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# Teaching and Learning for the 21st Century: Innovation, Infrastructure and Technology

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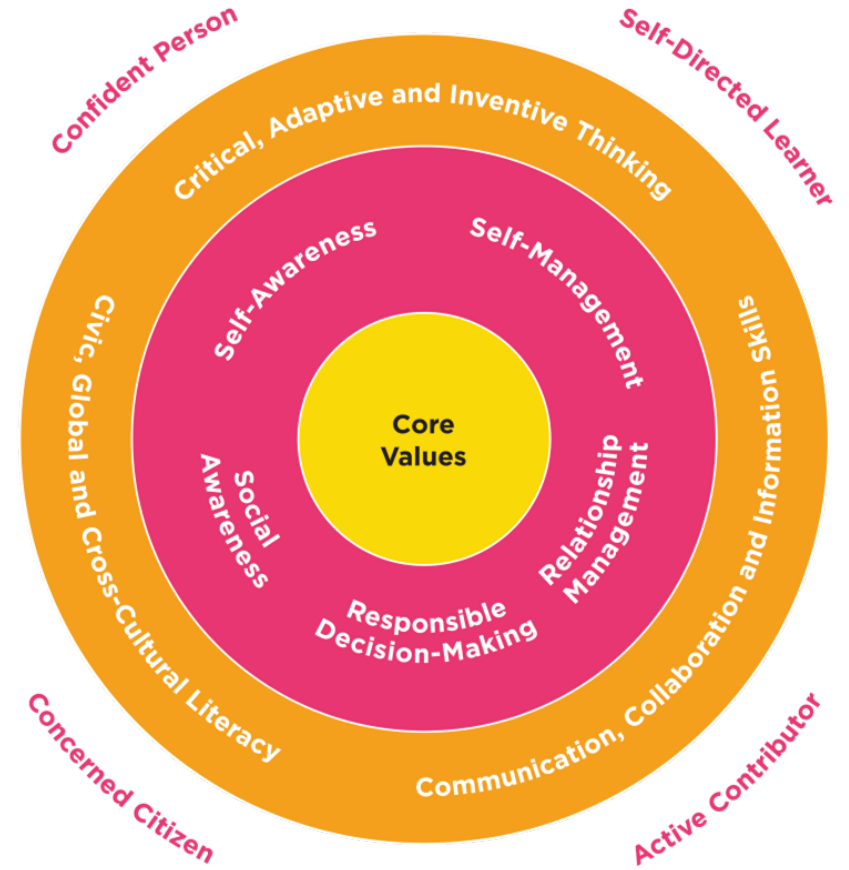
Immediate-past President, World Education Research Association (WERA) and  
Educational Research Association of Singapore (ERAS)

Executive Editor, Educational Research for Policy and Practice (ERPP)

INSPIRING LEARNING  
TRANSFORMING TEACHING  
ADVANCING RESEARCH

# Context: School White Area Grant

- Situated within a wider context of educational reforms, aimed at diversifying educational pathways and skillsets.
- Encouraged to critically re-examine our current methods of teaching and testing, and provide students with a variety of perspectives and experiences during their schooling.
- Emphasis not only on examinations, but STEM related skills, as well as soft skills such as MOE 21st Century Competencies (MOE, 2024).



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<https://www.channelnewsasia.com/singapore/chan-chun-sing-moe-diversity-schools-education-2115116>

# Context: School White Area Grant

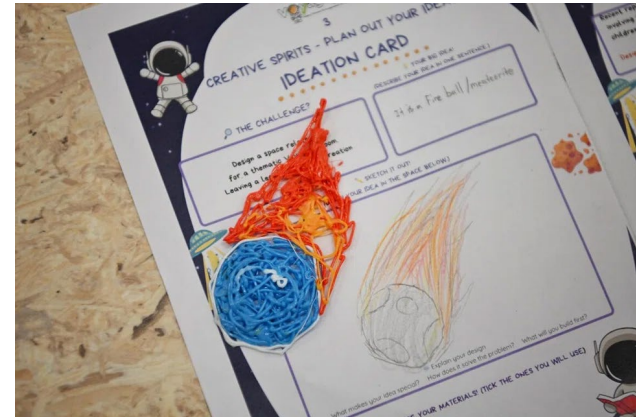
- Launched in 2024 April by MOE, to encourage schools to tap into underutilised spaces, using them to address the needs of a constantly-developing educational landscape.
- A grant of S\$ 64 million, utilised by 110 schools as of June 2025. Allocated funding per school ranges from \$170,000 to \$270,000. Additional funding can be provided for specific furniture and equipment (MOE, 2023).
- Maker-spaces, Tinkering spaces, Edible gardens, collaborative spaces and large display panels are just a few ways that schools have utilised the grant.



<https://www.straitstimes.com/singapore/parenting-education/schools-turn-underused-spaces-into-tinkering-hubs-edible-gardens-through-white-area-grant>

# An Informed Approach to Renewing Learning Spaces:

- The Ministry has provided schools with the means and support to create beneficial, engaging spaces to diversify students' learning and development of 21st-century competencies.
- However, *how* might schools go about designing these spaces?
- What are the theories and guidelines that schools may wish to take into account when designing these spaces, and the methods of using such spaces, for the most effective outcomes?



