# Persuasive Technology for Learning and Teaching - The EuroPLOT Project

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The concept of persuasive design has demonstrated its benefits by changing human behavior in certain situations, but in the area of education and learning, this approach has rarely been used. To change this and to study the feasibility of persuasive technology in teaching and learning, the EuroPLOT project (PLOT = Persuasive Learning Objects and Technologies) has been funded 2010-2013 by the Education, Audiovisual and Culture Executive Agency (EACEA) in the Life-long Learning (LLL) programme. In this program two tools have been developed (PLOTMaker and PLOTLearner) which allow to create learning objects with inherently persuasive concepts embedded. These tools and the learning objects have been evaluated in four case studies: language learning (Ancient Hebrew), museum learning (Kaj Munk Museum, Denmark), chemical handling, and academic Business Computing. These case studies cover a wide range of different learning styles and learning groups, and the results obtained through the evaluation of these case studies show the wide range of success of persuasive learning. They also indicate the limitations and areas where improvements are required.

**Keywords:** Persuasive Design, persuasive technology, eLearning, learning objects, case studies

## Background

In his seminal introduction of the concept of Persuasive Technology (PT), BJ Fogg [1] has identified several core principles of persuasive design of interaction systems. These principles have been shown to be able to change human behavior through indirect and informal learning. The question arose if these principles could also be put to use in more formal learning. In 2010 the EuroPLOT consortium [2] was formed to address this problem and to investigate the use of these persuasive principles in learning and teaching. . In this project, that is funded by the Education, Audiovisual and Culture Executive Agency (EACEA) of the European Commission in the Lifelong Learning Programme from 2010-2013, we have developed a framework for developing persuasive learning designs [6]. This framework was used to inform the development of two tools which allow the creation of persuasive learning objects based on persuasive learning designs: PLOTMaker and PLOTLearner. These two tools have been developed from existing software which has been extended with the persuasive elements and design options. These tools and the learning objects created with them have been applied and evaluated in four different case studies with groups of teachers and learners from realms with distinctly different teaching and learning practices: Academic business computing, language learning, museum learning, and chemical substance handling. Alltogether, these case studies have involved the following wide range of learner target groups: school children, university students, tertiary students, vocational learners and adult learners. With regards to the learning context, they address archive-based learning, industrial training, and academic teaching. The participants in these case studies are from Sweden, Africa (Madagascar), Denmark, Czech Republic, and UK.

## Main elements of Persuasive Design

The main idea in the EuroPLOT project is to develop technologies which would allow the designers of learning objects to create such objects with inherently built-in "persuasiveness". The seven persuasive design principles identified by BJ Fogg are:

1 **Reduction** refers to the design strategy of simplifying what would otherwise be a complex process. For example, Amazon's 1-click purchase which lets you skip a lot of time consuming navigations and tedious form filling, in order to make an instant purchase.

2 **Tunneling** is a design strategy which places the user inside a process that has a pre-determined direction. E.g. most installation processes require that the user completes several steps before the installations process is completed.

3 **Tailoring** is the degree to which a site or a program presents relevant content to individual users or user groups. Navigational options, filtering mechanisms and labelling systems can all be adapted to reflect user demographics.

4 **Suggestion** is the persuasive design strategy of delivering a message at the opportune moment. E.g. when Amazon suggests extra books which are closely related to the one you were just about to buy. - It is very important that suggestions are made at the right time, *Kairos*. This idea stems from ideas of Greek philosophers, in particular Aristotle. It may be defined as the opportune moment to perform a persuasive action. It is a quite powerful concept which is not easily formalised, but its use in technology applications can significantly contribute to persuasiveness by the just-in-time and just-in-place paradigms

5 **Self-monitoring** is the design strategy which allows you to monitor progress. E.g. sites which require a log-in and then enables the user to monitor the progress of weight loss.

6 **Surveillance** is closely related to self-monitoring; however the monitoring is not done by the user but by the system or the owners of the system. E.g. when using a weight loss website, users may be motivated not only by monitoring their own progress, but also by sharing experience and receiving feedback from other users who are struggling with similar issues. By sharing statistics, diet-plans etc. users feel more related to each other and may be inspired by actions taken by others.

7 **Conditioning** refers to the strategy of embedding emotional feedback into a design. It is often expressed as praise and rewards, but in a slightly more subtle manner than be the case with Persuasive Social Actors. E.g. when forums reward users with increasingly lofty titles (or user rights) in correlation to the number of posts made by the user.

## Tool development and case studies

### Tools
Two tools were developed in the course of the EuroPLOT project for creating such persuasive learning objects: PLOTMaker stems from the software tool GLOMaker [3] which allows to create self-contained digital learning objects and which has already been in use and development for several years before the EuroPLOT project. The additions to convert GLOMaker into PLOTMaker during the EuroPLOT project include several elements that refer to the persuasive principles, which can be put into the learning objects created with PLOTMaker. In particular the Augmented Reality component in PLOTMaker demonstrates the Kairos principle of just-in-place for location-based learning.

