# Problembasert læring

Problembasert læring eller prosjektbasert læring er en undervisningsmetode som tar utgangspunkt i et bestemt problem eller en utfordring. Utfordringen/problemet som det arbeides med kan gjerne være fiktivt, men gjenspeiler ofte reelle utfordringer. Undervisningen har ofte form som gruppearbeid, hvor medlemmene i gruppen over tid og gjennom samarbeid skal komme frem til en felles løsning på utfordringen. Formålet med problembasert læring er at elever og studenter skal kunne knytte undervisning og fagstoff til yrkespraksis eller utfordringer vi kan møte i hverdagslivet. Både problembasert læring og prosjektbasert læring omtales gjerne som PBL. Eksempler på forskningsartikler hvor problembasert læring eller prosjektbasert læring er benyttet som undervisningsmetode:

- Sculpting the barnyard gene pool
- The Sound of Music & Its Effect on Biological Systems: Project-Based Learning Tapping into Adolescents' Interests
- Developing a Module to Teach Thermodynamics in an Integrated Way to 16 Year Old Pupils
- The stories of inventions
- Building Measurement Devices with Students – From Hands-on to Minds-on

# Sculpting the barnyard gene pool

**Author:** Gina Childers, Kim Wolfe, Alan Dupree, Sheila Young, Jessica Caver, Ruby Quintanilla, and Laura Thornton

**Year**: 2016

## Abstract

Project-based learning (PBL) isn’t solely a student creating a PowerPoint about photosynthesis in biology class, designing a periodic table poster in chemistry, or constructing a papier–mâché volcano in Earth science. PBL takes student engagement to a higher level through reflective collaboration, inquiry, critical thinking, problem solving, and personal relevance. This article explains how six high school teachers developed an interconnected, interdisciplinary STEM-focused PBL called Sculpting the Barnyard Gene Pool. The objective was to engage students in an authentic learning experience by immersing them in the biological and engineering worlds of chicken genetics, chicken hatcheries, and livestock industry involvement.

**Keyword**: Project based learning, STEM,

**Referanse**: Childers, G., Wolfe, K., Dupree, A., Young, S., Caver, J., Quintanilla, R., & Thornton, L. (2016). Sculpting the barnyard gene pool: Immersing students in the science and engineering of chicken genetics and hatcheries. *The Science Teacher*, *83*(7), 49.

**Tag**: biologi, naturfag, prosjektbasert læring, problembasert læring

# The Sound of Music & Its Effect on Biological Systems: Project-Based Learning Tapping into Adolescents' Interests

**Author**: Josef De Beer

**Year**: 2019

## Abstract

Science education often fails to address the actual range of adolescents' interests. One such interest is music. Research shows that young people devote large amounts of time and money to music. By tapping into students' interest in music, affective outcomes can be achieved in the biology classroom. This article describes a project-based learning activity that studies the influence of music on seed germination. Part of the student project is to conduct a literature search on the influence of music on plants, and possibly also on people (its biological, psychological, and social effects). The project is contextualized in the indigenous practice of making music while planting crops. There is a growing body of literature suggesting that music can improve crop yields. Students are required to follow the key features of project-based learning to plan and execute an inquiry to determine the influence of music on seed germination. Students undertaking a literature study will find research showing that music affects the viscosity of the plasmalemma and the availability of intercellular Ca2+, which, in turn, influences the activity of membrane-based enzymes. This can lead to larger amounts of water, nutrients, and growth regulators entering the plant cell. The article also reflects on data obtained from high school biology students as they engage in the learning activity.

**Keywords:** Music; seed germination; project-based learning; indigenous knowledge; affective domain.

**Referanse:** De Beer, J. (2019). The Sound of Music & Its Effect on Biological Systems: Project-Based Learning Tapping into Adolescents' Interests. *The American Biology Teacher*, *81*(7), 507-512.

https://doi.org/10.1525/abt.2019.81.7.507

Tag: biologi, prosjektbasert læring, problembasert læring

# Developing a Module to Teach Thermodynamics in an Integrated Way to 16 Year Old Pupils

**Author**: Leen Goovaerts, Mieke De Cock, Katrien Struyven, Wim Dehaene

**Year**: 2019

## Abstract

In order to motivate secondary school pupils for STEM studies and professions, a teaching approach with a focus on integration of STEM components is developed. This paper focuses on the integration of physics and mathematics into an engineering design problem in K10 education, namely building and heating a model of a passive house with a sun boiler. Specific attention is given to the core ideas of integrated STEM while developing this module. These applied ideas comprise problem-centered and cooperative learning, with explicit attention to research and design, as well as taking into account results from discipline specific educational research results.

**Keywords**: thermodynamics, secondary education, problem-based learning

**Referanse:** Goovaerts, L., De Cock, M., Struyven, K., & Dehaene, W. (2019). Developing a module to teach thermodynamics in an integrated way to 16 year old pupils. *European Journal of STEM Education*, *4*(1).10.20897/ejsteme/3964

**Tag**: matematikk, fysikk, problembasert læring, prosjektbasert læring

# The stories of inventions

**Author**: Vanashri Nargund-Joshi and John Bragg

**Year**: 2017

## Abstract

During the second industrial revolution (1870–1914), scientists moved away from trial-anderror methods to more systematically apply the principles of chemistry, physics, and biology (Mokyr 1998). We chose this period as the foundation of a projectbased learning (PBL) unit integrated with the ninth-grade U.S. history curriculum (Thomas 2000). This project, a collaboration of two university faculty members (the authors) and a high school social studies teacher, reflected the integrative learning promoted by the Next Generation Science Standards (NGSS Lead States 2013; see box, p. 49). The unit encouraged students to associate the second industrial revolution's many inventions (in such areas as manufacturing, transportation, and communication) with methodical investigation and professional collaboration rather than random eureka moments. The goal was to develop student understandings about the evolution of different inventions within their scientific and societal contexts.

**Referanse:** Nargund-Joshi, V., & Bragg, J. (2017). The stories of inventions. *The Science Teacher*, *84*(5), 44.

**Tag**: historie, prosjektbasert læring

# Building Measurement Devices with Students – From Hands-on to Minds-on

**Author**: Gilit Porat and Shulamit Kapon

**Year**: 2018

## Abstract

Although the teaching of mechanics at advanced K12 levels often starts with a brief introduction to physical quantities and units, the nature and function of measurements in physics and their inherent uncertainty are hardly ever discussed. The laboratory is mainly used to illustrate the theoretical principles taught in class. This paper presents a project-based learning approach that aims to provide high school students with a sense of the nature and role of measurements in physics (units, uncertainty, etc.) as well as help them develop laboratory, data analysis, and scientific communication skills in a fun and engaging way. Each project involves the design, building, and calibration of a measurement device for a basic physical quantity (time, length, and mass). Each measurement device is made up of recycled materials (e.g., plastic bottles) and simple pieces of equipment available in any high school physics laboratory (e.g., springs). The students build the device, calibrate it, and write a detailed documentation that explains how it works, its specifications, and instructions for use. The students also present their work to peers and visitors. We describe five basic measurement devices, the scaffolding we used to help the students make the transition from the “arts and crafts” aspect of the work to its deeper scientific meaning, and different orchestrations for various classroom settings.

**Keywords:** project-based learning, physics

**Referanse:** Porat, G., & Kapon, S. (2018). Building measurement devices with students–From hands-on to minds-on. *The Physics Teacher*, *56*(7), 461-465. https://doi.org/10.1119/1.5055330

**Tag**: fysikk, prosjektbasert læring