

# Innovation in teaching methodologies in welding - distance learning tool for welding engineering

## Project presentation

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### Keywords

Distance learning, teaching methodology, welding engineering, learning tool, qualification of professionals, software, multimedia tool.

### Introduction

With welding being the most important fabrication technique used in manufacturing (representing an annual added value of € 86 billion [1]), where a failure in a weld can lead to disastrous consequences, the effort to assure that welding is performed with proper quality is clear from the amount of standards that exist in the field which include standards for certification of welding professionals (EN 287 for welders and ISO 14731 for Welding Coordinators). One of the ways to reduce failures is to assure the proper training of the persons dealing with welding. Nowadays, welding training can benefit from a wide range of tools and processes that allow for providing welding education to wider audiences as well as presenting it in a new, friendlier perspective.

The introduction of a distance learning tool, like the one being used for the DISTOOLWELD project, allows for a substantial reduction in the course's duration, as well as providing new approaches to welding education.

Distance learning methodologies are an important component of lifelong learning practices by allowing the course contents to be adjusted to the trainee's needs. Most of the target audience have already undergone academic education and now have to balance their professional activities with the welding course.

The present tool, therefore, allows for trainees to have an interactive environment in which they can perform exercises as well as gaining contact with conventional and advanced welding techniques.

This is a very significant issue, in order to help in countering the still existing lack of IT technologies in welding education. Wider dissemination of IT tools can substantially contribute to modernizing welding education and its appeal to an audience that is much more familiar with IT practices and technological innovation.

In practical terms, the use of the training tool allows for a higher flexibility of learning on the part of the trainee, as well as allowing for a clear reduction in course hours.

The paper will now detail the main characteristics of the software, and describe at length the main benefits of its use, ending with a set of relevant conclusions.

### The software

The multimedia based training program developed by SLV Duisburg is a distance learning course designed to self-study the first part of the International Welding Engineer/Technologist course according to IIW Guideline IAB-252-07. The course is an approved alternative to conventional classroom training and entitles to participation in the examination part 1.

The technical quality of the multimedia tool has been proven through its use in Germany, under the umbrella of EWF. The Distoolweld Project will take the necessary actions to ensure that the target countries - Romania, Italy, Poland and Portugal - will have, by the end of the project, the knowledge and expertise to implement this training tool to their own specific national needs.

### The content of the software

The interactive training program comprises the fundamentals of the training for qualification to be a welding engineer / technologist in accordance with IIW Guideline IAB-252-07.

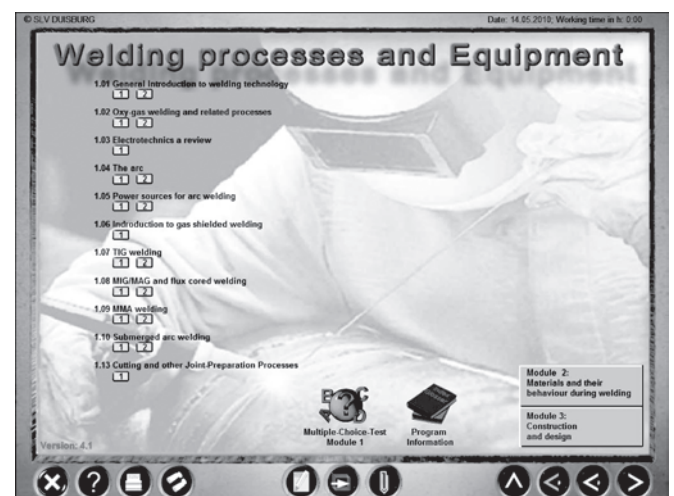


Figure 1. Initial screen of the software

The section on the technology of welding processes deals with different welding methods. Material technology includes Material Science, Metallography and the classification of steels. The section in Design includes the computation of forces and tensions and the presentation of welds (figure 1).

The program can be used without specific PC knowledge and it does not take long preceding times to become familiar with the subject. Will be selected one of the three main sections from a start menu (figure 2).

Thus, on gains access to an overview of the several lessons. The lessons may be chosen at will and will be supported by text, sound, images, video films and interactive animations.

By using the media mentioned the contents are given close to practice with the effect that the motivation to learn remains high. Notebook functions, a full text search, bookmarks, history as well as a help function are integrated in the program.

