

# Learning to Teach and Learning to Learn

## Running a Course

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### Introduction

These patterns belong to the category of pedagogical patterns [5]. They provide a way to communicate proven solutions to common problems in teaching.

While many ideas are presented at OO conferences and published in journals each year about design, relatively little attention has been paid to effective techniques in didactical and social issues for educating people.

The intended audience of this paper is educators who care not only about what they are teaching but also about how they are mediating the topics. This paper addresses the learning on the students' side as well as the teaching on the educator's side.

These patterns were recognized in industrial training settings. So it is not clear how well they can be applied in an academic environment.

The courses where these patterns have been applied were all related to object-oriented topics, however they may also be applied to other areas.

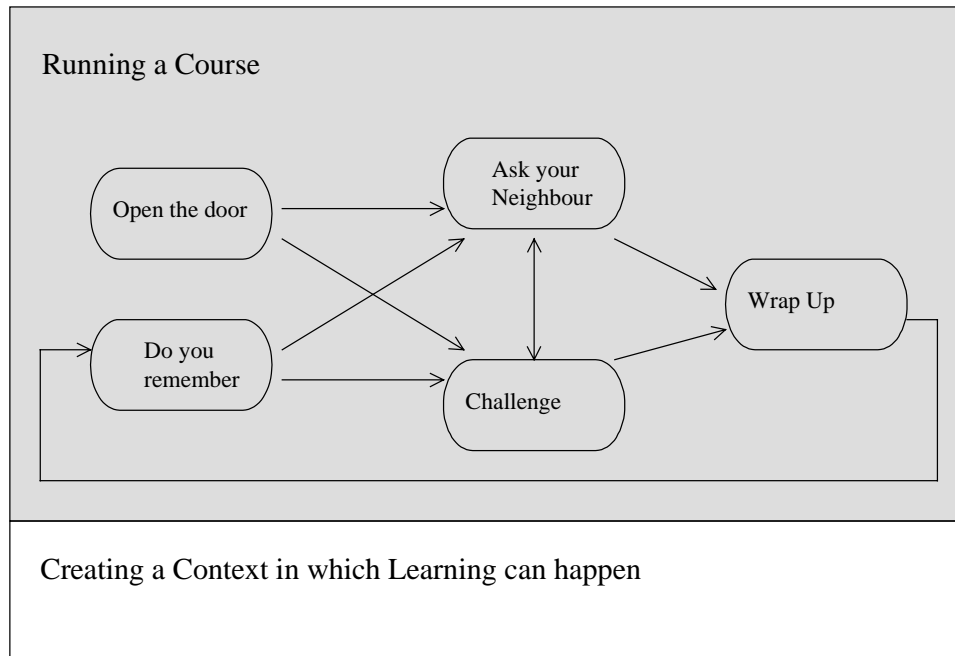
### Overview

The structure of these patterns is similar to the one introduced by Andreas Rueping [6]. The problem section formulates an issue as a question. The forces are the considerations that lead to the solution. The solution answers the question of the problem section. In the discussion section, some examples are presented or drawbacks of the solution are discussed. Some of the patterns have a related patterns section. Each pattern has a thumbnail printed in boldface. The thumbnail is assembled from the problem statement and the first paragraph of the solution section. Andreas referred to them as pattlets.

These patterns have to be regarded as a work in progress towards a pattern language. The following diagram shows the relationships between the patterns that have been discovered so far. They focus on learning to teach.

As I worked on this paper, I realized that I had wandered into a wealth of industrial training related patterns. You could say I found the first few nuggets in a unknown and vast gold field. I decided to name this gold field *Creating a Context in which Learning can happen* as that

seems to describe the magic embodied in each pattern found. In this paper, I offer you my first five discoveries or patterns. No doubt I will continue to mine this area, as more wisdom and insights come to me.



