



## Effective Learning in Classrooms of Tomorrow at NTU

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Centre for Excellence in Learning & Teaching

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## Overview

- **Background**
- **Classroom of Tomorrow @NTU**
  - **Physical layout**
  - **Instruction medium**
  - **Technological tools**
- **Students' feedback**
- **Comparison with other learning environment**
- **Concluding remarks**



## Background



Channel NewsAsia, Singapore Tonight (15 March 2011, 10pm)

## Background

THE STRAITS TIMES, WEDNESDAY, 16 MARCH 2011, PAGE D6



NTU will move away from holding classes in large lecture halls, and instead use tutorial rooms that facilitate small-group discussions. PHOTO: NTU

### 'Teach less, learn more' now at NTU

Fewer classes, more overseas exchange trips for new intake

By AMELIA TAN

Fewer classes, more overseas exchange trips and a greater emphasis on head-based learning. These are just some of the changes in store for this August's new intake at the Nanyang Technological University (NTU).

Students will also take at least two more elective modules from a larger selection of subjects, and have the chance to pursue new minors in areas such as energy, environmental and urban studies, and sports science. They will have to take a new compulsory course in environmental sustainability - on top of the existing compulsory courses of communication skills and Singapore studies. The changes were outlined for reporters yesterday by NTU president -

Full-degree engineering programmes which aims to groom students to become heads of organisations. Students on this programme will graduate with a degree in engineering science as well as a Master of Science in technology management in 4½ years. They also get to spend a year at a top university overseas, on top of internships in California's Silicon Valley. To support the changes in its curriculum, NTU will move away from holding classes in large lecture halls. Instead, it will use tutorial rooms that allow for small group discussions, expand the range of online learning platforms, and encourage teaching staff who use innovative teaching methods, for example, by giving them grants. Prof Anderson said implementing the changes will be difficult. The biggest challenge will be getting students, parents and teaching staff to buy into them. Teaching staff and students interviewed have welcomed the changes. Associate Professor Cui Chen Lip of the School of Materials Science and Engineering said: "Small group discussions are a good way to get students in-

- New undergraduate curriculum from AY2011/12 onwards
- Allows more time for group-based learning and self-reflection
- New tutorial rooms that allow for small group discussions



The Straits Times, Pg B6 (16 March 2011)

## Classroom of Tomorrow @NTU



- Physical layout
- Instruction medium
- Technological tools



## Physical Layout



6 hexagonal discussion table for 6 students each

## Physical Layout



- White board space for each group on all walls in new TR
- Allows students to have face-to-face discussion
- Space between tables allow tutor to move about to facilitate discussion among students



## Physical Layout



- Facilitates 2 of the “Seven Principles for Good Practice in Undergraduate Education”
  - encourages contact between students and faculty
  - develops reciprocity and cooperation among students



*\*A.W. Chickering and Z.F. Gamson, Seven principles for good practice in undergraduate education, AAHE Bulletin, 39(7): 3-7.*

## Instruction Medium



Smart projector / whiteboard & 6 LCD screens

## Instruction Medium



- Smart projector/screen allows visual annotation by tutor on projected images
- Visualizer in place of overhead projector
- Individual LCD screen for each group that can be connected to individual laptop or sync with instructor's



## Instruction Medium



- Each group's presentation can be shared on main screen and all LCDs as well
- Facilitates another point in the "Seven Principles for Good Practice in Undergraduate Education"\*
  - encourages active learning



\*A.W. Chickering and Z.F. Gamson, *Seven principles for good practice in undergraduate education*, AAHE Bulletin, 39(7): 3-7.

## Technological Tools

- Tablet PCs enable writing of *group* discussion results and sharing through LCDs
- Clickers require *individual* student response to questions posed



9. In this movie (top view), the atoms are flowing \_\_\_\_\_, and the stress at the left end of the interconnect is \_\_\_\_\_.

1. Rightward; tensile
2. Rightward; compressive
3. Leftward; tensile
4. Leftward; compressive

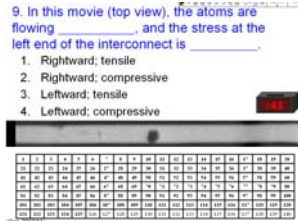


1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140

(Gian 2010T1)



## Technological Tools

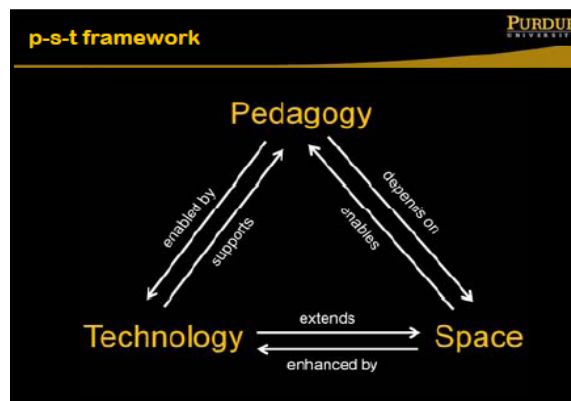


- Tutor can assess group discussion and learning, as well as gauge understanding of the whole class
- Individual performance can also be tracked in clicker software
- Facilitates another point in the “Seven Principles for Good Practice in Undergraduate Education”\*
  - gives prompt feedback



\*A.W. Chickering and Z.F. Gamson, *Seven principles for good practice in undergraduate education*, AAHE Bulletin, 39(7): 3-7.

