

Learning Tool Labor

Tool for Learning a Physics or Chemistry Concept

Purpose

To evaluate a technology for learning or teaching a science concept.

Method

Present and critically analyze a tool for learning a PHYS 1090 objective.

Overview

You will present a “tool” designed to communicate one of the PHYS 1090 content objectives. The tool is anything that could assist a learner to master the objective. It could be an inquiry lab, a board game, a demonstration, a Java applet, a web investigation, a guided reading sheet, a song, a formal lesson plan, a museum exhibit, or anything else that your imagination can conceive.

The labor consists of a written report and a live presentation before the class. The report is submitted as an HTML file for posting to the class web site. It contains a description and, more importantly, an evaluation of the tool. (Supplementary materials may be included in other formats if appropriate.) It should follow the format described below. The live presentation briefly recapitulates the report to the class.

The tool presentation is a mechanism for you to demonstrate your mastery of the content objective and your understanding of the learning process. The tool itself does not need to be perfect, and it does not need to be original. (Good teachers are good thieves!) Your *evaluation* of the tool is the critical aspect of this labor.

Submission of the labor denotes your permission for me to publish it on the web and to reproduce it on other media. You will be credited as author on all copies.

Graded Components

Initial plan: Outline the tool (a paragraph should suffice).

Rough draft: Presented to your group members and the instructor prior to final submission. Your group members will review it and give you constructive comments.

Feedback: Your reviews of your group members’ reports. You will help your group mates craft evaluative reports that are clear, complete, and thoughtful.

Written report: This contains the tool itself, your recommendation of how the tool should be used, and an evaluation of the tool’s potential to teach the objective.

Oral presentation: Describe the tool and its implementation to your classmates.

What to Do

Choose the objective you will examine. You have some freedom in this regard; I will allow a maximum of three people to evaluate tools addressing objectives from the same unit. All students must address different objectives. Please work out the apportionment amicably with each other. Only with the greatest reluctance will I arbitrate intractable disputes.

Find a tool that communicates the objective, or create one yourself. Let me know what you have in mind. Analyze the tool according to the criteria given below. Write up your analysis in a rough draft. Submit your draft to your group mates and obtain drafts from your group mates. Evaluate your group mates' drafts. Discuss your draft with your group. Make any appropriate revisions and submit the final report. Finally, summarize your tool and report orally before the class.

Dates and Deadlines

Oct 30	Labor introduced
Nov 4	Objectives claimed
Nov 11	Outline due
Nov 9–24	Optional instructor conference
Nov 18	Rough draft submitted to group members
Nov 20	Group review of draft
Nov 30	Feedback reports due
Dec 2	Written report due
Dec 9	Oral presentation (Final Exam)

Scoring

Outline 5%

The outline should identify and quote the objective addressed and briefly explain what the tool is and how it would be used. The tool chosen should relate to your objective. If you plan to use a tool that is already published, submit a copy of the tool as well.

Example: "My tool to help understand entropy is the song 'High Entropy' by the band Cab City Combo. Lyrics are attached. Students would examine the song to decide if its references to thermodynamics concepts are correct."

0–2	Identifies the objective.
3	As above, plus quotes the objective.
4	As above, plus includes or thoroughly describes the tool.
5	As above, plus identifies how the tool would be used.

Rough Draft 5%

Although this is a draft, it should be more complete than the outline submitted earlier. It must contain the description, implementation, and analysis sections required in the final product.

0–2	Rough draft is submitted to me.
3	As above, plus copies to your group mates as well.
5	As above, plus contains all required sections.

Feedback 10%

The focus of your feedback to your group mates' rough drafts should be content and organization, NOT mechanics. Does the tool actually relate to the objective? Would the proposed implementation help to teach the objective? Is the evaluation of the tool valid? Are any parts of the draft especially effective or admirable? Constructive comments should clearly identify the parts discussed, specifically describe what is effective or ineffective and why, and suggest specific improvements if appropriate.

Write in paragraph form the comments and suggestions you made for each of your group mates' drafts. Discuss each draft individually, not concurrently.

0–5	Focuses on mechanics rather than content.
6	Comments address content, but are holistic or vague. Specific examples or evidence are rare.
7	Points out specific deficiencies of the draft but offers little constructive advice.
8	Comments on the draft are specific and constructive.
9	Specific, constructive comments offered on at least two sections of the draft.
10	Specific, thoughtful, constructive comments offered on all sections of the draft.

Since each student comments on several drafts, the score received is the average of the scores for the separate drafts.

Electronic-Format Report 70%

This is the actual product. Its three parts—description, implementation, and evaluation—should be separate and clearly labeled. The report must be submitted as an HTML file.

The score for the report is adjusted by its ESWE multiplier.

Description 20%

Objective 5%

State the objective the tool addresses, with the number and title of the unit that contains the objective.

Note extremely well: The objective must be your previously agreed-upon objective for the report to receive any points at all.

