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# Design Principles for the Conceptualization of Games for Health Behavior Change

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**Abstract**

This paper presents a list of principles that could be used to conceptualize games for behavior change. These principles are derived from lessons learned after teaching two design-centered courses around Gaming and Narrative Technologies for Health Behavior Change. Course sessions were designed to create many rapid prototypes based on specific topics from behavior change theory coupled with iterative human-centered and games design techniques. The design task was composed of two broad goals: 1) designing efficacious technologies, with an emphasis on short-term behavior change and 2) using metaphors, dramatic arcs and game dynamics as vehicles for increased engagement and long-term sustained change. Some example prototypes resulting from this design approach are presented.

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**Keywords**

gaming, serious games, gamification, drama therapy, narrative therapy, narratives, behavior change, identity, personalization

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**General Terms**

Design, Experimentation, Human Factors

**Introduction**

Persuasive technologies such as phone apps or serious games share common goals of creating an engaging and efficacious experience towards behavior change. Either by modifying or adapting current interventions or by designing new applications based on behavior change theory, these techniques have the potential to reach millions of people who can benefit from a pervasive medium. Most designers and HCI professionals deal on a regular basis with apps focused mostly on usability and engagement. In parallel, many health and biomedical researchers focus mostly on high efficacy. Appropriate usability design may not be sufficient to guarantee long-term engagement - many times needed to gain adequate efficacy levels - however it is a needed condition for initial engagement/adoption. In this paper we present a preliminary list of principles for conceptualization of games for behavior change derived from key lessons learned after teaching two semesters of design-oriented classes, focused on games to improve wellbeing and health.

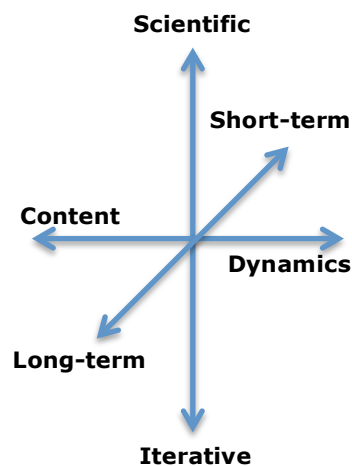
**Previous work**

Several studies have shown that CCBT (Computerized Cognitive Behavioral Therapy) such as MoodGym [12], Beating the Blues [13], among others, compare very well with face-to-face therapy. However, engagement and attrition levels are not acceptable. Indeed, even though 2/3 of depressed patients say they would prefer therapy over drug treatment, only 20% of patients referred for in-person psychotherapy actually start it, and 1/3 of those will drop out [9]. Web-based therapy also has very poor engagement, although apparently for different reasons [8]. Dropouts may be due to (i) lack of commitment by patients (ii) lack of a regular schedule for system use (iii) difficulty or tediousness of using the tools.

Gaming has important characteristics that enhance some cognitive elements such as selective attention [5], which can play an important role in behavior change, as they could help people pay more attention to the main message. Another very important characteristic gaming offers is that it also makes the learning process fun [7], which in turn generates better engagement. Complementary, games also help increase motivation [10] and emotional engagement. [6]

Previous work from Baranowski, et. al. [2] has already shown success using games for health behavior change. Some other gaming examples focused on health are the Personal Investigator [4] leveraging CBT for mental health, and Superbetter.us [17] which leverages real-life social support embedded into a superhero story.

Complementary to the gaming literature, the use of persuasive technology to improve usability and



**Figure 1 – Efficacy + Engagement game design dualities**

engagement for physical activity has been studied with the Ubit system [3], which showed increased exercise levels by improving goal tracking, as well as using metaphors to improve people's engagement. Many other examples around exercise, sleep and stress reduction, such as Nike Plus [14], HearthMath [15] and FitBit [16] seem to indicate that systems associated with a lifestyle change have also higher levels of engagement among their niche adopters. In any case, it is yet to be seen if these technologies are set to be adopted widely.

the use of games to improve engagement we find the Lumosity [18] suite of games used for cognitive training. Cognitive techniques are wrapped around mini games, improving engagement, ensuring improved efficacy over time [11].