## Pedagogy-Space-Technology Framework



- New pedagogy is enabled by technology and afforded by the space in the new tutorial rooms



D. Radcliffe, H. Wilson, D. Powell, B. Tibbetts, *Designing next generation places of learning: Collaboration at the pedagogy-space-technology nexus* (2008).  
[http://www.altc.edu.au/system/files/resources/grants\\_pp\\_projectreport\\_nextgeneration\\_uq\\_jan09.pdf](http://www.altc.edu.au/system/files/resources/grants_pp_projectreport_nextgeneration_uq_jan09.pdf).

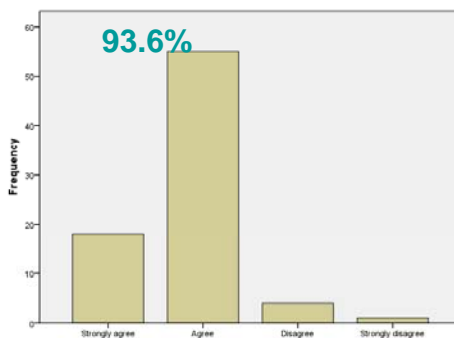
## Students Survey and Feedback

- Carried out for 3 classes of tutorials (2 from MSE and 1 from SCE)
- To evaluate the impact of
  - renovated tutorial room space (tables, chairs, writing spaces)
  - technology in room (team LCD panels + interactive projector/Activboard)on their learning

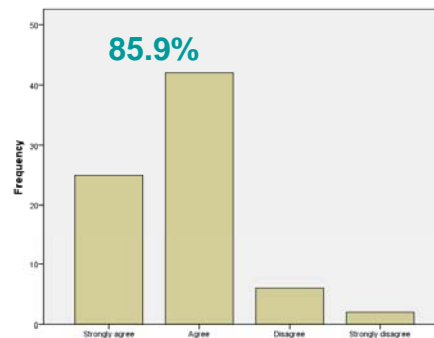


## Enables me to interact well with my lecturer.

### Room Space



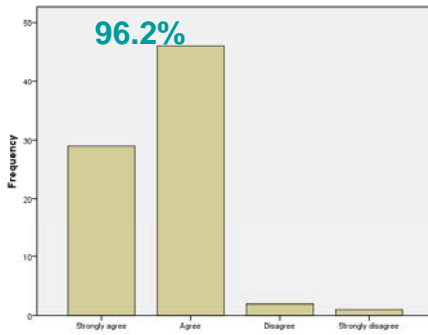
### Technology



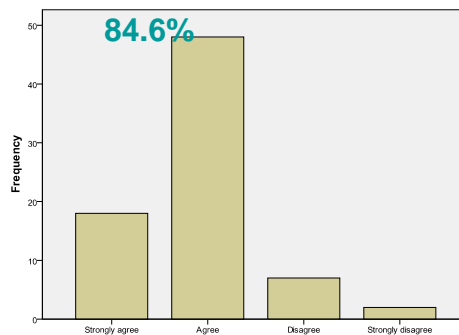


## Enables me to discuss effectively with fellow students.

### Room Space

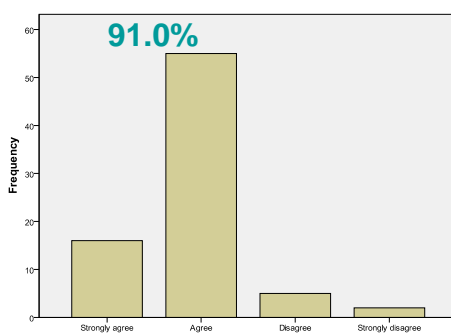


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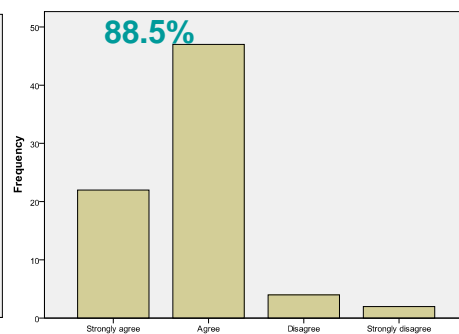


## Enables me to do individual and group presentations.

### Room Space

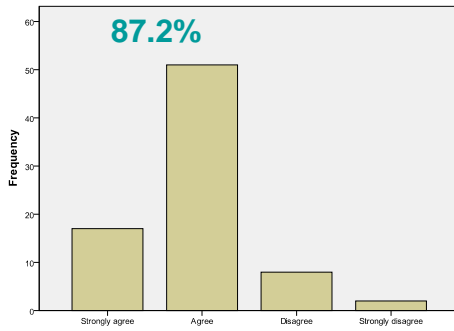


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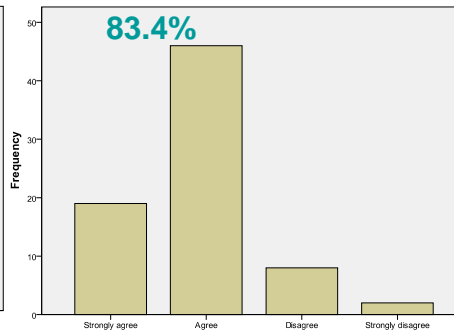


