus materials should be used to avoid overstimulating students with sensory sensitivities.
- The guidelines emphasise the importance of creating safe and engaging environments that cater to the diverse needs of children with autism.
- Design features that promote social interaction and cooperative play are essential for fostering inclusion among all students.

Tags: [autism]

58. Usability of playgrounds for children with different abilities

Citation: Prellwitz, M., & Skär, L. (2007). Usability of playgrounds for children with different abilities. *Occupational Therapy International*, 14(3), 144-155. <https://doi.org/10.1002/oti.230>

Summary: This study examined the experiences and use of playgrounds by students with and without disabilities. The key findings include:

Key Findings:

- Students with disabilities faced significant challenges in accessing and using school playgrounds, often finding them difficult or unusable, due to the presence of numerous barriers (e.g., sand, small playgrounds and playhouses, grey wood). They often needed help from an adult to use the playground.
- Swings were identified as the most desired and usable piece of playground equipment by students with disabilities.
- Students with disabilities had fewer opportunities for imaginative play and social interaction on the playgrounds compared to their peers without disabilities.
- The study highlights the importance of designing inclusive playgrounds that cater to the diverse needs of all children.

Tags: N/A

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Sensory gardens

59. Sensory garden design proposal for children with autism spectrum disorder

Citation: Pouya, S., Bayındır, E., & Pouya, S. (2024). Sensory garden design proposal for children with autism spectrum disorder. *Support for Learning*, 39(1), 44-57. <https://doi.org/10.1111/1467-9604.12466>

Summary: This study proposed a sensory garden design for a school serving autistic students, based on interviews with parents and observations. The key findings include:

Key Findings:

- Parents reported that taking autistic children to parks and natural spaces helped reduce their stress and improve their mood, communication, and social skills.
- School staff commented that activities in the schoolyard helped students with sensory integration, socialization, psychological relaxation and self-confidence
- The authors developed design recommendations for the sensory garden, including zoning, varied sensory elements, and accessible features, but did not implement or evaluate the proposed design.

Tags: [autism]

60. Designing special education school gardens as playgrounds: Aliaga Special Education and Application Center playground arrangement

Citation: Guller, E. (2023). Designing special education school gardens as playgrounds: Aliaga Special Education and Application Center playground arrangement. *Online Journal of Art & Design*, 11(3), 309-320. <https://adjournal.net/articles/113/11319.pdf>

Summary: This case study proposed design recommendations for the school garden and playground of a special education school in Turkey.

Key Findings:

- The existing school garden lacked accessibility, color, and play equipment suitable for students with disability.
- The proposed design incorporated zoning, green spaces, varied play equipment, and sensory elements to create a more inclusive and engaging outdoor environment.
- The proposed design encourages participation, strength training, access, social integration and independence.
- The authors developed the design recommendations based on interviews with school staff and observations but did not implement or evaluate the proposed changes.
- The study highlights the importance of creating accessible and stimulating outdoor spaces that cater to the diverse needs of students with disability.
- The findings suggest that well-designed school gardens can enhance social interaction, physical activity, and overall well-being for students with disability.

Tags: [special school]

61. Design clues for a sensory garden

Citation: Eraslan, Ş., & Akyyev, A. (2022). Design clues for a sensory garden. *Online Journal of Art & Design*, 10(3), 37-48. <https://www.adjournal.net/articles/103/1033.pdf>

Summary: This study proposed design recommendations for a garden at a special needs school in Turkey that addressed both sensory and inclusion needs. The key findings include:

Key Findings:

- The sensory garden should incorporate a variety of sensory experiences, such as textures, sounds, balance activities, water features and places for rest.
- The design should cater to the diverse needs of students with various disabilities, including physical, sensory, and developmental disabilities.
- The design should also cater for the parents and carers of students.
- The authors developed a design brief for the sensory garden based on interviews with school staff and observations but did not implement or evaluate the proposed design.
- The findings suggest that sensory gardens can enhance the well-being and engagement of students with disabilities by providing stimulating and calming environments.
- The study highlights the importance of involving education leaders, their staff and allied health professionals in developing design responses.

Tags: [special school]

62. Designing an impactful sensory garden for children and youth with autism spectrum disorder

Citation: Wagenfeld, A., Sotelo, M., & Kamp, D. (2019). Designing an impactful sensory garden for children and youth with autism spectrum disorder. *Children, Youth & Environments*, 29(1), 137-152.
<https://doi.org/10.7721/chilyoutenvi.29.1.0137>

Summary: This article describes the design process and key features of a sensory garden created for a school serving autistic students. The key findings include:

Key Findings:

- The collaborative design process between the landscape architect, occupational therapist, and school staff aimed to design an inclusive, multi-sensory outdoor environment that is catered to autistic students.
- The sensory garden incorporated design principles like routine, pattern, sightlines, wayfinding, easy transitions, clear circulation patterns, and inviting spaces.
- It included sensory-rich zones, planters that established a green space, quiet spaces as 'places away', seating and outdoor furniture, and interactive elements like water features and musical sculptures.
- Even though the paper listed the features of their sensory garden design, it did not rigorously measure outcomes, only arising from what a few people had said.
- The study highlights the importance of considering sensory needs in the design of outdoor spaces for children with autism.

Tags: [autism]

63. Sensory affordances in outdoor play environment towards well-being of special schooled children

Citation: Hussein, H. (2017). Sensory affordances in outdoor play environment towards well-being of special schooled children. *Intelligent Buildings International*, 9(3), 148-163.
<https://doi.org/10.1080/17508975.2015.1015945>

Summary: This study observed the use of sensory gardens by students in two special schools.

Key Findings:

- Zones with more sensory features and dedicated seating options saw higher levels of student engagement and use.
- The variety and accessibility of sensory stimuli, like sound and texture, were important in encouraging students to interact with and remain in the outdoor spaces.
- Positioning sensory features adjacent to pathways encouraged circulation and engagement with the outdoor environment.
- The study highlights the value of incorporating diverse sensory experiences and clear circulation paths in designing inclusive school gardens and playgrounds.
- The findings suggest that well-designed outdoor environments can enhance the participation and well-being of students with disability.
- The research advocates for ongoing assessments of sensory garden designs to ensure they meet the needs of all students.

Tags: [special school]

64. Evaluation of land use eligibility regarding disabled children in special education school garden

Citation: Pouya, S., Akyol Şatiroğlu, E., & Demirel, O. (2016). Evaluation of land use eligibility regarding disabled children in special education school garden. *International Refereed Journal of Architecture and*

Summary: This study evaluated the accessibility and suitability of a special education school's outdoor garden and playground for students with disabilities. The key findings include:

Key Findings:

- The existing school garden lacked accessibility features, appropriate play equipment, and dedicated seating/resting areas for students with disabilities.
- Entrances, pathways, and play areas were not designed to accommodate students using wheelchairs or with other mobility challenges (e.g., entrances were too narrow and doors did not fully open).
- The authors proposed design recommendations to improve the inclusiveness and accessibility of the school's outdoor spaces.
- The findings suggest that well-designed outdoor environments can enhance the participation and well-being of students with disabilities.
- The study highlights the importance of creating accessible and engaging outdoor spaces that cater to the diverse needs of all students.

Tags: [special school]

65. Patterns of seated activity in sensory gardens among children educated in special schools

Citation: Hussein, H. (2013). Patterns of seated activity in sensory gardens among children educated in special schools. *Support for Learning: British Journal of Learning Support*, 28, 73-78. <https://doi.org/https://doi.org/10.1111/1467-9604.12021>

Summary: This study observed the use of sensory gardens by students in two special schools. The key findings include:

Key Findings:

- Students spent the most time seated in areas of the sensory gardens that had dedicated seating, as well as features like water elements and raised planting beds.
- Zones with fewer seating options and less sensory stimuli tended to have lower levels of student engagement and use.
- The findings suggest the importance of incorporating a variety of sensory features and seating options to encourage student use and interaction with sensory gardens.
- The study highlights how well-designed sensory gardens can enhance engagement and social interaction among students with disabilities.

Tags: [special school]

66. Using the sensory garden as a tool to enhance the educational development and social interaction of children with special needs

Citation: Hussein, H. (2010). Using the sensory garden as a tool to enhance the educational development and social interaction of children with special needs. *Support for Learning*, 25(1), 25-31. <https://doi.org/10.1111/j.1467-9604.2009.01435.x>

Summary: This study observed the use of sensory gardens by students in two special schools. The key findings include:

Key Findings:

- Students were drawn to features like water elements, covered tunnels, and rubber walkways that encouraged verbal communication and social interaction.

- Cooler temperatures in the morning and evening were preferred when using sensory gardens, while high noon temperatures and stormy weather limited the use of the gardens.
- The sensory gardens were seen as calming, pleasant, and stimulating environments for students with disability, and can promote positive behavioural changes, social interaction and mental development.
- Incorporating diverse sensory features in garden design can enhance the educational experience and social skills of students with special needs.

Tags: [special school]

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Other indoor settings

67. Participation in science and engineering laboratories for students with physical disabilities: Survey development and psychometrics

Citation: Jeannis, H., Goldberg, M., Seelman, K., Schmeler, M., & Cooper, R. A. (2019). Participation in science and engineering laboratories for students with physical disabilities: Survey development and psychometrics. *Disability and Rehabilitation: Assistive Technology*, 14(7), 692-709. <https://doi.org/10.1080/17483107.2018.1499049>

Summary: This study developed and validated a survey instrument to assess the extent to which students with physical disabilities can participate in science and engineering laboratories. The key findings include:

Key Findings:

- The survey evaluated factors like access to the building and laboratory, ease of setting up experiments, and ease of operating equipment.
- The survey demonstrated good content validity and moderate reliability in assessing the physical environment barriers experienced by students with disabilities.
- The findings suggest the survey could be a useful tool for evaluating the accessibility of laboratory learning environments.
- The study highlights the importance of addressing physical barriers in science and engineering labs to enhance participation for students with disabilities.

