

# From Theory to Practice: On Designing a Pervasive Learning Game

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## Abstract

*This paper moves the discussion of pervasive learning from the domain of theory into the domain of practice. It provides an overview of a model of pervasive learning and discusses how the model was used to support the development of one type of pervasive learning environment, specifically, a pervasive learning game called ProjectY.*

## 1. Introduction

A theoretical model of pervasive learning that could be used for the design and evaluation of pervasive learning environments was presented at last year's Pervasive eLearning workshop [1]. This paper moves the discussion of pervasive learning from the domain of theory into the domain of practice. It discusses how the pervasive learning model was used to support the development of one type of pervasive learning environment, specifically, a pervasive learning game called ProjectY.

ProjectY was a proof of concept with the aim of identifying whether a pervasive learning game could be used to teach complex subject matter (in this case, economics and politics) to a teenage audience and to see if learners responded positively to a pervasive learning game.

While player response to the game is outside the scope of this paper, a small pilot study conducted in 2004 found that participants responded positively to the game and demonstrated motivational and learning gains [2].

This paper highlights some of the considerations made during the design of ProjectY. First, a brief overview of the pervasive learning model and its 13 principles is presented. Next, the game concept and intended learning outcomes are described. Finally, the paper concludes with a discussion of how the game met the criteria set out in the pervasive learning model.

## 2. What is Pervasive and Ubiquitous Learning?

Pervasive—or ubiquitous or ambient—learning relies on the concept of “always on” education. Always on education is available 24 hours a day, 7 days a week, anywhere, at anytime. Pervasive learning is a social process that connects learners to communities of devices, people, and situations so that learners can construct relevant and meaningful learning experiences, that they author themselves, in locations and at times that they find meaningful and relevant. This definition points to four key elements of pervasive learning and it is these elements which comprise the four key components of the pervasive learning model [2]:

**Community:** Pervasive learning is a social process that connects learners to communities of devices, people, and situations, including other pervasive learning situations. Learners are not “taught” by one teacher. They are educated by the community (of which they play a central part), and educate others in the community as well.

**Autonomy:** Learners author learning experiences themselves and in doing so they take control of and direct their own learning processes. They have power over their own learning and have the ability to perform actions and intervene as they deem necessary. They are freed from power politics which see one central authority figure or authority structure directing the course of learning. They become comfortable with the knowledge that in the world questions do not necessarily have a single, correct answer, but that there are many variations and possibilities and learning feedback comes from a variety of sources.

**Locationality:** Learning occurs in locations and at times that are meaningful and relevant for the learner. Learning is not just for the classroom but for the world outside classroom doors, of which the classroom is a part, a persistent world where learning has no “on/off” switch.

**Table 1. Principles of Pervasive Learning**

COMPONENT	PERVASIVE LEARNING PRINCIPLE
COMMUNITY	<i>Principle One.</i> Relationship Building: Architect Situations but Forsake the Blueprints <i>Principle Two.</i> Conversation Instances: Don't Shut the Door on Collaboration <i>Principle Three.</i> Learner Roles: Resist the Urge to Typecast
AUTONOMY	<i>Principle Four.</i> It's All About Control: Give Learners the Power <i>Principle Five.</i> Content Ownership: Let Them Author and They Will Stay <i>Principle Six.</i> Multiple Solutions: Give Learners Freedom to Explore Possibility <i>Principle Seven.</i> Prior Experience, Future Growth: Make Knowledge a Valued Commodity
LOCATIONALITY	<i>Principle Eight.</i> Choice: Let the Learner Choose When and Where <i>Principle Nine.</i> Dynamic Content, Dynamic Environments: Design for Always On Not Always the Same <i>Principle Ten.</i> No Learner is an Island: Don't Deny Learners Their Context
RELATIONALITY	<i>Principle Eleven.</i> Personal Environments: Help Learners Personalize Public Spaces <i>Principle Twelve.</i> Personal Goals: Let Them Achieve Their Mission, Should They Decide to Invent It... <i>Principle Thirteen.</i> Personal Meaning: Account for Learner Perspective

**Relationality:** Learners construct meaningful and relevant learning situations to which they can relate. Because learners are learning concepts within their own personal environments they can understand better the implications of what they are learning and can construct ways to relate this knowledge to their lives.

Each of the components of the pervasive learning model overlaps and interacts; each influences the others and, thus, does not function on its own. Further, each of these spheres offers possibilities for extrinsic and intrinsic motivation.

