JURNAL PENDIDKAN BITARA
Volume 18 Special Issue (2025) / eISSN 2821-3173 (120-130)

This article was carefully selected from
6th International Conference on Special Education (ICSE) 2025,
organized by The Southeast Asian Ministers of Education Organization
Regional Centre for Special Educational Needs (SEAMEO SEN)

21ST CENTURY LEARNING TRANSFORMATION FOR SPECIAL NEEDS STUDENTS: REDESIGNING EDUCATIONAL SPACES IN SPECIAL EDUCATION SCHOOLS

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Published: 17 September 2025

To cite this article (APA): Zainon, O., Zakaria, S. R. A., Mohd Yusoff, N. S., Md. Yunus, N., Zainudin, A. Z., & Adi Maimun, N. H. (2025). 21st Century learning transformation for special needs students: Redesigning educational spaces in Special Education Schools. *Jurnal Pendidikan Bitara UPSI*, *18*(Special Issue), 120-130. https://doi.org/10.37134/bitara.vol18.sp.10.2025

To link to this article: https://doi.org/10.37134/bitara.vol18.sp.10.2025

ABSTRACT

The transformation of 21st century education emphasizes inclusivity, innovation, and adaptability to meet the diverse needs of students, including those with special needs. This study explores the impact of redesigning educational spaces in special education schools to enhance learning outcomes for students with unique learning requirements. By integrating principles of universal design, sensory-friendly environments, and collaborative spaces, the research identifies key elements that contribute to creating supportive and stimulating learning environments. According to the Malaysian Education Act 1996, integrated education programs with conducive infrastructure facilities and learning spaces are necessary for students with special needs in line with SDG4 of Education Quality and SSDG9 of UNESCO Infrastructure. Four sub-projects have been planned involving infrastructure, conducive learning spaces, quail farming and economic generation of the Herb Park. This project is implemented with community and industry network certificates. All projects have been implemented within 12 months involving surveys, knowledge transfer, preparation of 21st century learning spaces and communal work. The results of the project effectiveness evaluation showed that the participants had benefited from this project through the addition of knowledge on herb crops, quail farming, 21st century learning and entrepreneurship. On average, 65% of students strongly agree and 32% of students agree that this program is indispensable to them. This shows that programs like this can help students improve their learning performance in the classroom. Furthermore, 68% of students strongly agreed and 19% of students agreed that they really had knowledge of learning in the 21st century classroom. The study employs a quantitative analysis of student engagement. Findings reveal that thoughtfully designed learning spaces not only improve accessibility but also foster emotional well-being, creativity, and active participation among special needs students.

Keywords: Education; Learning; Transformation; Special Needs; Educational Spaces

INTRODUCTION

Every person on the planet has the right to receive an education in order to gain knowledge. Learning-disabled children are also included in the category of children with special needs. Since some of them possess cognitive intelligence on par with neurotypical individuals and can even surpass the achievement of typical students, they should be afforded the same opportunities as other normal people in order to ensure that they are not excluded from the national learning stream (Mohd Tahir, Mustafa and Mohd Yassin, 2009). Individuals with special needs or disabilities can receive special education services and facilities, which include mental and learning disabilities, emotional and behavioral disorders, speech and language impairments, hearing loss, vision loss or low vision, physical disabilities, and intelligent people. The Ministry of Education Malaysia has offered special education and facilities for students with visual and hearing impairments in accordance with the Education Act 1996, Education (Special Education 1997) Regulations Part II 3(2).

Integrated special education is for students with learning, vision, and hearing impairments. It uses a distinct and semi-inclusive teaching methodology and is implemented at the preschool level, primary and secondary conventional day schools, and technical or vocational secondary schools.

Primary schools have a six-year study time, whereas secondary schools have a five-year term that can be extended by up to two years based on the requirements of the students. The infrastructural requirements of students with disabilities have also been addressed by the National Education Policy. Students with disabilities are also included in the 21st century learning approach's implementation in the educational system in accordance with the Malaysian Education Development Plan 2013–2025.