Tags: [university]

68. Building bridges: Fostering dynamic partnerships between the library department and office of student disability services in higher education

Citation: Sanchez-Rodriguez, N. A., & LoGiudice, J. (2018). Building bridges: Fostering dynamic partnerships between the library department and office of student disability services in higher education. *Journal of Access Services*, 15(4), 142-160. <https://doi.org/10.1080/15367967.2018.1520640>

Summary: This case study examined the collaboration between a university library and the office of student disability services to improve accessibility and inclusion. The key findings include:

Key Findings:

- An assessment of the university's seven libraries found significant accessibility barriers, such as lack of ramps, elevators, and clear signage.
- Collaboration between the library and disability services led to improvements in physical accessibility, wayfinding, and the overall inclusiveness of the library environment.
- The study highlighted the importance of engaging diverse stakeholders and soliciting feedback to monitor and improve accessibility in campus facilities.
- The findings emphasize the need for ongoing collaboration between departments to ensure that libraries and other campus facilities are accessible and welcoming to all students.

Tags: [university]

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Specific inclusive design characteristics & features

Physical accessibility

69. Finding the optimal route for people with mobility impairments: A case study of the Inonu University campus

Citation: Kocaaslan, H., Pouya, S., & SÖNmez, S. (2024). Finding the optimal route for people with mobility impairments: A case study of the İnönü University campus. *Urbani Izziv*, 35(1), 122-135.

<https://doi.org/10.5379/urbani-izziv-en-2024-35-01-03>

Summary: This study used an analytical hierarchy process to identify the most accessible route for students with mobility impairments to go from the trolleybus stop to reach the university library on the Inonu University campus in Turkey. The key findings include:

Key Findings:

- Students with mobility impairments placed the greatest importance on suitable paving and ramp slopes when evaluating the accessibility of routes.
- The researchers' visual evaluation identified various barriers along the routes, such as handrails only on stairs and not ramps, worn/broken paving, inadequate wayfinding and obstructing plants.
- The findings highlight the need for a holistic approach to improving campus accessibility beyond just meeting regulatory requirements.
- The study suggests that careful planning and design can significantly enhance the mobility and independence of students with disabilities on campus.
- The research advocates for ongoing assessments of campus routes to ensure they remain accessible and user-friendly for all students.

Tags: [physical disability], [university]

70. Access to education in terms of the elimination of architectural barriers - On the example of selected Polish universities located in historic buildings

Citation: Nowak-Pieńkowska, M., & Brutkowski, M. (2023). Access to education in terms of the elimination of architectural barriers - On the example of selected Polish universities located in historic buildings. *Architecturae et Artibus*, 15(2), 1-12.

<https://doi.org/10.24427/aea-2023-vol15-04>

Summary: This study audited the accessibility of historic university buildings in Poland for students with disabilities. The key findings include:

Key Findings:

- Many university buildings had accessibility barriers such as stairs, narrow doorways, and lack of ramps or elevators.
- Older buildings posed challenges in making them fully accessible.
- The study focused more on documenting accessibility issues rather than proposing solutions.
- The findings indicate a pressing need for targeted renovations and adaptations to historic university buildings in Poland to improve accessibility for students with disabilities.

Tags: [university]

71. Barriers in higher education: Perceptions and discourse analysis of students with disabilities in Spain

Citation: García-González, J. M., Sonia Gutiérrez, G.-C., Eva Solera, H., & Ríos-Aguilar, S. (2021). Barriers in higher education: Perceptions and discourse analysis of students with disabilities in Spain. *Disability & Society*, 36, 579-595. <https://doi.org/https://doi.org/10.1080/09687599.2020.1749565>

Summary: This study explored the experiences and perceptions of university students with disability in Spain. The key findings include:

Key Findings:

- Students reported significant physical accessibility barriers, such as stairs, narrow doorways, and inadequate furniture, that hindered their ability to fully participate in university life.
- A lack of disability adaptation in older infrastructure including buildings, campus environment and transport options.
- Other barriers included inflexible teaching practices and a lack of awareness among faculty about the needs of students with disability.
- The study highlighted the need for more inclusive university policies and environments to support the full participation of students with disability.
- Barriers resulted in students with disability preferring work from home options.
- The findings emphasize the importance of addressing both physical and attitudinal barriers to create a truly inclusive higher education environment.

Tags: [university]

72. Examination in terms of accessibility and use of place of unimpeded wellness center: The case of Ankara

Citation: Çetinkale Demirkan, G. (2020). Examination in terms of accessibility and use of place of unimpeded wellness center: The case of Ankara. *Journal of Agriculture Faculty of Ege University*, 57(4), 467-478. <https://doi.org/10.20289/zfdergi.634651>

Summary: This study evaluated the accessibility and usability of the Unimpeded Wellness Center in Ankara, Turkey for individuals with disabilities.

Key findings:

- The researchers assessed the facility against accessibility standards and guidelines, including the "Basic Accessibility Handbook for Local Governments", "The Guide for Universal Standards for Disabled", and Turkish Standards Institution (TSI) standards.
- The evaluation focused on features like hard floors, wider doorways, barriers for vision impaired, handrails, motion sensor lighting, disability elevators, and legible signage.
- The findings highlighted that the facility generally adhered to accessibility standards, with features that benefited individuals with mobility and visual impairments.
- Specific areas of concern included the adequacy of ramps, the positioning of handrails, and the accessibility of restrooms and other essential facilities.
- The study noted that while the facility met many accessibility criteria, there were still gaps in ensuring full usability for all individuals, particularly those with complex needs.
- The study did not involve direct engagement with users or staff, limiting the understanding of the lived experiences within the facility.
- The lack of user engagement also means that the study may not fully capture the effectiveness of the design features in supporting independence and comfort for individuals with disabilities.
- The study provides an example of an accessibility audit of an existing facility but lacks the perspective of users with disability to fully evaluate the inclusiveness of the environment.

Tags: N/A

73. Disabled students need more than just ramps

Citation: Hede, P. (2015). Disabled students need more than just ramps. International Specialised Skills (ISS) Institute. https://www.issinstitute.org.au/files/ugd/51e950_5dba1f3666ab41f9b4834714138bb1f6.pdf

Summary: This report discusses the environmental factors and design characteristics that can support the inclusion of students with disabilities in mainstream school settings.

Key Findings:

- Inclusive school planning should include early intervention, sub-schools, a dedicated support base, and a variety of adaptable learning spaces.
- Inclusive spaces should allow students with disabilities to have some control of their learning and involvement and have the capacity to withdraw if needed.
- Inclusive design should promote a model of student-initiated learning and help all students learn about disability and see it as a part of everyday life.
- The report emphasises the need for a holistic approach to accessibility that goes beyond physical modifications to include social and educational considerations.
- The findings advocate for a comprehensive understanding of the diverse needs of students with disabilities in the design of educational environments.

Tags: N/A

74. Physical activity and the development of the built environment in schools for youth with a functional disability in Quebec

Citation: Roult, R., Carbonneau, H., Chan, T., Belley-Ranger, É., & Duquette, M.-M. (2014). Physical activity and the development of the built environment in schools for youth with a functional disability in Quebec. *Sport Science Review*, 23(5-6), 225-240. <https://doi.org/10.1515/ssr-2015-0003>

Summary: This study examined the built environment of schools serving students with physical disabilities in Quebec, Canada, through interviews and observations. Participants involved 15 schools, 16 school administrators, 18 physical education teachers and professional staff, 8 parents and 10 students with physical disabilities.

Key Findings:

- Many schools, both mainstream and specialized, had inadequate or poorly adapted built environments for students with physical disabilities.
- Accessibility issues were found not only in classrooms, but also in areas like gymnasiums, change rooms, and outdoor play spaces.
- The study identified accessibility barriers in both mainstream and specialist settings.
- The study highlights the need for a holistic, barrier-free approach to designing school facilities that can accommodate the diverse needs of students with physical disabilities.
- The findings suggest that thoughtful design can enhance the participation and well-being of students with disabilities in physical activities.
- The research advocates for ongoing assessments of school facilities to ensure they meet the needs of all students.

Tags: N/A

75. Inclusive design in the implementation of projects for schools modernization in Portugal - case studies

Citation: Lopesa, L., Aguiarb, C., & da Silvac, F. M. (2012). Inclusive design in the implementation of projects for schools modernization in Portugal - case studies. *Work*, 41(S1), 5579-5582.
<https://doi.org/10.3233/wor-2012-0888-5579>

Summary: This study evaluated the implementation of inclusive design principles in school modernization projects in Portugal. The key findings include:

Summary:

- The absence of architectural supports (e.g., no ramps for students on wheelchairs to walk alongside their friends, no rails to go upstairs, too much space between stair steps) can be significant barriers to students with disability navigating around secondary school, particularly those who have cerebral palsy. This leads to feelings of exclusion among students with disability.
- The authors recommend that children with disability and their family members should be included in the design team to provide a lived experience perspective of the difficulties they experience when navigating around school.
- The authors emphasized that accessibility design requires more than just meeting minimum standards - a holistic, barrier-free approach is needed to accommodate the diverse needs of students with physical disabilities.

Tags: N/A

76. An exploration into the barriers and facilitators experienced by university graduates with disabilities requiring personal assistance services

Citation: Stumbo, N. J., Hedrick, B. N., Weisman, C., & Martin, J. K. (2011). An exploration into the barriers and facilitators experienced by university graduates with disabilities requiring personal assistance services. *Journal of Science Education for Students with Disabilities*, 14(1), 1-24.
<https://repository.rit.edu/cgi/viewcontent.cgi?article=1014&context=jsesd>

Summary: This study explored the experiences of university graduates with severe physical disabilities. The key findings include:

Key Findings:

- Good campus accessibility was a major educational facilitator.
- The university campus was generally accessible, but students often required assistance from the disability office to ensure access, such as changing classroom locations.
- Barriers in building interiors included lecture halls with hidden access and older buildings generally.
- Barriers in campus exteriors included lack of ramp access or steep travel pathways around campus.
- Barriers extended beyond the campus, such as public transportation systems to get to campus.
- STEM alumni were more likely to encounter architectural barriers due to inaccessible science buildings, while non-STEM alumni faced more social challenges.
- The study highlights the need for ongoing support and advocacy to ensure that students with disabilities can navigate university environments effectively.

