

→ input from TU Delft; outline for the tot manual

Title: Problem-Based Learning: A practical teachers' guide

- Introduction
 - CH1: Develop
 - CH2: Teach
 - CH3: Supervise
 - CH4: Assess
-

Training of Trainers (ToT) Manual on Facilitating PBL courses

KEY APPROACHES

ToT ought to be "Practical, Example-based, hands-on, tips and tricks, tools and methods, DOs and DON'Ts (Your Role in ... perspective)

WHAT IS IT USED FOR?

For introducing PBL

WHO IS IT FOR?

For mentors, teachers, case-partners (client), who are new to PBL

HOW IS IT PUBLISHED?

Open source, visual document (online, pdf & printed)

Printable slide-set, that can be easily presented to new partners, teachers, mentors and students in the beginning of the PBL process.

Open for the public, possibly an online publishing platform? Yet to be decided. Ideas are welcome!

Maximum 5 pages per chapter incl. visuals (total ToT Manual not exceeding 25 pages)

WHO DOES WHAT?

Aalto+KTU+TU Delft+IISc+IITB contributing to the content.

Nepal and Bhutan partners for active commenting.

WHEN? TIMELINE

DL for draft material and next meeting: Thursday 28 October at 10:30 (time in Helsinki)

All contributing partners to be participating

Material to be added to this google drive document under each chapter

DL for the First draft of the whole document by end of October

FOR INSPIRATION AND GOOD/BAD EXAMPLES

GOOD:

https://drive.google.com/file/d/1coO_orNe5m9sKOJ2NljN2acq4zJ_wQ1z/view?usp=sharing

GOOD: <https://www.lawbydesign.co/>

BAD: <https://www.diva-portal.org/smash/get/diva2:911624/FULLTEXT01.pdf>

Table of contents

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Foreword

Introductory chapter: (a little context and theory) **TU DELFT**

- What is PBL? Why PBL? When can one tag/label a course as PBL?
- What is this manual about? What is this not about?
- How does it support PBL course planning, implementation etc.
- Your role (Mentor or Teacher or Facilitator)

Chapter 1 Preparation **IISc**

Chapter 2 Implementation **AALTO**

Chapter 3 Closure **IITB**

Chapter 4 Communication **KTU**

Chapter 5 Integration with online learning (MOOC and others) **TU DELFT**

Conclusion **TU DELFT**

Glossary

References

Appendix

*Please add the draft text and possible ideas for visuals under the chapter assigned for you!
Chapters could include following.*

Chapter 1 Preparation [IISc]

- Formulation of tangible and feasible PBL learning objectives
- How to design a PBL course (content), what does a PBL course look like, what it does not? Course planning, preparation, resources, estimation, including risk assessment (internal/external) and remedial measures
- Planning of Assessment and Evaluation
- Accreditation and recognition
- Feedback mechanisms

Formulation of tangible and feasible PBL learning objectives

- To equip students with course related knowledge and skills and thus fulfil course goals and corresponding learning objectives.
- To inculcate 21st-century skills such as complex problem solving, critical thinking, creativity, collaboration, communication.
 - To provide practical experience of finding and solving real-world, ill-structured and complex problems and thus make learning contextualised.
 - To promote collaborative work with peers and other stakeholders and thus make learning self-directed and student-centred.
 - To train students to come up with new solutions to the problems.
 - To engage students in hands-on activities and provide practical experience.
 - To spread awareness about social, environmental, and economic issues and sustainable development goals and their local implications.

How to design a PBL course (content),

PBL methodology can be designed at a subject level, a chapter level, or even at a topic level.

Broad steps are as follows:

1. Select course-related learning objectives and associated outcomes
2. Select PBL learning objectives and associated outcomes
3. Identify real-world applications or context of the content knowledge
4. Formulate vague problems or ask students to identify problems for a given context.
5. Facilitate PBL process (See Best Practice Review for the steps of PBL learning process)
6. Evaluate the course related learning outcomes and PBL learning outcomes

What does a PBL course look like,

PBL course includes a set of activities, where

- Students encounter the problem before learning
- A facilitator provides a vague problem, or students find a problem by themselves.
- A group of students work on a problem having no predefined goals and solutions.

- Students understand the problem, set current and goal states, analyse the problem, create and test solutions to the problem.
- Students construct/ co-construct the knowledge by themselves to solve the problem.
- The facilitator supports and directs the process

what it does not?

