# Designing in-class, group-based worksheet activities

## What are they, Why use them, and When?

Guided in-class, group-based worksheet activities are opportunities for the expert to guide novices in thinking that they cannot (yet) reliably do on their own. Using peers (groups) helps scale up the interactions in large classes because they will help each other with new or novel thinking. Peer interaction also supports metacognitive growth and development of reasoning skills. Whatever the purpose, in-class worksheet activities enable peer support and expert intervention in a controlled environment for ALL students in the course. If the activity does not benefit from these three opportunities, perhaps it could be done as an assignment.

To achieve these objectives, avoid activities where the logical step would be to divide the work. Consider exercises that create opportunities for different groups to select different "correct" answers. Then, follow up can include defending these decisions with arguments based on the course concepts. Practicing basic skills is probably best left to homework or labs, unless expert intervention will help ensure students don't go wrong during their first encounter with a concept or procedure.

## Worksheet Elements

Following are key elements of in-class worksheet activities. These were compiled by CWSEI STLFs between March and August of 2012.  This handout has top level items only, in the form of questions to help users design and improve their in-class teaching activities. **Full details (& refs) are in V.5, #7, http://www.eos.ubc.ca/research/cwsei/eossei-times.html.**

### Context, Goals and Evaluating effectiveness
Here are notes about what to consider prior to designing a worksheet.

1. **The #1 key element is clear, succinct learning goal(s) for the activity which align with course goals.** [-->3 notes]
2. What product will students generate? Good ideas include ...  [-->**5 notes**]
3. Be prepared to tell students how they will benefit from working on **this** exercise, in **groups**, at **this** moment in the course.
4. Can any instructor or TA run this activity with just the worksheet, or might a note about implementation be needed? Can the exercise *degrade gracefully* (i.e. is it relatively robust to instructor inexperience or other uncontrollable circumstances)? [-->**4 notes**]
5. What happens if students run out of time? [-->**3 notes**]

### Motivation: how will students' attention be captured and retained?
Many items throughout this document contribute directly or indirectly to helping students "want" to do activities in class. Some instructors say "it's not my job to make students desire to work". However, we all work more effectively when the task is intriguing, interesting, valuable (to "me"), or even entertaining. Therefore, address motivation and learning will improve.

1. Is the subject matter or task known to be interesting to students? Have you told them this is the case? [-->**2 notes**]
2. Is the topic particularly relevant to individuals, society or the discipline?
3. Do students have to USE prior learning (from homework, pre-reading, or skills practice exercises)? Eg. Some instructors use inclass activities as followup to a lab or homework exercise.
4. Are you, the instructor, excited by the issue being dealt with? Can you incorporate your experiences the lesson?
5. Were details of the activity designed with motivation in mind? **[-->5 notes]**
6. Will students see clearly that they are becoming more "expert" at something?
7. Do students see their own work in feedback sessions, even if only sampled?
8. Does the exercise start in a way that supports early success?
9. Is there an emphasis on relevance to exams or labs, etc.? Are the linkages to these clear? (it helps to use similar formats)
10. Are any grades being awarded? For participation? For completeness? Correctness?
11. Will students be able to say "The instructor will give answers, so I do not have to work." This is as strong DE-motivator.
12. Are all activities in the course properly resolved? See also the Feedback section.

---

**Design Decisions and Details**
Questions to answer about optimal group size, worksheet design and deployment and using figures. These are not "rules" - they are recommendations for "common" settings.

1. What is the optimal size of groups for THIS PARTICULAR exercise?
   - Pairs are commonly used for discussing clicker questions.
   - Groups of 3-4 might be appropriate if ... [-->**6 notes**]
   - Groups of 5-8 students might work if ... [-->**7 notes**]
2. How to arrange the room? [-->**4 notes**]
3. How many copies? Consider one worksheet per **group** if you want to ... [-->**3 notes**]
4. How many copies? Consider one worksheet per **student** if ... [-->**4 notes**]
5. How many pages? (Regardless of how length, keep in mind the efficiency of class time - i.e. simplicity is good!)  [-->**5 notes**]
6. How should I choose to project and/or print figures? [-->**8 notes**]

**Logistics: How to orchestrate or choreograph the activity?**
1. Do I need teaching assistance (TAs) in the class? [-->**4 notes**]
2. Do you have a lesson plan for this activity? (Hopefully yes - they are useful!)
3. Or at least sketch out a timeline for yourself and the TAs.
4. Milestones - consider 5-10 minute intervals.
5. If TAs will be helping, review the timeline with them before class.
6. Consider giving your setup "lecture" before asking ad-hoc groups to form so that you don't have to talk over noise.
7. Were learning goals or exercise purposes made clear to students?
8. What if only 50% of students have achieved an intermediate milestone in time available? This may be OK, especially if practicing (and revealing) thinking is the main purpose.
9. How to collect the work (see also feedback)? [-->**3 notes**]
10. Can feedback (or worksheet resolution) be given later? [-->**1 note** ]
11. Consider tracking the timing (TAs can help) the first time you use the worksheet.

**Feedback -- closing the learning loop**
In-class worksheets are not the same as assignments or labs. Worksheets should enable "instant" feedback in the form of peer discussions AND instructor / student interactions. However, activities should also be resolved by the expert, either in class, online, or later. Bear in mind that *delayed* feedback is much less beneficial than giving expert input while (or soon after) students are actually doing the thinking.

*Feedback to students*
1. What constitutes useful feedback to students about their own learning? [-->**8 notes**]
2. Is simply telling everyone the answers adequate? [-->**3 notes**]
3. Can I get **students** to contribute to feedback for one another or a few other students? For everyone? [-->**6 notes**]
4. Is sampling of worksheets acceptable for generating feedback? [-->**3 notes**]
5. Finally, consider reminding students how to make use of this kind of feedback.

*Feedback for the instructor*
**How will you know the activity was effective?** Ask yourself "what does 'effective' mean to you in this particular case?" Some ideas for strategies to determine effectiveness:

1. Circulating while students work is crucial for gathering your own observations about student thinking.
2. You could jot down notesabout what you noticed while helping students during the activity.
3. Align some quiz, midterm and/or final exam questions with worksheet activities.
4. Review clicker question results.
5. Use collected worksheets to compare student work to learning and teaching goals. Look for evidence that students have demonstrated appropriate thinking or changed how they think.
6. Consider using whole-class discussion sessions as follow-up. These "tell" you if students are generally on track or not.
7. Useful End-of-Term survey questions include "Are worksheet activities helping you grasp concepts?" or "Do you agree that spending time on worksheets is more effective than using the same time for more lecturing?"

**All further notes (and references) are in  Vol 5, #7 at http://www.eos.ubc.ca/research/cwsei/eossei-times.html.**