



Impacts of Space and Furniture Design on Student Learning

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Influence of Modern Technologies

- IT technologies > an effective tool for access to, presentation and real-time interactive communications ➡ vast array of teaching opportunities (Collace et al., 2003; Fruchter, 1999)
- Traditional teacher-centered teaching in tertiary education ➡ student-centered and flexible learning approaches (Brown, 2006; Jamieson, 2003; Jamieson et al., 2001)
- Learning becomes an active constructive process (Jamieson, 2003)
- Interactions with teacher
- Students' active participation and interactivity (Brown, 2006)
- Group activities/discussions are necessary

Space Design to provide facilities that encourage student participation



Built Pedagogy

- “Shape and identity of the relationship within” ➡
SPACE
- Learning space create an impact on learning approaches (Oblinger, 2006; Lefebvre, 2001; Ceppi & Zini, 1998)
- Built pedagogy defines the teaching mode (Oblinger, 2006)
- User-centred
- Enhance active learning/grouping
- Promote use of provided facilities
- Flexible and adaptable
- Comfortable
- Aesthetic



Furniture Design

- Enhance group work in different sizes
- Facilitate speedy reconfiguration
- Enable multiple use and transformable layout (Fruchter, 1999; Chism & Bickford, 2002; Taylor, 2009)
- Modular table (Cornell, 2002)
- Movable chairs with flexible back, adjustable seat height and adequate foam support (Cornell, 2002)



Fig. 1 Modular furniture



Strategic Plan 2012-18 of The Hong Kong Polytechnic University

- Updating, upgrading and creating innovative learning spaces ➡ improve learning environment
- Traditional teaching rooms ➡ modern and technology-enhanced rooms
- Spaces combined to support different sizes of teaching groups
- Upgraded IT/AV facilities
- New lectern design
- Multiple monitors
- Flexible furniture
- Comfortable, flexible & movable furniture
- Vibrant colours
- Adequate lighting



Modular Furniture



Modular furniture to
facilitate group discussion

Vibrant colour to promote
learning incentive in BC402



Fig. 2 Renovated Classrooms



Double Swirl Chairs

- Double swirl chairs to facilitate grouping and interaction among students in lecture theatre



Fig. 2 Double Swirl Chairs in Lecture Theatre N003



Movable Glass Partitions

- Movable glass partitions to reconfigure 3 classrooms into different sizes to facilitate different types/sizes of group activities



Fig. 4 Sliding glass partitions in N1f classrooms



Adequate Lighting

- A glass wall used in BC404 at PolyU to brighten up the room



Fig. 5 Glass Wall in BC404



Multiple Monitors

- Lecture theatres were refitted into modern, comfortable and technology-enhanced teaching spaces to facilitating active learning
- Multiple monitors for better visibility



Fig. 6 Renovated TU201



Assessment of Renovated Learning Space

- **Aim:**

- *Evaluate the renovated work*

- **Objectives:**

- *Questionnaire Survey on performance of renovated learning space*

- *Collect students' comments on the use of space*



Assessment of Renovated Learning Space

- 500 questionnaires > undergraduates attending classes in the renovated classrooms/lecture theatres
- 402 copies of completed questionnaires (80% return rate)
- Questions are categorized into 6 sections:
 1. *Application of modern technologies*
 2. *Flexibility in space design*
 3. *Comfort*
 4. *Aesthetic*
 5. *Continuous assessment*
 6. *Overall performance*



Overall Performance of the Refurbished Teaching Rooms

- Application of modern technologies can promote active learning
- Students can easily present, modify, record and retrieve information by using the provided facilities
- The new layouts are adaptable for multiple uses
- The space designs facilitate group discussion
- The flexible furniture design allow easy reconfiguration
- Comfortable furniture enhance concentration in learning
- Acoustic improve students' concentration
- Students prefer adjustable lighting level, which can enhance learning



Overall Performance of the Refurbished Teaching Rooms

- Ability to adjust interior temperature is important to learning comfort
- Vibrant color elements can motivate learning
- The created environments are comfortable and enjoyable
- An Assessment System for periodic review on the effectiveness of space design is important for long-term development
- Achieve the purpose of renovation
- Can enhance active learning
- Emphasizes interaction and collaboration among teacher and students



Summary of Questionnaire Survey

Table 1: Students' comments on renovated learning space

| | Improvements Work | Comments from students |
|------------|--|------------------------|
| 1.0 | Application of modern technologies | |
| 1.1 | Upgraded IT/AV facilities | Agreed |
| 1.2 | Access to technology, provision of ubiquitous power and data connection | Agreed |
| 1.3 | Ease of using the provided facilities | Agreed |
| 2.0 | Flexibility in space design | |
| 2.1 | The learning space is designed for multiple uses | Agreed |
| 2.2 | Space design facilitate group discussion | Agreed |
| 2.3 | Use of flexible furniture can facilitate grouping in different sizes | Agreed |
| 3.0 | Comfort | |
| 3.1 | The chairs with flexible backs and adjustable seat height is comfortable and enhance concentration in learning | Agreed |
| 3.2 | The acoustic of the room is satisfactory and improve concentration | Agreed |
| 3.3 | Lighting is ambient | Agreed |
| 3.4 | Adjustable lighting level can enhance learning | Agreed |
| 3.5 | The interior temperature is comfortable | Agreed |
| 3.6 | Ability to adjust interior temperature is important to learning comfort | Agreed |
| 4.0 | Aesthetic | |
| 4.1 | Are flexible furniture comfortable? | Agreed |
| 4.2 | Can the use of vibrant colour promote learning incentive? | Agreed |
| 4.3 | Does the interior design create a comfortable environment for learning? | Agreed |
| 5.0 | Assessment | |
| 5.1 | Setting up assessment | Agreed |
| 5.1 | Conducting periodic assessment | Agreed |
| 6.0 | Overall Performance | Agreed |



Conclusion

- IT technologies in tertiary education have induced pedagogical changes
- Teaching mode shifts from teacher-centered to student-centered
- Active learning emphasizes collaboration among students
- User-centered classroom is functional, user-friendly, comfortable, psychological appealing and facilitates interaction among students
- Space design should be comfortable, enhance safety and health of users and support information technology
- A comfortable environment motivates learning
- Furniture design should be flexible and multi-functional, allow quick reconfiguration for grouping



Future Research

- Collect comments from teachers teaching in the renovated learning spaces using both traditional teacher-centred and student-centred modes of teaching for comparison
- Study the holistic impacts of learning space design on teaching & learning



Acknowledgement

- The authors gratefully acknowledge the Working Group of Innovative Learning Spaces of The Hong Kong Polytechnic University for providing funding to support this research effort



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