Tags: [physical disability], [university]

[Go back to TOC](#)

Wayfinding

77. An exploratory study testing environmental wayfinding aids as an intervention for children with autism

Citation: Irish, J. E. N. (2022a). An exploratory study testing environmental wayfinding aids as an intervention for children with autism. *Health Environments Research & Design Journal*, 15(4), 114-130. <https://doi.org/10.1177/19375867221111467>

Summary: This study examined the use of environmental wayfinding aids to support the navigation of autistic students in an unfamiliar school setting. The key findings include:

Key Findings:

- The wayfinding aids placed in the school did not significantly improve the students' ability to reach their destination, however the quality of the wayfinding installed for the study appears from the photos in the study to be difficult to differentiate because of their small size and insufficient contrast with the surrounding environment.
- The treatment group also had participants with unanticipated ambulatory issues which may have affected the results when compared against the control group.
- Some students used their own "seemingly irrelevant" details as navigational aids, rather than the provided cues.
- Long, undifferentiated corridors posed challenges for the younger autistic students in wayfinding.
- The study highlights the need for more effective and tailored wayfinding strategies to support autistic students in navigating school environments.

Tags: [autism]

78. From prose to poetry: Retelling the experiences of children with autism navigating around a school to promote empathy and understanding

Citation: Irish, J. E. N. (2021). From prose to poetry: Retelling the experiences of children with autism navigating around a school to promote empathy and understanding. *Qualitative Research Journal*, 21(4), 483-497. <https://doi.org/10.1108/QRJ-10-2020-0137>

Summary: This study used a phenomenological approach to explore how autistic students navigated an unfamiliar school environment. The key findings include:

Key Findings:

- Autistic students used various "navigational aids", including seemingly irrelevant details, to find their way around the school.
- Long, undifferentiated corridors posed challenges for the younger autistic students in wayfinding.
- The researcher used poetic transcription to convey the essence of the students' experiences in a more empathetic manner.
- The findings suggest that understanding the unique navigational strategies of autistic students can inform the design of more accessible school environments.
- The study highlights the importance of considering the sensory and cognitive needs of autistic students in the design of school layouts.

Tags: [autism]

79. Blind photographers: A quest into the spatial experiences of blind children

Citation: Herssens, J., & Heylighen, A. (2012). Blind photographers: A quest into the spatial experiences of blind children. *Children, Youth & Environments*, 22(1), 99-124. <https://doi.org/10.1353/cye.2012.0039>

Summary: This study used a photovoice methodology to explore the spatial experiences of blind children in their school environment. The key findings include:

Key Findings:

- Blind students relied heavily on auditory, haptic, and olfactory cues to navigate and make sense of their surroundings.
- Specific features like textures, materials, sound, clear paths and sightlines were important in helping students orient themselves and feel a sense of safety and independence.
- Everyday objects and building features are used by visually impaired students as landmarks.
- The study highlighted the value of engaging directly with students with disabilities to understand their unique perspectives on the built environment.
- The findings underscore the importance of designing educational spaces that cater to the sensory needs of blind students, promoting their independence and engagement.

Tags: [blind and low vision]

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Sensory spaces and stations

80. Sensory spaces in schools

Citation: National Council for Special Education (NCSE), Ireland. (2021). Sensory spaces in schools. <https://ncse.ie/wp-content/uploads/2021/10/NCSE-Sensory-Spaces-in-Schools-2021.pdf>

Summary: This guideline from the National Council for Special Education in Ireland provides recommendations for creating sensory spaces within schools to support students' self-regulation and well-being. The key points include:

Key Findings:

- Sensory spaces should be designed to provide calming, sensory-rich environments where students can regulate their emotions and sensory needs.
- Key design elements include acoustic treatment, adjustable lighting, defined boundaries, and a variety of sensory tools and equipment.
- Sensory spaces can benefit all students, not just those with identified needs, by providing a space to manage stress and anxiety.
- The guidelines emphasize the importance of involving students in the design process to ensure the spaces meet their specific sensory needs.
- Regular evaluation and feedback from users should be incorporated to adapt the sensory spaces to changing needs over time.
- Training for staff on how to effectively use and manage sensory spaces is crucial for maximizing their benefits for students.

Tags: N/A

81. Creating and testing a sensory well-being hub for adolescents with developmental disabilities

Citation: Park, G., Nanda, U., Adams, L., Essary, J., & Hoelting, M. (2020). Creating and testing a sensory well-being hub for adolescents with developmental disabilities. *Journal of Interior Design*, 45(1), 13-32. <https://doi.org/10.1111/joid.12164>

Summary: This study describes the design, construction, and evaluation of a sensory hub within a school to support the sensory needs of students with developmental disabilities (e.g., autism, ADHD, intellectual disability, visual impairment and wheelchair use). The key findings include:

Key Findings:

- The sensory hub consists of three zones: a sensory cocoon (reduced sound intensity and illumination); a respite zone (to calm the senses down via tactile stimuli); and an active zone (to stimulate senses).
- Students used the sensory hub to rest and relieve stress and anxiety.
- Students mostly used the sensory cocoon and the respite zone, particularly the bean bag, weighted blanket and fidget wall.
- The study highlights the importance of creating sensory-friendly spaces within schools to support the emotional and sensory regulation of students with developmental disabilities.

Tags: N/A

82. Making a sensory cocoon: Translating discrete sensory needs into a built solution with emerging digital fabrication workflows

Citation: Essary, J., Park, G., Adams, L., & Nanda, U. (2020). Making a sensory cocoon: Translating discrete sensory needs into a built solution with emerging digital fabrication workflows. *Technology - Architecture & Design*, 4(1), 80-91. <https://doi.org/10.1080/24751448.2020.1705717>

Summary: This study describes the design, construction, and evaluation of a "sensory cocoon" space within a school to support the sensory needs of students with developmental disabilities.

Key Findings:

- The sensory cocoon provided a calming, sensory-rich environment that students used for relaxation and regulation.
- Students spent an average of 3 minutes and 45 seconds per visit in the cocoon, finding it to be a beneficial space.
- Challenges included the cocoon's lack of wheelchair accessibility and the need for further refinements to the design.
- The findings suggest that sensory cocoons can be effective tools for supporting students with sensory processing challenges.
- The study highlights the importance of considering accessibility in the design of sensory spaces to ensure they are usable by all students.

Tags: N/A

83. A relaxation station in every location

Citation: Maich, K., Davies, A. W. J., & van Rhijn, T. (2019). A relaxation station in every location. *Intervention in School and Clinic*, 54(3), 160-165. <https://doi.org/10.1177/1053451218767916>

Summary: This article provides guidelines for creating "relaxation stations" within classrooms to support the self-regulation of students, particularly those with special needs. The key findings include:

Key Findings:

- Relaxation stations should be designed as a calming, private space within the classroom where students can go to regulate their emotions and sensory needs.
- Key design elements include clear boundaries, defined expectations, comfortable furnishings, sensory tools, and procedures for entering and exiting the space.
- Relaxation stations can benefit all students, not just those with identified needs, by providing a space to manage stress and anxiety.
- The study emphasizes the importance of integrating relaxation stations into classroom design to promote emotional well-being and self-regulation for all students.

Tags: N/A

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Indoor environmental quality (IEQ)

Acoustics

84. A research on acoustical comfort for hearing-impaired individuals in inclusive education places

Citation: Uzeyirli, Z., & Bilen, A. (2021). A research on acoustical comfort for hearing-impaired individuals in inclusive education places. *Building Acoustics*, 28(1), 57-75. <https://doi.org/10.1177/1351010X20923581>

Summary: This study examined the speech intelligibility and acoustic conditions of standard high school classrooms in Turkey and enhanced laboratory settings, drawing on insights from seven students with hearing impairments and seven students with hearing in the normal range.

Key Findings:

- The acoustic conditions of typical Turkish learning environments, characterised by rectangular rooms, plaster ceilings and ceramic tile floors, presented speech intelligibility challenges for all students.
- The laboratory settings with more sound-absorbing surfaces led to better outcomes for students with normal hearing but did not improve speech intelligibility for students with hearing impairments.
- Design solutions should consider hearing augmentation technologies in conjunction with good acoustic design, so that students can learn in shared spaces.
- Schools and designers should be aware of the diverse hearing augmentation technologies used by students, as this may have led to the difference in outcomes in the acoustically enhanced environment.
- The study highlights the need for improved acoustic design in educational settings to enhance the learning experience for students with hearing impairments, particularly in terms of enhancing speech intelligibility.

Tags: [deaf and hard of hearing], [secondary]

85. Innovative learning environments, are they inclusive? Why evaluating the speaking, and acoustic potential of the space matters

Citation: Rose-Munro, L. (2021). Innovative learning environments, are they inclusive? Why evaluating the speaking, and acoustic potential of the space matters. In W. Imms & T. Kvan (Eds.), *Teacher Transition into Innovative Learning Environments: A Global Perspective* (pp. 151-165). https://doi.org/10.1007/978-981-15-7497-9_13

Summary: This study examined the acoustic conditions and their impact on the inclusion of students with hearing difficulties in an innovative learning environment. The key findings include:

Key Findings:

- The open-plan, high-ceilinged collaborative areas had high noise levels that made it difficult for students to hear the teacher's voice.
- Students preferred to use the quieter, acoustically-treated breakout spaces, which allowed them to better hear and participate.
- The study highlights the importance of considering acoustic performance when designing inclusive innovative learning environments.
- The findings suggest that effective acoustic design can significantly enhance the learning experiences of students with hearing difficulties.
- The research advocates for the integration of acoustic considerations into the design of learning spaces to support all students' communication and engagement.