# **Creative Learning Spaces: Theoretical Perspectives and Guidelines**



# Inclusive and Immersive Experiences for Teaching and Learning

- Environment as the “third teacher”  
Strong-Wilson and Ellis’s (2007)
- 21<sup>st</sup> century learners
- Student-centred, inquiry-based pedagogical approaches
- Student Engagement (affective, cognitive and behavioural) and Motivation
  - ✓ Learning process, Learning outcomes

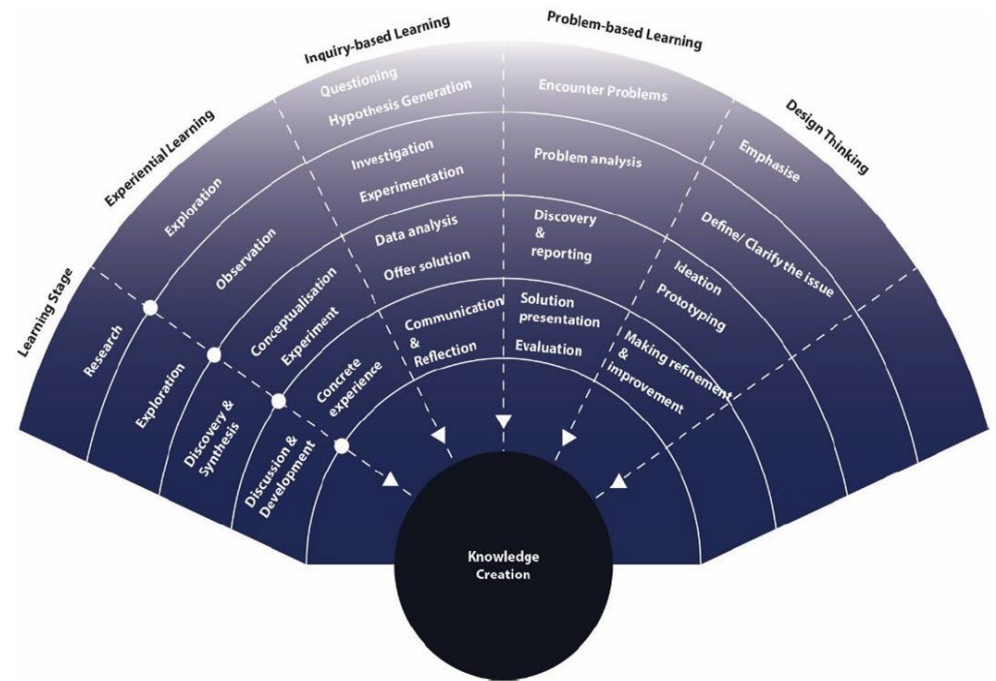
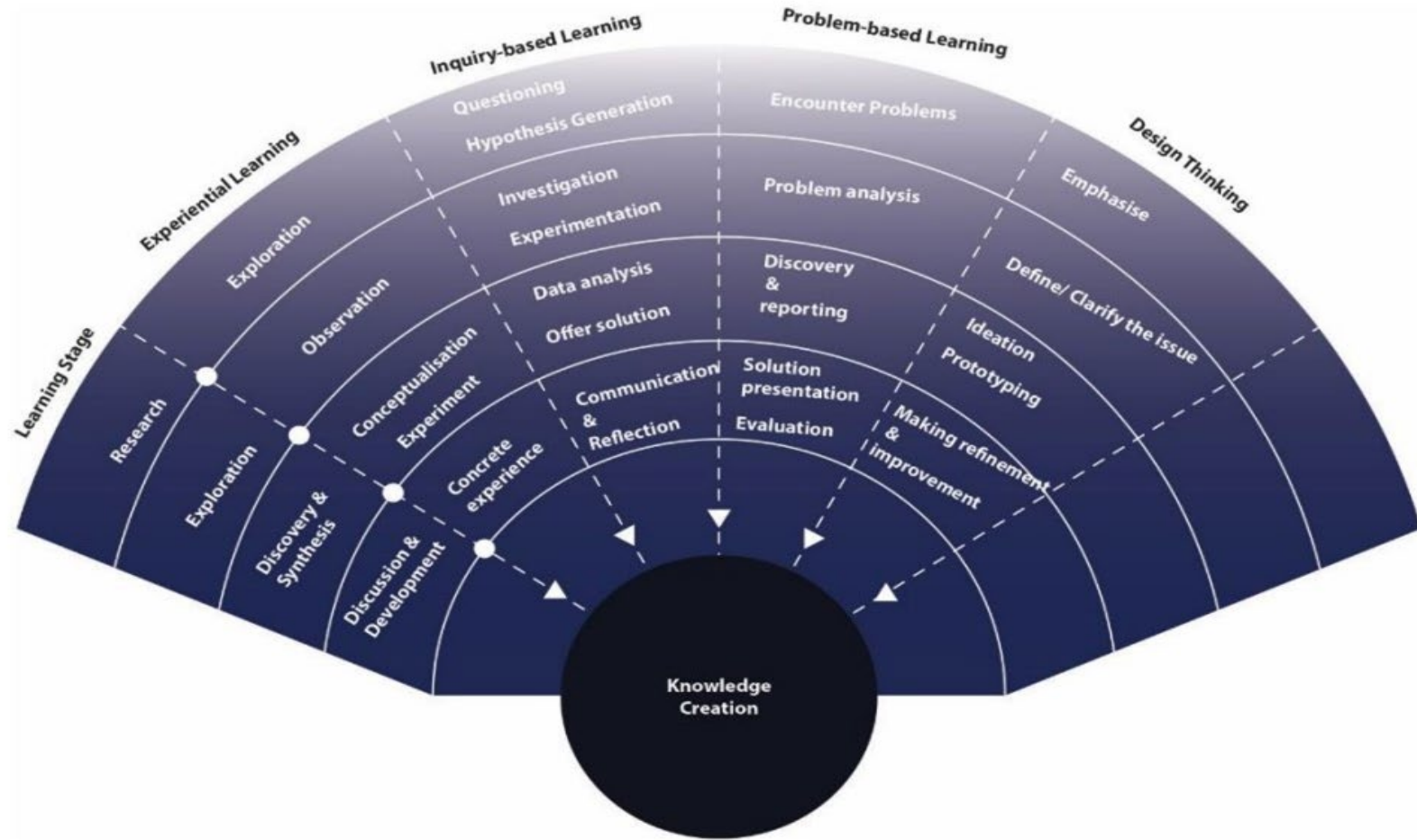


