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# Game Principles: Change, Choice & Creation: Making Better Games

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**Abstract**

Heuristics or player experience principles have evolved to assist designers and evaluators in creating better games. Heuristics are intended to provide a structure for improving game design. The technique of using heuristics to review designs has gained wide acceptance in productivity products. The PLAY heuristics [2] is the further iteration of HEP [1], general principles of optimal player experience. GAP is another set of principles, focused on first time player, tutorial use and initial game play. We conducted a study to assess the benefits of using heuristics for games. Results showed that heuristics are more effective than “unassisted intuition” not only in identifying problems, but also in inspiring recommendations for enhancements to the games’ player experience. Future analysis of the data will take this analysis further, examining the quality of recommendations.

**Author Keywords**

Video Games; Game Designers; Heuristics; Evaluation; Playability; HEP; PLAY; GAP; Game User Research

**ACM Classification Keywords**

H.5.3. [Information interfaces and presentation]: User Interfaces- Evaluation/Methodology.

**General Terms**

Evaluation, Design, Human Factors, Video Games

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*CHI 2013 Extended Abstracts*, April 27 – May 2, 2013, Paris, France.

ACM 978-1-978-1-4503-1952-2/13/04

## **Introduction**

Heuristic principles for the design and evaluation of video games have been gathered and researched since the year 2000. Starting with J. Nielsen's 10 heuristics for productivity systems [8], Federoff [6] began the study and exploration of heuristics and Games. Desurvire, Caplan and Toth [1] created one of the first sets of heuristics for games, evolved them and assessed their usefulness. These principles became the PLAY heuristics [2], and the GAP [3,4] heuristics when focusing on first time play and tutorials.

Assessing the impact of the PLAY and GAP heuristics on design and evaluation in over 50 games in industry, and with over 100 game design and evaluation students, we found that the application of these heuristics help identify player experience problems and suggested fixes.

However, we discovered through these experiences, the use of PLAY and GAP makes additional contributions to game design. Namely, we have found they are useful at the initial phase of design, in the creation of the game. At this first phase, these principles seem to inspire design recommendations when there is a problem found. Most impressively, their application seems to provide suggestions not only for fixes, but enhancements to what is already working, thus improving even further the players' positive experience. These recommendations for retention and enhancement are independent of identifying problems and their fixes.

### *Gap and Play Principles List*

#### *Content of Play*

PLAY principles consist of a checklist of areas of game play, such as: game usability, game play, game

mechanics, game immersion, and emotional connection, as well as coolness and delight. The collection is based on an earlier compilation, HEP, further honed, which have been validated in several studies, and is derived for several sources, including theories of play, design, practitioner experience, and prior game design principle lists [2, 5].

#### *Content of Gap*

GAP principles consist of learning principles as applied to video games, based on theories of retention, and easy use of tools to play. Results for the 400 Project [5] and the work by authors, such as Gee [7], have been included in the GAP principles. When the player finds the tools to play the game easily, they can focus on the game itself, which includes the intended challenge and immersion of the game. In other words, players are not distracted by the unintended difficulties. For more information on GAP, see references [3, 4].

#### *Utility of Heuristics in Games*

Used by some of the most successful and well-known game publishers and studios, filters or heuristics are useful in making what is mostly implicit and intuitive, explicit. Their utility is in assisting the designer in ensuring they have considered all the areas of game play from the players' perspective. It also provides a common language to communicate what is intangible, made tangible. Evaluators use them to look at the multidimensional aspects of a players' experience. These are the elements that make heuristics, like GAP and PLAY, useful to both game designers as well as evaluators.

### *Impact of PLAY and GAP Heuristics*

We performed a study to identify the contribution of Heuristics in the evaluation of video games and what differences there are in using heuristics for video game designers and game evaluators (researchers). In this study we compared the designer and evaluator performance, using heuristics versus unassisted (without heuristics) performance, controlling for game and order.