Tags: [deaf and hard of hearing]

86. Noise and acoustic conditions of premises for hearing-impaired people in Korea

Citation: Jeong, C. H., Cho, W. H., Chang, J. H., Lee, S. H., Kang, C. W., & Park, J. G. (2021). Noise and acoustic conditions of premises for hearing-impaired people in Korea. *Noise Control Engineering Journal*, 69(1), 77-85. <https://doi.org/10.3397/1/37697>

Summary: This study examined the acoustic conditions in special education schools for students with hearing impairments in South Korea. The key findings include:

Key Findings:

- Despite the classrooms having reverberation times exceeding recommended levels, students with hearing impairments reported being able to hear speech clearly.
- This was likely because the students could not distinguish acoustic differences and were not exposed to good acoustic conditions to compare to.
- Secondary school students with hearing impairments evaluated speech clarity higher than primary school students, even in the more challenging acoustic environments.
- The researchers noted that the Korean expression for "high speech clarity/intelligibility" may have been misunderstood by the students as simply "hearing sufficiently loudly".
- The study highlights the challenges in accurately assessing the acoustic experiences of students with hearing impairments, who may have limited reference points for what constitutes good acoustic conditions.
- The findings suggest that improvements in classroom acoustics are essential for enhancing the learning experiences of students with hearing impairments.

Tags: [deaf and hard of hearing], [special school]

87. A field study on the acoustic environment of special-needs education classrooms

Citation: Ueno, K., Noguchi, S., & Takahashi, H. (2019). A field study on the acoustic environment of special-needs education classrooms. *Building Acoustics*, 26(4), 263-274. <https://doi.org/10.1177/1351010X19877545>

Summary: This study examined the acoustic environment of special education classrooms in Japan for students with intellectual disability and co-morbidities (e.g., autism, down syndrome, epilepsy). It also looked at the outcomes of a small calming space, a cubicle made of metal frames and surrounded by sound-absorbing material to block external noise. The key findings include:

Key Findings:

- Teachers and school staff identified that a poor acoustic environment, due to sound reverberation around the room and lack of sound insulation, can be a barrier to learning and inclusion for students with intellectual disability.
- Students who used the small calming space (either by themselves or under the guidance of a teacher) were able to calm themselves down. As a result, disruptive and self-injurious behaviour were reduced.
- This study highlights the importance of controlling the classroom acoustics in enabling the learning and inclusion of students with intellectual disability, and the impact that a small calming space can have to this population.

Tags: [special school]

88. An observational study of classroom acoustical design and repetitive behaviors in children with autism

Citation: Kanakri, S. M., Shepley, M., Tassinary, L. G., Varni, J. W., & Fawaz, H. M. (2017a). An observational study of classroom acoustical design and repetitive behaviors in children with autism. *Environment & Behavior*, 49(8), 847-873. <https://doi.org/10.1177/0013916516669389>

Summary: This study examined the relationship between classroom noise levels and the behaviors of autistic students by using an observational checklist in classroom settings. The key findings include:

Key Findings:

- As noise levels increased, autistic students exhibited more repetitive behaviors such as repetitive speech, producing loud sounds, repetitive motor movements, and covering their ears.
- Louder classrooms were associated with increased instances of complaining, repetitive speech and motor movements, hitting, producing loud sounds and covering ears compared to quieter classrooms.
- The findings suggest that close attention to acoustic design and modifications to reduce noise are essential to providing a supportive educational environment for autistic students.

Tags: [autism]

89. Noise and autism spectrum disorder in children: An exploratory survey

Citation: Kanakri, S. M., Shepley, M., Varni, J. W., & Tassinary, L. G. (2017b). Noise and autism spectrum disorder in children: An exploratory survey. *Research in Developmental Disabilities*, 63, 85-94. <https://doi.org/10.1016/j.ridd.2017.02.004>

Summary: This survey study examined the impact of noise on the behavior of autistic students in school environments. The key findings include:

Key Findings:

- A noisy classroom, particularly from air conditioner, echoes and hard floors, is a barrier to learning and inclusion for autistic students. Implementing ways to reduce noise (such as carpeting, wood furniture, transitional spaces and thick/acoustical walls) can ameliorate barriers associated with excessive noise.
- 95.77% of teachers observed autistic students covering their ears in response to noise, indicating behavioral changes.
- Teachers strongly agreed that noise control is an important issue for autistic students, though this belief was not associated with behaviour change to reduce noisy distractions for autistic students.
- The study highlights the need to address acoustic conditions in classrooms to support the sensory needs of autistic students.
- The findings suggest that reducing noise levels can significantly improve the learning experiences and behaviour of autistic students.
- The research advocates for the implementation of noise control measures in educational settings to enhance inclusivity for students with autism.

Tags: [autism]

90. Spaces matters: Classroom acoustics and repetitive behaviors in preschool children with autism

Citation: Kanakri, S. M. (2017c). Spaces matters: Classroom acoustics and repetitive behaviors in preschool children with autism. *American Journal of Pediatrics*, 3(6), 89-94. <https://doi.org/10.11648/j.ajp.20170306.15>

Summary: This observational study examined the relationship between classroom noise levels and repetitive behaviors in autistic preschool students. The key findings include:

Key Findings:

- As noise levels increased, autistic students exhibited more repetitive behaviors like repetitive speech and movement, producing loud sounds, and covering their ears.
- Autistic students in louder classrooms showed more of these disruptive behaviors compared to quieter classroom environments.
- The findings suggest that acoustic design and noise reduction are important considerations for supporting autistic students in educational settings..

Tags: [autism], [kindergarten]

91. The effects of environmental noise on the behavior of children with autism spectrum disorders

Citation: Gaines, K., & Sancibrian, S. (2014a). The effects of environmental noise on the behavior of children with autism spectrum disorders. *International Journal of Architectonic, Spatial, and Environmental Design*, 7(2), 51-64. <https://doi.org/10.18848/2325-1662/cgp/v07i02/38364>

Summary: This study surveyed teachers on the impact of noise on the behaviour of autistic students in school environments.

Key Findings:

- Majority of teachers observed autistic students exhibiting either stereotypical behaviour or self-stimulatory behaviour in response to unexpected or excessive noise.
- Materials and spatial arrangements in observed schools do not adequately consider sound.
- The study highlights the need to address acoustic conditions in classrooms to support the sensory needs of autistic students.
- Implementing soundproofing measures and reducing background noise can significantly improve the learning environment for students with autism.
- The findings suggest that teachers should be trained to recognize and manage noise levels in the classroom effectively.

Tags: [autism]

92. Assessing communication accessibility in the university classroom: Towards a goal of universal hearing accessibility

Citation: Cheesman, M. F., Jennings, M. B., & Klinger, L. (2013). Assessing communication accessibility in the university classroom: Towards a goal of universal hearing accessibility. *Work*, 46(2), 139-150. <https://doi.org/10.3233/WOR-131742>

Summary: This study examined the acoustic conditions in university classrooms, levels of speech intelligibility and their impact on students with hearing loss. The key findings include:

Key Findings:

- Only 4 out of 34 classrooms met the recommended background noise level of 35 dB(A) for normally hearing students.
- Only 4 out of 14 classrooms met the recommended speech-to-noise ratio for students with hearing loss.
- The researchers noted the need for better acoustic design and the use of natural listening technologies in university classrooms to support students with hearing impairments.
- The findings highlight the critical need for universities to improve classroom acoustics to enhance communication accessibility for all students, particularly those with hearing loss.

Tags: [deaf and hard of hearing], [university]

93. How close should a student with unilateral hearing loss stay to a teacher in a noisy classroom?

Citation: Noh, H., & Park, Y. G. (2012). How close should a student with unilateral hearing loss stay to a teacher in a noisy classroom? *International Journal of Audiology*, 51(6), 426-432.
<https://doi.org/10.3109/14992027.2012.654855>

Summary: This experimental study examined the optimal seating distance for students with unilateral hearing loss in noisy classrooms. The key findings include:

Key Findings:

- Over different distances, students with unilateral hearing loss were less likely to distinguish individual letters from a dictation test compared to normal hearing students.
- Through linear interpolation, the optimal sitting distance for students with unilateral hearing loss was estimated to be 4.35m-6.27m from the teacher. This would equate their hearing ability to that of normal-hearing students and adults in the classroom environment.
- The findings suggest students with hearing loss need to sit closer to the teacher to achieve the same level of speech clarity as their peers.
- The study highlights the importance of considering seating arrangements in classroom design to support students with hearing impairments.
- The research advocates for adjustments in classroom layouts to enhance auditory accessibility for all students.

Tags: [deaf and hard of hearing]

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Visual stimulation

94. Effects of framing and the color red on in-class performances of children with attention deficit hyperactivity disorder

Citation: Öktem, Z., & Olguntürk, N. (2019). Effects of framing and the color red on in-class performances of children with attention deficit hyperactivity disorder. *Education & Science/Egitim ve Bilim*, 44(200), 389-408.
<https://doi.org/10.15390/EB.2019.8169>

Summary: This experimental study examined the impact of classroom wall and board colors on the performance of students with ADHD, with a focus on use of the color red.

Key Findings:

- Classrooms with contrasting wall and board colors (e.g., white walls with red boards) led to fewer errors and faster performance on cognitive tasks for students with ADHD.
- The findings suggest that strategic use of color in the classroom environment can support the learning of students with ADHD by focusing their attention, such as painting the wall behind the board a different colour from the instructional board.
- The use of red color, either on the walls or boards, was found to facilitate focused attention and task completion for students with ADHD.
- The study highlights the importance of considering visual elements in classroom design to enhance student focus, engagement and performance.

Tags: [adhd]

95. 'Visual clutter' in the classroom: Voices of students with autism spectrum disorder

Citation: Zazzi, H., & Faragher, R. (2018). 'Visual clutter' in the classroom: Voices of students with autism spectrum disorder. *International Journal of Developmental Disabilities*, 64(3), 212-224. <https://doi.org/10.1080/20473869.2018.1468619>

Summary: This study used arts-informed methods to explore the perspectives of three autistic students on visual clutter in the classroom environment.

