

## **MLT 803(903)/MID834/MPS803(903): Technologies as Cognitive Tools**

January 2019

### **Dates and Venue**

Dates:

39/54 (3AU/4AU) hours in 13 weeks

14/1- 12/4, Friday (18:00-21:00)

Venue: ECL1, 2-02-10

### **Lecturer**

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### **Course Description**

One of the effective ways of using technologies to support student learning is to use technologies as cognitive tools or Mindtools (Jonassen, 2000). Students can use mindtools to construct personal meaning, engage in critical, creative, and complex thinking. Mindtools act as intellectual partners that the students learn *with*, rather than the traditional computer-assisted instruction where students learn *from* computers. Examples of mindtools include concept mapping tools, and collaborative learning tools.

In this course, participants will learn the underpinning learning theories and practical considerations for the use of technologies as mindtools. At the end of the course, participants should be able to use certain ICT tools as mindtools to enhance students' cognition. Participants are expected to engage in critical thinking and collaborative learning in this course.

## Course Website

- Weebly: <http://cogtools.weebly.com/>
- Blackboard: <http://online.nie.edu.sg>

## Course Objectives

Through readings, online learning and discussions, and classroom hands-on activities, participants should be able to:

- a. Analyze the affordances and demonstrate effective strategies to use appropriate mindtools to enhance learning in specific subject areas;
- b. Design coherent and effective lesson plans or learning processes with appropriate combinations of mindtools; be able to justify the choice of tools in relation to classroom learning problems and assess the effectiveness of the implementation;
- c. Consider issues related to the integration of cognitive tools into the teaching and learning process.

## Course Evaluation

1. Participation (10%, individual)
  - a. Attend face-to-face sessions, be punctual, and take part actively in class discussions (5%)
  - b. Complete online activities on time (5%)
2. Online reflections (10%\*3, individual): Each online reflection covers:
  - a. your understanding of the specific topic (5%); and
  - b. the application of the topic into your teaching practice (5%)
3. Online activities (Concept mapping, 10%)
  - a. Build an individual concept map of your personal understanding of ICT as cognitive tools.
  - b. Topic: "Use of ICT as Cognitive Tools for Teaching & Learning"
  - c. At least 40 nodes (for 3AU) or 50 nodes (for 4AU) with labelled relationship
4. Online sharing and critique (20%)
  - a. Describe a cognitive tool you have used (or intended to use) in your teaching subject. Specify its actual and perceived affordances, (pedagogical, social and technical) affordances for teaching and learning, how it is used to

- facilitate cognition, its outcomes and takeaways from the use of the tool for learning(15%)
  - b. Critique on the sharing given by peers (5%)
5. Ideas to design a lesson which incorporates the use of 2-3 cognitive tools (30%, group) (Group size: 4). The ideas should include the following components:
- a. Learning context (subject topic, level of learning, learner characteristics, lesson objectives, lesson duration and learning environment) (2%)
  - b. Learning activities (includes a description of the strategies) that are supported by cognitive tools (8%)
  - c. Justification for why the tools are chosen based on the PST model and how they are used as cognitive tools in the lesson (10%).
  - d. Discussion of possible implementation issues (5%)
  - e. Group presentation (5%)

### Course Delivery

The course delivery will be a mixture of face-to-face tutorials and online learning (asynchronous learning and synchronous video conferencing). The participants are expected to read beyond the materials provided and to engage in active discussions and sharing.

### Course Materials

Lecture slides and relevant materials can be downloaded from the course website. The participants are encouraged to share their resources and ideas through the course website.

### 3AU/4AU differences

	3AU	4AU
Each F2F session	<ul style="list-style-type: none"> <li>• Read the online materials</li> </ul>	<ul style="list-style-type: none"> <li>• Read the online materials</li> <li>• Online discussion: give at least 2 comments and 1 reply on the websites</li> </ul>
Online session: tool sharing	<ul style="list-style-type: none"> <li>• Create a video of about 15 minutes</li> </ul>	<ul style="list-style-type: none"> <li>• Create a video of about 20 minutes</li> </ul>
Online session: Concept mapping	<ul style="list-style-type: none"> <li>• At least 40 nodes</li> </ul>	<ul style="list-style-type: none"> <li>• At least 50 nodes</li> </ul>

Online session: Modeling	<ul style="list-style-type: none"> <li>• Read online materials and do online activities</li> </ul>	<ul style="list-style-type: none"> <li>• Read online materials and do online activities</li> <li>• Online discussion: 2 comments and 1 reply</li> </ul>
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## Key References

