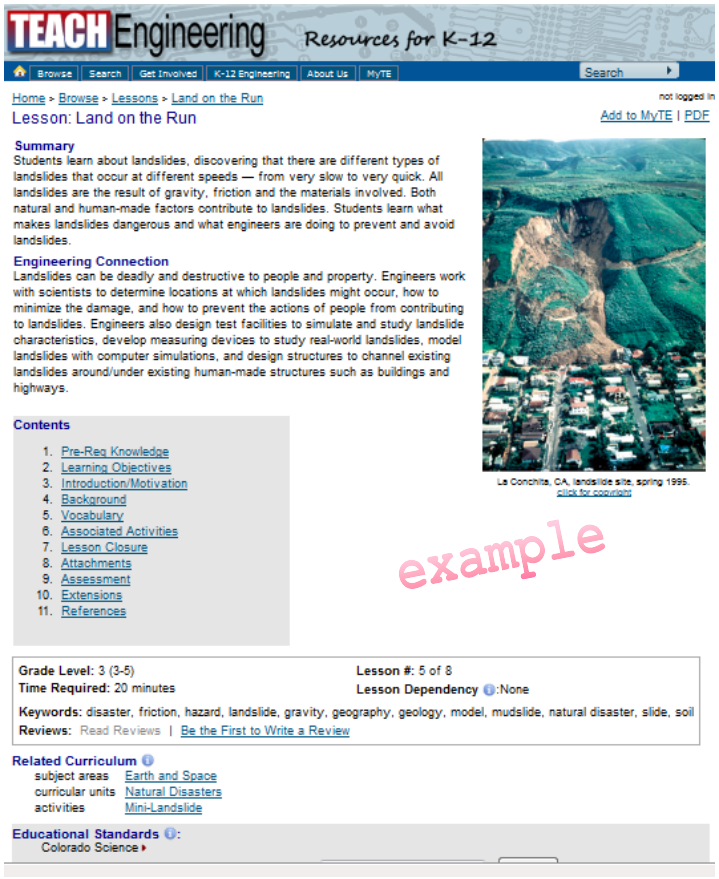
Lesson Template

A published lesson on *TeachEngineering* might look like this example ➔

After the table of contents, notice the "information box" on the first page (➔); it provides teachers with key information to quickly review the lesson to see if it meets their needs, before they look at the rest of the lesson write-up.

From this point on, this template describes the **required** and optional components for all lessons published in the TE digital library collection.

Visit http://TeachEngineering.org to see examples of lesson content and how they render on the website.



Subject Area(s) [Choose from: algebra, biology, chemistry, computer science, data analysis & probability, earth & space, geometry, life science, measurement, number & operations, physical science, physics, problem solving, reasoning & proof, science & technology. Users can browse TE for curricula by subject area.]

Associated Unit _____
[To what unit does this belong? Leave blank if does not apply.]

Lesson Title _____ [Provide a catchy lesson title]

Header *Example*: Insert Image 1 here, right justified to wrap
[(optional) Use Header if you want an image or other text to appear at the top of the document.]

Image 1

ADA Description: Drawing of a jet airplane flying directly at the viewer, over the arc of the earth.

Caption (optional): Engineers design navigation systems for all types of transportation.

Image file name: cub_airplanes_lesson01_image1.jpg

Source/Rights: Copyright © 2004 Microsoft Corporation, One Microsoft Way, Redmond, WA 98052-6399 USA. All rights reserved.

Grade Level __ (__-__)
[What grade(s) is (are) targeted in this lesson? "It is targeted for grade _, but could work for grades __ to __." *Example*: 8 (7-9) or 8 (8-8) for just eighth grade, or 8 (5-9) if it also works for lower-grade students.]

Lesson # __ of __
[(optional) Leave blank for standalone lessons that are not part of a unit. This is a way to make sure a unit's many lessons are listed in the order you want. This is flexible, though, so if a unit has three lessons that may be taught in any order, the lesson numbers may still be left blank.]

Lesson Dependency [(optional) Does the lesson depend on another *TeachEngineering* lesson? If so, list the title(s) in the order you would like them to appear on the website.]

Time Required __ minutes, hours, days or weeks *Example:* 20 minutes
[(optional) To help in teacher planning, provide an estimate of time to complete the lesson. Cannot be a time range, however you may include an optional text note for a brief explanation. We often find that lessons take 15-20 minutes, and associated activities take longer, often one or more 50-minute class periods.]

Summary
[Provide a brief paragraph summarizing the lesson and topics students learn about. Must be one paragraph of plain text, which means no images or formatting. Write in present tense, not future.]

Engineering Connection
[Provide 60-100 words or ~3 sentences clarifying how the scientific and mathematical concepts being studied in this lesson pertain to real-world engineering. Do not recap the lesson. It often works to associate lesson concepts to particular fields of engineering. For example, if the lesson is about tension and compression, you might say that mechanical engineers use these principles when they design structures such as bridges and roller coasters. Must be one paragraph of plain text, which means no images or formatting.]

