Creating and publishing active learning handouts

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Abstract

An essential part of Active Learning is mobilizing students to participate in their learning processes. Although many different strategies exist, such as inverted classrooms, collaborative learning groups, think-pair-share activities and project-based learning, a frequent way to deliver these activities is thought the use of handouts that describe the proposed activity and what students should do to complete it. One of the main benefits of using handouts is the possibility for each student (or group of students) to control their own pace and proceed only when they have mastered each section. This is especially useful in engineering contexts, where there are many courses that benefit from laboratory sessions that are self-paced. Creating, delivering, and updating this kind of material requires effort both for creating the content and for formatting and design. High quality materials that are pleasant to use are hard to create from scratch. In this workshop, we present a workflow for creating interactive handouts and general course materials using Markdown, a plain text format that can be easily converted into many formats. As a participant in this workshop, you will learn to: 1) create and deploy a static website for your course using Mkdocs and GitHub; 2) Use Markdown annotations to indicate practical and written exercises and to publish expected solutions; 3) include interactive material such as lecture slides and videos, quizzes, and links to other sources of information; and 4) generating print versions for physical labs where students do not use computers. At the end of the workshop each participant will have developed and published their own course materials using the proposed tools and will be able to adapt their course contents to this new format. Templates for different common active learning strategies will also be provided to make it even easier to adopt this format.

Keywords: Active Learning; Engineering Education; Conference Information; Project Approaches.
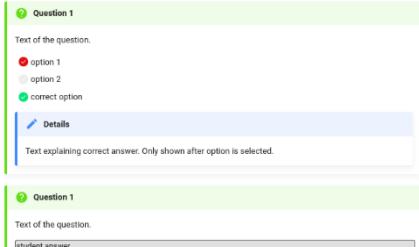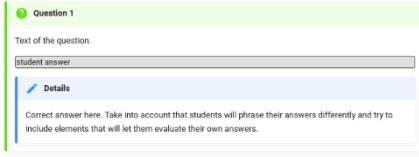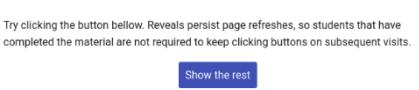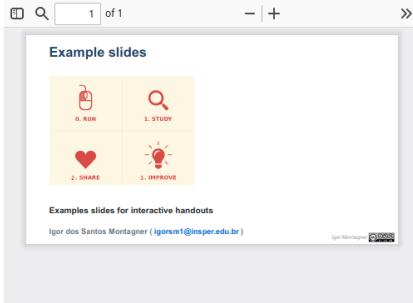
1   Introduction

A learning strategy or activity is considered "Active" if "[...] they are doing something besides passively listening" (Bonwell & Eison, 1991). Many strategies were developed in accordance with this principle, such as flipped classroom (Bergmann & Sams, 2012), Project Based Learning, Think-pair-share (Lyman, 1981). These strategies are particularly valuable in Engineering Education not only to improve instruction (Freeman *et al.*, 2014), but also to introduce more practical experiences in the learning process. No matter which active strategy is used, students need some sort of document that details what should be done, what are the expected results and provides a guide to achieving them. We refer to such documents as handouts in this workshop, inspired by the handouts originally used in experiments conducted in traditional Laboratory courses. However, we expand their use beyond traditional lab handouts that describe in detail a set of steps to reproduce an experiment with a known outcome. In this workshop a handout is any document that describes hands-on learning experiences that will guide the students to achieve the sessions' learning objectives. For instance, a handout for a Project Based Learning experience could include not only the expected outcomes but also questions to help students organize their ("What is your strategy to approach this issue?"), document their design decisions ("Why did you decide to adopt this technology/format?") or register their progress over time ("What did each team member do in the last week?").

Creating pleasant to use course materials with good design that are easy to distribute and update is a labor-intensive process. One can certainly use Word to author documents and publish them using some LMS, but the process is far from seamless. Adding rich content such as videos or animations; or supporting files such as example code adds another layer of complexity to this process, since Word files or PDFs are not suited for interactive and rich content. In this workshop, we propose the use of *Active Handout*, a tool created at Insper to author handouts and automatically publish them as webpages. Handouts are written using Markdown, a plain text format that's easy to learn, and stored in a Git repository automatically configured to deploy a website

as soon as modifications are made. Extra files can also be stored in the Git repository and easily downloaded by students.

At Insper we use handouts extensively to support many types of classroom dynamics. The proposed format has been used in more than 5 courses in the Computer Engineering course and is being considered for adoption in others. The following interactive and rich contents will be used in the workshop (Table 1). All workshop materials, including examples on how to use the content below, will be available at https://insper-education.github.io/active-handout/.

Table 1. List of interactive and rich content used in the workshop.

	Type	Recommended use
	Quiz	Recall of already seen subjects.
	Single line answer	Writing a line of code or a simple mathematical expression.
	Checkpoint	Indicating that students won't be able to proceed unless a certain set of tasks and readings is completed.
	Reference slides	Facilitate using lecture or reference materials during practical activities.

2 Activities

The workshop is organized using the following structure (Table 2).

Table 2: Lesson plan for the workshop.

Activity	Type	Duration
Introduction to the use of handouts in active learning	Lecture	15 minutes
Publishing your first course materials	Practical	30 minutes
Which strategies can be supported by handouts?	Interactive lecture	10 minutes
Adding interactive content	Practical	30 minutes
Closing	Lecture	05 minutes

During the passive parts of the workshop, we will discuss the use of handouts in active learning strategies and list advantages and disadvantages of using the proposed tools.

In the first practical part, participants learn how to setup a git repository with the proposed tools and use it to publish their first materials. Then they learn the basic authoring tools used to create new pages and format documents. This includes writing formulas using Latex notation and add images, tables and code snippets.

In the second practical part, participants learn how to add interactive elements to handouts. Each interactive element is explained in the context of a possible application according to Table 1. Thus, this part serves not only as a way of learning the syntax for adding interactivity but also as suggestions of how they could be applied in real handouts. In fact, each activity in this part is modelled after a real use in courses taught at Insper.

3   Expected results

By the end of the workshop participants will be able to:

1. Publish a course website containing basic information about a course, practical activity handouts and supporting files.
2. Author practical handouts using Markdown to add rich content such as images, formulas and code snippets.
3. Add interactive elements to handouts such as quizzes, short answers and validation checkpoints.
4. Generate printed versions for offline handouts.

Although this workshop focuses on the operational aspects of creating handouts, there will be brief discussions on how to use handouts to support different active learning strategies.

4   Additional information

- The workshop will be in online format
- Duration: 90 minutes

5   References

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