Key Findings:

- Autistic students found visually congested and overly colorful classrooms to be distracting and even physically uncomfortable.
- Calming colors, reduced visual stimuli, clear sightlines, and flexible furniture were identified as important environmental features.
- The study highlights the need to design classrooms that support the sensory needs and preferences of autistic students.
- Involving students in the design process can lead to more effective learning environments that cater to their unique sensory requirements.
- The findings suggest that reducing visual clutter can enhance focus and engagement for students with autism.

Tags: [autism]

96. The perceived effects of visual design and features on students with autism spectrum disorder

Citation: Gaines, K. S., Curry, Z., Shroyer, J. A., Amor, C., & Lock, R. H. (2014b). The perceived effects of visual design and features on students with autism spectrum disorder. *Journal of Architectural & Planning Research*, 31(4), 282-298. <https://www.jstor.org/stable/44113088>

Summary:

This study examined the perceptions of educators and specialists on how visual design features impact students with autism spectrum disorder. The key findings include:

- Reduced visual clutter (by keeping the classroom clean), defined spaces, flexible furniture arrangements, adjustable lighting and adequate natural light were identified as beneficial for autistic students.
- Open spaces without boundaries, bright lights, visual distractions, and highly decorated classrooms were seen as problematic, as they can overstimulate and distract autistic students.
- Educators noted that certain visual elements, like items hanging from lights, could be acceptable if they provided meaning and organization for autistic students (for example, to establish a dedicated space with a specific function).
- The study emphasizes the need for careful consideration of visual design elements in classrooms to support the learning and well-being of students with autism.

Tags: [autism]

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Lighting

No articles found that met the selection criteria with a focus on lighting for students with disability in educational settings

Air quality

No articles found that met the selection criteria with a focus on air quality for students with disability in educational settings

Thermal comfort

No articles found that met the selection criteria with a focus on thermal comfort for students with disability in educational settings

Adaptations for learners with specific disabilities

Autism

97. Effectiveness of stability ball seating in special education classroom in students with autism

Citation: Brewer, K. L. (2024). Effectiveness of stability ball seating in special education classroom in students with autism. The University of Wisconsin. <https://minds.wisconsin.edu/handle/1793/85394>

Summary: This study examined the use of stability ball seating in a special education classroom for autistic students.

Key Findings:

- The use of stability ball seating was associated with increased focus and engagement for some autistic students, while others did not show significant changes.
- The study highlights the need to consider individual student preferences and responses when implementing sensory-based classroom interventions.
- Findings suggest that while some students benefit from alternative seating options, others may require different strategies to enhance their learning experience.
- The research advocates for a tailored approach to seating arrangements that considers the unique needs of each student.

Tags: [autism]

98. Exploring environmental barriers and facilitators to inclusion on a university campus for autistic students

Citation: O'Connor, M., Jones, S. C., Gordon, C., & Joosten, A. (2024). Exploring environmental barriers and facilitators to inclusion on a university campus for autistic students. *Autism in Adulthood*, 6(1), 36-46. <https://doi.org/10.1089/aut.2022.0053>

Summary: This study explored the experiences of autistic university students regarding the physical environment of their campus. The key findings include:

Key Findings:

- Autistic students identified quiet spaces, natural light, comfortable furniture, and access to outdoor areas as important environmental facilitators.
- Barriers included sensory-challenging environments like loud noises, bright lights, crowded spaces, disorganised and/or uncomfortable furniture, and lack of signage and information on university spaces that caused physical and cognitive discomfort.
- Uncomfortable spaces produced physical sensations (e.g., pain, nausea, hot) that reduced their engagement and capacity to focus and learn. In contrast, comfortable spaces increased the chances that students would participate in class as they felt less anxious, less fatigued, calmer and more productive.
- The findings suggest that creating sensory-friendly environments can significantly enhance the inclusion and well-being of autistic students on campus.
- The study highlights the need for universities to consider the sensory needs of autistic students in their environmental design.

Tags: [autism], [university]

99. Muting, filtering and transforming space: Autistic children's sensory 'tactics' for navigating mainstream school space following transition to secondary school

Citation: Birkett, L., McGrath, L., & Tucker, I. (2022). Muting, filtering and transforming space: Autistic children's sensory 'tactics' for navigating mainstream school space following transition to secondary school. *Emotion, Space And Society*, 42, 100872. <https://doi.org/10.1016/j.emospa.2022.100872>

Summary: This study explored how autistic students navigated and adapted to the sensory environment of mainstream secondary schools.

Key Findings:

- Autistic students used various "sensory tactics" like muting, filtering, and transforming spaces to manage the sensory challenges they experienced.
- Factors like noise, crowds, and lack of clear boundaries in the new school environment exacerbated the students' sensory processing difficulties.
- The study highlights the need to consider sensory geography and the relational nature of space when designing inclusive school environments.
- The study highlights the benefits of smaller educational environments, micro-spaces within existing larger spaces, and quiet indoor spaces for students with autism.
- The findings suggest that understanding the sensory strategies used by autistic students can inform the design of more supportive educational spaces.
- The research advocates for a more nuanced approach to school design that takes into account the sensory needs of all students.

Tags: [autism], [secondary]

100. Ten years on: A post-occupancy evaluation of classrooms for pupils with severe autism

Citation: Irish, J. E. N. (2022b). Ten years on: A post-occupancy evaluation of classrooms for pupils with severe autism. *Facilities*, 40(9/10), 656-674. <https://doi.org/10.1108/F-10-2021-0097>

Summary: This study conducted a post-occupancy evaluation of classrooms designed for autistic students in a special school (via a survey and a school tour). The key findings include:

Key Findings:

- Classrooms were organized into distinct zones for different activities, with dedicated withdrawal rooms and sensory areas, which satisfied the needs of autistic students.
- Environments could be adjusted to suit autistic students (such as cream walls, grey floors and plain, neutral curtains, adjustable lighting) to avoid overstimulation.
- Teachers were generally satisfied with features like color schemes, zoning, and wayfinding, which helped autistic students navigate themselves around the school.
- However, teachers complained on the constant maintenance needs of the classroom and sensory area, particularly furniture and equipment which are often broken.
- The study highlights the importance of ongoing evaluation and adaptation of specialized learning environments to meet the evolving needs of autistic students.

Tags: [autism], [special school]

101. The design of autism-friendly learning environments: Exploring flexibility in the built environment as a means to support the variability of individual manifestations of ASD

Citation: Ansara, M. (2022). The design of autism-friendly learning environments: Exploring flexibility in the built environment as a means to support the variability of individual manifestations of ASD. Sheridan College. https://source.sheridancollege.ca/swfaad_theses/2

Summary: This study explored the role of flexible design approaches in creating autism-friendly learning environments. The key findings include:

- Different types of furniture, flexible spatial layouts, and the use of visual dividers and acoustic barriers were seen as important in supporting the diverse needs and learning styles of autistic students and promote socialisation and independence.
- Additionally, organising spaces so that it is easier to go from one room to another, and incorporating areas of refuge for students to relax in times of stress or overstimulation, can also support the learning of autistic students.
- The study highlights the importance of adaptability, flexibility and choice in the physical environment to accommodate the variability of autism and to enhance the overall educational experience for students with autism.

Tags: [autism]

102. Designed by the pupils for the pupils: An autism-friendly school

Citation: McAllister, K., & Sloan, S. (2016). Designed by the pupils for the pupils: An autism-friendly school. *British Journal of Special Education*, 43(4), 330-357. <https://doi.org/10.1111/1467-8578.12160>

Summary: This study involved autistic students in designing their ideal school environment by arranging their spaces from a jigsaw kit before explaining their designs to the researchers. The key findings include:

Key Findings:

- Autistic students prioritized features like being able to play safely outside, having quiet spaces away from noisy areas, more space in circulation areas, integration of the autism resource classroom with the rest of the school, and separate playgrounds for junior and senior students.
- Students disliked feeling "crammed" in classrooms and found noisy areas problematic.
- The collaborative design process allowed the autistic students' preferences to directly inform the design of an autism-friendly school.
- The findings suggest that involving students in the design process can lead to more effective and meaningful educational environments for autistic individuals.
- The study highlights the importance of creating spaces that cater to the sensory and social needs of autistic students to enhance their learning experiences.

Tags: [autism]

103. Supporting students with autism spectrum disorder in higher education

Citation: Owen, C., McCann, D., Rayner, C., Devereaux, C., Sheehan, F., & Quarmby, L. (2015). Supporting students with autism spectrum disorder in higher education. University of Tasmania. <https://www.ncsehe.edu.au/wp-content/uploads/2016/03/Supporting-Students-with-Autism-Spectrum-Disorder-in-Higher-Education.pdf>

Summary: This study explored the experiences of autistic university students and identified environmental factors that enabled or hindered their inclusion. This was done by autistic students completing a self-directed photography activity. The key findings include:

Key Findings:

- Autistic students faced challenges with sensory-rich environments, including noise, bright lights, crowded spaces, and illegible wayfinding (causing confusion on where to go) which caused discomfort and distraction.
- In these cases, autistic students felt sensory overload, feeling exhausted, stressed and distracted. They also had to self-exclude themselves from classes and noisy campus spaces to avoid sensory overload.
- Quiet spaces, low stimulation spaces, natural elements, and comfortable furniture were identified as important environmental facilitators.
- The study highlighted the need for universities to adopt a more holistic, sensory-aware approach to creating inclusive physical environments.

Tags: [autism], [university]

104. Supportive learning environments for children with autism spectrum disorders

Citation: Henriksen, K., & Kaup, M. L. (2010). Supportive learning environments for children with autism spectrum disorders. *Undergraduate Research Journal for the Human Sciences*, 9(1).
<https://publications.kon.org/urc/v9/henriksen.html>

Summary: This study surveyed educators on the environmental factors that support or hinder the learning of autistic students.