Engineering Category
[(optional for lessons and units; required for activities) Indicate which of the following four engineering categories best describes this lesson's amount or depth of engineering content:

1. relates science concept to engineering,
2. relates math concept to engineering,
3. provides engineering analysis or partial design
4. provides complete engineering design process.

Anecdotally, categories 1 and 2 are primarily science/math with some engineering, category 3 items are primarily engineering with some science/math, and category 4 presents full engineering design. For more complete descriptions of each category, see the TE Engineering Categories Description document (PDF) on the Submit Curriculum page. In most cases, units and lessons will either not have a category or use the category of the most relevant lessons and activities below them. In rare instances, activities work as a whole, in terms of their level of engineering design content, so that the lesson or unit actually has a different category than the activities below it. For example, a unit might be category 4 because its lessons and activities contain all of the steps in the engineering design process even though none of those individual lessons and activities is categorized as providing the complete engineering design process.

Keywords
Example: compression, force, mechanics, tension, tensile, skyscraper, structure

[Provide 4-10 keywords. They should be words the layperson and a K-12 teacher would know and **might use to search** for the lesson. List in A→ Z order, lower-case unless proper nouns.

Usually, make nouns singular. Avoid highly-technical or lingo words. It is likely you have used these words in the summary. For example, keywords might be concepts (tension, photosynthesis), or real-world examples (skyscraper, artificial leg) from the write-up. Even though TE provides full text search capability, often these become the few keywords that are seen by other websites that search the collection.]

Educational Standards

[List 2-4 educational standards that students would learn as a result of completing this lesson or activity. They should be treated like learning objectives, and it should be clear in the curriculum where students will learn them. If you need to identify more than four educational standards, ensure the standards are specifically taught in the lesson or activity.

Be accurate in listing educational standards. For example, if students need a skill to complete an activity, but the activity assumes they already have that skill, then the activity does not teach the skill. For instance, a standard might say, "students use protractors to measure angles." An activity in which students use protractors to measure the angle of a shadow while making a sun dial would not teach this standard unless it contained specific language designed to introduce students to the use of protractors in the activity. If it does not contain that language, then it assumes students already have previously used protractors. In this case, students would be practicing the skill — but not learning it. (Note: You might mention the skill under the Pre-Requisite Knowledge section.)

List the educational standards addressed in the lesson from the state and national standards available at the online ASN viewer at http://www.jesandco.org/asn/viewer/default.aspx. These should be **specific standards, not just the broader objectives of the standards**. Please include the source, standard number(s) and text of each standard. *Example:*]

North Carolina, science, 2004, 1.01: Identify and create questions and hypotheses that can be answered through scientific investigations.

[Special note for Massachusetts: The middle school science standards are written in the same format except that instead of a "strand" there is a number: 1 for Earth and Space Science, 2 for Life Science and 3 for the Physical Science strand. For example, 1.12 stands for the "Relate the extinction of species to a mismatch of adaptation and the environment" standard in the earth and space science strand.]

Pre-Requisite Knowledge

[(optional) What does the student need to know to be successful in this lesson (a previous lesson, a certain topic, specific math skills)? *Examples:* A familiarity with north, south, east, west compass directions. A basic understanding of gravity and friction. Ability to calculate averages.]

Learning Objectives

After this lesson, students should be able to:

- Describe, list, relate, define**...**

[(optional) In statement form, identify **2-4 main** intended goal(s) or student outcome(s) of the lesson in STEM standards covered. Learning objectives often come from the educational standards you identified.]

Introduction / Motivation

[***Write this section as if you were directly talking to the students***. Suggest how the teacher might prepare the students for the lesson and activities. Provide an engineering context. How do you

grab the students' interest? This could be a demo, an example or real-world context. Ask questions of the students to engage them. Create a storyline that flows with the objectives to make the lesson more challenging and exciting. Suggested half-page minimum. Address the learning objectives identified earlier. Incorporate vocabulary. Include teacher instructions and answers in parentheses, ex: (write on the classroom board) or (possible answers: xxx, yyy, zzz).]

Lesson Background & Concepts for Teachers

[***This is written for the teacher only.*** Include a clear and complete explanation of the lesson subject covered, in layperson's terms. Summarize pertinent background to make the teacher's job easier; do not just copy information from other resources. It is okay to provide a few hot links/URLs to high-quality relevant information links. Information should provide teacher with a bit more information than needed to teach the lesson, so the s/he can answer student questions competently. Provide sub-headings or bullets, as necessary, to organize the material.

Image Insert Image # or Figure # here, [note position: left justified, centered or right justified]

Figure 1

ADA Description: Photo shows a huge concrete dam blocking a canyon, and water spraying below it.

Caption: Figure 1. Hoover Dam, NV.

Image file name: cub_earthsci_lesson01_activity1_figure1.jpg

Source/Rights: Copyright © Bureau of Reclamation, U.S. Department of the Interior, http://www.usbr.gov/lc/hooverdam/.