### *Cognition & Cognitive Tool*

1. Cognitive Load Theory:  
[http://dspace.ou.nl/bitstream/1820/2328/1/Cognitive\\_Load\\_Theory%20-%20Psychology%20of%20Classroom%20Learning.pdf](http://dspace.ou.nl/bitstream/1820/2328/1/Cognitive_Load_Theory%20-%20Psychology%20of%20Classroom%20Learning.pdf)
2. Iiyoshi, T., Hannafin, M. J., & Feng, W. (2005). Cognitive tools and student-centred learning: rethinking tools, functions and applications. *Kognitive Werkzeuge und studentenzentriertes Lernen: Das Überdenken von Werkzeugen, Funktionen und Bewerbungen.*, 42(4), 281-296. doi: 10.1080/09523980500161346
3. Jonassen, D. H. (2000). *Computers as mindtools for schools: Engaging critical thinking* (2nd ed.): Prentice-Hall Inc.
4. Jonassen, D., Howland, J., Marra, R., & Crismond, D. (2008). *Meaningful learning with technology* (3<sup>rd</sup> ed.). Upper Saddle River, NJ: Pearson.
5. Tsai, C. C. (2004). Beyond cognitive and metacognitive tools: the use of the Internet as an 'epistemological' tool for instruction. *British Journal of Educational Technology*, 35(5), 525-536.
6. Chi, T. H. & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, 49(4), 219-243. DOI: 10.1080/00461520.2014.965823. Available: <https://chilab.asu.edu/papers/ChiWylie2014ICAP.pdf>

### *Affordances*

7. Bower, M. (2008). Affordance analysis – matching learning tasks with learning technologies. *Educational Media International*, 45(1), 3-15.
8. Wang, Q.Y, Woo, H.L., & Chai, C.S. (2010). Affordances of ICT tools for learning. In C.S. Chai & Q.Y. Wang (Eds.), *ICT for self-directed and collaborative learning* (pp. 70-79). Singapore: Pearson/Prentice Hall.

### **Concept Mapping**

9. Nesbit, J. C., & Adesope, O. O. (2006). Learning with concept and knowledge maps: a meta-analysis. *Review of Educational Research*, 76(3), 413-448.
10. Tan, S.C. (2010). Concept mapping with ICT. In C.S. Chai & Q.Y. Wang (Eds.), *ICT for self-directed and collaborative learning* (pp. 168-182). Singapore: Pearson/Prentice Hall.

### **Computer-Supported Collaborative Learning**

11. Chai, C.S., & Tan, S.C. (2010). Collaborative learning and ICT. In C.S. Chai & Q.Y. Wang (Eds.), *ICT for self-directed and collaborative learning* (pp. 52-69). Singapore: Pearson/Prentice Hall.
12. Hmelo-Silver, C. E. (2006). Introduction: Cognitive tools for collaborative communities. *Journal of Educational Computing Research*, 35(2), 97-102.
13. Kirschner, P. A. (2006). Cognitive tools and mindtools for collaborative learning. *Journal of Educational Computing Research*, 35(2), 199-209.
14. Nuutinen, J., Sutinen, E., Botha, A., & Kommers, P. (2010). From mindtools to social mindtools: Collaborative writing with Woven Stories. *British Journal of Educational Technology*, 41(5), 753-775. doi: 10.1111/j.1467-8535.2009.00973.x

### **Modeling**

15. Fretz, E. B., Wu, H.-K., Zhang, B., Davis, E. A., Krajcik, J. S., & Soloway, E. (2002). An investigation of software scaffolds supporting modeling practices. *Research in Science Education*, 32(4), 567 – 589.
16. Schwarz, C. V., & White, B. Y. (2005). Metamodeling knowledge: Developing students' understanding of scientific modelling, *Cognition and Instruction*, 23(2), 165-205.

### **Mobile Learning**

17. Chan, T.-W., Roschelle, J., Hsi, S., Kinshuk, Sharples, M., Brown, T., et al. (2006). One-to-one technology-enhanced learning: An opportunity for global research collaboration. *Research and Practice in Technology-Enhanced Learning*, 1(1), 3-29.
18. Sharples, M., Arnedillo-Sánchez, I., Milrad, M., & Vavoula, G. (2009). Mobile learning: Small devices, big issues. In S. Ludvigsen, N. Balacheff, T. De Jong, A. Lazonder & S. Barnes (Eds.), *Technology-Enhanced Learning: Principles and Products* (pp. 233-249). Berlin: Springer-Verlag.

19. Wong, L.-H., & Looi, C.-K. (2011). What seams do we remove in mobile assisted seamless learning? A critical review of the literature. *Computers & Education*, 57(4), 2364-2381.

