

# Evaluating Games Designed to Improve Financial Capability

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## Abstract

A multi-level approach to evaluation of serious games for financial capability is presented in this poster. The approach has been implemented as a toolkit in the context of xDelia, a collaborative project on game-based learning with a focus on emotions in financial decision making. The toolkit has been developed as part of a larger design and evaluation framework for the project. Four facets for financial capability games are targeted by the evaluation: game design, financial capability, behaviour change, and learning with technology. The development of this toolkit is work in progress. An evaluation exercise is planned with existing financial capability games, where we want to assess the toolkit and refine its design to make it more effective for evaluators to use.

## 1 Introduction

This poster illustrates the multi-level evaluation approach of xDelia ([www.xdelia.org](http://www.xdelia.org)), a research and technology development project funded by the European Commission under the 7th Framework Programme. xDelia is an interdisciplinary project that brings together experts from the fields of organisational behaviour, neuroeconomics, experimental psychology, sensor systems, experimental economics, cognitive sciences, game research, educational technologies, practice-based learning, financial capability, and investment banking.

xDelia exploits new and emerging game and sensor technologies to investigate financial decision-making processes, including the role of emotions in people's decisions. Based on the insights gained from this research, the project will develop new, technology-enhanced approaches to financial training, with support for non-formal and informal learning in real-world settings.

## 2 The design and evaluation framework

The interdisciplinary character of xDelia, the multitude of interlinked empirical studies and game prototypes, and the international nature of the project's expert team requires an iterative approach to project implementation that is flexible enough to support the complex design and evaluation processes, and, importantly, to enable team learning and a shared understanding of research objectives, strategies, and activities. To ensure that comprehensive, ongoing evaluation is built into all facets of the project and that evaluation findings feed back into the ongoing development activities, xDelia has developed a Design and Evaluation (DE) framework tailored to the project's specific needs (Clough et al., 2009, Clough et al., 2010).

By focusing on the problem of evaluation and design, the DE framework fulfils a dual role. On the one hand, it acts as a guide for designing effective project interventions – workshops, studies, learning games, and so on – providing structure and support for good practice. On the other hand, it acts as a means by which to reflect on implementation processes and on outcomes, involving the stakeholders as reflective evaluators and feeding the findings back into the project on an ongoing basis.

The role of the DE framework is to structure and coordinate the different project interventions, making sure in particular that the information generated by the different design and evaluation activities finds its way back into the development process. We refer to this as *macro-level design and evaluation*. Macro-level DE thus organises the overall design and evaluation activities of the project, and reports its findings back to the project. For the more detailed specification of individual design and evaluation processes, the DE framework provides a *micro-level design and evaluation* template. For a given project intervention, micro-level DE describes the different design and evaluation activities, together with any resources needed for their implementation. Since xDelia consists of numerous project interventions ranging from workshops to studies and prototypes, the collection of micro-level DE processes is in fact a network of interrelated design and evaluation activities, where each concrete DE process is structured according to the micro-level DE template shown in the centre of the poster.

Certain parts of a micro-level DE process may be sufficiently well-structured to allow for a stable representation through conceptual schemata or procedures, and can therefore be implemented as paper-based or software *tools*. The purpose of this article is to report on the first design iteration of a micro-level DE *toolkit* – a set of tools designated for a common use – for financial capability games.

### **3 A design and evaluation toolkit for financial capability games**

The skills and knowledge, attitudes and behaviours that consumers need to enhance their financial security and wellbeing are generally referred to as financial capability (Kempson et al., 2005). The financial capability track of the xDelia project focuses on people's financial skills, attitudes and behaviours rather than on knowledge, and explores whether and to what extent serious games can be effective in this underexplored area. As a foundation for learning game design in financial capability, we have developed a design and evaluation (DE) toolkit that focuses specifically on the psychological determinants of financially capable behaviour. The goal is to streamline the DE process, making it more efficient and more transparent, and to facilitate collaboration between domain experts and game designers. At the same time, we want to explore more systematically the possibility offered by game-based technologies to modify people's behavioural patterns and decision making.