Figure 1 Learning pedagogies for 21st Century learning

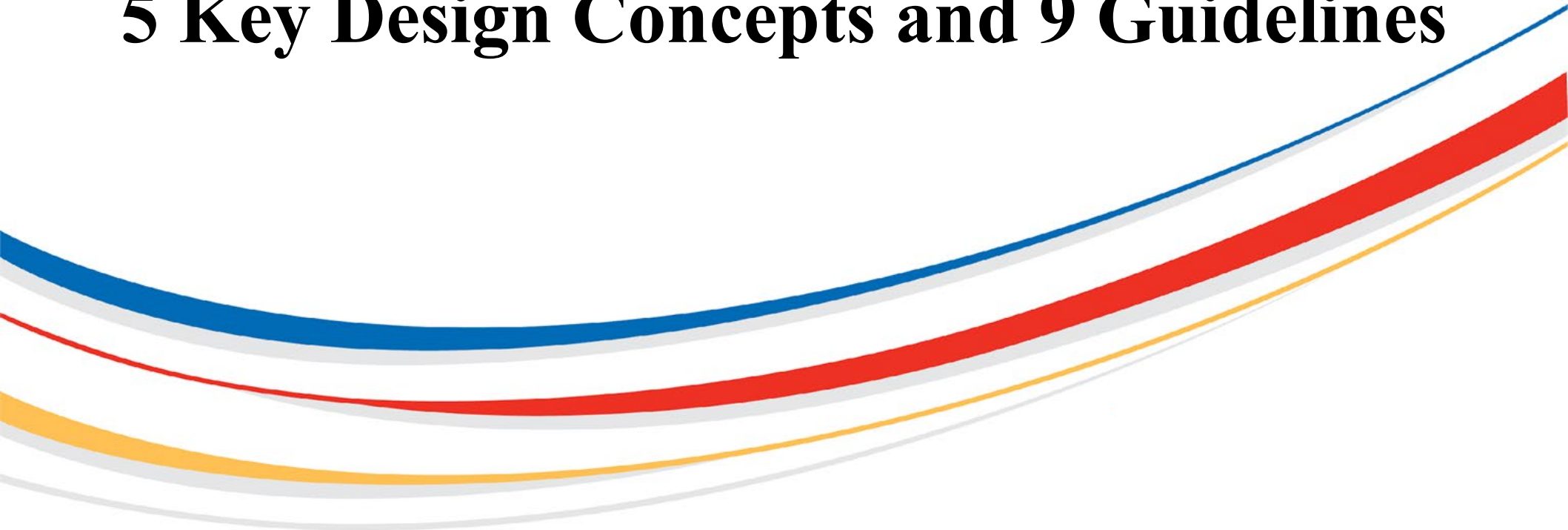
Chua, B. L., & Min, H. Y. (2019) *21st Century Learning Spaces Design Guidelines*. NIE, NTU



Chua, B. L., & Min, H. Y. (2019) *21st Century Learning Spaces Design Guidelines*. NIE, NTU

“ Teacher of School A: The key thing to use these spaces is that it must be designed for the student's use primarily. If it's not, you know, it's just a working space. It must be *a place that the students like to go to... it is essentially a place to think, to work, to experiment with a lot of materials.* ”

# **5 Key Design Concepts and 9 Guidelines**



# 5 Key Design Concepts and 9 Guidelines: Breakdown

*Appropriate learning facilities  
and resources to support  
learning processes*

1) Students need facilities and resources to support their learning processes such as research, ideation, collaboration, visualisation and expression.