- Students work on well define problems having the immediate solution.
- Students work on a problem that can not be contextualised.
- Teachers transfer the content knowledge to students.
- Students learn content knowledge before encountering a problem.

Course planning, preparation, resources, estimation, including risk assessment (internal/external) and remedial measures

Input is required from Alto (Especially from Prof. Luis de Jussilainen Costa)

Accreditation and recognition

Content related to Policies & Accreditation is provided in Best Practice Report (Section 1.3).

Planning of Assessment and Evaluation

Evaluation of content knowledge and skills

- Assignments (rare)
- Formative (e.g., group discussions) and summative evaluation (e.g., presentations, written examination.)
- Self-assessment
- Peer assessment

Evaluation of problem-solving skills, self-directed learning, self-perception and confidence can be assessed by

- Self, peer, mentor and expert/jury across the course duration.
- Survey questionnaires, open-ended questions, observation, focus or directive Interviews, etc.

Various self-assessment tests for skills like collaboration, communication, creativity, critical thinking:

- Critical thinking skills can be evaluated using Critical Thinking Skills Test (CTST)
- Motivation and engagement of students can be evaluated using the Motivated Strategies for Learning Questionnaire (MSLQ) Manual
- Collaboration skills can be evaluated with Team Assessment Tool

Chapter 2 Implementation [AALTO]

“How to teach, how to coach?”

- How to facilitate **teamwork** among the students
 - Balanced teams (Who)
 - Shared understanding (Why)
 - Team expertise, skills and roles (What)
 - Facilitating the process (How)
- How to **communicate** with PBL **teams** and other **stakeholders**
 - Different online platforms and channels in use
- How to facilitate during and overcome students' internal as well as team **conflicts**
 - Talking about it before the conflict happens
 - Shared understanding (agreement) how to handle these situations
- How to make students **capture the learnings**
 - About reflections and continuous feedback and peer-feedback
- How to make students **communicate the learnings** to various stakeholders (>> to be covered in Communication Chapter 4)
- How to talk about and foster learnings on (normative framework) incl. sustainability, systems thinking, HRBA, Design thinking on global and local context
 - Through various standard templates
- How to foster other relevant **cognitive and non cognitive skills**

Chapter 2 Implementation [AALTO]

“How to teach, how to coach?”

How to facilitate **teamwork** among the students

Forming **balanced teams**. This is the workforce. **Who** is doing the work?

Example:

- open call with motivation letter + CV
- in multidisciplinary teams, aiming for balance between study fields and prior experience
- pay attention to the team size!

Shared understanding of the team purpose. **Why** we are doing this?

Example:

- **creating ground rules (maybe in forms of team contract)** together how to work as a team (incl. how to communicate, how to meet conflicts, how to make and share notes, when to meet), hopes & fears (ideo.org), clear responsibilities and division of tasks agreed together

Getting to **know team members and their members' skills**; professional and others. **What** they know?

Example:

- identity cards with academic/professional skills and other skills and hobbies – making the skills visual / shared / accessible to the whole team. Later during the process, team members can add skills to each other.
- **Belbin 9 Team roles as a guide** (<https://www.belbin.com/about/belbin-team-roles>)
- identify roles, incl. role of a mentor/teacher/professor/client/partner
 - **As a mentor**
 - **Role having two dimensions:**
 - **teamwork & learning process**
 - **Substance (content or context)**
 - **Trusts the students, know your learners**
 - **Recognizes efforts, motivates,**
 - **Mentor is not a project manager, but a facilitator**
 - **Mentor supports, encourages and coaches the team, becomes a co-learner**
 - **Not giving the students right answers but enabling students to find them**

Facilitating (helping/guiding/enabling) the teaming up process. **How** to do this?

Example:

- ice-breaker games, casual discussions, out of classroom meetings, paying attention to the positive atmosphere by showing example and building on the ideas of others (yes, and...)

How to **communicate** with PBL **teams** and other **stakeholders**

Agreeing on which communication channels to use!

Examples:

Course LMS (Moodle or similar learning management system) for messages, news and announcements **from teacher to students**. This is good when the whole class needs to be informed jointly and more formally.

Teams channel for each team might also work.