### **Study**

We performed a study to identify what heuristics provide versus not using heuristics, in evaluating video games, and what differences there are using heuristics for video game designers and evaluators.

### *Procedure*

We conducted the study with Game Designers and Game Evaluators, each evaluating two games, at two different times. Each group evaluated a game once using no heuristics (Informal), and once with the heuristics PLAY and GAP a formal method. Each group evaluated each game. We counterbalanced the order of conditions: doing heuristics Evaluation (PLAY and GAP) and no heuristics Evaluation (Informal) and a particular game. Comparing the impact of PLAY and GAP conditions to the Informal condition was our focus.

For each heuristic, participants were asked to decide if the heuristic applied in one of the following ways:

- It identified a problem (P)
- It suggested a fix (F)
- It showed a positive element, i.e. the game followed the heuristic (G – good)

- It suggested an enhancement that did not address any specific problem (I - Improvement)

A given heuristic could suggest none or any one or more than one of the above.

### *Study Design*

We had 13 Game Designers from the Intermediate Game Design class and 9 Game Evaluators from the Game Usability class at the Interactive Media department at the University of Southern California.

The dependent variables (DV) were:

- Number of Problems (P)
- Number of Fixes (F)
- Number of positive elements (G)
- Number of Enhancements (E)

We analyzed:

- Difference between PLAY and GAP heuristics and Informal conditions
- The difference between Game Designers versus Game Evaluators
- The difference between Informal evaluations done after a heuristics Evaluation versus heuristics Evaluations done first

We used two simple comparisons to test possible confounding factors:

- The difference between evaluations done at Time 1 versus Time 2 (regardless of condition)
- The difference between evaluations done for Game 1 versus Game 2 regardless of condition.

## Games Tested

Zombies, Inc. (see Figure 1) and Elephant Quest (see Figure 2) are both released strategic online games, similar in their complexity, and challenge.



Figure 1. Game 1 - Zombies, Inc.



Figure 2. Game 2 - Elephant Quest

Time 1		Time 2	
Heuristics	No-Heuristics	Heuristics	No-Heuristics
1 <sup>st</sup> half of Game Evaluators	2 <sup>nd</sup> half of Game Evaluators	2 <sup>nd</sup> half of Game Evaluators	1 <sup>st</sup> half Game of Evaluators
1 <sup>st</sup> half of Game Designers	2 <sup>nd</sup> half of Game Designers	2 <sup>nd</sup> half of Game Designers	1 <sup>st</sup> half Game of Designers

Table 1. The Study Design

## Analysis and Results

### Impact of Heuristics

Use of both PLAY and GAP heuristics showed a strong impact on all dependent variables compared to the Informal condition (no heuristics used). The figure below (Figure 3) shows mean frequency of responses for each dependent variable, plotted by condition.

Performing an ANOVA on all dependent variables, we found significant main effects.

- Problems:  $F(2,20)=51.7$ ,  $p < .001$  (eta squared = .86)
- Fixes:  $F(2,20)=43.5$ ,  $p < .001$  (eta squared = .84)
- Effective:  $F(2,20)=98.7$ ,  $p < .001$  (eta squared = .92)
- Enhancements:  $F(2,20)=16.75$ ,  $p < .001$  (eta squared = .66)

The overall results show that heuristics (both PLAY and GAP) not only help spot problems and suggest fixes, but also help participants recognize effective elements of the designs and suggest enhancements.