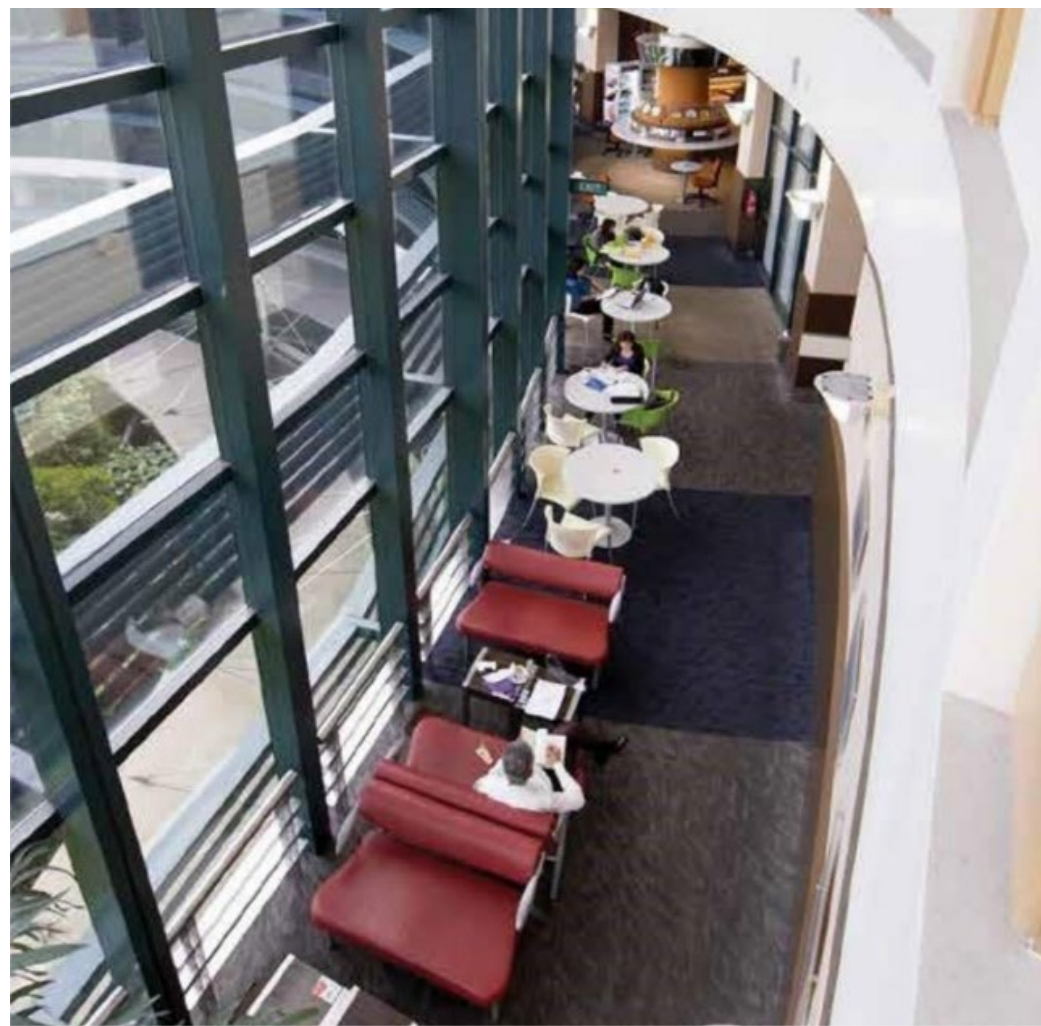
2) These facilities (e.g. artwork facility, presentation facility, media production facility, prototyping facility) together with learning resources (e.g. books, software, internet access, computers, printers and prototyping machines) need to be accessible and available to facilitate students' self-directed learning.



*Media lab of school B*



*Word-works room (for literature lessons) of school B*



*Library Space, National Institute of Education, Singapore*

# 5 Key Design Concepts and 9 Guidelines: Breakdown

*Furniture and spatial layout  
impact learning behaviour*

3) Circular tables facilitate efficient group discussions and communication, while large rectangular tables are suitable for design modelling work and collaboration.

4) Enclosed areas and corners aid students in learning internalisation and reflection.

5) The learning spaces should be planned to provide sufficient spaciousness in order to support students' movements during learning activities.

“

Student A of School B: *The tables are round, so it is good for group discussions.* We have a few projects, so my team always goes there to conduct our discussions, because it is very conducive.

”

*corner area*

*Lecturing type  
of furniture setting*

*Free flow type of  
group discussion  
with round-shape table*

*Collaborating  
learning setting*



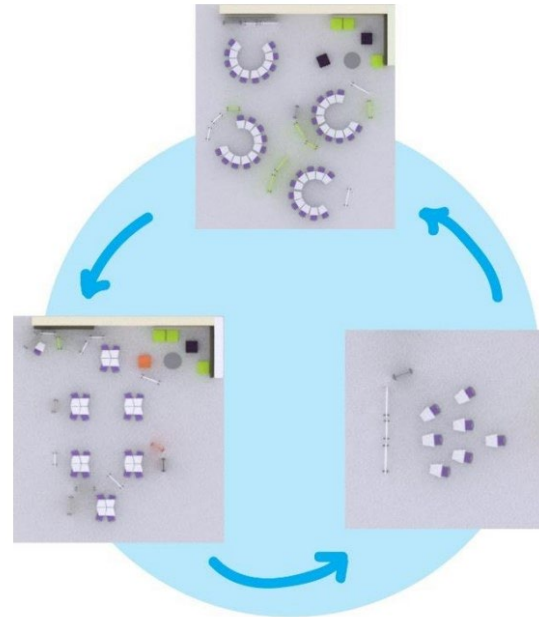
# 5 Key Design Concepts and 9 Guidelines: Breakdown

***Flexible features in learning spaces to adapt to learning needs***



6) Learning space settings should be sufficiently flexible and fluid to facilitate various learning activities and to increase the level of students' self-directedness.