The patterns presented in this paper are all related. The first one, *Open the door*, addresses the problem of starting a course. *Ask your neighbor* and *Challenge* could be used several times during the course, whereas *Wrap-Up* concludes either a session or even a whole course. *Do you remember* is used when proceeding after a break. In a typical industry training setting this would be used for starting a new day.

# 1 Open the door

*... there is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things.*

Niccolo Macchiavelli, The Prince

## Problem

**How do you start a course?**

## Forces

You want to break the ice and you also want to provide a smooth introduction to the topic.

You do not know all of the participants and the participants do not know each other.

You want the participants to be open-minded but you realize on entering the room, that they are not confident about the instructor or about the course.

You want to know the participants, their skills (technical and social), their humanity aspect, their expectations, and you want some insight into their everyday work. But you might have to teach several courses in a curriculum where you will meet some of the participants several times. Therefore you can't have the same opening for every course.

## Solution

**The participants introduce themselves in a way which at the same time provides an introduction to the topic.**

Here are some variants, which you can use to open the door:

- Smiley: Ask the participants to introduce themselves, and answer the following questions:
  - ☺: "What do you think we can all (the whole group, including the instructor) contribute to make this session successful?" This question could be answered with a short phrase written on a whiteboard in a column led by a smiley.
  - ☹: "What do you think we can all contribute to make this session a failure?" This question could be answered in the sad face column.
- Ball: Throw a koosh-ball to each participant and ask questions you would like to have answered to know them better.
- Partner Interview: Let them interview each other but be sure to clarify which questions you would like them to answer. Watch the time as people tend to talk forever.
- Dreams: This is not a complete opening method as the others are, it is rather a helper that could be used in all the other openings. Just ask the participants about their dreams or what they would do if they mustn't do what they are doing right now.

## Discussion

- For participants who seem to be defensive or aggressive, choose the *Smiley* opening method. By making it obvious how they can influence the unsuccessfulness of the course, they will find it hard to disturbing the session.
- For people who do not seem to be open minded use the *Ball* opening. By catching the ball people not only have to open their arms, but also open their minds. This is good for an OO introductory course, because you also communicate the concept of objects responding to messages. But make sure that all the participants are capable to catch and throw a ball, which might not be true if you have handicapped people in your course.
- The *Partner Interview* is a perfect opening for any course related to distributed objects, because it shows how every object could be a server object at one point and a client object at another point.
- *Dreams* is always a good icebreaker. When you hear that one participant dreams about running a pub and another about living in a hut in the mountains, often this tells you more about the people than all the other *serious* questions.

## 2 Ask your neighbor

*Together we are strong.*

Idiom

### **Problem**

**How can you make students less dependent on the teacher?**

### **Forces**

When students struggle, it is easy for the students to ask the teacher; however, in the work environment the teacher will not be around.

Often the students only trust themselves and the teacher, but they could work much more efficiently if they would also accept help from other students.

A single person often gets stuck when a problem occurs, but a group of people always provides a great mix of experiences and ideas.

Some students are afraid of asking questions in front of the whole group, but you want everybody actively participating in the course.

Discussions with the whole group tend to be teacher-centered, where the roles of the ones who are posing and answering the questions are fixed. But everybody in a group could provide both questions and answers.

Often students can not imagine how they can transform what they have learned in a course into their work environment without the backup of a teacher. However in the work environment their colleagues could serve as the backup.

### **Solution**

**Assign a problem to your students. When they ask about the solution because they are stuck, invite them to ask their neighbors by making a tour through the other teams. The students have to figure out what the other teams are doing and discuss their problems with them, or ask the other team how they dealt with this problem.**

At least one member - the presenter - of the team stays at the team's location. All the other members of each team - the agents - wander around and ask the other presenters to explain their team's solution. The agents are allowed to ask any question, they can even bring up their problems, as perhaps the other team has also had a discussion about this problem.

A single team should consist of two to five people. By assigning smaller and more intimate groups of people shy people may have the courage to actively participate in discussions. Working in teams changes the focus of the students away from the instructor toward their colleagues. This way the experiences of all the participants are used as a rich resource for learning.