The main aim of this research is to implement the 21st century learning transformation for special needs students by creating learning spaces and infrastructure that are conducive to learning. By implementing creative teaching and learning activities that encourage experiential learning methods. The objective of this project is to identify learning environments and infrastructure that support students' exploration and creation. The second objective is using 21st century learning and landscape technologies into innovative teaching and learning activities both inside and outside of the classroom. The third objective involves establishing a learning environment outside of the classroom that supports experiential learning and teaching activities. This can be achieved by growing herb gardens and quail farming to boost the school's revenue from livestock and herb cultivation.

Through special education integration programs in science, social studies, and the environment, this initiative aims to offer the learning infrastructure of the twenty-first century. The results of a research conducted both before and after activities were conducted at the Kulai Special Education Vocational Secondary School in Johor were used in this project. To assist schools in raising the standard of instruction and creating a favourable learning environment, four projects pertaining to science, society, and the environment have been put into place. Additionally, to raise students' performance levels in the disciplines they are studying, particularly in the areas of science, society, and the environment course.

The goal of this study is to educate the target audience about the value of having a pleasant and conducive learning environment. Extracurricular activities can also contribute by enhancing comprehension of how the charity training exercises should be conducted. This educational program offers a range of engaging teaching and learning activities through knowledge exchange and charitable training programs through students' real-world experiences in the field using creative approaches. Faculty of Built Environment and Surveying (FBES) introduces ideas created in collaboration with students to enhance their understanding of science, society, and the environment using the quadruple helix concept. STEM education, which encompasses science, technology, engineering, and mathematics, is strongly tied to all of these concepts. FBES UTM are working together with the Kulai Municipal Council, Iskandar Puteri City Hall, and private organizations to make this educational service initiative a success.

LITERATURE REVIEW

An educational paradigm known as "21st century learning" places a strong emphasis on digital, financial, and global cultural literacy in addition to abilities like creativity, teamwork, critical thinking, communication and the capacity to adjust to a world that is changing quickly. This paradigm is intended to equip students to meet the needs of the Industrial Revolution 4.0 (RI 4.0) and globalization, which place an increasing emphasis on lifelong learning. According to research by Yahaya et al. (2020), 21st century learning encompasses cutting-edge pedagogical strategies including problem-based learning (PBL) and student-centered learning in addition to the use of technology in the classroom. This method seeks to create people who are resilient and adaptable in addition to being academically skilled.

The fundamental theories of 21st century learning, which underpin these ideas, are essential in constructing creative and successful teaching methods. These include constructivism, which emphasises active learning through practical experience; social constructivism, which describes how social interaction shapes understanding; and cognitivism, which concentrates on mental processes like memory, analysis, and thought. Additionally, situational learning theory introduces the idea that learning happens best when it is associated with real-world situations. It emphasizes the importance of authentic activities and relevant context in the learning process. Digital constructive theory, which has emerged in tandem with technological developments, promotes the use of technology as a tool to foster interactive and creative learning experiences.

In addition to serving as the cornerstone of contemporary education, these theories also help educators develop pedagogical strategies suitable for a range of settings, such as inclusive and special education. By incorporating these notions, education in the twenty-first century may inspire students to become highly competent, competitive, and prepared to contribute to a global society.

21st Century Learning Theories

Numerous foundational ideas that direct teaching and learning strategies promote 21st century learning. These ideas serve as the foundation for cutting-edge methods meant to foster abilities including critical thinking, creativity, teamwork, and communication. 21st century learning theory is greatly influenced by constructivism, social constructivism, and cognitivism:

(1) Cognitivism Theory: This idea holds that learning is dependent on how the mind processes information. Through the use of virtual learning platforms and simulation software, for example, technology significantly speeds up information processing in the twenty-first century.

(2) Theory of Constructivism: According to Piaget (1971), learning happens when pupils actively explore and construct understanding from their own experiences. This philosophy is used in the twenty-first century through methods like experiential learning and investigation-based initiatives.

(3) Social Constructivism Theory: The "Zone of Proximal Development" (ZPD), a theory first proposed by Vygotsky in 1978, highlights the value of social contact in the learning process. This is implemented in the 21st century through collaborative learning, in which students work together to solve challenges.

