The CALIX

ways to improve training in the life sciences

Pilot issue

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by Kristian Rother & Pedro Fernandes

Editorial

A few months ago, we figured-out that rapidly exchanging ideas on training and teaching using dynamic social media such as blogs and websites is insufficient. Typically the materials are articles that are too simple to be published in a scientific journal. Placing them in a blog that can be freely accessible is a better idea. However, locating materials in these blogs is awkward and time-consuming. This is why we created the **CALIX** newsletter.

We would like to hand-pick the best materials from blogs and other media and reuse it in a way that meets your interests. Selected entries can be put into a PDF document and be distributed as a newsletter. This first issue of the **CALIX** newsletter is our attempt to do just that, for the first time.

We would like to create a second issue with a focus on **wrap-ups and repeating**. If you wish to receive the issue or would like to contribute a short article, please drop a line to the editorial office krother@academis.eu.

Have fun reading!

Kristian Rother and Pedro Fernandes

A Recipe for Bioinformatics Training Course Design

Pedro Fernandes

This "recipe" is a method for generating a training course skeleton. The goal is to provide a stepwise roadmap for trainers and organisers that have materials like slides and exercises, but need to go one step further, in order to create a training instance that is structured, balanced in timing, coherent and "measurable".

Definitions

A **training course** is aimed at **participants** and is delivered by **instructors**. A third role (the coordination) is taken by the **organiser**. Such a training course is a way to provide a large amount of **skills**, in a defined **conceptual framework**, in a **short period of time**. The **course plan** will include a **timetable** divided in **sessions**. A **successful training course** delivers **skills** that participants can **use** with a high degree of **independence**.

Model

The model course that emerges from the recipe matches the typical needs of a three day face-to-face training course. A suitable training room is assumed to be in place, where participants can work in small groups (2 to 4 people each) Naturally, some **major adaptations** may be needed if one departs from this assumption, but that may very well be the theme for another newsletter article. **Minor adaptations** are always needed in the field, so the plan must be built with minimum provision for that to happen.

Recipe

Define an an **overall objective**, linked to your conception of what set of skills the training course will provide. Be prepared to revise it at the end of this exercise if needed. As you do not know the audience, this definition cannot be tailored in an *a-prioristic* way. Start from what you imagine could be the audience and establish what the most likely **knowledge gap** is. Then, establish what training levels are required, often a blend of of them.

Opening session

The first 30-60 minutes of any course should be spent familiarizing people with each other, breaking the ice, defining ways of working in a team and creating a nice environment for learning together, getting accustomed to the environment, establishing the ground rules as if you were entering a ship or aircraft. Take the chance to explicitly say hat is allowed and what is disallowed, at the necessary level of detail. The beginning is the most suitable to create a teamwork atmosphere, in which every participant, instructor and organiser establish that a common goal is at stake and that reaching it is a mission for all, in a single team.

Sessions

The training course will consist of several **sessions,** composed of a **presentation** an **practical exercise** and an optional **focused wrap-up.**

Make a **list** of the exercises that you need for the course. Sort this list in a logical way, and divide it in blocks that can contain one or two exercises. **Each block is now the seed for a session in the course**.

> **For each** block:
> - **Write a learning objective** that reflects the reason why you chose the exercise (**solving a problem** using a technique or something simlar). Use SMART rules to refine the learning objectives.
> - Prepare a **short presentation**, using materials from your pool and borrowed ones, aiming at establishing **a conceptual framework where the problem fits, nothing else!**. Avoid details, go directly to the point. A possible structure for a presentation is: subject introduction / explore the subject / show an example / show limitations.
> - Consider adding an **optional short wrap-up** to consolidate the new knowledge.
>
> **Repeat**

Review. Aggregate short blocks if needed. Now you have **sessions**, with one or more blocks each. Attribute sessions to slots in the **timetable (Figure 1)**. Partition through the three days, so that the second an third days **begin with a wrap-up of the previous day** (typically less than 30').

There must be a **final wrap-up** (maybe 1h) at the end of the course. Make a slot in the timetable for it and be prepared to take notes, as some important verbal feedback is very likely to happen at that moment. A course feedback questionnaire should have been filled and collected before the final wrap-up.

	Day 1		Day 2		Day 3
Session 1	ice breaking introduction	**Session 5**	wrap-up	**Session 9**	wrap-up
	presentation		presentation		presentation
	exercise		exercise		exercise
	wrap-up		wrap-up		wrap-up
Coffee break					
Session 2	presentation	**Session 6**	presentation	**Session 10**	presentation
	exercise		exercise		exercise
	wrap-up		wrap-up		wrap-up
Lunch break					
Session 3	presentation	**Session 7**	presentation	**Session 11**	presentation
	exercise		exercise		exercise
	wrap-up		wrap-up		wrap-up
Tea break					
Session 4	presentation	**Session 8**	presentation	**Session 12**	presentation
	exercise		exercise		Final wrap-up
	wrap-up		wrap-up		

Figure 1. Typical timetable of a course built using this recipe.

