

# Invisible Learning in Online Systems

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## Preface

This paper looks at the concept of invisible learning in the context of the Oxford University Enabling Mothers to Understand Maternity (E-Mum) project. It argues that users take in messages from an online system's structure, layout and navigation alongside more direct methods of information uptake such as reading or scanning. If this subliminal absorption is harnessed and exploited by developers, it can be used to encourage learning in overlooked or excluded target user groups. The principle can be developed using other models of information uptake such as gaming and cartoon-reading to encourage learning to take place beyond the ubiquitous textbook paradigm. User groups of materials ranging from online support to e-commerce websites can also benefit from developer awareness of invisible learning principles at the design stage of online systems.



Figure 1) Using the E-Mum website© BBC

## 1 The concept of invisible learning

Invisible learning is nothing new and it is not limited in its application to web pages. It is why we learn a bus number that always sits in our line of vision next to the destination that we are actually reading; it is why children's pop-in-the-hole toys often re-enforce the shape that matches the hole by making them both the same colour. It is the contention of this paper that, while users are absorbing information from the screen by reading or scanning, the screen's message can be reinforced by subliminal uptake resulting from the online system's structure, layout and navigation.

To understand how this works, we need to examine the range of online learning activity that might occur when a user is engaging with a website page.

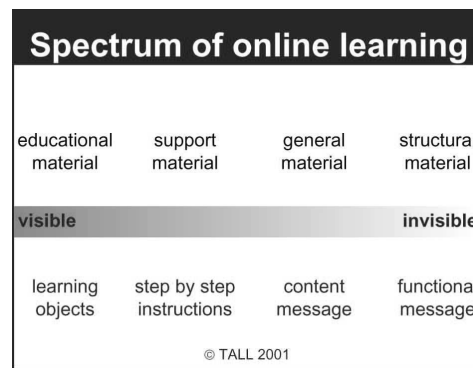


Figure 2) The online learning spectrum

If we consider the spectrum of online learning in Figure 2, we can see that at the visible or overt learning end sits educational material. This is material or a learning object designed with a specific pedagogical aim in mind. From here we move along the spectrum to support material - online help files, user support materials on the web - that are designed to connect with the world of user experience, although the teaching aims may not be so specific. They are dictated by user requirement. Next, we move to general online material, that is to say a website on fishing or salsa-dancing that a user consults to gain or learn information. Here it is much harder to say whether the developer's aims are met when users read or scan the site; although we know that the user can go to a site and take away information<sup>1</sup>. Finally at the invisible or covert learning end of the spectrum sits structural online material - such as navigation features - users take away or learn from these features in a way that has not been definitively researched. It is clear however that users learn the structure of the site from its design and navigation system efficiently or less successfully depending on the efficacy of these features.<sup>2</sup>

In web pages, you can see how developers exploit this principle in a number of ways; usually always disruptive in that they rely on breaking a user's train of thought to draw attention to a desired subject. For example, advertisement banners are often put next to navigation features in an effort to ensure that users see them: however this device is mostly counter-productive<sup>3</sup>. In an online system or learning environment, however, the aim is to

<sup>1</sup> In **Web Site Usability: a Designer's Guide**, Jared Spool et al set questions on selected sites for users to answer during the course of observed tests: the results show that users learnt information from the sites - although not always everything they wanted to know.

<sup>2</sup> The same study highlights how navigational design - especially of links - affects user uptake.

<sup>3</sup> The Stanford Poynter Project Eyetracking Online News study 2000 at <http://www.poynter.org/eyetrack2000/index.htm> showed that 55% of banner ads were ignored while the other 45% were looked at for an average of one second.

make invisible learning work for us not merely by forcing an attention conflict that forces user's attention off in different directions.

To gain from this principle effectively, existing and expected models of information uptake - such as the book, proto-web<sup>4</sup> and online help models - may need to be extended. Or we may need to incorporate models of learning culled from fields as diverse as gaming and teenage magazines which might be termed the gaming and browsing models of online information uptake. If we look at the former for example, it is clear that structural and navigation information is almost always learnt invisibly, with no recourse to manuals as young users like to get on with playing or are in arcades<sup>5</sup>. This incorporation of other models is of particular relevance to targeted user groups who are often not supported or even excluded from an online system's remit. These might include non-English speakers, the illiterate or the non-technical beginner. As will become clear in the next section, the E-Mum project provides a prime opportunity for application of invisible learning techniques.

