



Guidelines for running group worksheet-based activities (Most recent update Feb 26, 2012)

Context: Lecture-based class, 100-200 students, 10-50min activities, instructor + (optional) TAs for 1 instr / ~50 stdns.

Setting up before class (suggested practices)

- Never do only one or two worksheets in a course. This mode of learning must be “normal practice” in the class¹.
- Produce only enough worksheets for $\#grps=(class\ size)/5 + TAs \& instructor + 3-5\ spares$.
- Just before class, TAs & instructor meet to review classroom procedures.
- Ideally each group’s worksheet should be numbered, but this is not crucial.
- Include space for 6 (not 8) student ID’s on the top.
- Consider adding timings on each projected slide, large enough so you can see it from anywhere in the room.
- Consider adding “strategy” notes to yourself on each slide, especially clickers.
- Use projector for displaying a detailed figure. If there is more than one figure, the exercise may be too complicated.
- Using clickers for the “deliverable” is an excellent idea. Single questions is good – sequences are better.
- The clicker question(s) could be on the worksheet, or not. For example, discussing 4-5 questions in groups before clicking has worked well in some situations.

Explain why and how (two or three times during the term)

- The first time group worksheets are used give a 2-min. “lecture” on how and why groups are used and formed.
- Do this again a couple of weeks later.
- Explain that help provided during work is necessarily very quick because the aim is to see the thinking, not discuss the details with any one group.
- The point is NOT to “get it right”. Group work is a place to “get it wrong and figure out why” in a safe – i.e. low stakes – setting. Hence the notion of “practice work”.
- Worksheets should if possible emulate some types of exam questions.
- Worksheets count for participation marks the same way as clickers.

Managing groups

- Cover introductory talking (or lecture) BEFORE starting with groups².
- Consider doing one quick clicker question before forming groups³.

Forming groups

- Waiting until 5-10 minutes into the class helps ensure class has settled down⁴.
- Group size should be 4-8 (lots of research on this).
- Avoid 4 or more sitting in a row.
- Best is 4 or 6 arranged 2 (or 3) facing 2 (or 3) across a table⁵.
- Ad-hoc groups do not have to be the same from day to day.
- Using a count-off procedure is OK for permanent teams, BUT it is time consuming for ad-hoc groups because of the disruption while teams form up.
- Hand out worksheets carefully. Show clearly who is in each group you are assigning.

¹ “New” or “rare” classroom behaviors will likely fail. But – students respond well to habitual practices.

² Students will become inattentive once worksheets are handed out and groups are formed.

³ This helps ensure everyone has their clicker ready before moving to form groups.

⁴ At UBC, it is common for 10 or more folks to arrive late.

⁵ Helping students when they face each other across large lecture theater benches (or tables) is easier than when everyone faces forward because you can actually get to groups in the middle of rows.

Running the exercise

- Before the class's first group exercise explain why and how. See "Explain why and how" above.
- TAs – if you can afford it, have TAs in the room during longer exercises. Having 1 tutor per 50 or so students is much better than being alone for a 50 minute activity sequence with 150 students.
- Pacing: watch the time carefully!
- Once groups have formed, the instructor should talk as little as possible owing to the buzz.
- When talking – use a microphone if possible.
- When talking – try to minimize getting sidetracked. Talking should HELP (not hinder) students with staying on task.
- If you must get everyone's attention, use a bell or other consistent noise.
- Having a laser pointer is really helpful.
- Circulate. Observe what's going onto paper. Judge timing based on what you observe.
- Do not wait for 100% of students to reach a milestone – 50% may be enough to move on.
- If an intermediate step is necessary for progressing, that result may have to be provided. THEREFORE see endnote⁶.
- When circulating, provide very succinct guidance. Do not get trapped into long discussions with any one group.
- Ask individual groups often: "Do you folks feel on track? Do you know what's to be done?"
- Maybe, if you see three or more groups with the same problem or issue, consider stopping everyone to address it.
- Simply not finishing the last few parts may be OK⁷ if you are running late.
- If late, consider running a quick wrapup on the following day, ideally a few clicker questions – not a "lecture"⁸.
- Highlight implications for study habits when difficulties due to not staying current become apparent⁹.

Resolving the work and providing feedback – i.e. whether to release "results" or not.