*Flexible learning space-setting with modular type of furniture*





*Mobile partitions, mobile whiteboards, and adjustable tables and chairs are suggested elements to create a flexible learning space:*

- Mobile partitions and whiteboards can be used by students to build partitioned spaces*
- Mobile whiteboards can help students express and share their ideas regardless of location.*
- Tables and chairs are light-weight and movable so that students can customise the space.*
- The storage space under the table will help to optimise space.*



*Space setting for  
small-sized group work  
(4-5 persons per group)*



*Space setting for  
large-sized group work  
(9-10 persons per group)*



*Space setting for knowledge  
dissemination and presentation*



*Learning Space,  
National Institute of Education,  
Singapore*

“ Student B of School B: I think it is way more comfortable to have lessons here actually, than the normal classrooms upstairs, because I feel like having my own space. For example, *for the table, we can move it around anywhere we like, like any space that we want to. And it is really up to us, how we want to discuss.*

”

# 5 Key Design Concepts and 9 Guidelines: Breakdown

*Learning environments affect students' emotions and moods*



7) Create learning environments that generate positive feelings in students.

*Placing sofa type furniture will create a comfortable environment.  
Alternatively, the area can be utilised for facilitating game activities.*



# 5 Key Design Concepts and 9 Guidelines: Breakdown

*Learning environments affect students' emotions and moods*



8) Choose colours that promote intended learning moods.

Nair (2014) suggests using bright and primary hues along corridors or outdoor areas to activate rather than to calm students' moods. According to other studies on the use of colours, each colour hue can produce a specific emotional reaction. For instance,



*Primary hue*



*Example of neutral tone*

“ Student C of School B: *I work better the moment I feel more relaxed*, and not like in a sterile environment where when I enter, I am just there to get work done. But when I come here, *I feel at ease. Because a lot of the work that we do require creativity*. That's why sometimes I cannot work in a very sterile environment where there is high pressure. ”

# 5 Key Design Concepts and 9 Guidelines: Breakdown

*Inspirational stimuli to encourage and motivate students*



9) Quotations and students' works can be displayed to provide inspirational stimuli.



*Foyer, Administration Block,  
National Institute of Education,  
Singapore*

“ Student D of School B: I think the wordings in the room... it is pretty inspiring at times. Sometimes you feel like letting loose and get lazy but when you read inspirational things, to me *it means something. I use it to inspire myself more. Motivate!*

”

## 5 Key Design Concepts and 9 Guidelines: At a Glance

Key Design Concept	Guidelines
Appropriate learning facilities and resources to support learning processes.	1) Students need facilities and resources to support their learning processes such as research, ideation, collaboration, visualisation and expression.
	2) These facilities together with learning resources need to be accessible and available to facilitate students' self-directed learning.
Furniture and spatial layout impact learning behaviour	3) Circular tables facilitate efficient group discussions and communication, while large rectangular tables are suitable for design modelling work and collaboration.
	4) Enclosed areas and corners aid students in learning internalisation and reflection.
	5) The learning spaces should be planned to provide sufficient spaciousness in order to support students' movements during learning activities.
Flexible features in learning spaces to adapt to learning needs	6) Learning space settings should be sufficiently flexible and fluid to facilitate various learning activities and to increase the level of students' self-directedness.
Learning environments affect students' emotions and moods	7) Create learning environments that generate positive feelings in students.
	8) Choose colours that promote intended learning moods.
Inspirational stimuli to encourage and motivate students	9) Quotations and students' works can be displayed to provide inspirational stimuli.

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# Self-Determination Theory (SDT)

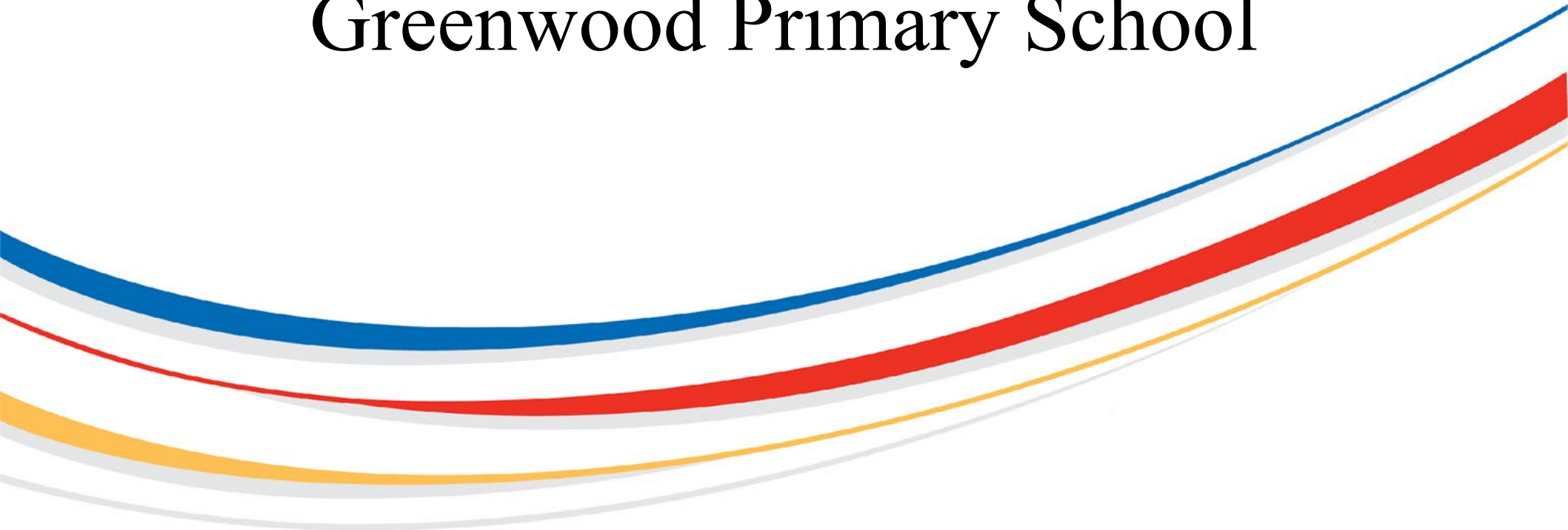
- Basic psychological needs are assumed to be innate and universal.
- Needs for competence, autonomy, and relatedness
- These needs must be satisfied for people to possess psychological well-being, as well as to enable optimal functioning and performance (Deci & Ryan, 2000; Reis, et. al., 2000).