### **The challenge: Efficacy + Engagement**

The challenge to merge efficacy and engagement can be dissected into the following design dualities (Figure 1) :

*Scientific vs. Iterative methods:* A gap exists between current clinical intervention development methods based on the scientific method (hypotheses + statistical validation) and iterative gaming and app technology design. Usability design demands an approach that favors exploring ideas based on prompt user feedback through the construction of prototypes. However, it is necessary to keep in mind that the overall goal is to generate efficacious behavioral change that helps overcome health or wellbeing problems. Merging these two approaches is one of the constraints used to design our course sessions.

*Short vs. Long-term focus:* Short vs. long-term change is treated differently from a behavioral perspective. The former demands knowledge around decision-making, emotional elements and personal skills, while the latter demands a deeper understanding of identity and personality. A good way to mix behavior change goals with identity and personalization are narratives and games. These two elements incorporate concrete micro tasks associated with roles and missions that can be translated into smaller behavior change skills, while the metaphors, scenarios and stories support a deeper immersion into new identities.

*Content vs. Dynamics:* When designing interventional technology, efficacy is usually regarded as the main goal. Engagement usually plays a secondary role, which could have a major impact in the adoption of the technology. Commercial apps do look for a more complete user experience, which pays attention to execution as well as engagement and identity details. However, success is usually measured in terms of revenue generation, rather than behavioral metrics. Merging both the content (i.e. narrative) as well as the dynamics of the game into a coherent design that help develop real life skills is yet another design challenge to be considered.

### **Design methodology**

It is important to note that the methodology followed during the conceptualization process in the course is focused on maximizing creativity provided the aforementioned constraints. To help students acquire sensibility around behavioral efficacy, specific behavioral theories are used as the basis of design challenges to promote rapid prototyping in very short sessions. A specialist, who many times has little design

### Behavior Change Topics:

- Intro to Behavior Change
- Intro to Life Stories
- Body-Mind Connection
- Positive Psychology
- Narrative Psychology
- Sports Psychology
- Anxiety, Depression and Cognitive-Behavioral Therapy
- Behavior Change in Society
- Drama Therapy
- Neuroscience Games
- Trauma Narratives
- Improv-based Games
- Communitarian Mental Health Interventions
- Digital Storytelling
- Social Networking for Behavior Change

**Table 1 – Behavior Change and Narrative Topics taught in addition to Gaming Development and Human Centered Design Topics**

experience, presents the theoretical component in a one-hour talk (Table 1). Students can ask questions associated with the topic being presented, and the specialist intervention closes with a brief discussion around the way such behavior change theories can be used to design new technology. Table 1 shows a list of the theoretical topics presented. During the second hour a design challenge is presented to the students. They need to go from problem assessment to a complete game concept with rules, usability scenarios, title and introduction. In many cases we even ask them to create a suggestive billboard to position the idea. Students need to begin by expressing a behavioral problem through its disempowering narrative and find the counteracting empowering narrative, which leverages the behavior change concept taught by the specialist. The students must storyboard both narratives (disempowering and empowering). They must also externalize relevant intangible elements such as the problems themselves and/or the feelings associated with it by converting them into enemies, scenes, obstacles or other gaming elements. Additionally, they need to externalize the skills needed to overcome such problems by portraying them as weapons or as specific game dynamics. At all times, students are encouraged to make sure game progression is elicited and not only end goals, to make sure change is embraced by the users. Finally, students are asked to test each other's games, present their game as if it was being launched on TV or act their games out.

### Prototype examples

Among many others we chose a few examples of the work done in class:

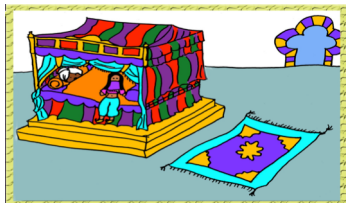
- *Monsters* (Figure 2) – a simple two-player game based on monsters and weapons. Concepts around externalization and empowering metaphors drawn from drama therapy and narrative therapy are used to make “visible” enemies and the weapons to destroy them. These elements have clear links to the problems and skills needed to solve them. For example, a monster representing stress can be seen as a flaming monster, and player 2 can be used to help you blow the torch by teaching you how to breath correctly to calm you down. Figure
- *Scheherazade's World* (Figure 3) – a game that aids in the prevention of suicide by creating a community for at-risk young women to share their stories. The One Thousand and One Nights tells of a king named Shahryar, who would marry a new wife each day and sentence yesterday's wife to death. Unlike previous wives, Scheherazade had a secret weapon to keep her alive. Every night, she would tell the king a story, only to end with a cliffhanger each night. Because the king wanted to know the rest of the story, he would spare her life for another day. Through stories, she was able to survive. This game is based in part on Narrative Therapy and Drama Therapy aspects, as well as Digital Storytelling.
- *Semester Adventure* (Figure 4) – a simple game to reduce stress and improve time management around test exams, where the player follows an adventure as a warrior that needs to reduce stress by gaining powerful tokens by improving his/her time management skills, i.e. fulfilling tasks on time, which are portrayed as enemies to be beaten. This game leverages personality theories based on life stories, which indicates that people assume new roles based on the way they define themselves. A