Components of 21st Century Learning

Research indicates that 21st century learning is supported by a number of essential elements:

(1) Communication Proficiency

The four communications proficiency such as creativity, communication, cooperation, and critical thinking are essential components in equipping students to handle issues in the real world, claim Wardyawaty and Hamzah (2020). For instance, project-based learning in the classroom fosters students' ability to think critically and creatively.

(2) Technology and Digital Literacy

A fundamental requirement for education in the twenty-first century is digital literacy. Students that are exposed to digital technologies often have a stronger comprehension of complicated issues, according to Zubaidah (2019). For instance, students can tour actual places while learning geography in the classroom by using virtual reality (VR).

(3) Student-Centered Approach

This method gives pupils the chance to take charge of their own education, claim Restu et al. (2022). Students with special needs, for instance, could be allowed to select a project that reflects their hobbies, like quail farming or herb gardening.

(4) Inclusive Education

All students, including those with special needs, must have access to a learning environment in the twenty-first century. Derapa and Mohamed (2018) claim that special education has improved learning results for kids with special needs by utilizing strategies like universal design for learning (UDL).

21st Century Learning Practices and Applications

Several practices and applications in 21st century learning have been explored in recent studies:

(1) Conducive Learning Space Design

According to study by Yasin et al. (2019), the physical environment is essential for fostering 21st century learning. High-tech, adaptable environments can boost pupils' desire to study.

(2) Project Based Learning (PBL)

PBL is a learning method in which students engage in real projects. A study by Muhammad Ayisy and Mohd Ashraf (2019) found that PBL helps students improve their critical thinking through complex problem-solving.

(3) Use of Technology in Teaching and Learning

A study by Nurdiana and Surif (2018) emphasizes the importance of using technology such as mobile applications and visual aids in supporting 21st century learning. This technology can help students understand abstract concepts better.

(4) Service Based Learning

Programs such as SULAM integrate academic learning with community service. A study by Syed Lamsah and Melor (2019) shows that this approach helps students develop soft skills while contributing to the community.

Challenges in Implementing 21st Century Learning

Learning in the twenty-first century places a strong emphasis on combining technology, soft skills, and creative teaching methods to satisfy the demands of the contemporary world. However, there are a number of obstacles to its execution. There are several key challenges that need to be addressed to ensure the effectiveness of this project.

(1) Digital Gaps

Not all students have access to modern technology. A study by Restu et al. (2022) found that these digital gaps can hinder efforts to implement inclusive 21st century learning.

(2) Teacher Capabilities

Teachers play a crucial role in 21st-century learning, but a lack of training and the ability to use technology and innovative approaches are major obstacles. Teachers need to be trained to use the 21st century pedagogical approach. According to Wardyawaty and Hamzah (2020), some teachers are still not ready to use technology in the classroom.

(3) Assessment Difficulty

It is challenging to evaluate 21st century abilities like creativity and critical thinking using conventional evaluation techniques. In place of standardized assessments, a research by Zubaidah (2019) recommended using portfolios and rubrics.

(4) Infrastructure and Physical Resource Constraints

According to the research, one of the biggest challenges facing the participating schools is providing 21st century infrastructure and appropriate learning environments. Technology assistance, flexible classrooms, and facilities for studying outside of the classroom are examples of infrastructure that is frequently insufficient. Wardyawaty and Hamzah (2020), stated that many schools in Malaysia are facing a lack of funds to upgrade infrastructure that supports modern learning.

METHODOLOGY

The study's research methodology attempts to guarantee that the project will be successful in accomplishing its objectives, which include creating a comfortable learning environment, implementing a 21st century learning strategy, and enhancing the academic wellbeing of students with special needs. The methodology includes implementation approaches, study design, data collection techniques, data analysis, as well as stakeholder engagement. The methodology is outlined in four main sub-projects, each with a clear procedure for implementation:

a) Improvement of 21st Century Learning Space Infrastructure

Upgrade classrooms with interactive learning features, including the installation of teaching aids such as murals and ergonomic furniture. Using a collaborative approach between teachers, students, and facilitators to ensure that the learning space meets the needs of all parties.

b) Beautification of School Spaces with Landscape

Engage students in art activities such as painting murals and designing landscapes, to increase creativity and engagement in learning.

c) Entrepreneurial Potential through Quail Mini Park

Teaching student’s basic entrepreneurial skills through quail management. The transfer of knowledge involves breeding techniques and marketing quail products.

d) Sustainability Awareness through Herb Gardens

Students are taught about environmental care by growing herbs, which also contribute to the school's income.