Each participant has valuable questions and answers. Use this by inviting the participants to take different roles (agents or presenters) in changing groups.

## Discussion

A group of participants often has diverse skills. This becomes obvious when the students have to do some practical stuff like implementing some methods. Some students finish much earlier than others. On the one hand you don't want the fast people sitting around being bored (or even worse doing strange things with your equipment). On the other hand you want to give everybody a chance to finish the exercise.

It is helpful having enough students to be able to split them up into at least two teams. Variant: No teams, every single person works on her own, but has at least one neighbor to ask.

Use this pattern in a short form, by allowing the interruption to another team by asking them if they also came across that problem and how they solved it.

Use the people who are grasping the topics faster as coaches for the ones who have more problems.

This pattern is one of the core practices of Extreme Programming (XP), where the developers always implement in pairs.

Asking your neighbor may lead to a big group discussion. Be careful that all the time is not spent discussing all the different opinions. Watch out for the five people five opinion problem.

It is much harder to implement this pattern in countries where the culture does not allow people to admit that they need help or where the students are regarded as impolite if they admit that they do not know the answer.

## Related Patterns

**Round and Deep** from Helen Sharp could be used as the foundation for *Ask your neighbor*. An experienced student is likely to gain a deep understanding of a complex concept by relating it to his or her own experience. But the experience that results in a deep understanding may also limit it because a round and deep understanding of a complex concept can only be achieved by considering different perspectives (published at the pedagogical patterns home page).

**Cardboard Consultant** (also known as: Discuss it with your spouse. Tell it to your dog.) from Charles Weir and John Noble often helps in its own right. Explaining your problem in detail can be very valuable, even if there's little chance that the listener will be able to find a solution. Your listener may be human, animal, plant or artifact. Some people like to explain things to their dog, or to a character in a picture. Others tell their spouse or a passing friend. Describe the problem in detail, assuming an intelligent listener with only a basic background in the problem domain. The process of explaining the problem forces you to look at the issues from a different point of view. Typically this generates ideas to new approaches to the problem, or suggests one or more obvious misconceptions in your logic (published at EuroPLoP '99).

### 3 Challenge

*Not because things are difficult, we do not dare them. Instead because we do not dare them, they are difficult.*

Idiom

#### **Problem**

**How do you challenge trainees to develop their own solutions?**

#### **Forces**

You want to teach complex concepts, but you do not want to provide solutions.

You want the trainees to uncover solutions for complex problems by drawing on their own experience rather than just letting them approve what they have learned by listening.

Students expect the one and only right solution to a problem from the instructor. But often there is no single answer, but many equally correct answers.

#### **Solution**

**Before lecturing about a new topic, present a problem taken from the domain of the trainees. Provide some hints via questions that have to be answered and that may lead to a solution.**

Prepare the students for what they will have to do on their own, so the objectives are clear. You might also want to point out where they have to be cautious and where to focus.

Ask the students to develop several solutions with accompanying criteria for defining the context in which the solution works.

#### **Discussion**

Developing several solutions is often done automatically when working in teams. Each team develops a different solution. The challenge is then to provide the criteria for the context, so the other teams can be convinced. If the participants come up with only a single solution, you will have to provide some additional ones.

Afterwards be sure to discuss afterwards what they have learned, without using the "killer" question, "Any questions?" And do not forget to consider human reaction, for example, how they felt, especially if they were overwhelmed.

Often students are irritated or uncertain how to progress. Some people aren't able to handle a situation like this at all. If this is the case, then you have to provide hints, so the students are able to overcome their own uncertainty and handle the situation for themselves. The difficulty for you is to find the optimum way between providing a structure (so the students won't explore for themselves anymore) and *laissez-faire*, which can mean an incompetent trainer.