**Figure 2 – Monsters Game Screen**



Bedroom – Write stories here



Sultan's bedroom – Listen to Scheherazade

**Figure 3 – Scheherazade's World Game Screens**

"warrior" narrative helps people to be active and assertive, while a "victim" makes the person passive and receptive of disgrace.

## Principles for Conceptualization

### ***Understanding disempowering narratives***

- a. *Narratives are lived* - not only used to tell stories about one self. People confront ideas and situations based on the way they portray themselves. This is observed in trauma patients who cannot overcome the generalization of their disempowering narratives. Understanding the narratives new empowering narratives underneath unhealthy behaviors will help design new empowering narratives that change unhealthy habits, eliminate over-generalizations and organize thoughts around the appropriate context.
- b. *Focus on strengths* - Design around behavior change can benefit from understanding people's current strengths, rather than imposing an ideal model for functioning under a specific situation. A key concept that describes the basis for behavior change is what Bandura defines as self-efficacy [1]. In a nutshell, self-efficacy explains using current strengths. However, discovering strengths may demand an exploration not only of thriving experiences, but also difficult experiences, where strengths are used to be resilient and survive emotional or physical pain or disgrace.

### ***Externalizing problems***

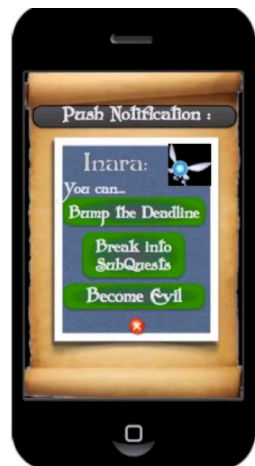
- c. *Interpretation and introspection* - Problems are rarely completely understood by users. Designers should strive to provide tools, time spaces and cues to help people interpret problems and introspect. Games with forced pauses and prompts for

reflection could help increase people's awareness of their own thoughts and further understand their problems. Furthermore, health behavior change games must be designed to be adaptive to changes in problem definition, as the game helps the user discover the root cause of a superficial problem.

- d. *Problems as fictional enemies* - Externalizing problems into concrete game elements (i.e. objects, monsters, obstacles, etc.) help people understand that a problem does not occupy every aspect of their lives. It also helps the user understand the characteristics of the problem, which in turn will help understand the possible solutions around it. Designers should provide users the possibility to externalize their problematic feelings into a concrete game or narrative element that can later be destroyed or controlled. The element representing the problem should have a clean metaphor, for example, stress into an oppressive rock, or depression as glue that impedes you to move, in order to help the user understand the characteristics and affordances of the problem at hand.
- e. *Materializing Skills into weapons* - As well as tangible problems, weapons that represent the skills required to overcome the problem should be materialized. Such tools must carry a clean meaning that is memorable and supports the notion that change is possible via the use of the metaphors associated with such weapons.

### ***Game Dynamics as Interventions***

- f. *Progress as a proxy for self-efficacy* - Eliciting progress should be a key element of game design for behavior change. Many times users need to realize first that "change" is actually possible. If no progression is clearly observed, the sensation of



**Figure 4 – Semester Adventure Game Screen**

inefficacy is perpetuated and therefore, any additional effort to develop skills or change motivations could be futile. The initial game levels must demonstrate to the user that change is possible.

- g. *Social Validation* – Sharing and celebrating with others helps assimilate the new changing reality. Without social affirmation around change, progress may seem part of our imagination. Designers should use social affirmation to promote self-efficacy. Using social influence could be used as a vehicle to get some concrete change, but it runs the risk to leave the user believing that they were imposed a new reality by others and therefore reducing gains in self-efficacy, which ultimately drives change.

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