Review the timetable, fittting all the above plus the breaks for food and refreshments, so that no session lasts for more than 2 hours. **Picture the flow of events in the brain of the learner and how he/she could react.**

You have NOW built the **course plan!**

Review of the course plan

Check if the materials that the course will need are provided (data, software, etc.) or need to be put together. Plan a time for their review and evaluation, so that you have a chance to correct mistakes just before the course, when you may also know who your audience is, and the possible misfits. Review the set of presentations again, to make sure that all important concepts that may be needed for an exercise are covered. Altogether they must constitute **a solid CONCEPTUAL framework.** Check if each of the skills that the course provides has a clear way of sitting in that framework. Check if the order of your sessions makes sense in that framework as well.

Figure out what you want to give away to the participants aside from the contents of the presentations and the exercises. Results sheets? Audiovisuals (movies, infographics, reference information, quick guides, etc.? Make a repository of all that in a folder that you can pull out at any time during the course.

Your **course content** is NOW ready.

Announcement (for organisers)

Make a **one paragraph summary** of the course that describes the content thematically, defines the overall learning objective, defines the target audience, the pre-requisites if any and the physical deliverables that you can promise to the participants (documentation, certificates or badges for recognition, etc.).

Briefly **describe your training staff**. Any learner prefer to know who is delivering the training course and why. A short biographical not and a photo are ideal. A digital footprint is a valuable add-on. Badges if they have them.

Finally, choose a **title** for the course. Remember that as in newspapers the title is what catches the eye. Without a good title, a potential participant will not read the description. Avoid negatively charged words, humour, interrogation, etc. Choose a simple but catchy wording that points at the objective, not necessarily the content. Add a subtitle if you find it useful to disambiguate the title.

Final Remarks

Remember that the purpose of the training is NOT to replace a formal university course. We aim at providing **skills** and **usage autonomy** (self-sufficiency), not at transferring knowledge as such.

The outcome of the training course can also include a fair amount of new knowledge. Still, the aim of the instructor is to make sure that the skills are transferred, and that the participants do not need significant help to use them.

Please do not use this technique on the spot, or just before you deliver a training course. It is bound to fail under high pressure of any kind. I am having good results, but having time to think and iterate is absolutely essential.

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SMART objectives for teachers

Kristian Rother

To reach your target, you need to know where you are going. This is very much so in teaching. To teach successfully, you need to know what you want your students to learn. In this article, I would like to present **SMART goals** as a tool to formulate objective and tangible teaching goals [1]. SMART goals are well-known concept from project management and career development plans [2]. They make goals objective and tangible. The acronym SMART stands for **simple, measurable, ambitious, realistic,** and **timed**. These criteria can be applied to teaching as well. Imagine you are to give a lesson about carbohydrates. You are expected to cover

> *glucose*
> *structural formulas*
> *stereochemistry*

This list of topics tells you what the lesson should be about, but it does not tell you what your students are to take home, let alone how to prepare. On the contrary, take a look at a SMART learning goal:

> *Students can draw the structure of glucose at 10:45.*

The sentence provides not only a subject but also a practical skill that the students have after the lesson. The goal suggests practical exercises like drawing the glucose molecule on paper, finding the correct structure from a series of images, or annotating the structural formula on paper. The time window helps to decide which exercises fit in.

The SMART acronym stands for five criteria:

Simple – **M**easurable – **A**mbitious – **R**ealistic – **T**imed.

- Your goal is **simple** if it can be understood by a person not familiar with the topic. That is, you can explain to your students beforehand what they are going to learn. It is usually a good idea to present your goal a the beginning of a lesson. Simple also means that the goal can be put into no more than one short sentence.

- Your goal is **measurable** if you can determine objectively whether the goal has been reached. Measurability prevents imprecise goals like *"students know what glucose is"*. Instead, use verbs that are **actionable**: identify, draw, name, explain, calculate etc. Verbs for good teaching goals have been categorized by the Blooms taxonomy of cognitive domains [3]. Measuring is not only important for exams, but it helps you and your students to assess or self-assess progress.

- Your goal is **ambitious** if you challenge your students. Is there a clear benefit for them? Do you want the lesson to widen their horizon? In which way does it give them an edge? Being ambitious means having an answer to the question: *What will students learn that they could not by other means?* If you feel a desire to make your stand and defend your goal against doubt, it probably is ambitious.