# Inclusive and Immersive Experiences for Teaching and Learning

- Phygital Spaces for hybrid teaching and learning
  - ✓ Microsoft - Phygitalised experiences by blending physical and digital experiences for students, faculty and stakeholders.
  - ✓ Connected campus
  - ✓ Mixed Reality

<https://www.microsoft.com/insidetrack/blog/working-in-a-phygital-world-why-businesses-need-to-rethink-their-workspace-experiences-now/>

# Greenwood Primary School





**Media Resource Library (Level 3)**



**Wonder in the Woods (Level 1)**

Source: <https://www.greenwoodpri.moe.edu.sg/about-gwps/learning-spaces/>



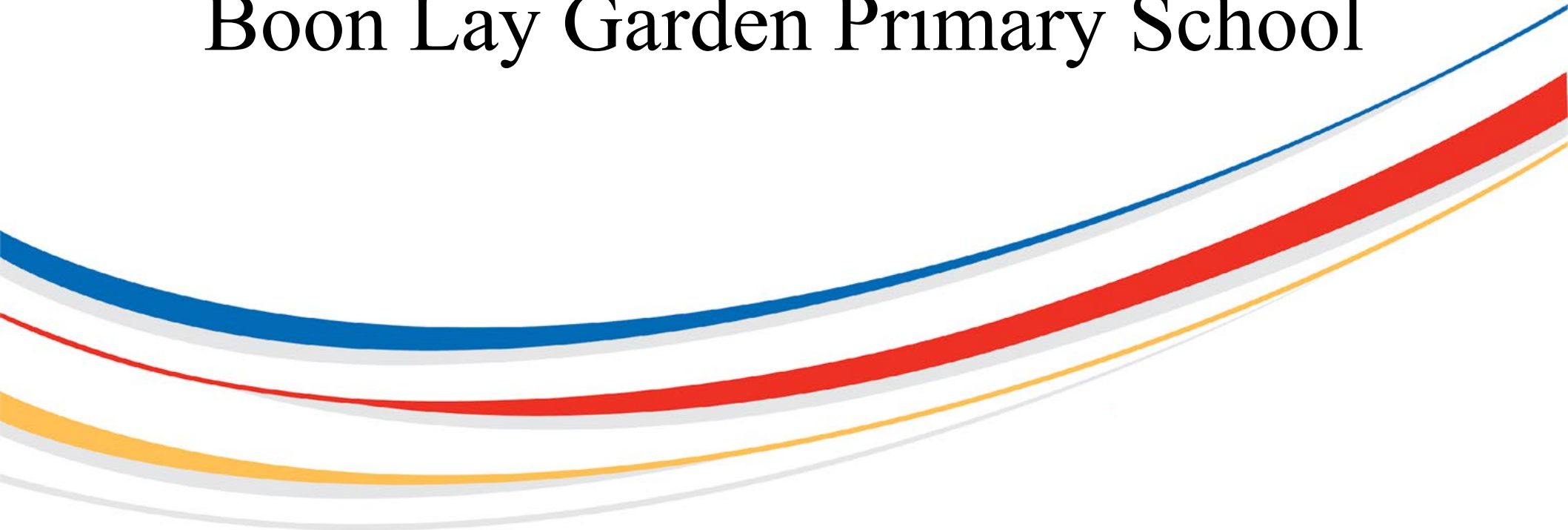
**Imaging Lab**



**Inquiry Lab**

Source: <https://www.greenwoodpri.moe.edu.sg/about-gwps/learning-spaces/>

# Boon Lay Garden Primary School



# THE LITERACY COVE



**FLEXIBLE LEARNING SPACE**



**PHONICS WALL & GAMES**



**TREASURE COVE OF READING RESOURCES FOR YOUNG READERS!