At present, there exists no unified method to design and evaluate learning games, let alone games for financial capability. Also, the idea of changing people's financial behaviour or target the psychological antecedents of maladaptive behaviour with learning interventions is quite new for policy makers and educators. Hence no well-documented initiatives exist to help us with the design of financial capability games. As a starting point, we chose a few topics that we thought our toolkit should address: financial capability, game design, learning with technology, and behaviour change. Each of these topics offers a useful and unique perspective on the game.

To speed up the game DE process, we have developed a set of spreadsheet-based evaluation tools that draw on existing models, frameworks, and taxonomies in financial capability, game design, learning, and behaviour change. The following sections describe the four different tools that make up the toolkit in more detail.

#### **3.1 Financial capability DE tool**

A central aim of most financial education initiatives is to provide individuals with the necessary knowledge and skills to make informed financial decisions and appropriate choices. The financial capability DE tool evaluates the extent to which a game targets different financial knowledge and skills. To ensure that these are in fact relevant in the context of financial capability, we use the FSA/BSA Adult Financial Capability Framework (2006) to develop the different measurement scales of the tool. The FSA/BSA framework, which proposes a set of key skills and competences that characterises a financially capable person, has guided the design of numerous financial education initiatives.

The current version of this spreadsheet-based tool groups the evaluation into three core sections – knowledge and understanding, skills and competences, responsibility – and nine sub-sections, which are further divided into 113 specific areas of knowledge, skills, and competences. Because evaluators may have problems to assess a game based on the rather

vague short descriptions of the nine sub-sections, we have combined the over one hundred specific areas into a more manageable set of 34 categories. Currently, the tool allows evaluators to indicate which financial capability areas the game targets and how well it does this, and provide a weight for each of the evaluation areas.

### ***Behaviour change DE tool***

While the financial capability DE tool primarily covers the more conventional financial skills, knowledge, and competences, what we are really concerned with in xDelia are games that in some ways target psychological and social factors that play a key role in motivating and influencing an individual's financial judgments and behaviour. Much of the psychological and behavioural research in economics has yet to find its way into developing better learning approaches for financial capability education. Since behaviour change – and here we include changes in antecedents of behaviour such as attitudes or perceived social norms – has been widely researched in health psychology, we turn to that literature to develop this DE tool. In particular, we draw on standard behaviour models (Glanz et al., 2008) and on a behaviour change evaluation tool for physical activity web sites (Doshi et al., 2003).

In the current version of the tool, we have adopted the taxonomy of behaviour change strategies proposed by Doshi and colleagues – knowledge, cognitive strategies, behavioural strategies, and emotion-focused strategies – and added antecedent factors of behaviour found in standard models such as the health belief model and the theory of planned behaviour. Examples of such factors are self-efficacy, subjective norm, goal setting, feedback, and emotion regulation. Although each of these factors can in principle be changed through learning or training, in practice this might be difficult to achieve or the effect on actual behaviour might be negligible. In general, because very little is known about effective ways to improve financial behaviour, the tool can only be indicative as to possible positive effects of a behaviour change strategy for an individual's financial capability.

The evaluator uses the tool to rate the presence or absence of the different behaviour change strategies within five different levels of increasing player interaction with the learning game. For instance, a game may provide the player with information about a behaviour change strategy, or it may help a player to find out about her maladaptive cognitions, or it may try to change a particular behaviour through game play. The levels of interaction are: information, skills, diagnosis, feedback, and gameplay. The tool calculates a score for the depth of player interaction, and we do not foresee at this point to rate the quality of individual strategies, since this is a complicated task that requires very specific expertise for each case.

### ***Game design DE tool***

Badly designed games are unappealing, demotivating, and are unlikely to generate useful learning in individuals. At present, there exists no unified approach to game design – let alone to serious game design – that we could use as a basis for this tool. Nor are there any standardised methods to evaluate games, with serious games posing a particular challenge here. Here, we use Jesse Schell's (2008) design lenses paradigm as a foundation for the game design DE tool. This is a broad, practice-based approach to game design, incorporating a set of one hundred different design aspect, such as essential experience, problem solving, competition, feedback, and so on. Each of these lenses asks a unique set of questions about the design, and we have modified them for the purpose of design *evaluation*.

