

In pursuit of excellence through e-learning

steeluniversity.org is a free online resource that complements traditional and practical learning of steelmaking technologies, steel applications and ferrous metallurgy. It is available for individual study and through many educational institutions worldwide. It is also used by steel companies for in-house training.

Successful organisations are those that develop their most important resource: the people they employ. One way to do this is by adopting innovative training and development practices that have a measurable impact on performance.

In the steel industry, there is constant pressure to innovate and implement advances in production processes. Steel companies must also ensure that employees have the skills to exploit these improvements. Not only is this crucial to worker productivity, it is fundamental to job satisfaction and employee retention.

The growth of the steel industry also increases the need to develop the next generation of steel industry professionals. Today, the industry recognises that it is important to manage knowledge of metallurgy and steelmaking, particularly when more professors and industry experts are retiring than are joining the industry.

The greatest training hurdle was the global nature of steel-producing companies. This creates the need to provide educational opportunities to workers and students on six continents and in at least 20 time zones.

The innovative e-learning resource steeluniversity.org is one solution to this global educational challenge. The World Steel Association (worldsteel) launched steeluniversity.org in 2003.

Learning about steel in real and virtual classrooms

Within the virtual walls of steeluniversity.org, students use e-learning modules that cover all aspects of steel. This includes the steelmaking process, the applications for steel, steelmaking technology and sustainability. The modules are highly interactive and allow students to test what they have learned as they progress through the course.

A particularly valuable feature of steeluniversity.org is that students can “see” many of the subjects. There are 14 real-time simulations, ranging from self-guided tours of a virtual steelworks to programs that enable students to play the role of a metallurgist and practise steelmaking techniques.

steeluniversity.org is designed for flexibility in learning styles and situations, including self-motivated or directed study. Its resources can be used to supplement traditional learning methods by providing professors and lecturers in universities with practical examples from the steel industry. The resources illustrate and demonstrate essential basic principles and theoretical concepts.

Who uses steeluniversity.org?

Registered users:	18,246 (40% academia, 37% industry, 23% others)
Top 10 countries of registered users:	China, South Korea, US, India, UK, Mexico, Brazil, Russia, Germany, Argentina
Location of users 2005-2011:	China/Korea/Japan (29%) Europe (25%) Latin America (16%) US and Canada (10%) India (7%) CIS (5%) Middle East (4%) Australia/NZ (2%) Africa (2%)
Academic institutions:	>400
Steel companies:	>100 (includes associated companies in the supply chain)

The website receives 30,000 visits a month and is used by over 100 steel companies and 400 universities worldwide.

Approximately 50 companies and 50 universities include steeluniversity.org’s resources in formal courses. This significantly extends its impact and helps to ensure that the study of metallurgy remains vital and available to future generations of steelmakers.

The modules are designed to be useful and comprehensible to a broad range of viewers. This includes instructors, steel industry workers, employees and their trainers from companies within the steel industry supply chain. Many of the modules and simulations also are suitable for use by graduates from other disciplines, operators and older school students.

The e-learning resources

steeluniversity.org has five main categories of e-learning modules, all developed by experts from the steel industry and academia. Typically, the modules contain a mixture of information and interactive exercises that test a user’s understanding as they work through the module. Each module can be studied and operated as a separate unit.

The four categories of modules:

1. **Steel processing:** Steel production involves several processing stages including ironmaking, primary and secondary steelmaking, casting and hot rolling. These are followed by fabrication processes such as cold rolling, forming, forging, joining, machining, coating and/or heat treatment. These modules provide a series of realistic, game-like simulations of the main steelmaking operations, in which users make technical and operational decisions to control these processes. This encourages users to take a hands-on approach to learning and helps develop a more in-depth understanding of the process. The simulations are supported by e-learning activities so that users can understand the chemical reactions and metallurgical principles underpinning these processes.
2. **Steel applications:** Steel is used in a wider range of products and applications than any other material. This is due to the vast number of alloy compositions that give it unique mechanical properties and unparalleled versatility. In this section, users explore and understand the use of construction, automotive and engineering steels, and steels for packaging and oil and gas recovery offshore platforms.
3. **Sustainability:** Users examine sustainability and the environment, drawing on examples from the automotive, construction and steel industries. They then move on to the principles of life cycle thinking and life cycle assessment (LCA). They also learn about environmental management.
4. **Ferrous metallurgy:** This section deals with the complex interdependencies between the composition of steel, steel production processes, the resulting microstructure and properties of the product and its application requirements. Modules cover the basic scientific principles that are related to processes and applications of steel and include kinetics and thermodynamics, strengthening mechanisms, mechanical properties, and phase transformations.
5. **Safety and health:** This section introduces the principles of hazard analysis and there are examples of risk assessment and injury prevention based on the hierarchy of control. The user can develop an understanding of safety statistics by completing a set of simple exercises.

Some of the simulations are linked and, by registering and logging in, users can save and retrieve data to use in 'downstream' processes. For example, results can be saved from the EAF simulation and retrieved for refining in the secondary steelmaking simulation.

Students can also assign themselves a teacher. The teacher can view results and provide feedback on simulation attempts.

What the future holds

worldsteel plans to add innovative academic programmes, including a recrystallisation module and simplified processing simulations for a broader audience.

Future development will focus on usability enhancement and customisable content.

Many modules have been translated into Spanish, Chinese, Korean, Russian, German and Japanese. Other translations are in progress.

steeluniversity.org aims to inspire and excite students about the value and wonders of steel, the opportunities steel presents for the sustainability of our world and the challenging and rewarding training and careers in the steel industry.

The steeluniversity Challenge

worldsteel launched a virtual steelmaking contest, the steeluniversity Challenge, in 2005. This 24-hour online competition is based the virtual steelmaking simulations.

The Challenge attracts participants from around the world. In 2008, over 16,000 attempts were made by 478 teams from 26 countries.

Teams or individuals – students or new steel industry employees (with less than three years' experience) – can make several attempts during the competition period to achieve a successful result at the lowest cost.

The winners in each category are awarded a prize and trophy. Several worldsteel member companies support this event by offering additional regional prizes.

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Accolades for steeluniversity.org

European Academic Software
Award Winner (2004)



Royal Academy of Engineering Education
Innovation Prize Finalist (2006)



Association for Iron & Steel Technology - AIST
Benjamin F. Fairless (AIME) Award Winner (2008)