**

## THE SCIENCE LABS



**SEATING FOR COLLABORATIVE EXPLORATION & LEARNING STATIONS**



**AMPLE WORK SPACE FOR MANIPULATIVES USED IN INQUIRY-BASED LEARNING!**

## THE ART SPACES



**ART ROOMS FOR DIFFERENT LEARNING ACTIVITIES**



**ILLUSTRATIONS ON WALL TO GUIDE FIGURE DRAWING**

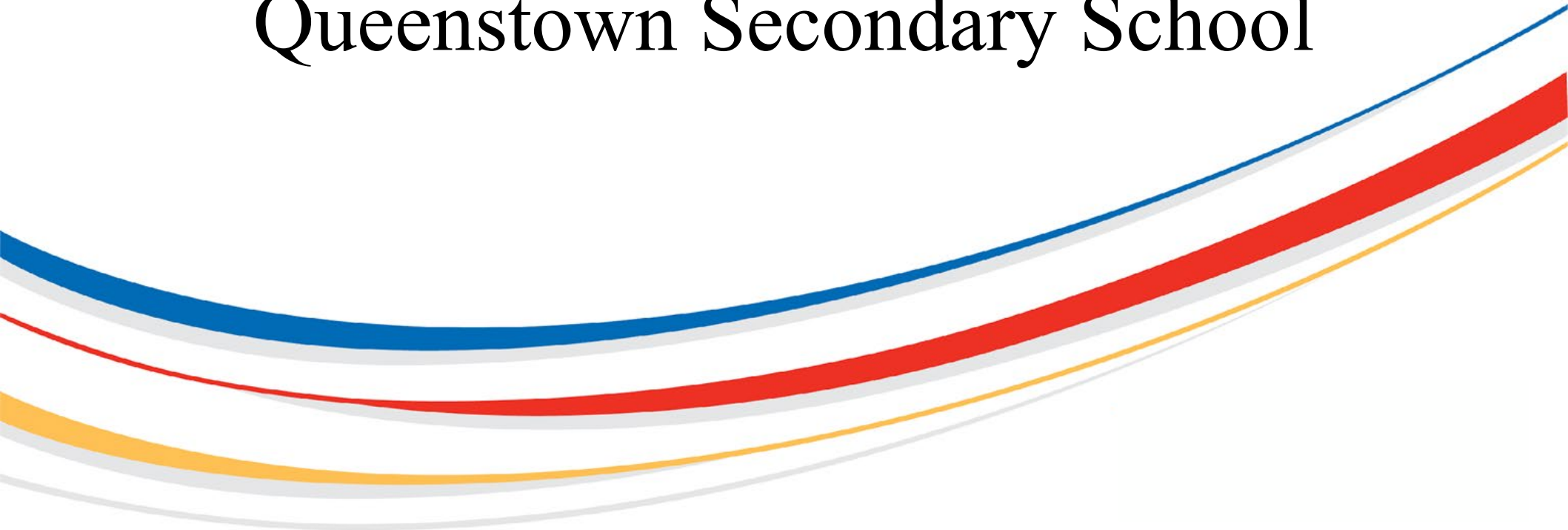


**MURAL ART TO INSPIRE STUDENTS' IDEATION PROCESS**



**TABLES DESIGNED FOR COLLABORATIVE LEARNING**

# Queenstown Secondary School



## The Foyer: After Renovation



Interactive Spaces

## The Foyer

**Spaces to Showcase Students' Work and Achievements**



Students' Projects & Voices

# Learning Commons: After Renovation

## 3D rendering of the Main Areas @ the Learning Commons



Source:  
[https://www.qu  
eenstownsec.m  
oe.edu.sg/learn  
ing-spaces-  
qtss/](https://www.queenstownsec.moe.edu.sg/learning-spaces-qtss/)