Artifact 15%

This tells the reader what the tool is. It must be detailed enough for a reader to implement the tool. In many cases, the description may simply be a verbatim copy of the tool, such as for a tool that is a lesson plan, web site, or song. Whether or not the tool is copied from another source, the description must be clear, legible (or audible, or otherwise intelligible), and organized.

If the tool is entirely your creation, say so. If it is even partially from another source, completely cite the source and clearly identify your changes to the tool. In your citation, include the name of the creator and where the tool was found (book, journal article, web site, other class). Use these citation formats:

Book: Author, *Title*. City: Publisher, year, pp. pages.

Example: Robertson, W. C., *Electricity and Magnetism: Stop Faking It! Finally Understand Science So You Can Teach It*. Arlington, VA: National Science Teachers Association, 2005, pp. 2–3.

Journal Article: Author, “Title,” *journal*, **year**, *volume*, pages.

Example: Baker, B. “Using an Expandable Toy in Discussing Rotational Motion,” *The Physics Teacher*, **2005**, *43*, 247.

Web site: “Title,” retrieved month day, year from URL.

Example: “Wave Properties,” retrieved July 13, 2006 from <http://www.nationalgeographic.com/xpeditions/lessons/07/g912/wavesproperties.html>.

0–8	Tool is incomplete, unintelligible, or improperly attributed.
10	Tool is complete, legible, and properly attributed. Its description is poorly organized or the attribution does not follow the specified format.
13	Tool is complete, legible, and well organized. It is properly attributed in the specified format. It may contain unnecessary or wordy information.
15	Tool is complete, legible, well organized, and concise. It is properly attributed in the specified format.

Implementation 20%

Describe how the tool could be used to learn the objective. Is it appropriate as a formal lesson, reinforcement, self-assessment, etc.? In this section, you must

- Identify and defend the learning context(s) in which the tool should be used. Who are the intended learners? What topic unit would include the tool? What activities should be completed before and after using the tool? What should the learner know before using the tool?
- Identify prior preparation and necessary materials. Where can the materials be obtained, or how does one make them?
- Describe the step-by-step procedure for using the tool.

- Address any safety, legal, and ethical issues associated with using the tool. Should learners wear any protective equipment? If using the tool generates any waste, how should it be disposed? Is prior parental permission required? If use of the tool involves no safety, legal, or ethical issues, explicitly say so.

0–10	Many components are missing; answers to many questions are absent; badly disorganized; or largely unintelligible.
13	A component is missing, or answers to many questions must be inferred
15	All components are present and most questions are answered.
18	All components described above are present, and all questions above are answered specifically and completely. May contain unnecessary information or wordy descriptions.
20	As above, plus clear, organized, and concise.

Evaluation 30%

Here, you evaluate the tool according to criteria that might be considered in selecting a tool for use: completeness, effectiveness, and cost.

Completeness 10%

How **completely** does the tool address all aspects of the objective? Specifically identify the aspects that it does and does not address. If it does not cover the entire objective, what additional tools should accompany it?

0–5	Key aspects are missing or the section is unintelligible or disorganized.
7	One aspect is not addressed or supplementary tools are not mentioned.
9	All aspects are examined, though some cursorily. Appropriate supplementary tools are identified.
10	All aspects of the objective are thoroughly examined. Supplementary tools, if needed, are proposed and concisely described.

Effectiveness 10%

If the tool is implemented as suggested, how **effectively** will it help the learner master the objective? Here, the concern is with the aspect(s) of the objective that the tool addresses well. How will targeted learners of different abilities and interests experience the tool cognitively and emotionally? What misconceptions about the objective will learners likely bring with them, and how will the tool spark conceptual change?

0–5	Some answers are cursory, unreasonable, unintelligible, or absent.
7	Answers all questions. Some answers may be vague or superficial.
9	Answers all questions thoughtfully. Some answers may be wordy.
10	Answers all questions specifically, thoughtfully, and concisely.

Cost 10%

What **costs** are involved with using the tool? In the implementation section, you identified materials and preparation. Here, examine what this means. Preparation takes time, obtaining supplies costs time and money, and simply using the tool takes time that could be applied toward something else. What are these costs? Compared to other ways the objective could be communicated, are this tool's costs justified?

0–5	Conclusion is missing, or examination of costs and alternatives is missing or unintelligible.
7	Conclusion is stated. Costs are examined superficially or comparison to alternative tools is cursory.
9	Conclusion is stated clearly. It is supported by a thorough count of costs and comparison to alternate tools. May contain unnecessary information or wordy descriptions.
10	As above, but clear and concise.

Oral Presentation 10%

You will orally share your tool with the class. Identify the unit, state the objective, and describe the tool. Your description should be correct, complete, and clear. Speak audibly and with animation, and maintain eye contact with your audience.

0–5	Inaudible, unintelligible, or incomprehensible.
6	Speaks clearly and understandably.
7	As previous, plus the unit and objective are identified.
8	As previous, plus tool description is clear, organized and concise.
9	As previous, plus maintains eye contact with class.
10	As previous, plus conveys enthusiasm.