Implementation Approach

This project uses a knowledge and technology transfer approach through community service programs. The activities implemented emphasized elements of active learning, innovation, and collaboration, in line with the needs of 21st century learning. The implementation approaches consist of:

a) Provision of Infrastructure and Learning Spaces:

The project involves upgrading classroom infrastructure and outdoor learning spaces such as a herb garden and quail mini garden to support experiential learning.

b) Community Engagement:

The Faculty of Built Environment and Surveying (FABU), Universiti Teknologi Malaysia (UTM) acts as the main facilitator with support from schools, local communities, and government agencies.

c) Inclusive Education:
Adapting learning spaces and materials to meet the needs of students with special needs.

Data Collection Techniques

Several techniques are used to gather relevant data in this project:

1) Questionnaires

Questionnaires are used to obtain quantitative information from students, teachers, parents, and school staff. A total of 240 questionnaires were distributed to students of Indahpura Special Education Vocational Secondary School to evaluate the effectiveness of the project.

2) Observation

Observation is carried out during activities such as the provision of learning infrastructure, gotong-royong, and knowledge transfer. These observations provide first-hand insights into the implementation of the project as well as the impact on participants.

Data Analysis Methods

Data analysis in this project is carried out through quantitative approaches:

The data from the questionnaire is analyzed using descriptive statistics such as averages, percentages, and graphs to illustrate the effectiveness of the project. This study was conducted to investigate individuals' understanding and perception of information space in 21st century learning rooms. A questionnaire containing nine questions was distributed to the participants. The questions were designed to gather information about the effectiveness of this project. Respondents are required to provide their answers based on the "Likert" scale, which is shown in Table 1

Table 1: Likert scale

Scale	Indicator
5	Strongly Agree
4	Agree
3	Not Sure
2	Disagree
1	Strongly Disagree

Based on Table 1, scale 1 represents indicators of strong disagreement with their perception and awareness of the importance of this project. On the other hand, scale 2 represents an indicator of their disagreement with the perception and awareness of the importance of this project. Next, a scale of 3 shows an uncertain indicator of their perception, and awareness of the importance of the project. A scale of 4, on the other hand, shows an indicator of agreement on their perception, and awareness of the importance of this project. Last but not least is a scale of 5, where the indicators strongly agree on the evaluation of this project.

RESULTS AND FINDING

Results of the project effectiveness study for the 21st century learning space infrastructure improvement project. A total of 240 questionnaires were distributed to respondents consisting of students of Sekolah Menengah Kebangsaan Vocational Special Education Indahpura Kulai Johor. Figure 1 shows the respondents' responses to the needs of the program. Figure 2 shows the respondents' responses to technology knowledge or methods prior to the implementation of the program before the program was implemented.