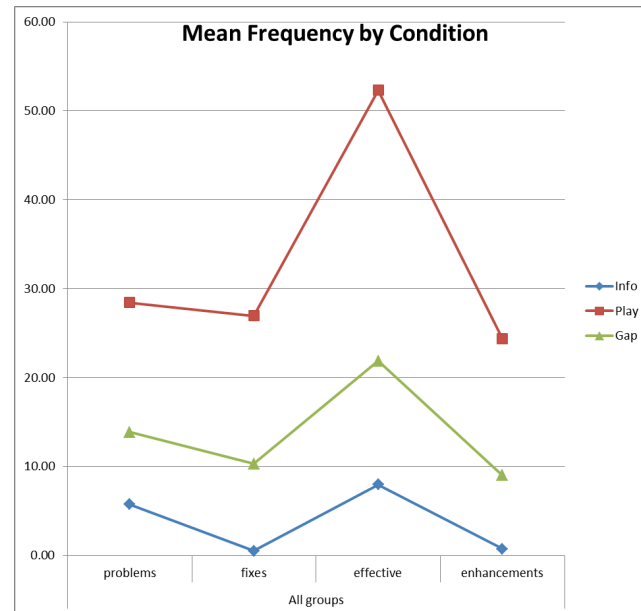


Figure 3. Impact of condition

In addition to the effect of the condition, the graph shows that over all participants, more effective aspects of the designs were found than problems. The results suggest that the games were relatively well designed. This also suggests that the heuristics helped validate the effective design. This pattern also occurs across all groups. In addition, for all groups, participants were more likely to find a problem than suggest a fix. A reasonable conclusion is that finding a problem is a prerequisite for suggesting a fix. However, enhancements were identified regardless of problems.

#### Game Designers vs. Evaluators

Figure 4. Shows the pattern of results for designers and evaluators plotted by condition (Informal, PLAY, and GAP) and dependent variables (problems, fixes,

effectiveness, enhancements). The pattern for both groups is similar in several respects. Lowest frequencies occur in the informal condition, GAP next, and the most in the PLAY condition, regardless of user group. The number of problems identified is higher than the number of fixes. Positive aspects of the designs (effectiveness) are highest with enhancements being the lowest.

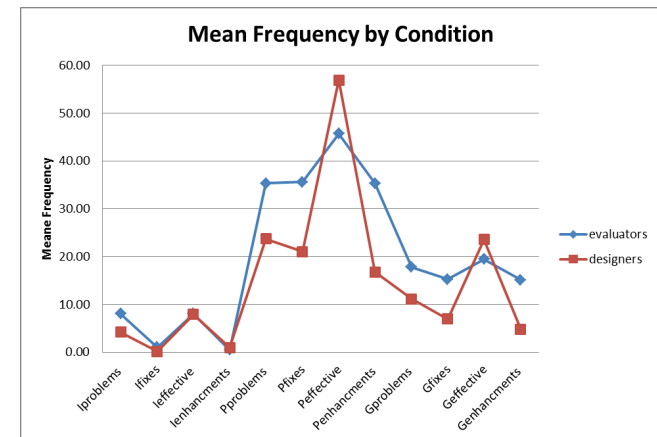


Figure 4. Results for Designers and Evaluations

Even though there are no overall differences between user groups, Figure 4 does show the patterns are complex, with Evaluators generating a higher frequency of responses in some conditions for identifying problems and fixes, and Designers producing more identification of effective design elements, but these are not significantly different.

#### Prior Experience with Heuristics

The hypothesis that participation in a heuristic review (PLAY and GAP) would improve performance thereafter

with an Informal evaluation was not supported F (1.20) = .174.

#### *Effect of Game and Order of Test*

When collapsed over condition, neither Game nor order of the Test (Informal first vs. heuristic first) showed any significant effects.

### **Conclusion**

Heuristics provide a structure which improves the performance of both designers and evaluators when reviewing video game designs. This result is reflected in more problems identified, more fixes suggested, more effective elements noted, and more enhancements suggested. Designers are more likely to see effective elements while evaluators are more likely to see problems, suggest fixes, and suggest enhancements. These differences between designers and evaluators are only found when both groups use heuristics. In summary the current results strongly support the value of heuristics in improving game design.

### **Acknowledgements**

We would like to gratefully thank the interns extraordinaire, Baldur Tangvold and Colleen Dimmer for their work in data collection and management. We also gratefully acknowledge the two classes for their time, classes CTIN 404 Game Usability and CTIN 484 Intermediate Game Design Fall 2012 Semester, in the Interactive Media Department at the USC.

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