Sollmann [7] reports that the more often students are in this uncertain situation the better they can handle this kind of situation, or rather the longer it takes till they really feel uncertain. It is like in a physical training setting, the more you overcome your limits, the higher your limits will become.

## **Related Patterns**

The pattern could be used with **Mission Impossible** (also known as: Kobayashi Maru) from Alan O'Callaghan. The Mission Impossible pattern is used to make learners suspicious about their understanding of important Object Technology concepts so that they continually question those concepts and improve their understanding of them. Learners occasionally need to be "shocked" into deeper thinking about what they are doing in order to appreciate some of the subtleties. This is all the more necessary when such ideas as "objects model the real world" can be understood in an entirely naïve way which disarms the learner in the face of real problems when they occur. The Mission Impossible pattern achieves this by presenting apparently simple problems that cannot be solved by the naïve application of received wisdom.



## 4 Wrap-Up

*In a time of drastic change it is the learners who inherit the future. The learned find themselves equipped to live in a world that no longer exists.*

Eric Hoffer

### Problem

**How do you end a course?**

### Forces

You want to end a course, but you do not want the participants to run away.

In a course people might learn a lot of things, but at the end (even of a day) they are often unsure if the time was well spent.

### Solution

**Provide a wrap-up that repeats the main points learned.**

- **Minimum Wrap-Up:** The minimum you should provide is a wrap-up of the day. Just mention every topic that has been covered and review the specific points people have experienced. You can turn this around and let the students do it. This is also known as *Flashlight*: Each of the participant mentions one item of the day that was important for her.
- **Reflective Wrap-Up:** Ask the people to write down e.g. three things they have learned in the course and one action they want to perform in the next two weeks, because of what they have learned. You do not have to discuss these things with the whole group, but it is better not to mention this up front, because otherwise people won't answer the questions seriously.
- **Sweet Wrap-Up<sup>1</sup>:** Invest in some sweeties. Pass them around and dispense one sweetie for every item or topic remembered.

### Discussion

The *Minimum Wrap-Up* is very useful for summing up a session.

The *Reflective Wrap-Up* - although it could also be used in the same manner as the minimum wrap-up - is best for ending a whole section or course.

When you use *Sweet Wrap-Up*, your choice might not agree with the students' taste or it bankrupts you if the group is very big.

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<sup>1</sup> Special thanks to Rolf F. Katzenberger who provided this example implementation of the pattern.

## 5 Do you remember?

*Progress, far from consisting in change, depends on retentiveness...Those who cannot remember the past are condemned to fulfill it.*

George Santayana, *Life of Reason*

### **Problem**

**How do you recapture what was learned days before?**

### **Forces**

You want to repeat what the participants have learned so far, but you would also like to know how well they understood it.

Although things are sometimes complex, often they are more likely to be understood if a student uses her own words to explain the concepts to somebody else.

### **Solution**

**Provide a short exercise where the students have to express the topics in their own terms.**

- Vocabulary Exercise: Write the key terms which have been used so far on the white board. Each participant can pick one, so each explains one term.
- Questionnaire: Give the participants two or three questions, which cover what has been learned so far and which they have to discuss in small teams, for example in pairs.
- Mini project: Give the participants a very small problem to solve, which covers most of the topics.

### **Discussion**

It is essential for the *Questionnaire* that the questions are not too easy, so the participants have to discuss a possible answer and perhaps assemble an example for their solution.

The challenge when using the *Mini Project* is to find a project, that is really tiny. You don't want to spend too much time; you just want to review the concepts.

## Know Uses

These patterns have been recognized during my several years of teaching experience. My wisdom comes not only from regular training settings but also from sessions at various conferences. I want to name two of them, because they have been a critical influence on my teaching style. They are the DesignFest and the Educators' Symposium both of which are regularly held at OOPSLA.

Furthermore, it helped me to watch other trainers and I value my discussions with people in other disciplines. In particular, I value most highly my discussions with Monika Bobzien, a German psychologist.

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