Evaluating a learning game by asking focused questions about specific aspects of game design is highly intuitive and has a small learning curve for the evaluator, but still leaves room for expert judgment. Not all of the hundreds of questions of Schell's lenses are relevant for us at this point, and we have therefore reduced them to a more manageable size of 43 questions organised into eight categories: experience, game, elements, theme, iteration, player, mind, and mechanics.

This is the most complex of the four tools, with several auxiliary sheets to support the evaluation process. Each question, or aspect, is assessed on a five-point Likert scale and individual weights can be assigned to account for the importance of a particular aspect in a given evaluation exercise. Based on the rating and weight, scores are calculated for each of the five categories, and a total score gives an indication of the overall quality or merit of the game design.

### ***Learning with technology DE tool***

Learning design, technology, content, and outcomes are important features of serious game design and evaluation. We are at a very early stage in terms of learning DE tools, and at this point we have added only one tool for learning-specific design and evaluation in financial capability games: learning with technology. The tool draws directly on Jonassen et al (2003), who proposed five attributes to characterise constructive learning with technology: active, constructive, intentional, authentic, and cooperative learning. So-called assessment rubrics are used to evaluate the extent to which both technologically mediated learning activities and the environment in which they take place promote meaningful learning in formal learning situations. Clough (2009) adapted these rubrics to learning that takes place outside of the formal setting, and our goal is to modify them for learning with games. In next design iteration we plan to add DE tools for learning design and design evaluation, and for learning outcome evaluation.

In the current version of the tool, evaluators assess the games in terms of the 20 sub-rubrics and along the two or three levels of achievement proposed by Clough. A weighted score is calculated for each of the rubrics, where the weights vary as a function of the level of achievement. A first trial with these rubrics has shown that they will have to be modified in order to be operational and useful for serious game design and evaluation. Also, there are clear links between some of the sub-rubrics and the other tools, and these links need to be determined and incorporated in later versions of the toolkit.

### **Conclusions**

In this position paper we describe ongoing work on a design and evaluation toolkit for financial capability games as part of the xDelia project. The toolkit itself is developed in accordance with the design and evaluation process described in this article. We have now concluded the design part of the first iteration, where we developed four evaluation tools for financial capability, behaviour change, game design, and learning with technology respectively. The remaining work in this iteration is to evaluate the toolkit, which we will conduct using existing financial capability games. The outcome of this evaluation is recorded in the spreadsheet tools and provides the input to the second design iteration which will adapt and refine the tools. The second iteration will also provide us with an opportunity to extend the learning-related DE tools, especially in terms of learning design and learning outcomes.

### **References**

- Clough, G., Conole, G. & Scanlon, E. (2009) "Behavioural Finance and Immersive Games: A Pan-European Framework for Design and Evaluation", in *Same places, different spaces. Proceedings ascilite Auckland 2009*.
- Clough, G., Conole, G. & Scanlon, E. (2010) "Using Participatory Evaluation to Support Collaboration in an Interdisciplinary Context", in *7th Networked Learning Conference*.
- Doshi, A., Patrick, K., Sallis, J. & Calfas, K. (2003) "Evaluation of physical activity web sites for use of behavior change theories", *Annals of Behavioural Medicine*, (Vol. 25, 2), 105-111.
- Fsa & Bsa (2006) *Adult Financial Capability Framework*, Financial Services Authority & Basic Skills Agency.
- Glanz, K., Rimer, B. & Viswanath, K. (Eds.) (2008) *Health Behavior and Health Education: Theory, Research, and Practice*, San Francisco, Jossey-Bass.
- Jonassen, D. H., Howland, J. L., Moore, J. L. & Marra, R. M. (2003) *Learning to Solve Problems with Technology: A Constructivist Perspective*, Upper Saddle River, New Jersey, Merrill Prentice Hall.
- Kempson, H. E., S. Collard, et al. (2005). "Measuring Financial Capability: An Exploratory Study", London, Financial Services Authority.

Schell, J. (2008) *The Art of Game Design: A Book of Lenses*, Burlington, MA, Morgan Kaufmann Publishers.