

Bridging the gap: From education to implementation

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ReproducibiliTeach

The problem

For training to have an impact, students must implement what they've learned in their own research.

Many courses aren't designed for implementation.

Common obstacles to implementation

- Straight lectures
- Buffet style courses
- Participants face many barriers to implementing things on their own after the course
 - No dedicated work time
 - No support network
 - Resistance from supervisors & co-authors
 - Power dynamics
 - Small obstacles and unanswered questions can halt implementation or lead to major mistakes

Ten simple rules for implementing open and reproducible research practices after attending a training course

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See tips for course instructors
in the supplement

Rules	Stages		
	Plan	Implement	Look to the future
Rule 1: Make a shortlist	x		
Rule 2: Join a community	x	x	x
Rule 3: Talk to your study team	x		
Rule 4: Address resistance constructively	x	x	
Rule 5: Decide what to implement. Make a plan.	x	x	
Rule 6: Compromise and be patient		x	
Rule 7: Reassess and adapt your plan		x	
Rule 8: Share best practices and lessons learned			x
Rule 9: Get credit. Make your contributions visible.			x
Rule 10: Seek supportive future employers			x

Our courses

ReproducibiliTeach: Each week, students implement a new skill in their own research (e.g. RRIDs, reporting guidelines, protocol writing & depositing, blinding & randomization plans, data visualization, etc.)

Write and/or Publish My Protocol: Working group - participants write protocols, deposit them on protocols.io and may prepare a PLOS One Lab Protocol article

Participant-guided “learn by doing” meta-research course: A multidisciplinary team of early career researchers from different universities/countries collaboratively design, conduct and publish a meta-research study

Participants should be able to point to items on their CV showing that they have implemented the skills learned in the course

Strategy 1: Flipped classroom

Before class: Students watch videos

During class: Students have dedicated time to implement skills. Instructors can address immediate barriers to implementation.

Tips: Getting students to ask questions

- **Virtual classroom:** Check in by sending a direct message to each student
- **In person:** Walk around

Strategy 2: Q&A teaching format

Answer all questions and address concerns that a student might have about implementing a new skill, in order.

Why?

- Unanswered questions or concerns become barriers to implementation
- Students learn how to address concerns raised by supervisors and co-authors

My students work on many different types of research projects and are from different fields. What if I get questions that I can't answer?

Strategy 3: Manage expectations

- You will get questions you can't answer and **that's perfectly OK**
- Let your students know that you aren't an expert in everything. They will understand.
- **Encourage students to draw on other expertise when appropriate:**
Example – we suggest that students get feedback on their protocols from others in their research group

...but there are ways to reduce the number of questions that I can't answer, right?

Strategy 4: Team teaching & group mentoring

- **Team teaching:** Choose co-instructors with complementary expertise (field, study design, etc.)
- **Use group mentoring:** Students learn about different scenarios by listening to each others' questions. Students also share their own expertise.

My students are all at different phases of the research process...

Strategy 5: Offer options for how one might implement the skill at different phases

RRIDs

- **No methods section yet:** Add RRIDs to your research group's materials list, or to the list of materials you use in your research
- **Have a methods section:** Add RRIDs to your methods section

Reporting guidelines

- **Study design:** Make sure you're recording the info you will need; find out if there is a study design guideline. Make a folder for your research group of reporting guidelines relevant to your team's research.
- **No methods section yet:** Use the reporting guideline to write your methods
- **Have a methods section:** Incorporate all guideline elements into your methods section

Does this teaching format constrain the skills
that I can teach?

Strategy 6: Your format should allow enough time to make significant progress on the skill

ReproducibiliTeach:

- We choose skills where students can make significant progress in 45-90 minutes
- Intermediate step: For some skills, students critique examples from the published literature (e.g. data visualization) or work through scenarios in groups (e.g. blinding/randomization plans)

Write and/or publish my protocol: We use a working group format because everyone has a different amount of work to do, and moves at their own pace. Setting a time schedule that works for everyone would be impossible.

Can this make me a better instructor or meta-scientist?

Strategy 7: Learn from your students

- Implementation-focused training helps you to understand and address the limits of our current solutions and recommended practices
- Students won't be able to implement every skill that you teach and that's OK
 - Doesn't apply to the project
 - Resistance from the research group -> focus on the future
 - Major problems that can't be resolved

What are we trying next?

Next steps...

- Examining student papers
- High structured course design
 - Video study guides
 - Pre and post unit quizzes
- Train the trainer
- Working groups
 - Students provide feedback on each other's work

An experiment...

Normalizing active learning in academia

New approach for responding to requests for talks

When asked to do a straight lecture on a teaching topic, I politely decline, but say that I would be willing to do a flipped workshop instead. I share the link to our YouTube channel in my response.

Results since September

- Most organizations feel that the workshops are much better for their students
- Two refusals
- Have contingency plans in case students haven't watched the videos
- Students like the fact that they can go back to the videos later

Try new things: Integrate implementation into your courses

1. Flipped classroom – class is protected time for implementation
2. Q&A teaching format
3. Manage expectations
4. Team teaching and group mentoring
5. Offer implementation options for different study phases
6. Allow enough time to make significant progress on implementing the skill
7. Learn from your students

Thank you

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