- If possible, avoid just giving answers¹⁰.
- The work flow itself might serve as sufficient resolution to the work (eg. a good closing clicker sequence).
- Ideally review all worksheets and write a separate comment sheet about both the common or specific misconceptions and parts that are consistently correct.
- Deliver the blank worksheet plus these comments to all students as a PDF via website or Vista.
- If demonstrating methods is important, give some answers but leave others for students to practice.
- Alternatively, copy one or two examples of work, hide student IDs, and deliver as PDFs saying these are examples of work that is "sufficient" or "incomplete" or "on the right track but ...", etc.
- If a surprising results occurs (e.g. using clickers), this should be reviewed and noted for future questioning opportunities in exams, homework, or as a source of continuity in future lessons.
- Ideally the exercises should be debriefed with TAs. This often does not happen, but it is the best way to ensure that next time (whether it's you or another instructor) will be better, or at least not worse, than this session.

After class logistics

- Always collect worksheets – check they have student ID's on them.
- Step1: grade all worksheets, and collect comments (see "Resolving..." above).
 - When worksheets are "participation", grading can be on a 0,1,2 scale.
 - If grading is to be slightly more comprehensive, a rubric should be produced, even if it's simple.
- Step2: number all graded worksheets (if not already done).
- Step3: enter first 4 digits of all student ID's into a blank spreadsheet column next to group (worksheet) number.
- Step4: enter group's "grade" in a column next to the group number.
- Step5: in the class list, add a column and extract first 4 digits of student ID for all students (if not already done).
- Step6: add a column for this exercise to the class list
- Step7: fill this new column with each individual's worksheet grade using VLOOKUP. If you are using the first 4 digits of the student numbers, there may be one or two duplicates that need to be handled separately. --- Done!

⁶ Orient the deliverable around "evidence" and "thinking" rather than "answers". That way, giving answers is not "giving away the result" because the result is the thinking not the answer.

⁷ Recall the point is to practice, and see, thinking. NOT to complete a task or "get it right".

⁸ Recall worksheets are all about "doing it", not about "telling the story".

⁹ For example, it becomes obvious when pre-readings have not been done, and this can (should) be pointed out to students.

¹⁰ Giving answers sets up the idea that "I don't really have to do it because we get given the answers anyway".

Background information about why, characteristics of good exercises, etc. This is not part of the checklist.

Purposes for instructors:

- Make student thinking visible¹¹.
- Deliver expertise exactly where it's needed, to more students, based on seeing student thinking.
- Supports “circulating of expertise”, i.e. makes for a more inclusive learning setting.
- Enables cold calling via groups as an alternative to singling out individuals.

Purposes for students:

- Make their own thinking visible to themselves (i.e. to develop metacognitive skills).
- Practice working with concepts.
- Make use of peers to support self-checking and sense-making (metacognition again).
- It is much harder to zone out when busy, and instructors (and TAs) are circulating.
- Practice moving away from “*getting the answer*” as a primary mode of thinking.
- Provides experience with inexact (e.g. modeling) aspects of scientific (or any other) thinking.

Exercises – what works

- Simple and short is best.
- Longer activities are more challenging to run because uniform pacing is harder to achieve.
- Pacing: incorporate a deliverable or milestone roughly every 5-8 minutes¹².
- A single sheet may be best.
- Use as little text as possible. More text increases the likelihood of confusion. It won't get properly read anyway.
- No long recipes. These are not “labs”.
- Minimize the amount of student writing. Graphic “product” is quick, easy to assess, and avoids problems with writing skills. These activities are NOT about communication – they are about thinking.
- Can computers be part of the activity? They can, but hazards you must avoid are
 - Partitioning of work taking the place of peer-to-peer interaction.
 - Getting side tracked with irrelevant or hard-to-find information or details.
- Computers used with simulations can be effective, especially if using the internet can be avoided.
- Having no worksheet is possible if the deliverable can be produced on a blank sheet (or 3x5 or 5x7 card). The work and data or figures can be projected on a single slide.
- Make explicit connections with other parts of the course and with the course themes.
- Include succinct learning goal(s) but don't dwell on them. They help YOU stay focused and write exam questions. Tell students they should use learning goals to guide study practices.
- A few types of questions that can serve as “instant deliverables” or milestones:
 - How many steps did you come up with?
 - How many items (features) did you identify?
 - If you do x...y...z.. does the process increase, decrease, remain unchanged, not enough information to tell?
 - In what order did you do or find etc.?
 - Collect “items” on the chalk (white) board.
 - Many others ...
- Aim for evidence-based reasoning. For example, ask “*what evidence can you describe to support your decision?*” rather than “*what is responsible for...*” or “*why is ...*”¹³.
- Finally, add opportunities for open feedback about the exercise at intervals, or at the end, of worksheets.

¹¹ Examples include over-generalization from readings, improper transfer of ideas or skills from one context to another, difficulties with relevant scale (local versus regional versus global etc.),

¹² Any longer and groups start to diverge, with some getting rather far behind.

¹³ Some students take longer than others to switch from “*getting the answer*” to thinking in an evidence-oriented mode.