## 2 E-Mum Project

### 2.1 Overview

E-Mum (Enabling Mothers to Understand Maternity) - a BT Higher Education Award-funded project - is being worked on in collaboration by TALL (Technology Assisted Lifelong Learning) and MIHTR (Maternal Infant Healthcare and Telemonitoring Research Unit); both part of Oxford University. TALL is the only exclusive online educational development unit nationally and is responsible for the first online courses at the University. The Maternal Infant Healthcare and Telemonitoring Research (MIHTR) unit is based on 15 years of research using continuous physiological monitoring to investigate foetal and postnatal development and the impact of environmental factors, such as diet, stress and smoking.

The work planned over the next two years should benefit young and disadvantaged mothers by providing effective and potentially life-saving information about pregnancy in their own homes.

The challenge is twofold:

1. to provide educational material in a way that is suitable for our intended audience who may be deprived both socially and educationally;
2. to integrate live data from a foetal monitor within our online presentation making the material uniquely pertinent to each mother.

The project will be conducted with the support of young women in Oxford and in Great Yarmouth.

<sup>4</sup> The web model has, in the author's opinion, still to be finalised and agreed upon hence the term proto-web.

<sup>5</sup> Schneiderman, in **Designing the User Interface**, points out that in gaming 'The commands are physical actions - such as button presses, joystick motions, or knob rotations - whose results are shown immediately on screen. There is no syntax to remember, and therefore no syntax error messages'.

If successful, it is hoped that the work can be extended to other health conditions where home monitoring and education would be suitable: such as heart disease and diabetes.

## 2.2 Working with the Target Audience

The UK teenage pregnancy rate is the highest in Western Europe at around 90,000 conceptions a year of which about 56,000 (three fifths) result in live births. The rate is twice as high as Germany, three times as high as France and six times as high as in the Netherlands. Teenage pregnancy arises disproportionately in socially and educationally disadvantaged women. Inevitably, poor foetal, infant and long-term outcomes are much higher in these pregnancies.

Pregnancy and childcare responsibilities often prevent women from disadvantaged backgrounds gaining and maintaining marketable skills and knowledge. Isolation can further erode their employability by undermining self-confidence. These difficulties are compounded when the pregnancy involves medical complications.

In addition, lack or interruption of full-time education means women may have poor reading skills or may simply not be able to absorb information in conventional ways. But conflicting evidence shows that the target audience are often at home with new technology: many will have used computers and the Internet<sup>6</sup>, and possess mobile phones.



Figure 3) The guides screen uses sound and graphics to help overcome reading difficulties

## 3 How invisible learning might be applied

### 3.1 Overview

For complementary invisible learning to take place, developers need to be aware of where and how it can occur. They can then ensure that that subliminal messages taken, for example from positioning of items on the page, use of colour and other features, are re-enforcing the information they want to get across and not disrupting it. They also need to be aware

<sup>6</sup> In a recent study (July 2000) at the Great Yarmouth Young Women's Project, 97% of a group of 40 young women surveyed had used a computer and 52% had used the Internet.



of their target audience: in the case of the E-Mum project, whilst reading skills may be limited amongst the young women, there is a readiness to accept computers as learning tools and means of communication.

### 3.2 Examples from the E-Mum project

E-Mum aims to encourage invisible learning in several ways: some of which are listed below.

- Nowhere does the content rely solely on reading skills except where there is a clear motivation to read the information: for example, in the week by week descriptions of pregnancy. These are kept very brief and use simple text.
- Colours are used to re-enforce the site's structure showing the distinction between different subject areas and providing a simple non-text navigation system.<sup>7</sup>
- Magazine style, especially that of teenage magazines, is used to provide a framework for simple blocks of text. The framework is familiar to the target audience and provides a reassuring starting point from which to browse the site. The scanning type reading of magazines is also most suitable for reading web pages<sup>8</sup>, as the computer screen is hard to read from.
- Multimedia features are exploited so if users cannot get information one way, they can find it in another<sup>9</sup>; such as through a sound quote; see Figure 3 above. This also re-enforces the learning activity.
- Computer games and cartoon-reading provide the inspiration for new ways of learning in this example which follows the structure of platform games such as Super Mario World.