Emails from teacher to student team and vice versa – can be quite slow. One contact person from the team could be nominated as a focal point who communicates with the teacher and then shares with rest of the team.

Fast messaging: WhatsApp, Telegram, Messenger, Teams...WhatsApp groups are useful for fast messaging between the team members and teacher/mentor. They become useful especially during field study periods when things and schedules might change suddenly. Communication from students to the client/partner/other stakeholders. Should be clearly agreed. Often it's good that the teacher initiates the communication, for instance through email and then one student from a team is nominated to be the contact persons between the team and the client. It's good to **ask the client** how they would prefer to be contacted – and how often. Regular meetings can also be agreed. It's important that the client is part of the process and able to have dialogue with the team. The PBL case should never become a burden to the client. Agree also how and when the client is supposed to provide feedback to the team and if the client is participating in the assessment.

Note that students might need guidance on how to approach stakeholders and how to introduce the project and themselves in good polite and informative manner.

How to facilitate during and overcome students' internal as well as team **conflicts**

Most of the matters on how to handle such situations ought to be considered and included by the students themselves already while creating team ground rules (maybe in forms of team contract). The key issues to consider here; there should be clear understanding of processes and methods, among the students and mentors, to face and tackle these issues, as soon as possible. Preparations and planning of following issues are crucial:

- **whom to communicate with (regarding conflict)**

Is it with some selected team members, for e.g., team representative?

Is it with entire team?

Is it with only mentors?

Is it selected team members and mentors together?

Is it with entire team and mentors together?

- **how to communicate with**

- **Are there some standard forms or mechanisms? (*Complaint forms, feedback forms, daily team briefings, weekly team meetings, mentor meetings etc.*)**

How is anonymity respected, if needed?

- **how often? When?**

As required or regular

In weekly, bi-weekly team reflections among student themselves with or without mentors and/or course coordinators

In daily team reflections (especially during field trip)

How to make students **capture the learnings**

Personal reflections of learning

Examples: **reflections diary** regularly throughout the process (i.e. once a week), can be shared with team or not, it may help the discussion and also solve conflicts. Providing option to write/draw/or express in different ways will help the student's own learning process.

Team reflections

Examples: keywords + discussion, making the whole PBL case process visible and visual, and iterate (use timelines, share whiteboards online etc.)

How to make students **communicate the learnings** to various stakeholders

This will be covered in Section (Communication by KTU)

How to talk about and foster learnings on (normative framework) incl. sustainability, systems thinking, HRBA, Design thinking on global and local context

Through various standard templates of (maybe, selected links with brief intros?)

PBL Canvas

Stakeholder Analysis

HRBA manual

Theory of Change

How to foster other relevant **cognitive and non cognitive skills**

Transferable skills

Chapter 3 Closure [IITB]

- How to reflect on individual and team learnings
 - Frequent feedback on the activities and relationship to learning objectives
 - Value addition for the team
 - Focussed group discussion session two times in the course and one at the conclusion of the course.
- How to support student teams on their plans, prototypes, ideas (eagerness and enthusiasm)
 - Makers or Tinkerers Lab setup for students to test their prototype
 - Exhibition to demonstrate to end users
 - VC fests to attract seed funding to startups
 - Idea Hackathons etc?
- How to capture Impact of a PBL course (internal within HEI and external)
 - Feedback in templates related to learning, student enthusiasm, Team work, Learning beyond course objectives, Looking at the big picture (?)
 - External feedback on use and utility of the prototypes, solutions, processes evolved during the student projects/coursework.
 - Some Sample questionnaires (?)
- How to assess?
 - 180 degree peer and instructor evaluation
 - Weightage to participation through out the course
 - Scores from other team members
 - Scores from external parties (targeted by a particular course project)
 - Standard quizzes on the learning objectives
 - Final demonstrable prototype/project report on the course project/problem taken up

Chapter 4 Communication [KTU]

- External
 - How to communicate with external case partners (while scouting the case, entering into the collaboration/partnership agreement, during a PBL case, and after the PBL case is completed) from facilitators'/courses coordinators POV?
 - What kind of external partners can be there (features, expectations)
 - IPR, Partnership Agreements, MoUs, Sponsorships, NDAs, GDPR
 - How to involve with external experts, facilitators and workshop sessions (roles, expectations, involvement)
 - Comms and dissemination
 - Impact and Sustainability

External Case partners are selected depending on the objectives and the expected impact of the project.

