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Kinetic Energy and Work

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The module is prepared with the aim of facilitating the learning of concepts about kinetic energy and using English through activities focused on concepts by using CLIL methods. It contains assessment criteria grids for language, content and cooperative work, activity description grids, preparatory and warm-up activities and exercises.

AECLIL partner	Hacettepe University, Ankara, Turkey
Topic	Kinetic Energy and Work – Definitions and Applications
Subject area	Physics
Language	English
Language Level	B1
Target group	HU Faculty of Engineering, Mechanical and Industrial Engineering, 1st-year students
Time	Five hours
Aims	- to learn the concepts of energy; definition of work, work and kinetic energy, work done by a gravitational force, work done by a spring force, work done by a variable force; definition of power - to familiarize students with the basic concepts and vocabulary related to kinetic energy and work - to familiarize students with word-guessing strategies

	- to improve reading skills - to improve listening skills by note-taking during the lessons - to develop speaking abilities by encouraging the students to participate - to improve interaction between the teacher and the students as well as among students themselves by encouraging them to use everyday English - to enable the students to talk about the subject using the given activities - to practice thinking in English rather than thinking in the mother language while students express themselves.
Outcomes	- written classwork - activities and strategies.
Classroom activities	- lecturer's talk - group work
Assessment tools	- exam - direct observation
Assessment criteria **Content** **Language** **Cooperative work**	- knowledge of the subject - ability to solve exercise - use of BICS - use of CALP - participation in the classroom activities
Resources	- course textbook: *Fundamentals of Physics*, by Halliday, Resnick, Walker , 8th (extended) edition, ISBN 978-0-471-75801-3. - blackboard - transparencies, overhead projector - reading passage related to work, energy and power (taken from *How Things Work, The Physics of Everyday Life*, by Louis A. Bloomfield, 2nd edition, The University of Virginia) - the video of the lecture entitled *Work, Energy, and Universal Gravitation* and its transcript – Walter Lewin, *8.01 Physics I: Classical Mechanics, Fall 1999,* http://ocw.mit.edu (accessed 03.09.2012) - worksheets - scratch paper

Activities

Step 1

Students' work
Warm-up (paper airplane): The students are given some scratch paper to make an airplane and are asked to throw it as far as possible. They are then asked to answer the question: "Who has spent the maximum energy and how do you know that?".

Resources
- scratch paper

Assessment
The expected answer to the question is: "Whichever plane is thrown the farthest requires the hardest work; thus, whoever has thrown it the farthest has worked the hardest". This is the result of the work and kinetic energy theorem.

Step 2

Students' work
In worksheet 1 (*Work, energy and power*) a reading passage related to work, energy and power is distributed to the students. In worksheet 2 (*Language Strategie*s) the instructor pre-teaches some common strategies for guessing the meaning of words in context. While reading the text the students are asked to underline the given contextual clues and to guess the meanings of the words by using them. To check their understanding they are asked some follow up questions like: "How many names can you list for disordered energy"?

Resources
- worksheet 1: *Work, energy and power* (taken from Louis A. Bloomfield, *How Things Work, The Physics of Everyday Life*, 2nd edition, The University of Virginia)
- worksheet 2: *Language Strategies.*

Alteration: This could be done orally by eliciting the word-guessing strategies from the students. After that, the teacher goes through the word-guessing strategies and writes them on the board. The students are then given the text to work on the definitions of words and the contextual clues and to do the exercises.

Follow-up: The students are given another text to study the contextual clues as homework.

Assessment
Whoever finds the contextual clues could answer the questions correctly.

Step 3

Students' work
The task is to watch a video (worksheet 3).
Pre-listening: The teacher draws attention to the topic by asking a volunteer to stand up and stand still for a while. The teacher then asks the student and the whole class whether or not s/he would feel tired if s/he kept the same position for a long time; the answer is yes. Eventually, the teacher asks if there is any difference between tiredness and work and what the definition in physics is of work; the answer is: "In physics you can get tired without having done any work."
While listening: The students are asked to watch the video extract taken from a lecture on work and energy by paying special attention to certain terms in physics and their definitions and taking notes.
When the students finish listening they are asked some questions on the purpose of the activity, why they have listened to a video extract instead of merely listening to an audio cassette, and the problems they faced while doing the listening in L2, etc.

Post-listening*:* After the students listen, they are given worksheet 4 to do the exercise.

Resources
- overhead display
- the video of the lecture entitled *Work and Energy* and its transcript − Walter Lewin, *8.01 Physics I: Classical Mechanics, Fall 1999,* Massachusetts Institute of Technology: MIT OpenCourseWare, http://ocw.mit.edu (accessed 03.09.2012)
- worksheet 3: *Keywords and their Turkish equivalents*
- worksheet 4: *Listening and note-taking*
- worksheet 5: *Assessment grids* (see below).

Assessment
Those who supply the correct answers are the ones who have taken notes properly.

Reflections and Comments

We believe that teaching courses in English for non-native speakers of English is very important. At Hacettepe University, the medium of instruction is 100% English in many of the departments and 30% in some. The freshmen at the departments of Mechanical/Automotive and Industrial Engineering have been chosen as the pilot group. The lessons entail the practical use of the language via the AECLIL methodology and computer-based instruction; this approach is motivating for the chosen groups' learning and has improved their level of English.

Doing the lesson directly in English without any reference to their mother tongue is ineffective, as they sometimes need help to hear the words in Turkish to check

their understanding. Especially when a new concept in physics is introduced, it is necessary to understand what the concept is and to learn the new vocabulary efficiently, in part through direct translation.

Warm-up activities are especially effective in encouraging the students to participate in the lesson. Generally most students are willing to participate by speaking, i.e., by asking questions or by making comments, as long as they are given a task. However, some students reject learning because they feel frustrated and confused even if they do the task properly, and they keep complaining about the difficulties of learning the subject via another language.

One drawback is that this project is not part of our curricula, while for some partners there are even schools for implementing this. For the AECLILTR group, experimenting with CLIL methodology was a voluntary and experimental activity.