- Your goal is **realistic** if you sincerely believe that your learning goal can be reached in the given time. Being realistic involves some homework: Do your students have the necessary background knowledge? What practical abilities do they need? What technical prerequisites are there? Do you have planned for unexpected questions? For instance, learning to draw the structure of ten carbohydrates in one hour may be realistic for one group, but out of reach for another.

- Your goal is **timed** if there is a concrete time until which the goal is to be reached. First-time teachers often overextend their time budget. Setting time points for your learning goals helps you to structure your lesson, recognize and react to delays. A good form of planning time is having a detailed **schedule or lesson plan**.

Learning objectives formulated with SMART criteria are easy to communicate with training organizers and fellow teachers. They apply to one overall goal for a training day, but also to small objectives that structure your lesson. That makes SMART goals an excellent planning tool. On the downside, SMART goals create pressure that can lead to frustration if a goal turns out to be too ambitious. The challenge is to keep the pressure positive, so that it drives your students forward. Try small goals, and try easy goals. By formulating small SMART stepping stones for your students, you can achieve a lot, and know you achieved it.

Kristian Rother is training scientists in teaching, project organization and programming

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References

[1] Writing learning outcomes or learning objectives. London Deanery, http://bit.ly/YeSbT1

[2] Writing learning outcomes or learning objectives. University of Central Florida, http://bit.ly/RlHNlx

[3] Effective use of Performance Objectives for Learning and Assessment (For Use With Fink's and Bloom's Taxonomies). The University of New Mexico School of Medicine, http://bit.ly/12y9QMj

RHETORIC: The Public Speaking Game
Florian Mueck and John Zimmer

Public speaking. The mere thought of it can set hearts pounding! And yet, being able to communicate one's ideas in public is an important and sought-after skill. **RHETORIC: The Public Speaking Board Game™** can help you become a better speaker.

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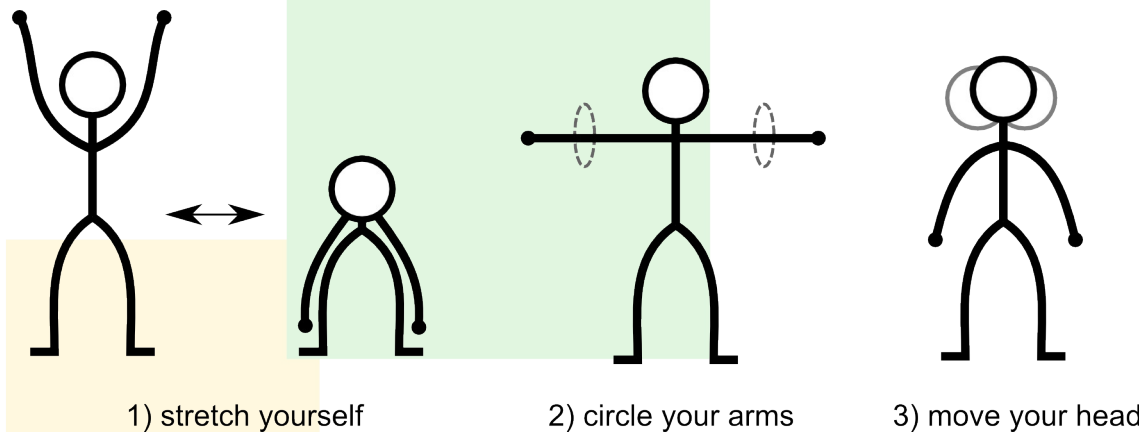
Florian Mueck and John Zimmer are professional speakers and speaking coaches

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www.mannerofspeaking.org

Overcoming Stage Fright

Gregor Stallmeister

1) stretch yourself   2) circle your arms   3) move your head

Your palms are sweaty. You breathe heavily. Your heart is pounding. You don't remember what you wanted to say. Are these symptoms familiar to you? No, you are not in love – they are only symptoms of **stage fright**. It is normal for beginners, but even experienced presenters get nervous before giving a talk. To regain control, try the following exercise. It is best enjoyed in a quiet room a few minutes before you start:

1) Stretch yourself: Breathe in and stretch your arms up. Breathe out while bending forward towards your shoe tips. Keep your knees straight. Repeat five times.

2) Circle your arms: Stretch your arms to both sides, parallel to the ground. Then move them in small circles, ten times forward and ten times backward.

3) Move your head: Lower your head forward to your thorax. Then circulate it slowly: to the right, to the back, to the left, and then back to the front. Repeat five times.

Although you may have lots of experience, prepare mentally and relax well before a presentation, you will still be a little nervous. Not only is it normal, but also necessary to have some adrenaline circulating – it will help you to deliver a powerful and enthusiastic presentation.

Gregor Stallmeister is a professional speaker and Distinguished Toastmaster (DTM).