- Ideally, the case is selected and discussed together with the course coordinators 2-3 months in advance.
- The possible results and outcomes are projected.
- The PBL case communication and external dissemination plan is proposed by the HEI, discussed and agreed with all the participating partners.

Agreement with External Partners: Aspects should be covered:

- IPRs https://europa.eu/youreurope/business/running-business/intellectual-property/rights/index_en.htm
- GDPR <https://gdpr-info.eu/>

Agreement examples:

- NDA https://intellectual-property-helpdesk.ec.europa.eu/system/files/2021-03/Mutual-Non-Disclosure-Agreement-EN_2021.pdf
- MoU https://intellectual-property-helpdesk.ec.europa.eu/system/files/2021-03/H2020-MoU-Memorandum-of-Understanding-EN_2021.pdf
- Sponsorship agreement – template?
- Partnership agreement – template?

Partner organisations should be:

- willing to contribute their time for the study process;
- share their expertise with the students this way helping them to produce high-quality innovative deliverables.

The collaboration between the HEI and the External partners might be agreed upon:

- for the scope of the specific PBL cases;
- cover the wider spectrum of activities: R&D, participation in study committees;
- cover internships, sponsorships, students scholarships, grants, financial awards, etc.

Involvement of the external partner:

- At the beginning of the course it should be the first visit organized to the project site together with the external partners;
- A week or two after the visit formal problem presentation meeting at the educational institution needs to be organized with an extended QA session;
- Request for information is available during the whole PBL case period via agreed communication channels. External Partners can be directly contacted by the student teams representatives or facilitators'/courses coordinators.
- The External case partners are invited for the mid-term case project presentation to provide their feedback;
- The External case partners are invited for the final case study presentations and are part of the to take participation in the final evaluation process.

After the case is completed, the dissemination of the case results and outcomes starts:

- The process is coordinated by the course coordinators.

- External partners have to provide their consideration for the dissemination content before it is released to the public.
- Tools:
 - workshops, (online) seminars, training courses, demonstrations;
 - reports, articles in the specialised press, newsletters, press releases, leaflets or brochures;
 - audiovisual media - radio, TV, YouTube, Flickr, video clips, podcasts or apps;
 - social media;
 - public events – conferences; seminars; exhibitions.

Aspects of impact and sustainability dissemination:

- promoting cross-sectoral cooperation;
- addressing a given field of education,
- strengthen PBL capacities to foster the innovations by involving quadruple/triple Helix
- science/education institutions, industry organisations and public/community stakeholders.

- Internal
- Tools, means and resources for communication
- Impact and Sustainability plan within HEI
- Comms and dissemination plan about popularising results, outputs and outcomes (within HEI)

Tools:

- Meetings;
- Workshops;
- Lectures; seminars;
- Intranet.
- Internal newsletters
- Blogs.
- Internal social media.
- Audio podcasts;
- Video broadcasts.

Means:

- oral communication,
- written communication,
- visual communication,

Resources: Students, course coordinators, facilitators, external partners might communicate/share the results based on:

- an approach or a model to solve a problem;
- a practical tool or product, such as handbooks, curricula, e-learning tools;
- research reports or studies;
- good practice guides or case studies;
- evaluation reports;
- recognition certificates;
- newsletters or information leaflets

- **Comms and dissemination plan about popularising results, outputs and outcomes (within HEI)**

- Planning: why, what, how, when, to whom and where disseminating results will take place?
- Communication during the PBL case and after.
- Output: a tangible product which is produced by a given project and which may be quantified;
 - o Examples: studies, reports, materials, events, or websites;
- Outcome: an intangible added value achieved through the achievement of the project objectives and targets.
 - o Examples: training, training platforms, content or methodology, increased skills or improved abilities, knowledge and experience gained by participants, partners or other stakeholders involved in the project.

- **Impact and Sustainability plan within HEI**

- The impact is the effect that the PBL Case activities carried out and their results have on people, practices, organisations and systems.
- Sustainability is the capacity of the project to continue and use its results beyond the duration of the PBL case. Examples of the project result exploitation in the longer-term - commercialisation (spin-offs, start-ups, etc.) accreditation of the study programmes, modules or mainstreaming.

Chapter 5 Integration with online learning (MOOC and others) [TU DELFT]