#### **AR/VR**

20. Akçayır, M., Akçayır, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review* 20, 1-11.

### **STATEMENT ON ACADEMIC HONESTY**

Academic dishonesty is a serious offense and will not be tolerated. Evidence of cheating or plagiarism of any kind will result in severe penalties. Students must ensure that their works have been responsibly and honorably completed. Any attempt to gain an unfair advantage over other students is considered dishonest. An example is passing off another person's assignment as one's own. When in doubt about plagiarism, paraphrasing, quoting, or collaboration, consult the course lecturers.

## Course Schedule

Session	Topic	Activities
1. 18/1	<ul style="list-style-type: none"> <li>▪ Foundation: What are cognitive tools and why use cognitive tools?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Course administration</li> <li>▪ ICT as cognitive tools</li> <li>▪ Hand-on activities</li> </ul>
2. 25/1	<ul style="list-style-type: none"> <li>▪ Learning theories</li> <li>▪ Classification of and research on cognitive tools</li> <li>▪ Use of technology as cognitive tools</li> <li>▪ Cognitive engagement</li> </ul>	<ul style="list-style-type: none"> <li>▪ ICT as cognitive tools</li> <li>▪ Hand-on activities</li> <li>▪ <b>Reflection 1</b></li> <li>▪ <i>BSL (Blended synchronous learning) 1</i></li> </ul>
3. 1/2	<ul style="list-style-type: none"> <li>▪ Concepts of Affordances</li> <li>▪ Actual/perceived affordance</li> </ul>	<ul style="list-style-type: none"> <li>▪ Self-directed learning: online materials</li> <li>▪ Discussion on affordance</li> <li>▪ Hands-on activities</li> <li>▪ <i>BSL2</i></li> </ul>
4. 08/2 (CNY)	<ul style="list-style-type: none"> <li>▪ <i>Online sharing: Share and discuss the affordances of an IT cognitive tool used in your school setting (Video recording and sharing)</i></li> </ul>	
5. 15/2	<ul style="list-style-type: none"> <li>▪ Affordance design and analysis</li> <li>▪ PST affordances</li> </ul>	<ul style="list-style-type: none"> <li>▪ PST designs</li> <li>▪ Affordance analysis on ICT tools</li> <li>▪ <i>BSL3</i></li> </ul>
6. 22/2	<ul style="list-style-type: none"> <li>▪ Theoretical underpinning of concept/mind mapping tools</li> </ul>	<ul style="list-style-type: none"> <li>▪ Discuss the concept and issues of concept/mind mapping</li> <li>▪ Hands-on activities</li> <li>▪ <i>BSL4</i></li> </ul>
7. 1/3	<ul style="list-style-type: none"> <li>▪ <i>Create a concept map based on your personal understanding of ICT as cognitive tools</i></li> </ul>	
8. 8/3	<ul style="list-style-type: none"> <li>▪ Collaborative learning and computer supported collaborative learning (CSCL)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Self-directed learning: online materials</li> <li>▪ Discuss the concept and issues of CSCL</li> <li>▪ Hands-on activities on CSCL tools</li> <li>▪ Group assignment briefing</li> <li>▪ <b>Reflection 2</b></li> <li>▪ <i>BSL5</i></li> </ul>
9. 15/3	<ul style="list-style-type: none"> <li>▪ Mobile learning</li> </ul>	<ul style="list-style-type: none"> <li>▪ Discuss concepts and affordances of mobile learning</li> <li>▪ Hands-on activities</li> <li>▪ <i>BSL6</i></li> </ul>
10. 22/3	<ul style="list-style-type: none"> <li>▪ VR/AR</li> </ul>	<ul style="list-style-type: none"> <li>▪ Discuss concepts and affordances of VR/AR for teaching and learning</li> <li>▪ Hands-on activities</li> <li>▪ <b>Reflection 3</b></li> <li>▪ <i>BSL7</i></li> </ul>
11. 29/3	<ul style="list-style-type: none"> <li>▪ <i>Model building</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ <i>Self-directed learning: online materials</i></li> <li>▪ <i>Online activities</i></li> <li>▪ <i>Video conferencing (1h)</i></li> </ul>
12. 05/4	<ul style="list-style-type: none"> <li>▪ Consolidation</li> <li>▪ Project consultation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Summary of the main topics</li> <li>▪ Group work</li> <li>▪ Project consultation</li> </ul>
13. 12/4	<ul style="list-style-type: none"> <li>▪ Group presentation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Group sharing, presentation and discussion</li> </ul>