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ResearchGate as a space for educational projects
Kristian Rother and ResearchGate
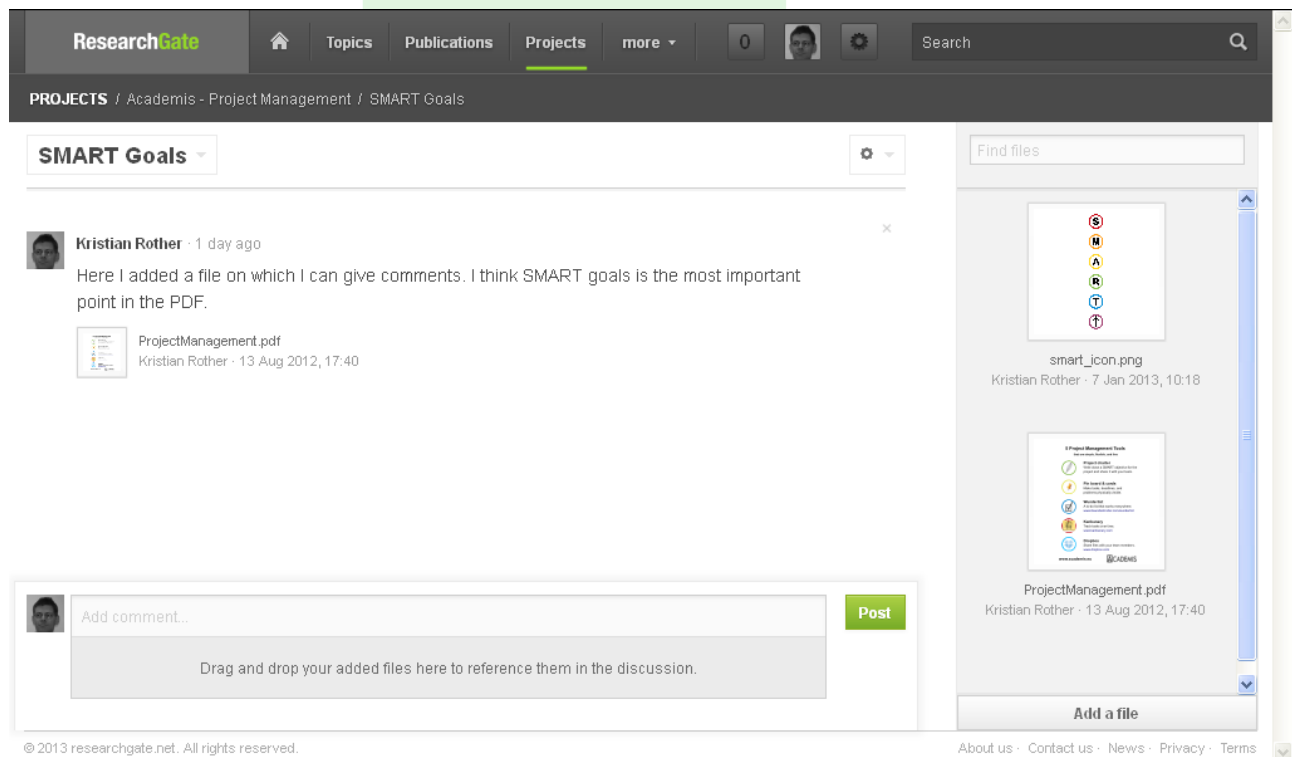
ResearchGate provides scientists and students with a private space for collaboration. This platform can be used for educational projects, which is why we decided to describe how you can collaborate on material, retrieve information, and disseminate results on our platform.

You can safely collaborate in **"Projects"** hosted on ResearchGate, a shared space for documents which are visible for invited members only. Documents can be uploaded by **drag & drop**, for group members to view and edit. The **timeline** of a document keeps track of all changes, and documents can be **commented** there. All content can be indexed by keywords so that they are easier to find. By one click members of your group can obtain an overview over the state of their project, and access all document versions. Each project is a closed space within the large ResearchGate community.

The community can be searched for more information. The **big literature search engines** integrated in ResearchGate provide access to more than **45 million abstracts** and **10 million full text articles**. Moreover, relevant questions to peers can be asked in the discussion groups called **"Topics"**. The community is huge: in Bioinformatics and Computational Biology there are currently 35751 members and in Structural Bioinformatics and Structural Biology there are 1261 members.

Training materials can be published directly on the ResearchGate platform. Every file gets a stable, unique URL. This way, it is easy to disseminate the outcome of courses: task assignments, data sets, and the results of students' efforts.

Taken together, **ResearchGate Projects** provide a platform to create, discuss, and disseminate material in collaborative educational projects.

*The ResearchGate portal is available for free on .***www.researchgate.net**