## Enables me to learn the subject matter effectively.

### Room Space

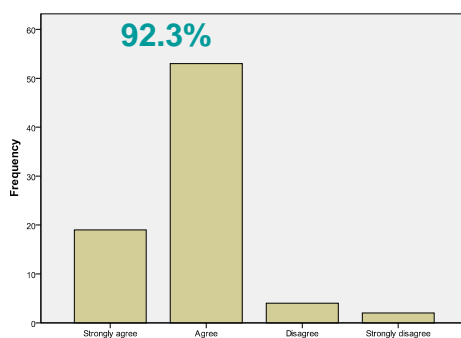


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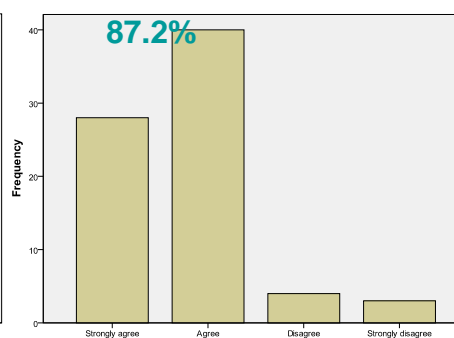


## Enables me to enjoy the learning experiences.

### Room Space

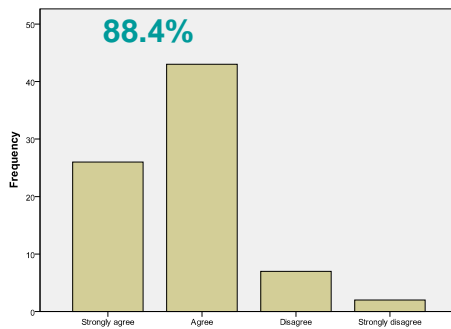


### Technology

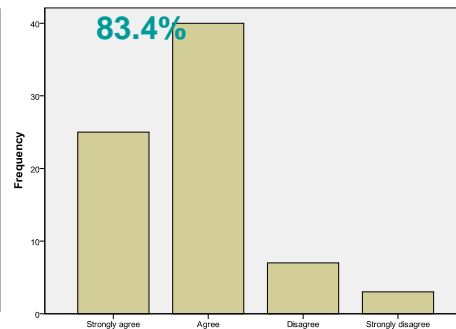


## Enables me to get to learn in different ways.

### Room Space



### Technology



## Quotes from Students

- Very *interactive* and promote group work
- Makes the class *interactive* and interesting
- Clear explanations and *interactive* class
- He encourages participation in the tutorial group in order to engage students in the tutorial
- He dares to apply new technologies in his teaching, thus maximizing the learning experience and making it fresh. It also maximizes the *interactions* between students and teachers
- His tutorial class is the MOST innovative and high tech
- Clicker questions and use of different classrooms, other than the usual TRs which can be quite boring. The new classrooms are more *interactive* as it forces students to think and discuss and enhance the learning process



## Quotes from Students

- Use of clicker and tablet pc
- *Interactive* clicker usage. makes students pay attention and involved during tutorials
- The involvement of clicker questions during tutorials is brilliant. Gets me thinking
- Makes lessons *fun* by using clickers
- Use of clicker to know how well the students understand his tutorial
- Use of clickers to make sure every students understand his tutorial
- Uses clicker in a very productive way
- I like the use of clickers even during tutorials. triggers thinking of students. and also clarifies more during tutorials when the pace of lectures can get a little too fast



## Comparative Study on Learning Spaces



G. Viswanathan, C.L. Gan, P.D. Looker, *A Comparative Study of Technology-enabled Small Group Learning Spaces: Student and Faculty preferences and perspectives*, to be presented at 6<sup>th</sup> International Conference on Teaching and Learning in Higher Education (TLHE 2011).

## MSE E-Studio



Flexible & casual setting for small group learning

## MSE E-Studio



- Multiple projectors allow simultaneous display of tutor and students' work
- More colourful and cozy environment with comfortable chairs
- Smaller groups with all students facing tutor



- Tables are too small

## MSE E-Space (computer lab)



PCs for each student in computer-based learning

## MSE E-Space (computer lab)



- Individual computer for each student allows everyone to research through internet simultaneously
- However, students may be side-tracked by other websites



## Concluding Remarks

- New tutorial room physical space and setup allow more interaction between students and tutor during class
- Different available instruction medium (smart board, visualizer, LCD screens, whiteboard) provides variety to classes
- Technological tools (tablet PCs and clickers) keeps the students engaged during class both as a group and an individual
- New tutorial rooms are conceptualized based on the Pedagogy-Space-Technology framework which drives new teaching/learning behaviour



## Acknowledgements

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