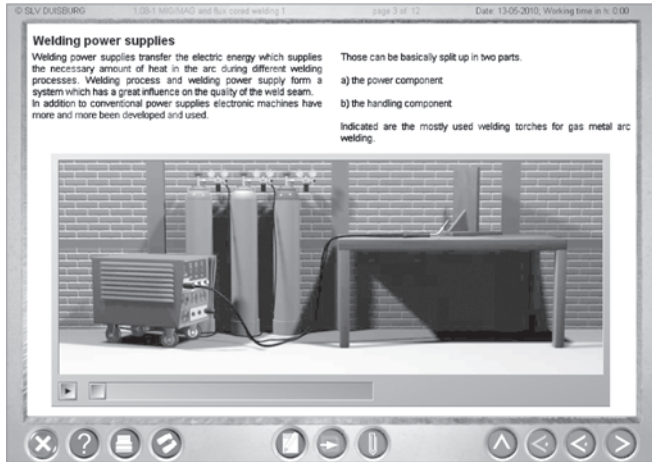


Figure 2. Screen of the software with an animation

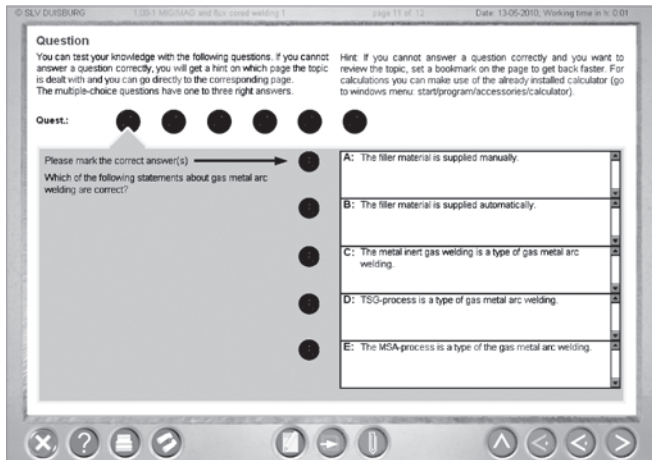


Figure 3. Screen of the software with a test in the end of the lesson

At the end of each chapter will be found a knowledge test with subsequent grading. Further, a general catalogue of questions and homework help to prepare for the examination (figure 3).

**Advantages**

One of the main advantages that this approach to training will bring is a reduction of the hours in the duration of the course from 438h to 350h as showed in figure 4 and figure 5.

Other advantages that can also be enumerated regarding the use of this tool are the following:

- Less traveltime and costs
- Less downtime in the company
- Fewer accommodation costs
- Fewer expenses
- Variable planning

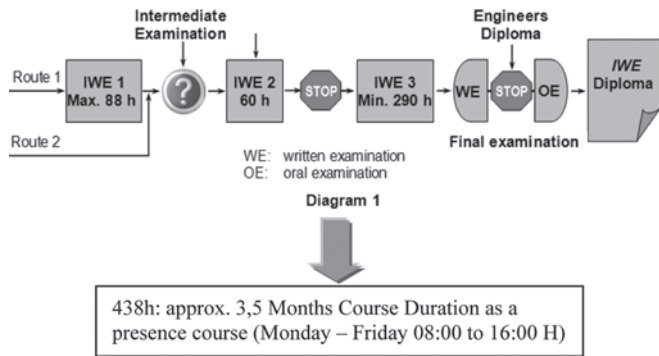


Figure 4. Normal IWE Course and normal course duration

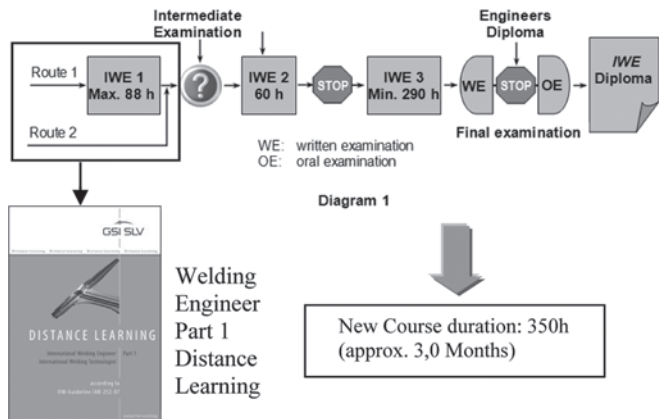


Figure 5. Reduction of course duration with distance learning training

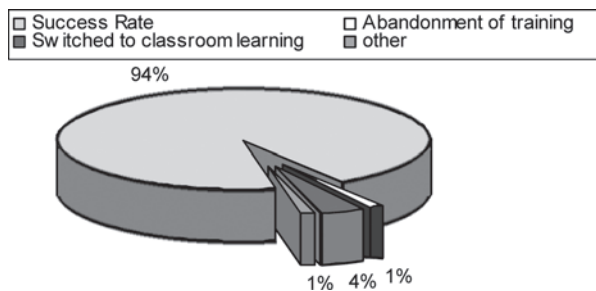


Figure 6. Students success rate of students in Germany

This type of distance learning training has been implemented in Germany since 2001 (English version in 2004) and had 1023 participants since then with a success rate of 94%, which proves that this type of training works in very technical courses like the Welding Engineering Post-Graduation Course, figure 6.

**Conclusions**

Currently, the training and qualification of welding engineers is harmonized throughout Europe according to the Qualification Guideline from EWF. However, distance learning courses and methodologies as envisaged by the DISTOOLWELD Consortium are still underdeveloped and require urgent improvement.

Since 1992 that EWF has been upgrading skill and competencies in welding related courses, contributing to the qualification of over 150.000 trainees. However, this has focused primarily in traditional in-room classes, where the student has to actually be physically in the classroom.

Distance learning courses are still not highly disseminated at the European level and this is something

that needs to be corrected. Therefore, this project will reinforce the European strategy of the EWF network for vocational training in the focused technological areas.