In its current incarnation the model presents 13 principles that can be used for the design and evaluation of pervasive learning environments.

The principles should be viewed as dynamic rather than static. The model will grow and develop, principles will be added, others removed, as more pervasive learning environments are created.

While it is outside the scope of this paper to review the principles in detail, they are outlined in Table 1.

It is the implementation of these principles which is the focus of this paper.

### 3. Implementation of the Model: ProjectY

ProjectY is an intricate immersive mixed-media murder-mystery pervasive game intended to teach economic and political theory. Mixed-media, or cross-media, games use multiple devices and media channels for gameplay. ProjectY teaches economic and political theory as players progress through 21 days of gameplay. Each day of the game brings unique challenges and complex curriculum-related learning opportunities “disguised” as gameplay.

There were several key philosophies that drove the game design and informed further development of the pervasive learning model, including:

- Users should be able to add content within the context of gameplay
- The game would continue as players slept
- Motivational prompts and triggers would include text messages, phone calls, etc.
- The game would incorporate some sort of meeting spaces for ongoing debriefing
- Game clues would provide mediation
- Each player would be provided with specialized information that would be tailored to his or her ability or challenge level
- Players would be able to play in multiple locations

### 3.1 Game Modules

I have argued previously that in order to facilitate pervasive learning experiences, pervasiveness can be “manufactured” by creating ad-hoc networks of devices, people, and situations, including other pervasive learning environments [2]. An ad-hoc network is one where the key “players”—devices, people, and situations—can enter, exit, and move at any time [4]. Each device, interaction, and situation can be thought of as an interchangeable “module” that can be added, remove, or altered as necessary. In order to “manufacture” pervasiveness, ProjectY relied on this modular approach. ProjectY plays out in the PY universe and the PY universe is structured through connected game modules: a game engine called Myzel; the ProjectY website; radio announcements, snail mail, voice calls, voicemail messages, text messages, email, MSN messenger, and the internet. Each module functioned as both a standalone game component and a connected game component: at any time the game could be accessed on one device (standalone) or an enhanced gameplay experience could be achieved by playing the game on multiple devices. Content delivered depended on the strengths and suitability of that medium. The rationale for designing this type of gameplay experience (isolated to one medium or across all mediums) was to provide users with as much flexibility for delivery as they wished.

### 3.2 Intended Learning Outcomes

ProjectY was intended to be an innovative way of introducing players to economic and political concepts. Key events and challenges in the game asked players to consider such issues as “Should a government intervene in an economic system to protect the interests of society?” and “To what extent should political and economic systems emphasize the collective good or individual interest?”

## 4. Meeting the Criteria Set Out in the Pervasive Learning Model

During the design process the principles in the pervasive learning model served as a series of “checks and balances”: they were used to refocus thinking and were used to remind the designer of the overarching “requirements” of a pervasive learning game. The following details are not meant to be exhaustive or comprehensive. They express salient points related to four of the model’s thirteen

principles in order to highlight some of the considerations made during the design process. The pervasive learning model is intended to be flexible enough to allow for many ways of interpreting its principles. Thus, it is important to remember, that the descriptions represent only one way that the principles in the model can be practically realized.

### 4.1 Community

#### *Community Principle One. Relationship Building: Architect Situations but Forsake the Blueprints*

Since knowledge and expertise are distributed through relationship building [5], learners needed to be given tools to build relationships. In order to meet this criterion of the pervasive learning model, I first ensured that there were multiple channels available for player communication.

The Myzel game engine already had some player-to-player(s) communication components built into it. These included a public chat function, a private message function, and a private chat function.

Myzel’s ready-made communication features were augmented by 1) developing a web-based forum to allow players to discuss gameplay and get technical help and 2) by setting up a mobile phone account that would allow the exchange of game-related text messages.

At all times there was an awareness of the potential pitfall of overdesigning opportunities for social interaction.

As the field of multiplayer game design has matured, game designers have had to come to terms with the fact that if they “overdesign” opportunities for social interaction, players will seek workarounds and look for other types of support to fulfill their socialization needs [6]. For this reason, possible player-to-player scenarios were not scripted out.

Instead, communication was encouraged by building things that players could talk about (e.g. creating interesting landmarks such as poisonous swamps or obstacles such as locked doors).

### 4.2 Autonomy

#### *Autonomy Principle Four. It’s All About Control: Give Learners the Power*

Because pervasive learning environments are big spaces, one of the roles of a game designer is to give learners the tools to make the game’s scope manageable. Players needed to be given mechanisms

to control, and to learn how to control, the game they were playing.