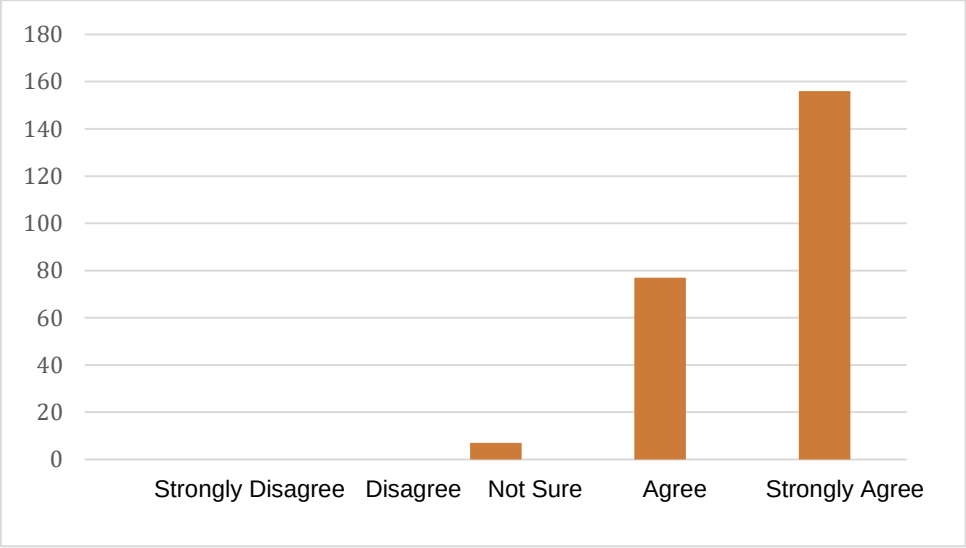

Figure 1: Respondents' responses to the needs of the program

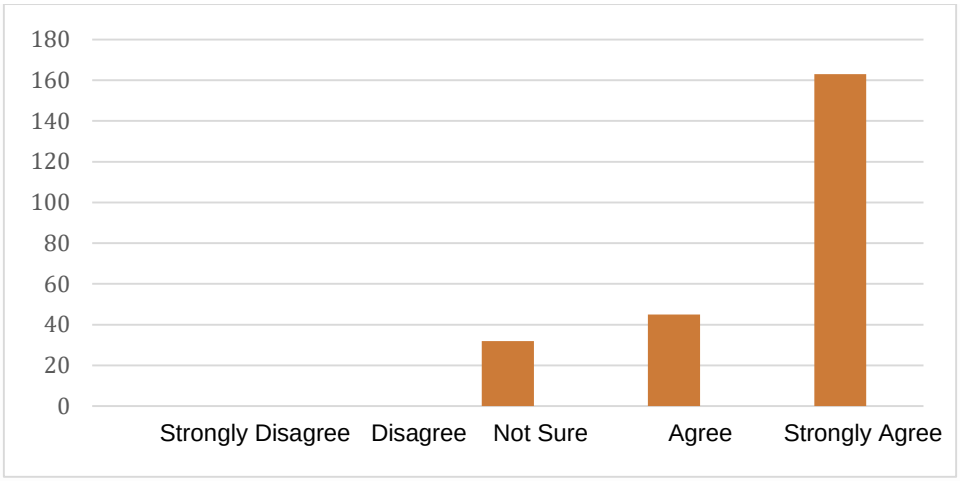

Figure 2: Respondents' responses to technology knowledge or methods prior to the implementation of the program

DISCUSSIONS, RECOMMENDATIONS AND CONCLUSIONS

Based on Figure 1, a total of 156 or 65% of students strongly agree and a total of 77 or 32% of students agree that this program is very necessary for them. This shows that programs like this can help students improve their learning performance in the classroom. Furthermore, Figure 2 shows that before the program was implemented, a total of 163 or 68% of students strongly agreed and a total of 45 or 19% of students agreed that they really had knowledge about learning in the 21st century classroom and the methods used such as learning aids in the classroom related to 21st century learning.

The execution of the core project under the Knowledge Transfer Programme (KTP) was to enhance the educational setting for special needs students at Sekolah Menengah Vokasional Pendidikan Khas Indahpura, Johor. This transition focused on implementing principles of 21st-century learning (PAK21), encompassing experiential learning, inclusive infrastructure construction, collaborative teaching practices, and community participation. A comparison of the project's impact before and after implementation demonstrates considerable shifts across numerous dimensions: students' involvement, pedagogical practice, learning settings, and stakeholder participation.

Changes in Students' Attitudes and Motivation

According to pre-implementation observations, kids with special needs showed little enthusiasm for formal education settings, especially in conventional classroom settings. They tended to be passive and individualized learners, and they had little exposure to hands-on or contextual learning.

A significant shift has been observed, according on post-implementation data gathered from 240 students using a standardized questionnaire:

a. A majority of students (65%) strongly believed that the new learning activities were entertaining and improved student engagement.
b. Of those surveyed, 32% felt that experiential and outdoor learning improved their engagement and comprehension.
c. Just 3% expressed uncertainty, indicating widespread approval of the modified strategy.

This suggests a favourable change in attitude, particularly after students started to actively participate in running the quail farm and herb garden and using their scientific and agricultural skills in practical work. Their greater engagement and zeal indicate that, especially for students with learning disabilities, participation in real learning experiences may greatly boost intrinsic motivation.