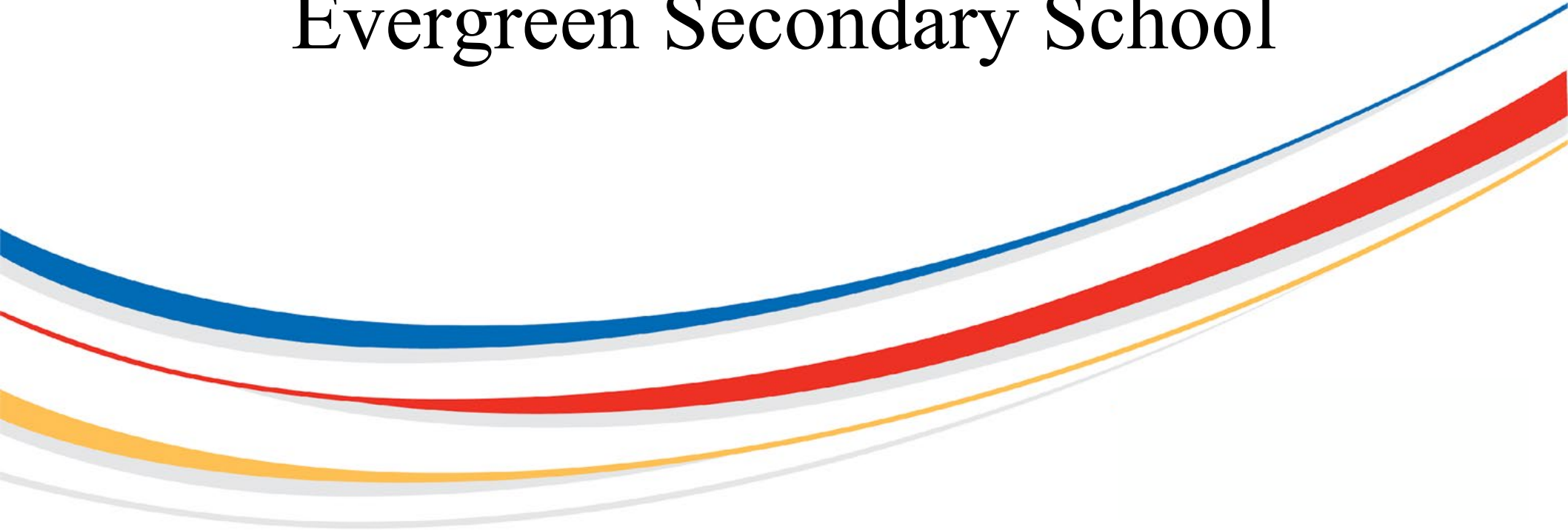


## New meeting & Study Areas @ the Learning Commons

Source: <https://www.queenstownsec.moe.edu.sg/learning-spaces-qtss/>



# Evergreen Secondary School



Evergreen Secondary offers our students and staff a conducive learning and working environment with ample facilities such as:

- Classrooms with lockers for every student
- School field with artificial turf that is also designed for rugby games
- A two-storey Indoor Sports Hall and another School Hall
- Applied Learning Programme space with performing stage and seating
- Special rooms such as our music studio, exercise gym, well-equipped Food & Nutrition studios, science laboratories, etc.
- Many learning spaces such as our Movers and Shakers study area
- Unique school architecture such as walkways with sandstone pillars



Source: <https://www.evergreensec.moe.edu.sg/life-at-evg/learning-environment/>



Source: <https://www.evergreensec.moe.edu.sg/life-at-evg/learning-environment/>

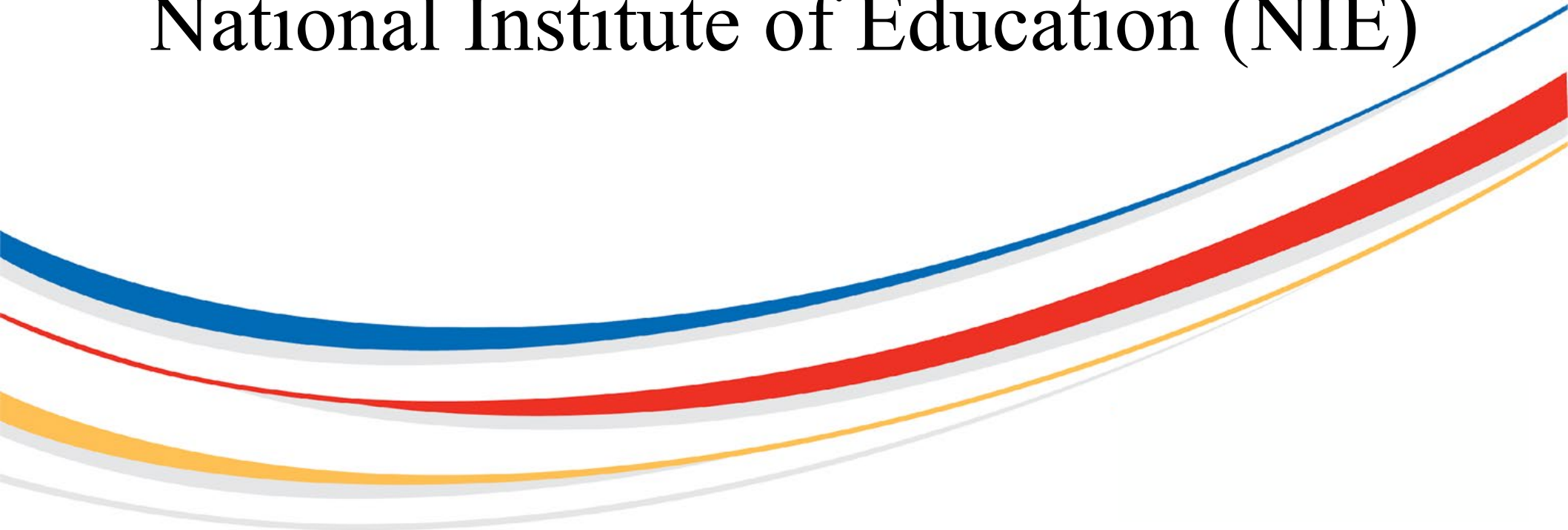
# The MOE School White Area Grant

- The grant is part of a larger movement to diversity education pathways and skillsets.
- Part of this is providing support and funding for schools to better utilise physical spaces.
- With a theoretical backing, schools may take a more considered and guided approach in how to design and use such spaces.
- Ultimately, the goal is for students to explore, experiment, and collaborate for learning processes and outcomes that are not easily replicable within a traditional classroom setting.



<https://www.straitstimes.com/singapore/parenting-education/schools-turn-underused-spaces-into-tinkering-hubs-edible-gardens-through-white-area-grant>

# National Institute of Education (NIE)





***U-Connect learning Space, Artists' rendition. NIE, Singapore***



***U-Connect learning Space, NIE, Singapore***





***U-Connect learning Space, NIE, Singapore***



*Learning Space, NIE, Singapore*

# Transforming Teacher Education at NIE through Innovative Learning Spaces



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Thank you!  
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