<sup>7</sup> Alan Dix et al in **Human-Computer Interaction** define three principles to support usability: learnability, flexibility and robustness. The colour map works to reinforce the first of these.

<sup>8</sup> Jakob Nielsen contends that readers don't read online pages; they always scan. See **How Users Read on the Web (October 1, 1997)** at <http://www.useit.com/alertbox/9710a.html>

<sup>9</sup> This supports Alan Dix et al's second principle to support usability: flexibility in a system or the multiplicity of ways the user and system can exchange information. (The third principle is of robustness or the level of support a user is given whilst achieving their goals is met within the website's help system and supporting links.)





Figure 3a) Enter the babycare game

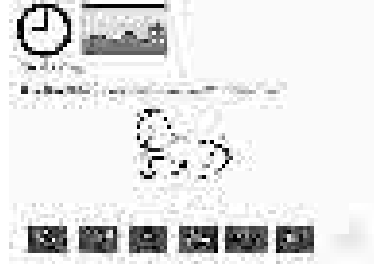


Figure 3b) Select your option: note that both scenario and choices are predominantly presented in graphic form.



Figure 3c) One of the right choices

Usability testing will be held at three stages of the project over 2000 - 2001:

1. **User evaluation (1):** an initial evaluation of the overall "look" of the screens and basic content, using static screens/print-outs with 5-10 young mothers at the John Radcliffe Hospital, Oxford in a series of informal semi-structured interviews.
2. **Expert Evaluation:** 3-5 peer evaluators not previously familiar with the site examine a working version in relation to a recognised set of usability principles (heuristics).
3. **User evaluation (2):** a video evaluation of the working website using 5-10 mothers at the Great Yarmouth Young Women's Project using both the video and discussion of key issues with the mothers to produce a written report.

These tests aim to capture the success or improve the results of the above methods using the responses of the target group users.

### 3.3 Avoiding the Pitfalls

In summary, it is important to avoid clashes between information that is absorbed subliminally and that taken in directly. Some problem areas that have informed the development of the website are listed as follows:

- Animations are a good example of where the constant flickering captures the eye's attention but distracts from more significant messages such as navigation structures.
- Differences in formatting, redundant colour and screen features -such as gratuitous design features - can also disrupt a user's information uptake.

- Research by Jared Spool<sup>10</sup> indicates that users expect key information to appear in certain screen areas and may discard important data if it doesn't appear where they would expect it to.

All of these features may appear to have a significance subliminally: the user looks for the message but there is none. In the meantime, the on-screen instruction or description loses its full force.

## 4 Conclusion

Invisible learning can be applied alongside more conventional techniques for getting your message across within online systems. It can re-enforce the content message but only as long as it is a considered stage in development. Invisible learning can also provide a mechanism for including user groups who may otherwise have difficulty taking in information from an online system. These user groups can benefit from incorporating Invisible learning elements and from the use of models that go beyond the textbook. There is evidence to suggest that getting away from traditional reading skills online suits the medium best and, as a result, it can encourage learning to take place for all users.

## References

- [1] Report by the Social Exclusion Unit, "Teenage Pregnancy", The Stationery Office, 1999
- [2] Web Site Usability: A Designer's Guide, Jared Spool et al., Morgan Kaufmann; ISBN: 155860569X, 1998
- [3] Designing the User Interface, Strategies for Effective Human-Computer-Interaction, Ben Schneiderman, Addison Wesley Longman Publishing Co; ISBN: 0201694972, 3rd Ed edition 1998
- [4] Human-Computer Interaction, Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Pearson Education (Academic); ISBN: 0132398648, 2nd Ed edition 1997

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<sup>10</sup> Visit the User Interface Engineering Site at <http://www.uie.com> for more information on this point.