Vocabulary / Definitions

[(optional) Define unusual or probably unknown words, including unclear keywords, for the target grade level, plus any engineering words that are used in the lesson. Only capitalize terms if they are proper nouns. Write definitions in sentence format, even phrases (begin with capital letter; end with a period).]

Word	Definition

Associated Activities

[(usually required; optional only with permission from reviewers.) List the names of each *TeachEngineering* activity associated with this lesson and a brief sentence or two describing each (a shortened Summary). On TE, the title hot links to the activity write-up. *Example:*]

What a Drag! Students investigate the forces of flight using a paper helicopter they construct.

Lesson Closure

[(optional) ***Write this section as if you were directly talking to the students.*** Help students bring it all together. Review what they should have learned in the lesson introduction and assessment(s). Make sure the learning objectives are covered. Provide connections to student outcomes, subsequent lessons and the overall unit topic. Suggested quarter-page minimum.]

Assessment

[***Provide assessment tools/activities for teachers to assess the learning objectives described earlier.*** How do you know if the students "got it" during the lesson and after the lesson? Provide active and embedded ways for the teacher to gauge what the students know about the topic at the beginning, and whether the students *met the learning objectives* at the end. For examples of assessment tools and activities, browse the *TeachEngineering* collection.]

Pre-Lesson Assessment (suggested subheading)
Descriptive Title: Describe the assessment procedure so the teacher knows what to do…

Post-Introduction Assessment (suggested subheading)
Descriptive Title: Describe the assessment procedure so the teacher knows what to do…

Lesson Summary Assessment (suggested subheading)
Descriptive Title: Describe the assessment procedure so the teacher knows what to do…

Homework (suggested subheading)
Descriptive Title: Describe the assignment so the teacher knows what to do…

Lesson Extension Activities

[(optional) Provide suggestions for additional activities that explore the lesson subject further, and suggestions for thought-provoking questions for the students in the weeks ahead.]

Additional Multimedia Support

[(optional) Provide ideas and sources for additional information to support the lesson, such as online animations and images, video/DVDs or attached PowerPoint slide presentations, etc.]

References

[(optional) List all references used to create the lesson, especially the background knowledge section. Also include suggested good resources. Use MLA format (see below). Provide in A → Z order according to authors' last names or website banner page name, whichever appears first in citation.]

For books:
Lastname, Firstname. Book Title. City, ST: Publisher Name, year.

For websites:
Author(s) [Lastname, Firstname]. BannerPageName. LastUpdated/Posted/RevisedDate. OwnerName, Organization. Accessed date. http://www.colorado.edu

Examples:
Dictionary.com. Lexico Publishing Group, LLC. Accessed March 4, 2010. (Source of some vocabulary definitions, with some adaptation) http://www.dictionary.com

Fish Management Office. Last updated January 15, 2010. Northwestern Division, US Army Corps of Engineer. Accessed March 4, 2010. (source of much teacher background information; good photos and diagrams) http://www.nwd.usace.army.mil/ps/home.asp

For magazine articles:
Doe, Juanita Q. "Title of an Article." Title of a Magazine. August 12, 1999: 23.

For journal articles:
Doe, Juan R. "Title of an Article." Title of a Scholarly Journal. 18 (1987): 112-28.

Attachments

[(optional) List lesson attachments, such as handouts, worksheets, worksheet answers, quizzes, data sheets, readings, graphics, visual aids, etc., in digital formats (for details, see Introductory Notes on the Submit Curriculum page). On TE, they will be hot-linked to files. In addition to PDF versions, provide original format versions (Word, Excel, PowerPoint) so teachers can modify. In listing the attachment names, include the file format (see example, below), to help teachers choose what to download/print. When naming files for attachments, use lower-case letters only (no caps). This includes file extensions: jpg, .doc, pdf, ppt, etc. Also, leave no spaces in the file names; use underscores instead.]

Examples:
Flying Solo Worksheet (pdf)
Flying Solo Worksheet (doc)
Flying Solo Worksheet Answers (pdf)
Flying Solo Worksheet Answers (doc)

Other

[(optional) This component is available for information that doesn't seem to fit in anywhere else.]

Redirect URL

[(optional) Provide one URL to direct teachers to required internet materials; URL will be rendered in *TE* by a note in the boxed information at the top of the document, like this: **Attention:** This lesson requires the following internet resource: URL here.] See an example.

Contributors

[(optional) List the name(s) of who contributed to developing, testing, reviewing and editing this lesson. List the primary creator first. Role and organization may be included, too.]

Example: Jay Shah, Malinda Schaefer Zarske, Janet Yowell

Copyright

[(optional) To include a brief copyright citation for the source of this curricular content, provide a copyright year and owner name. Check with your institution for the appropriate copyright text.]

Example: Copyright © 2010 by Regents of the University of Colorado. This digital library content was developed by the Integrated Teaching and Learning Program under National Science Foundation grant no. 0338326.

Supporting Program

[Briefly provide the name and organization of the source of this curricular content.]

Example: Integrated Teaching and Learning Program, College of Engineering, University of Colorado at Boulder

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