Key Findings:

- Factors like spatial arrangement, visual structure, and minimizing sensory distractions were identified as important in creating supportive learning environments.
- Classroom layout and acoustics provide the greatest challenge for ASD students.
- Educators emphasized the need for spatial order through clearly defined spaces and low-distraction layouts.
- The use of TEACCH program principles to organize the classroom enables greater autonomy through carefully arranged personal work spaces.
- The study highlights the importance of the physical environment in enabling the participation and independence of autistic students.
- Regular feedback from students can help educators adapt the learning environment to better meet the needs of autistic learners.
- Collaboration between educators and specialists can enhance the effectiveness of classroom modifications.

Tags: [autism]

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Neurodivergent conditions

105. Creating the conditions for inclusion: Investigating optimal physical spaces for supporting neurodivergent staff and postgraduate students

Citation: Riordan, J., Timperley, S., O'Brien, C., Edwards, C., Murrihy, C., Harrison, M., McKay-Brown, L., & Mendus, A. (2024). Creating the conditions for inclusion: Investigating optimal physical spaces for supporting neurodivergent staff and postgraduate students. *Neurodiversity*, 2, 1-16.
<https://doi.org/10.1177/27546330241285353>

Summary: This study explored the experiences of neurodivergent university staff and postgraduate students regarding the physical environment, both positive and negative, through interviews led by neurodivergent researchers. The key findings include:

Key Findings:

- Sensory discomfort, lack of privacy, and excessive distractions in open-plan workspaces were major barriers for neurodivergent individuals which led to participants feeling constantly “switched on”.
- Participants valued autonomy over their work/study spaces, as well as the ability to choose from a range of sensory-friendly environments to meet their diverse needs.
- Despite these commonalities, participants also reported a spectrum of experiences within the same space.
- The study highlighted the importance of co-creating inclusive physical spaces with neurodivergent individuals, rather than relying solely on universal design guidelines.
- The study identified specific design features that could enhance the comfort and productivity of neurodivergent individuals, such as adjustable lighting and soundproofing.
- Participants expressed a need for designated quiet areas where they could retreat to manage sensory overload.

Tags: [university]

106. Physical learning spaces and college students with ADHD

Citation: Winterhalter, E. (2016). Physical learning spaces and college students with ADHD. California State University. <https://scholarworks.calstate.edu/concern/theses/qt54kq72q?locale=pt-BR>

Summary: This study explored the experiences of college students with ADHD in relation to the physical design of learning spaces.

Key Findings:

- Students with ADHD identified features like small group areas, comfortable furniture, and open/bright spaces as supportive of their learning and attention.
- Factors like noise, visual distractions, limited climate control and inadequate personal space were seen as barriers that hindered their ability to focus and engage.
- The findings suggest the need for flexible, sensory-friendly learning environments that can accommodate the diverse needs of students with ADHD.
- The study highlights the importance of considering students' preferences in the design of learning spaces to enhance engagement and academic success.
- The research advocates for ongoing assessments of classroom environments to ensure they are conducive to learning for all students, particularly those with ADHD.

Tags: [adhd], [university]

107. Concentration difficulties in the school environment - With focus on children with ADHD, autism and Down's syndrome

Citation: Tufvesson, C. (2007). Concentration difficulties in the school environment - With focus on children with ADHD, autism and Down's syndrome. Lund University. <https://lucris.lub.lu.se/ws/portalfiles/portal/5582813/598855.pdf>

Summary: This study examined the impact of various environmental factors on the concentration and attention of primary school students with ADHD, autism, and Down's syndrome. The key findings include:

Key Findings:

- Factors like background noise, direct sunlight (due to too many windows in the classroom), and large, open classrooms were associated with decreased concentration times for students with these disabilities, particularly those with autism).
- Closed storage systems (such as cupboards and drawers), limited windows and doors, quiet zones and small classrooms were identified as enablers that supported students' ability to concentrate.
- The study highlighted the need to consider the specific sensory and environmental needs of students with different disabilities when designing learning spaces.
- The findings emphasize the importance of creating tailored classroom environments that minimize distractions and support the concentration of students with diverse needs.

Tags: [autism]

[Go back to TOC](#)

Deaf and Hard of Hearing

108. The architecture design checklist of classrooms for children with cochlear implant in rehabilitation centers

Citation: Marzouk, Y. S., El-Sherbiny, E., & Refaat, T. (2024). The architecture design checklist of classrooms for children with cochlear implant in rehabilitation centers. *Results in Engineering*, 22, 102175. <https://doi.org/10.1016/j.rineng.2024.102175>

Summary: This study developed an extensive design checklist for classrooms in rehabilitation centers that serve children with cochlear implants.

Key Findings:

- The checklist was developed through a literature review and survey responses from a global panel of experts in audiology, engineering, and architecture.
- The checklist covers factors related to classroom orientation, structure, materials, and electromechanical systems.
- Recommended design features include acoustic treatments to walls and floors, flat walls and ceilings to avoid noise reflection, avoiding fans, and consulting with cochlear implant audiologists.
- Involving audiologists in the design process ensures that classrooms meet the specific auditory needs of students with cochlear implants.
- Regular assessments of classroom acoustics can help maintain an optimal learning environment for students with hearing impairments.

Tags: [deaf and hard of hearing]

109. Classroom accessibility for students who are deaf and hard of hearing

Citation: Canadian Hearing Society. (2015). Classroom accessibility for students who are deaf and hard of hearing. https://www.chs.ca/sites/default/files/mhg_images/CHS003_AccessibilityGuide_EN_APPROVED.PDF

Summary: This guideline from the Canadian Hearing Society provides recommendations for creating accessible and language-rich classroom environments for students who are deaf or hard of hearing.

Key Findings:

- Classrooms should be designed to maximize visual clarity, minimize background noise, and provide appropriate lighting and technology to support communication.
- Everyday features such as the noise produced by heating and cooling systems, inadequate light fixtures, window treatments, and noise producing floor coverings need to be considered.
- Specific design features like sightlines, adjustable lighting, visual alarms, and acoustic treatments can enhance accessibility for deaf and hard of hearing students.
- The guidelines emphasize the importance of creating an environment that supports language acquisition and participation for students who rely on visual communication.
- The study underscores the need for thoughtful classroom design that prioritizes the unique communication needs of deaf and hard of hearing students to foster their learning and engagement.

Tags: [deaf and hard of hearing]

110. Modifying the classroom environment to increase engagement and decrease disruption with students who are deaf or hard of hearing

Citation: Guardino, C., & Antia, S. D. (2012). Modifying the classroom environment to increase engagement and decrease disruption with students who are deaf or hard of hearing. *Journal Of Deaf Studies And Deaf Education*, 17(4), 518-533. <https://doi.org/10.1093/deafed/ens026>

Summary: This study examined the impact of classroom environmental modifications on the engagement and behaviour of deaf and hard-of-hearing students.

Key Findings:

- Adjustments to seating, furniture, visual distractions, and acoustics were associated with increased academic engagement and reduced disruptive behaviour.
- Teachers were able to maintain most of the environmental modifications after the study period, leading to sustained improvements.
- The findings suggest that targeted classroom adaptations can significantly benefit the learning of deaf and hard-of-hearing students.
- The study highlights the importance of considering the specific sensory and environmental needs of students with hearing loss when designing learning spaces.
- The research advocates for ongoing assessments of classroom environments to ensure they remain supportive and inclusive.

Tags: [deaf and hard of hearing]

111. Modifying the physical environment to reduce disruptive behavior and Increase academic engagement in classrooms with students who have a hearing loss

Citation: Guardino, C. A. (2008). Modifying the physical environment to reduce disruptive behavior and Increase academic engagement in classrooms with students who have a hearing loss. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 69(3-A), 936. <https://www.proquest.com/docview/304684444>

Summary: This study examined the impact of modifying the physical classroom environment on the behavior and engagement of students who are deaf or hard of hearing.

Key Findings:

- Adjustments to factors like seating, visual stimuli, lighting, and acoustics were associated with decreased disruptive behavior and increased academic engagement.
- Teachers were able to maintain most of the environmental modifications after the study period, leading to sustained improvements.
- The study highlights the importance of considering the specific sensory and environmental needs of students with hearing loss when designing learning spaces.
- The findings suggest that thoughtful design can enhance the learning experiences of students with hearing loss by providing supportive and engaging environments.
- The research advocates for ongoing assessments of classroom environments to ensure they meet the needs of all students.

Tags: [deaf and hard of hearing]

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Intellectual disability

112. The dream school: Mind-changing perspectives of people with intellectual disabilities

Citation: Nieto, C., & Moraña, A. (2019). The dream school: Mind-changing perspectives of people with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities*, 32(6), 1549-1557.

<https://doi.org/10.1111/jar.12650>

Summary: This study explored the perspectives of adults with intellectual disabilities on their ideal school environment. The key findings include:

Key Findings:

- Participants emphasized the need for wide corridors and yards, comfortable furniture, and sensory-friendly features like air conditioning and heating.
- Narrow spaces and areas with poor visibility were seen as problematic, and were associated with increased anxiety and bullying.
- The study highlights the importance of incorporating the voices of individuals with intellectual disabilities in designing inclusive educational spaces. This was because in this study, participants collaborated with researchers to select topics for the interviews and to analyse the interview transcripts.
- The findings suggest that thoughtful design can mitigate feelings of anxiety and promote a sense of belonging among students.