This project will improve the qualification of persons through distance learning courses by transferring a product with proven quality and well accepted in Germany to 4 European Countries where distance learning courses have to be developed and improved in order for it to reach more persons, as well as making these training methodologies more appealing and user-friendly for the prospective trainee.

## References

- [1]. "The Economic Importance of Welding and Joining in Europe", DVS/EWF Study 2009.
- [2]. Cirirus, "Thematic Monitoring - E-Learning", p.7, 2007
- [3]. <http://www.ewf.be/DistoolWeld/>
- [4]. <http://www.adam-europe.eu/adam/project/>

*Lecture presented in the 4<sup>th</sup> International Conference "Innovative technologies for joining advanced materials", Timișoara - Romania (10-11.06.2010)*



## Calendar of international and national events

### Calendarul manifestărilor științifice și tehnice internaționale și naționale

2010			
4-15 Oct.	International Congress on Welding and Joining Join-Ex 2010	Vienna, Austria	Schweißtechnische Zentralanstalt, Martina Leibl Arsenal, Objekt 207 A-1030 Vienna, AUSTRIA; tel.: +43 1 798 26 28-38; fax: +43 1 798 26 28-65; e-mail: martina.leibl@sza.info; <a href="http://www.sza.info">http://www.sza.info</a>
7-9 Oct.	MTeM 2010 - The 10th International Conference Modern Technologies in Manufacturing	Košice, Slovakia	Technical University of Košice, Letná 9, 042 00 Košice, SLOVAKIA; tel.: +421-55-6023524; fax: +421-55-6225186; e-mail: mtem.sjf@tuke.sk; <a href="http://www.sjf.tuke.sk/mtem">http://www.sjf.tuke.sk/mtem</a>
17-21 Oct.	Conference & Exhibition MS&T 2010 - Materials Science & Technology	Houston, SUA	ASM International, Rita Foreman-House, 9639 Kinsman Road Materials Park, Ohio 44073 USA; tel.: (440) 338-5151 ext. 5471; email: rforman-house@asminternational.org; <a href="http://www.matscitech.org">http://www.matscitech.org</a>
20-22 Oct.	18 <sup>th</sup> Technical Sessions on Welding	Madrid, Spain	CESOL - Avda. del Mar Mediterráneo, 22 - E- 28918 Leganes, Madrid, SPAIN; tel.: +34-91-4758307; fax: +34-91-5005377; e-mail: jornadas@cesol.es; <a href="http://www.cesol.es">http://www.cesol.es</a>
21-23 Oct.	2 <sup>nd</sup> South East Europe Iiw International Congress	Sofia, Bulgaria	Scientific-Technical Union of Mechanical Engineering; 108 Rakovski str., 1000 Sofia, BULGARIA; tel./fax: (+359 2) 986 22 40; tel.: (+359 2) 987 72 90; e-mail: info@iiwcongress2010.com; <a href="http://www.iiwcongress2010.com">http://www.iiwcongress2010.com</a>
4-5 Nov.	8 <sup>th</sup> International Conference "Structural Integrity of Welded Structures - iscs10"	Timișoara, Romania	ISIM Timișoara, Bv. Mihai Viteazul nr. 30, 300222 Timișoara, ROMÂNIA; tel.: +40 256 200222; fax: +40 256 492797; e-mail: centa@isim.ro, <a href="http://www.isim.ro">http://www.isim.ro</a>
26-27 Nov.	The 12 <sup>th</sup> National Conference on Metallic Structures	Timișoara, Romania	Facultatea de Construcții Departamentul de Construcții Metalice, Str. Ioan Curea, nr. 1, 300224 Timișoara, ROMANIA; tel.: +40-256-403932; fax: +40-256-403932; e-mail: adrian.ciutina@ct.upt.ro; viorel.ungureanu@ct.upt.ro, <a href="http://www.ct.upt.ro/cm2010">http://www.ct.upt.ro/cm2010</a>
2011			
6-8 Apr.	ASR International Conference "Tradition and art in power plants building"	Reșița, Romania	Romanian Welding Association, 30 Mihai Viteazu Bv. 300222 Timișoara, ROMANIA, tel./fax: +40 256 - 200041; e-mail: asr@asr.ro; <a href="http://www.asr.ro">http://www.asr.ro</a>
16-17 Jun.	5 <sup>th</sup> International Conference "Innovative technologies for joining advanced materials - tima11"	Timișoara, Romania	ISIM Timișoara, Bv. Mihai Viteazul nr. 30, 300222 Timișoara, ROMÂNIA; tel.: +40 256 200222; fax: +40 256 492797; e-mail: centa@isim.ro; <a href="http://www.isim.ro">http://www.isim.ro</a>
17-22 Jul.	64th Annual Assembly and Iiw - International Conference	Chennai, India	3A, Dr. U.N. Brahmachari Street, Kolkata 700 017, INDIA, tel.: +91-33-2281 3208; fax: +91-33-2287 1350; e-mail: iiw2011india@gmail.com; <a href="http://www.iiw2011.com">http://www.iiw2011.com</a>