The tool PLOTLearner has been derived from the tool 3ET [5] and is using a large corpus of data in which language tests are stored, based on the database EMDROS [4]. This database is annotated and allows to retrieve text, broken into components of the language structure (words, phrases, clauses etc.). This very specific capability makes PLOTLearner suitable for learning where a large corpus of text is available.

### Case studies
These two tools have been used to create learning objects in four case studies for demonstrating the viability of the persuasive learning approach. Altogether, these case studies cover several different learning styles, learner and teacher groups, countries and cultures. As target learners they address school children, university students, tertiary students, vocational learners and adult learners. With regards to the learning context, they address archive-based learning, industrial training, and academic teaching. Internationally these case studies include participants from Sweden, Africa (Madagascar), Denmark, Czech Republic, and UK. These case studies do not claim to give a comprehensive answer to the question if persuasive learning does have a deeper positive impact than traditional learning. But they allow to exemplary show that this approach does have benefits for learning success. The reason for involving such a wide range of topics, learners, and learning styles was to demonstrate the applicability of persuasive learning across a wide range.

*Academic Business Computing*
This case study is undertaken in the framework of database teaching in academic computer courses which are taught at two universities. The learning objects in these courses are developed with the tool PLOTMaker and are focusing on teaching basic SQL. The goal of this case study is to demonstrate the applicability of this approach in two different countries and languages (English in UK, Czech in Czech Republic). The specific topic of these learning objects is database normalization and SQL querying, and the main persuasive principles used in the PLOT's design are **reduction** and **interactivity**.

*Language Learning*

This case study investigated the learning of language with the help of a large corpus of text. The learning tool PLOTLearner was specifically developed for this kind of learning with a large text repository (data-driven learning) from annotated texts. The language to be taught is Ancient Hebrew. Due to the difficulty of this language, this provides a valuable example of showing how a language with a different visual writing system can be taught effectively to students through the engagement with a large structured text corpus.

*Mediating Kaj Munk*

The Danish writer and vicar Kaj Munk (1898-1944) has produced a significant oeuvre of plays and other texts, all of which is archived in the Kaj Munk Archive in Aalborg University. In addition, there is a Kaj Munk Museum in his old Vicarage in Vedersø (Denmark). Learners who want to inform themselves about life and work of this writer can do so through several methods developed in the EuroPLOT project: they can explore the writings through an online Kaj Munk Study Edition that allows structured access through the EMDROS database of Kaj Munk's works. Furthermore, at a tool has been developed which makes it possible to visit the Kaj Munk Museum virtually using mobile devices, hereby using computers as persuasive media with Augmented Reality (AR) technology.

*Chemical Substance Handling*

In an industrial context, employees often need training in how to implement and handle new regulatory demands. This is especially important in the case of using chemical substances which may be harmful. In the EuroPLOT project, DHI has used PLOTMaker to develop learning objects which teach adult learners in an industrial context how to handle such dangerous chemicals. This considers health and safety aspects, and the persuasion of the learning objects is implemented through tailoring and simulation.

## Results

The evaluation is in its final phase, and the results will be available and presented at EC-TEL in September 2013. A common set of evaluation criteria was set for all case studies, although this could not consequentially maintained due to the fundamental differences of these scenarios.

The **Business Computing** case study uses an outcome-based learning design paradigm for creating the courses, hosted on the virtual learning environment *Blackboard Learn*. Student feedback was evaluated and overall positive attitude and reception was noted. Constructive alignment has been found in the context of this case to be a key principle for which learning objects can be perceived as persuasive and effective for learning.

The **language learning** case study for Ancient Hebrew has involved learners in Denmark, Sweden and Madagascar. The tool PLOTLearner was successfully evaluated with 91 learners. Instructional strategies that embed self-reflective learning activities and challenging interactive exercises have been detected as particularly valuable components of a persuasive design approach for learning the language.

The **Kaj Munk** case study has involved teachers and students in classroom and outdoors (AR). One novel contribution was the *Conceptual Pond* in which personal reflections can be collected in a simple and intuitive way.

The **Environmental Science** case study for teaching handling of harmful chemicals has involved 22 participants. The process of creating learning objects did lead to further improvements in the tool capabilities. In the context of this case study for adult education we

found that the use of explorative learning designs has shown potential towards creating an awareness of the practical relevance of what was learned.

## Future work

The EuroPLOT project will conclude in October 2013. Workshops will be held to inform about the results of this project, but also about lessons-learned and the general persuasive concepts for teaching and learning. Further work is to conduct an actual study on the true effectiveness of persuasive principles in teaching and learning, as these case studies only provide an indication of the effectiveness of persuasive learning.

## References

1. Fogg, BJ: Persuasive Technology - Using Computers to Change What We Think and Do. 2003, San Francisco: Morgan Kaufmann Publishers (2003)
2. EuroPLOT: Persuasive Learning Objects and Technologies. http://www.eplot.eu/ (2010)
3. GLOMAKER: http://www.glomaker.org/ (2013)
4. Emdros. Emdros - the database for analyzed and annotated text. http://emdros.org/ (2013)
5. PLOTLearner 2: http://www.ezer.dk/3ETusersguide/PL-2.0.1/en/intro.php (2012)