Tags: N/A

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Perspectives and attitudes towards inclusive learning spaces

113. Elementary classrooms for autism: Teacher perceptions of environment influence, adaptations and COVID-19 impacts

Citation: Rivera, K. E. (2023). Elementary classrooms for autism: Teacher perceptions of environment influence, adaptations and COVID-19 impacts. University of Missouri. <https://doi.org/10.32469/10355/96137>

Summary: This study explored how elementary teachers adapted their classrooms to support autistic students, including during the COVID-19 pandemic. The key findings include:

Key Findings:

- Teachers made various adaptations to the classroom environment, such as adjusting lighting, furniture, and creating dedicated sensory/escape spaces separated by furniture and highlighted by visuals.
- Factors like loud and sudden noises (e.g., fire alarm, computer sounds), visual distractions (e.g., computer screens, open shelves), intense light, and lack of storage space were identified as barriers that negatively impacted autistic students.
- Teachers balanced their desire to create an optimal environment (such as changing the classroom layout) with the need to respond to individual student needs and behaviors.
- The findings suggest that ongoing support and resources are essential for teachers to effectively adapt learning environments for autistic students.
- The study highlights the importance of flexibility in classroom design to accommodate the diverse needs of students with autism.

Tags: [autism]

114. Parents' view on accessible school design for individuals with autism spectrum disorder (ASD)

Citation: Kavaz, M. (2022). D). Parents' view on accessible school design for individuals with autism spectrum disorder (ASD). AS International Journal of Innovative Engineering Applications, 6(1), 129-137. <https://doi.org/10.46460/ijiea.983686>

Summary: This study surveyed parents of autistic students attending primary school to assess their perceptions of the accessibility and inclusiveness of school design (based on the ASPECTSS criteria). The key findings include:

Key Findings:

- Many parents felt their child's classroom was not safe or suited for autistic students, and that the overall spatial planning and transitions were inappropriate.
- Significant issues were identified related to acoustics, lack of escape spaces, and sensory challenges in the classroom environment.
- The findings suggest the need for design features that address the sensory, safety, and spatial needs of autistic students.
- Parents reported that classrooms often lacked adequate support for their children's unique needs, highlighting the importance of inclusive design.

Tags: [autism], [primary]

115. An analysis of ableism through the perception of university student tour guides towards individuals with mobility challenges on a university campus tour

Citation: Guerrero, G. (2021). An analysis of ableism through the perception of university student tour guides towards individuals with mobility challenges on a university campus tour. Dissertation Abstracts International: Section B: The Sciences and Engineering, 82(4-B).
<https://www.proquest.com/openview/f32cff2947435f9cb59fd8c4d39991e2/1?pq-origsite=gscholar&cbl=18750&diss=y>

Summary: This study examined the perceptions and attitudes of university student tour guides towards individuals with mobility challenges on campus tours. The key findings include:

Key Findings:

- Tour guides and administrators did not always have a good understanding of the accessibility challenges faced by students with disabilities.
- Physical barriers on campus, such as stairs, narrow doorways, and uneven surfaces, posed significant challenges for students with mobility issues.
- The study highlighted the need for better training and awareness among campus staff and tour guides regarding accessibility and inclusion.
- Ableism apparent in this study may pervade other university functions.
- The findings emphasize the importance of fostering a culture of understanding and empathy towards individuals with disability within educational institutions.

Tags: [physical disability], [university]

116. An exploration of teachers' perceptions of how the classroom environment can support pupils with autism spectrum disorder (ASD) in the mainstream primary school

Citation: Tynan, F., & Davy, K. (2021). An exploration of teachers' perceptions of how the classroom environment can support pupils with autism spectrum disorder (ASD) in the mainstream primary school. REACH: Journal of Inclusive Education in Ireland, 34(1).
<https://reachjournal.ie/index.php/reach/article/view/314>

Summary: This study explored teachers' perceptions of how the classroom environment can support students with autism in mainstream primary schools. The key findings include:

Key Findings:

- Teachers focused more on changes to the temporal environment, such as visual schedules and transition times, rather than physical adaptations to the classroom.
- Teachers did not mention making physical changes to the classroom environment, such as lighting, sound, furniture, or floor coverings, to support autistic students. This was even though teachers recognised the importance of the physical environment of the classroom to autistic students.
- The findings suggest teachers may not fully understand the impact of the physical classroom environment on students with autism.
- The study underscores the need for professional development to enhance teachers' understanding of the importance of physical adaptations in supporting autistic students.

Tags: [autism], [primary]

117. Inclusive education environments from the teachers' perspective: An inquiry in a Turkish primary school

Citation: Durak, S., & Erkiliç, M. (2012). Inclusive education environments from the teachers' perspective: An inquiry in a Turkish primary school. *Children, Youth & Environments*, 22(1), 304-313.
<https://doi.org/10.1353/cye.2012.0035>

Summary: This study explored teachers' perspectives on inclusive education environments in a Turkish primary school. The key findings include:

Key Findings:

- Teachers recognized the importance of combining appropriate physical layouts with educational practices to support inclusive learning.
- Barriers included the separation of special education and general education classrooms, which led to stigmatization.
- Recommendations focused on features like smaller nooks, resource zones, and accessible sinks to better meet the needs of students with disabilities.
- The findings suggest that inclusive design should consider both physical and educational factors to create supportive environments for all students.
- The study highlights the need for ongoing collaboration between teachers and designers to ensure that learning spaces are truly inclusive.

Tags: [primary]

118. The perspective of children and youth: How different stakeholders identify architectural barriers for inclusion in schools

Citation: Pivik, J. R. (2010). The perspective of children and youth How different stakeholders identify architectural barriers for inclusion in schools. *Journal of Environmental Psychology*, 30(4), 510-517.
<https://doi.org/10.1016/j.jenvp.2010.02.005>

Summary:

This study explored how students with and without disabilities, as well as school staff, identified architectural barriers to inclusion in schools. The key findings include:

- Students with disabilities were able to identify the greatest number and most detailed types of mobility barriers, such as inaccessible lockers and elevators.
- Students, both with and without disabilities, identified more barriers related to mobility and visual accessibility compared to school principals and staff.
- The study highlights the value of engaging students directly in assessing the accessibility and inclusiveness of the school environment.
- Involving students in the evaluation process can lead to more comprehensive identification of barriers and inform better design solutions.
- The findings suggest that students' perspectives are crucial for understanding the real challenges faced in school environments.

Tags: N/A

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Stakeholder engagement and participatory design

119. A neuroinclusive school model: Focus on the school, not on the child

Citation: Rajotte, E., Grandisson, M., Couture, M. M., Desmarais, C., Chrétien-Vincent, M., Godin, J., & Thomas, N. (2024). A neuroinclusive school model: Focus on the school, not on the child. *Journal of Occupational Therapy, Schools, & Early Intervention*, 0(0), 1-19. <https://doi.org/10.1080/19411243.2024.2341643>

Summary: This study developed a conceptual model for an inclusive school that supports the meaningful participation of all students, including those who are autistic or neurodivergent. The key findings are:

Key Findings:

- The model focuses on changing the school environment to support the participation of neurodivergent students, rather than just improving their skills.
- Key elements of the physical environment include reducing sensory stimuli, providing visual support, and having clearly defined spaces.
- The social environment should celebrate neurodiversity and provide safe and caring spaces for all students.
- School activities should harness students' passions, offer variety, be predictable, and incorporate stimulating and restorative activities.
- The study highlights the importance of involving neurodivergent individuals in the design process to ensure that their needs and preferences are met in the school environment.

Tags: N/A

120. Including students with disabilities in innovative learning environments: A model for inclusive practices

Citation: Page, A., Anderson, J., & Charteris, J. (2023). Including students with disabilities in innovative learning environments: A model for inclusive practices. *International Journal of Inclusive Education*, 27(14), 1696-1711. <https://doi.org/10.1080/13603116.2021.1916105>

Summary: This article proposes a conceptual framework for including students with disabilities in innovative learning environments. The key findings include:

Key Findings:

- The framework highlights the interrelationship between social, academic, and physical affordances of the learning environment.
- Factors like visibility, acoustics, and flexibility are important in ensuring innovative spaces are inclusive for students with diverse needs.
- The model emphasizes the need to balance and adapt the physical environment to support the varying capacities and preferences of all students.
- The findings suggest that inclusive design should consider the unique experiences of students with disabilities to create supportive environments.
- The research advocates for a collaborative approach to designing learning spaces that involves all stakeholders, including students with disabilities.

Tags: N/A

121. A community conversation: Summary report

Citation: ACT Education Directorate. (2022). A community conversation: Summary report. https://www.education.act.gov.au/data/assets/pdf_file/0003/2098515/A-Community-Conversation-Summary-Report.pdf

Summary: This report summarises the findings from a community consultation process conducted by the ACT Education Directorate in Australia. The consultation gathered feedback from 277 parents/carers, 46 students, and 133 school staff on the physical environment of ACT public schools.

Key Findings:

- Key enablers to learning and inclusion include quiet safe spaces, natural spaces, sensory rooms, secure fencing, accessible toilets, corridors and doorways, adjustable furniture, a variety of lighting and flooring options, and engaging play spaces.
- Barriers include inequitable physical access, excessive noise, over-stimulating environments, poor classroom layout, delays in making modifications, and budget constraints.
- Recommendations focus on improving safety, independence, social aspects, equitable access, and physical accessibility through design features like doors, zoning, play spaces, and sensory elements.
- The report highlights the need for ongoing community engagement in the design process to ensure that the voices of all stakeholders, especially those of students with disabilities, are heard and considered.

Tags: N/A

122. Designing with neurodiverse children and adults: Learning a different lesson with every engagement

Citation: Wigglesworth, S., & Bond, C. (2022). Designing with neurodiverse children and adults: Learning a different lesson with every engagement. In A. Clarke, J. Boys, & J. Gardner (Eds.), *Developments in Neuroethics and Bioethics* (Vol. 5, pp. 313-345). <https://doi.org/10.1016/bs.dnb.2022.05.002>

Summary: This book chapter describes the experiences of architects in collaborating with autistic students and adults to design inclusive learning environments.

Key Findings:

- The design process involved tailoring engagement methods and materials to each autistic individual's preferences and communication needs.
- The final designs incorporated features like varied sensory experiences, clear zoning, and connections to nature to support the diverse needs of autistic users.
- Preferred design characteristics included natural lighting, small nooks for reading, group learning or calming, textural zoning via carpets or objects, and lights with blue or purple tones.
- The architects emphasised the invaluable, deep learning possible through respectful engagement with neurodiverse individuals.
- The findings advocate for a more inclusive approach to architectural design that values the input of those who will use the spaces.