Impact on Learning Spaces and Environmental Transformation

Before the initiative, there were no elements in the physical learning environment that promoted interaction or diversity. Static, non-ergonomic classrooms were not designed with active or differentiated learning in mind.

Following deployment, the physical makeover included:

a. A revitalized classroom with adjustable furniture and better lighting.
b. The creation of a herbal garden as a venue for business, sustainability, and science education.
c. Outdoor learning areas with mural artworks and landscape elements created by students and facilitators;
d. A quail mini-farm that teaches fundamental animal husbandry and vocational skills.

Students were able to learn by doing as the learning environment evolved into an extension of the curriculum. This is in line with the tenets of situated learning and experiential learning, which place a strong focus on real-world assignments and context-based instruction. Key outcomes in 21st century teaching, such as inquiry, curiosity, and reflection, were fostered by these venues.

Limitations of the Study

Recognizing these limitations is essential to accurately interpret the results, assess the study's validity, and inform future replications or scaling efforts.

Time Constraints and Project Duration

The project's implementation timetable was shortened since it was constrained by the academic calendar and the KTP grant's parameters. School holidays and scheduling problems impacted a number of activities, making it impossible to adequately quantify long-term consequences such behavioural changes, sustained motivation, or academic accomplishment. The study cannot determine if the noted benefits are long-lasting or just transient responses to environmental or novelty changes in the absence of longitudinal data.

Insufficient In-Depth Data Gathering and Analysis

Basic observations, anecdotal input, and questionnaire-based surveys with Likert-scale replies were the main sources of data used in the evaluation. In-depth qualitative techniques that would have provided deeper insights on stakeholder involvement, teacher adaptability, and student learning experience like focus groups, structured interviews, and reflective journals—are absent from the study. The depth of analysis is diminished and subtle changes in learner behavior, socioemotional development, and teaching philosophy adjustments may be missed in the absence of triangulated, multi-source data.

CONCLUSIONS

In conclusion, this project has been successfully implemented within the stipulated period of 12 months. This project has involved surveys, knowledge transfer, provision of 21st century learning informational wall space and gotong-royong. This project has impacted 20 teachers, 100 special education students, 30 school staff and 10 people from the local community. This project has adopted the concept of quadruple helix by collaborating between universities, government agencies, industry and the community to provide 21st century learning spaces for students with special needs.

The purpose of this project is to expose and create awareness to the target group about the importance of having a conducive and comfortable learning room. Activities outside the classroom can also play a role by increasing understanding of the conduct of the charity training activities carried out. This innovative method offers a variety of interesting teaching and learning activities through practical

training and knowledge sharing activities. FABU brings innovations produced through partnerships with students to enrich them with Science, Social and Environmental knowledge. All of this knowledge is closely related to STEM education which covers science, technology, engineering and mathematics. This program is an educational service program of the Faculty of Built Environment and Surveying (FBES), Universiti Teknologi Malaysia. FBES has already collaborated with the Kulai Municipal Council, the Kenari Kangkar Pulai Apartment community and private companies to make this program a success.

According to the Education Act 1996, Education (Special Education 1997) Regulations Part II 3(2), the Ministry of Education Malaysia has provided special education and facilities for students with visual and hearing impairments, while integrated special education is for those with learning, vision, and hearing impairments. It is established at the preschool level, primary and secondary regular day schools and technical or vocational secondary schools, using a separate and semi-inclusive teaching approach. The study period for primary schools is six years, while for secondary schools it is five years and extended to a maximum of two years according to the needs of the students.

This project is in line with the intention of the National Education Policy which has addressed the need for infrastructure for students with disabilities. The implementation of the 21st century learning method in the learning system in line with the Malaysian Education Development Plan 2013-2025 also involves students with disabilities. According to the Education Act 1996, integrated education programmes with conducive infrastructure facilities and learning spaces are necessary for students with special needs in line with SDG4 of Quality of Education and SDG9 of UNESCO Infrastructure.

RECOMMENDATIONS

(a) Suggest further studies to assess the effectiveness of this approach in other contexts, such as mainstream schools or higher education levels.
(b) Propose a longitudinal study to see the impact of the project on student performance in the long term.

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