Scope was managed by allowing learners to set the boundaries for how and when they interacted with the game. For instance, players could set the devices on which they wanted to be contacted (e.g. mobile phone but not email) and they could set times during the day when they did not want to be contacted (e.g. 9 a.m. to 4 p.m.).

Any game has a learning curve. However, it was felt that because players would not have played a game like ProjectY before, the learning curve might be much steeper than if they were playing a game from a genre they were already familiar with.

If players were expected to set their own goals and direct the course of their own learning, they needed to be given time to do so.

Players were not expected to initially feel comfortable with goal setting. The game was structured so that in the early days of the game, as players were becoming familiar with the game system, they were exposed to “basic” situations that helped them learn how to use the game.

For instance, in order to help players learn how to read the asset and balance sheet of their game bank accounts, one of the first tasks players carried out was transferring money to a non-player character. As the game progressed, and as players became more comfortable with the game systems, they were introduced to increasingly complex situations.

Game pace was another mechanism relied on to help players become comfortable with taking control of their learning. Only a few events occurred in the first four or five days of the game. As the game progressed, the frequency of game events increased and the game’s pace accelerated.

Empowering learners did not involve creating a game space that had no boundaries, but, instead, involved communicating to players what aspects of the game they could and could not control. Players were not given control over situations that they might not feasibly have control over in “real” life. For example, if they needed 8000 credits to build a refinery they couldn’t use magic to conjure up the credits. They had to earn them, somehow.

Furthermore, the game was designed so that players couldn’t go back in time. They could not undo decisions that they made, nor could they replay the same scenario over and over again. Decisions had repercussions and players had to deal with the outcomes of their decisions.

### 4.3 Locationality

*Locationality Principle Eight. Choice: Let the Learner Choose When and Where*

One of the tantalizing possibilities offered by pervasive and ubiquitous computing is “learning anywhere, at anytime.” With the development of pervasive and ubiquitous environments comes a considerable expansion of the locations of learning. ProjectY was designed so that it could be played wherever and whenever learners chose. Learners could select the devices on which they wanted to play the game, from their mobile phones to their PCs. As a result I made the design decision to construct all game content in text first, before undertaking more time-consuming design work (e.g. recording voice calls or “typesetting” newspaper articles). This way, no matter what device learners chose, the entire game would be accessible at a base text level.

But letting a learner choose where and when they wanted to learn did not translate into a design mandate of only having the game deliver content if a player initiated it. In fact, quite the opposite. The game let players set the boundaries of contact (e.g. times they were unavailable and the devices on which they did not want to be contacted) but within those boundaries it offered them learning “temptations.”

Players received prompts and triggers—game events that required players to take action, such as meeting requests via text message—to entice them to play.

### 4.4 Relationality

*Relationality Principle Eleven. Personal Environments: Help Learners Personalize Public Spaces*

Both the virtual and the physical world were considered when determining how to make players’ pervasive learning spaces personal. In the virtual world, the game was designed to allow players to take over virtual spaces. Players could build houses, they could name areas of the game world after themselves, and they could erect monuments. But the game’s design wasn’t solely focused on letting players inhabit digital territory. It also required that players also be able to take real world spaces and make them personal. To this effect, the game was designed to allow players to interact with tangible objects, from both a visual and sensory (e.g. a

newspaper clipping) and also an auditory (e.g. a phone conversation) standpoint.

## 9. Conclusion

The pervasive learning model proved to be an invaluable tool for game development. However, the principles presented here are only a beginning and, certainly, the scope of the design process encompasses more than it has been possible to present in this paper. The pervasive learning model is only a first attempt at defining, and thinking strategically about, the pervasive learning space. There are many common threads that run between each of the components and the principles, so much so that when the principles are compared and contrasted there seem to be many thoughts described in each principle which overlap with the other principles of the model.

At this stage the mere act of compartmentalizing a complex phenomenon like pervasive learning could be considered reductive or premature. However, there seems to be value in undertaking such an exercise in order to go about the practical work of designing pervasive, ubiquitous, and ambient environments.

It will only be much later, after the pervasive learning model has been put to the test by the hundreds of pervasive learning scenarios yet to be developed, after the model has been adapted, revised, and contested countless times, that a more "accurate" model of pervasive learning will emerge.

But for now, the principles and components of this model are meant to support the development of pervasive and ubiquitous learning environments and to alert designers to areas that may need to be considered during development.

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