Tags: [autism]

123. The development and feasibility study of a multimodal 'talking wall' to facilitate the voice of young people with autism and complex needs: A case study in a specialist residential school

Citation: Richards, N., & Crane, L. (2020). The development and feasibility study of a multimodal 'talking wall' to facilitate the voice of young people with autism and complex needs: A case study in a specialist residential school

residential school. *Journal of Autism & Developmental Disorders*, 50(12), 4267-4279.
<https://doi.org/10.1007/s10803-020-04476-6>

Summary: This study developed and evaluated a "talking wall" intervention to give a voice to young people with autism and complex needs in a residential school setting. The key findings include:

- The talking wall allowed students to document and share their experiences and preferences through various media.
- While the fixed location of the wall posed some challenges, it was seen as a valuable method for eliciting the perspectives of non-verbal or minimally verbal students.
- The study highlights the importance of finding creative ways to center the voices of students with complex communication needs in the design process and looks at use of space as a means of communication.
- Engaging students in the design of communication tools can enhance their ability to express themselves and participate in their educational environment.
- The findings suggest that innovative communication solutions can foster social integration and understanding among students.

Tags: N/A

124. **Sensory spaces: sensory learning - An experimental approach to educating future designers to design autism schools**

Citation: Love, J. (2018). Sensory spaces: sensory learning - An experimental approach to educating future designers to design autism schools. *Archnet-IJAR: International Journal of Architectural Research*, 152-169.
<https://doi.org/10.26687/archnet-ijar.v12i3.1704>

Summary: This study describes an educational project where architecture students collaborated with autistic students to design sensory-focused spaces for an autism school. The key findings include:

Key Findings:

- The collaborative design process allowed the architecture students to learn directly from the autistic students about their sensory needs and preferences.
- Engaging methods like image selection, colour choice, and spatial exploration enabled the autistic students to actively participate in the design process.
- The final designs incorporated features like calming materials, adjustable lighting, and dedicated sensory zones to support the diverse sensory needs of autistic students.
- Feedback from both students and teachers was integral to refining the designs, ensuring they were practical and met the needs of the users. The design processes used in this study could serve as a starting point to develop more refined methods or methods tailored to others in a co-design process.
- The project highlighted the importance of co-design in creating environments that are truly inclusive and responsive to the needs of autistic individuals.

Tags: [autism]

125. **Effective building practices for children and students with disability project report: A report to the South Australian Minister for Education and Child Development from the Ministerial Advisory Committee: Children and Students with Disability**

Citation: Non-Government Schools and Services Unit. (2016). Effective building practices for children and students with disability project report: A report to the South Australian Minister for Education and Child Development from the Ministerial Advisory Committee: Children and Students with Disability. Government of South Australia: Department for Education and Child Development. <https://www.education.sa.gov.au/docs/p-and-c/whs/effective-building-practices-for-children-and-students-with-disability-august-2016.pdf>

Summary: This report summarises a project in South Australia that engaged students, families, educators, and other stakeholders to identify effective building practices for inclusive education environments.

Key Findings:

- Inclusive design features like clear wayfinding, adaptable spaces, calming sensory areas, and accessible facilities were seen as important.
- Inclusive design enables improved learning and participation opportunities for students with disability.
- Co-location of mainstream and special schools enabled greater exposure, resource sharing, and development of empathy and understanding.
- The built environment was found to enhance opportunities for community involvement and contribute to greater inclusion.
- The principles of Universal Design are essential to providing inclusive school facilities.
- The report highlighted the importance of involving students with disability in the design process to ensure their needs are met.
- Recommendations included the need for ongoing evaluation and adaptation of facilities to maintain inclusivity and accessibility.

Tags: N/A

126. Participatory action research with college students with disabilities: Photovoice for an inclusive campus

Citation: Agarwal, N., Moya, E. M., Yasui, N. Y., & Seymour, C. (2015). Participatory action research with college students with disabilities: Photovoice for an inclusive campus. *Journal of Postsecondary Education and Disability*, 28(2), 243-250. <https://files.eric.ed.gov/fulltext/EJ1074679.pdf>

Summary: This study used a photovoice methodology to engage six university students with disabilities in identifying barriers and proposing solutions for a more inclusive campus environment.

Key Findings:

- Students were able to document physical accessibility barriers, such as overgrown landscaping and non-compliant signage, through their photographs.
- The photovoice process empowered the participating students and led to some immediate improvements to the campus environment.
- The study highlights the value of centring the voices and experiences of students with disabilities in the design and evaluation of inclusive spaces.
- The findings suggest that participatory research methods can effectively engage students in advocating for their needs and improving campus accessibility.
- The research advocates for ongoing collaboration between students with disabilities and university staff to ensure that campus environments are inclusive and supportive.

Tags: [university]

127. Analysis of a project to design the ideal classroom undertaken by a group of children on the autism spectrum and students of architecture

Citation: Scott, I. (2011). Analysis of a project to design the ideal classroom undertaken by a group of children on the autism spectrum and students of architecture. *Good Autism Practice (GAP)*, 12(1), 13-25. https://www.pure.ed.ac.uk/ws/portalfiles/portal/4607452/School_project_published_paper_1_.pdf

Summary: This study involved autistic students and architecture students collaborating to design their ideal classroom. The key findings include:

Key Findings:

- Autistic students prioritized features like being able to play safely outside, having quiet spaces away from noisy areas, views of gardens and the sky, and more space in circulation areas.
- Autistic students emphasised orderliness, security, independence, and the use of technology in preferred learning spaces.
- Autistic students disliked feeling "crammed" in classrooms and found noisy areas like the dining hall to be problematic.

- The collaboration allowed the autistic students' preferences to directly inform the design of the ideal classroom.
- The study emphasizes the importance of involving students with autism in the design process to create environments that meet their specific needs and preferences.

Tags: [autism]

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Inclusive design research methodologies

128. Examining the methods for investigating behavioral clues of special-schooled children

Citation: Hussein, H., & Daud, M. N. (2015). Examining the Methods for Investigating Behavioral Clues of Special-Schooled Children. *Field Methods*, 27(1), 97-112. <https://doi.org/10.1177/1525822X14537579>

Summary: This methodological study explored different approaches to observing the behavior and use of a sensory garden by students with visual impairments in a special school. The key findings include:

Key Findings:

- There was a disconnect between what school staff anticipated about student use of the sensory garden and the researchers' observations. For example, while stakeholders anticipated that users would be influenced by the aesthetics of the garden, authors observed that users were influenced more by sensory parts of the garden (such as water features and raised planters).
- Engaging directly with students proved challenging, leading the researchers to rely more on interviews with teachers, therapists and landscape architects, and observations of the sensory garden.
- The study highlights the importance of triangulating different data sources when studying the experiences of students with disabilities in the built environment.
- The findings suggest that observational methods can provide valuable insights into how students interact with sensory gardens, but they must be complemented by direct engagement with the students.
- The research advocates for a more inclusive approach to data collection that prioritises the voices of students with disabilities.

Tags: N/A

129. Validation of environmental content in the young children's participation and environment measure

Citation: Khetani, M. A. (2015). Validation of environmental content in the Young Children's Participation and Environment Measure. *Archives of Physical Medicine and Rehabilitation*, 96(2), 317-322. <https://doi.org/10.1016/j.apmr.2014.11.016>

Summary: This study validated the environmental content of the Young Children's Participation and Environment Measure (YC-PEM) against a criterion measure, the Craig Hospital Inventory of Environmental Factors - Child and Parent Version (CHIEF-CP). The key findings include:

Key Findings:

- The YC-PEM and CHIEF-CP were found to have moderate to strong concurrent validity in assessing environmental factors that may help or hinder the participation of young children with and without developmental disabilities.
- The study supports the use of these measures in large-sample research to identify environmental barriers for each child that might influence their participation.
- The findings suggest that understanding environmental factors is crucial for promoting participation among children with disabilities.
- Regular assessments using validated tools can help identify specific barriers and inform interventions to enhance accessibility.
- The study emphasizes the importance of considering both physical and social environments in promoting children's participation.

Tags: N/A

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Appendix I: AI prompts used to generate the summaries

Generating initial summaries using the Anthropic Claude 3 Haiku LLM

- [Import a CSV file of the data extraction matrix and a TXT file of references (in APA 7th edition style)]
- “I have uploaded a CSV file of a data extraction matrix summarising the content of some references. I have also uploaded a separate TXT file containing the citations for each reference in the CSV file.

Can you please provide a summary of each reference in the CSV file? When providing the summary, please provide 1) the publication title, 2) the citation from the TXT file, 3) a summary of each reference in two sentences and 4) key findings in dot-points? Please ensure that the URL is added to each citation.”

Cross-checking initial summaries with the data extraction matrix using the OpenAI GPT 4o mini LLM

- [Import a DOCX file of the summaries and a CSV file of the data extraction matrix]
- “I have uploaded an annotated bibliography in a DOCX file, along with the original data extraction matrix in a CSV file. Could you look through the annotated bibliography and add any details that are missing in the key findings section in bold? Please do not make any changes to the citation or summary sections.”
- “I have uploaded a different version of the annotated bibliography in a DOCX file. Could you look through this annotated bibliography and add any details that are missing in the key findings section in bold?”

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Appendix II: References

Clark, C., Rowan, M., Stansfeld, S. A., & Candy, B. (2007). A systematic review of the evidence on the effect of the built and physical environment on mental health. *Journal of Public Mental Health*, 6(2), 14-27. <https://doi.org/https://doi.org/10.1108/17465729200700011>

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Müller, C., Paulsen, L., Bucksch, J., & Wallmann-Sperlich, B. (2024). Built and natural environment correlates of physical activity of adults living in rural areas: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 21(1), 52. <https://doi.org/10.1186/s12966-024-01598-3>

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