

**Seminar Speaker: Jason Tan**

**Topic: Using card sorting tasks to teach & assess student structuring of conceptual knowledge.**

**Date: October 16th, 2017**

**Card Sorting General Guidelines**

- Work with people next to you in groups of 2-3.
- Together, sort these cards into groups based on fundamental knowledge of...(provided by instructor).
- ***IMPORTANT: THERE IS NO RIGHT OR WRONG WAY TO SORT!***
- The only guidelines are that...
  - each card must belong to only one group
  - your team must have at least 2 & less than 9 groups
- Once you have formed your groups, decide on a name that for each group that reflects why you put them together.

**Card Sorting Activity 1: Superhero Card Sort (unframed)**

**Category Name**

**Cards**

**Card Sorting Activity 2: Biology Card Sort (unframed)**

Category Name

Cards

**Card Sorting Activity 2: Biology Card Sort (unframed)**

Category Name

Cards

## References

1. DNA Learning Center, 3-D Animations. <https://www.dnalc.org/resources/3d/13-transcription-advanced.html>.
2. Woodin T, Carter VC, Fletcher L. Vision and Change in Biology Undergraduate Education, A Call for Action—Initial Responses. CBE Life Sciences Education. 2010;9(2):71-73. **Biology “core concepts” established in this paper were used as a starting point for choosing “deep features” for biology card sort.**
3. Newman DL, Snyder CW, Fisk JN, Wright LK. Development of the Central Dogma Concept Inventory (CDCI) Assessment Tool. Nehm R, ed. CBE Life Sciences Education. 2016;15(2):ar9. **Intro does a nice job describing current issues in assessment as it pertains to conceptual knowledge. This paper deals with a classroom assessment technique that is related to but distinct from card sorting, called concept inventories.**
4. Waldrop MM. Why we are teaching science wrong, and how to make it right. Nature. 2015 Jul 16;523(7560):272-4. **Discusses the persistence problem in STEM-fields (most students do not follow through with their initial choice of STEM majors), how active learning is a powerful tool to change this trend, and why implementing active-learning at a wider level faces resistance (culture change).**
5. Smith JI, Combs ED, Nagami PH, Alto VM, Goh HG, Gourdet MA, Hough CM, Nickell AE, Peer AG, Coley JD, Tanner KD. Development of the biology card sorting task to measure conceptual expertise in biology. CBE Life Sci Educ. 2013 Winter;12(4):628-44. **The original biology card sorting paper put out by the Tanner lab, which adds quantitative analysis as a feature for this type of classroom assessment technique. Used entering biology majors and faculty for study.**
6. Bissonnette SA, Combs ED, Nagami PH, Byers V, Fernandez J, Le D, Realin J, Woodham S, Smith JI, Tanner KD. Using the Biology Card Sorting Task to Measure Changes in Conceptual Expertise during Postsecondary Biology Education. CBE Life Sci Educ. 2017 Spring;16(1). **Same biology card sorting task used in 2013 paper, but applied to additional intermediate expertise types.**
7. Freeman S, Eddy SL, McDonough M, Smith MK, Okoroafor N, Jordt H, Wenderoth MP. Active learning increases student performance in science, engineering, and mathematics. Proc Natl Acad Sci U S A. 2014 Jun 10;111(23):8410-5. **One of the largest meta-analyses performed on active learning and its effects on student learning, over 1,000 citations and counting. Outlines a wide range of benefits purported by active learning, suggests that traditional lecture should be replaced by active learning techniques.**
8. Angelo, Thomas A., and Kathryn Patricia Cross. Classroom assessment techniques: a handbook for college teachers. Wiley, 2011. **Handbook used in VCU Grad602: Teaching & Learning in Higher Education. Includes teaching goal inventory, which can be used to identify which C.A.T.s to use in your classes.**
9. “Working with a diverse group? Try card Sorting. <http://www.peternewbury.org/2015/07/working-with-a-diverse-group-try-a-card-sort/>. **One teacher’s experience in modifying Tanner’s card sorting activity by creating custom**

**“deck”. Discusses some of the “nitty-gritty” considerations that may help you implement a more successful card sort activity.**

10. Wright R. It's Not About You: A Simple Proposition for Improving Biology Education. *Genetics*. 2014;198(2):429-430. **Nice paper to read while thinking of the following question, “Why did you decide to become a biology researcher?”.**
11. Eddy SL, Hogan KA. Getting under the hood: how and for whom does increasing course structure work? *CBE Life Sci Educ*. 2014 Fall;13(3):453-68. **Details how to structure your course time to allow for more active-learning in-class. Includes excellent sample templates for guided reading questions to be implemented outside-of-class.**
12. Grimes CL, White HB 3rd. Passing the baton: Mentoring for adoption of active-learning pedagogies by research-active junior faculty. *Biochem Mol Biol Educ*. 2015 Sep-Oct;43(5):345-57. **Example of how support systems help teachers successfully implement active learning techniques.**
13. Genetics Society of America. PALM (promoting active learning & mentoring). <http://www.genetics-gsa.org/education/PALM.shtml>. **Provides faculty and postdoctoral fellows with resources that allow them to gain hands-on experience and long-term mentorship in bringing evidence-based, effective active learning strategies into their own classrooms.**
14. Shapiro C, Ayon C, Moberg-Parker J, Levis-Fitzgerald M, Sanders ER. Strategies for using peer-assisted learning effectively in an undergraduate bioinformatics course. *Biochem Mol Biol Educ*. 2013 Jan-Feb;41(1):24-33. **Details how to use peer (student) teachers in a classroom to better convey conceptual organization of knowledge.**
15. Cornell University. Center for Teaching Innovation. <https://www.cte.cornell.edu/teaching-ideas/engaging-students/active-learning.html>.
16. Berkeley Center for Teaching and Learning. <https://teaching.berkeley.edu/active-learning-strategies>.
17. Tanner KD. Promoting Student Metacognition. *CBE Life Sciences Education*. 2012;11(2):113-120. doi:10.1187/cbe.12-03-0033. **Really nice introduction to teaching metacognitive skills to students, details how to explicitly teach and why it's important.**