



Developing a Questionnaire Based on Learning Theory for Identifying Game Components (QIGC)

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Background

- In line with vast growth and expansion of games market, gamification, applying “game design elements in non-game contexts” such as fields of education, marketing, and health care, in which user motivation and continuous usage are major interest, is widely happening (Deterding, Sicart, Nacke, O’Hara, & Dixon, 2011).
- Scales developed in an attempt to investigate game elements and their effect on continuous usage and behavioral change (Boberg et al., 2015), were criticized for their lack of comprehensive theoretical framework (Seaborn & Fels, 2015). To solve this limitation, operant conditioning (Skinner, 1953) could give a proper perspective.

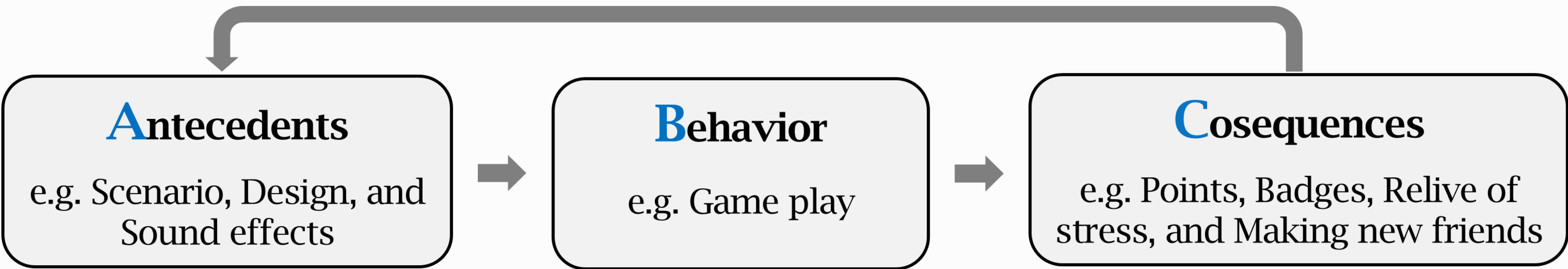


Figure 1. ABC's of Operant Conditioning

Purpose

- The purpose of this study was to develop and validate scale which investigates game elements based on 3-term contingency, in terms of game play.

Methods

- Development of the Questionnaire for Identifying Game Components (now called Scale for Game Structure; SGS, Chung, Kim, Ahn, Kim, Lee, & Lee, in preparation)
 - Various game elements were investigated through literature review and classified according to the principle of operational conditioning.
 - Content validity was assessed by (a) 3 game designer & developer (b) 2 heavy user.

Table 1. Questionnaire for Identifying Game Components (QIGC)

Constructs		# of Items	Items (e.g.)
Antecedents	Design and Structure	23	Overall difficulty, Sense of belonging, Suitability in Sound effects, etc.
	Reinforcement Systems	13	Fixed interval Reinforcement schedule, Variety of rewards, Negative punishment, etc.
Consequences	Natural Reinforcement	10	Killing time, Gaining social approval, etc.

Game selection

- 29 mobile games were selected based on market share, sales and download ranking (Role playing 48.3%, Action 20.7%, Puzzle/Board 13.8%, Strategy 10.3%, Casual/Arcade 6.9%)

Data collection (Online survey)

- Participants : 450 female/male adults, aged 20 to 49 years
- Participants chose two to four games that they are familiar with from the list of 29 mobile games, and they answered QJGC for each game they chose.

Data Anaysis

- Half of the data set was used to conduct EFA and item confirmation.
- The second half of data set was used to conduct CFA and internal consistency.

Results

- Exploring the underlying factors of three constructs of the QIGC

Constructs	Factors	# of Items	Factor Loadings
Design and Structure	Game Management	10	.603 -.465
	Degree of Freedom	9	.744 -.593
	Sound and Graphic	3	.786 -.501
Reinforcement Systems	Basic Reinforcement	7	.623 -.381
	Flexibility in Reinforcement	4	.592 -.421
	Punishment	2	.701 -.685
Natural Reinforcement	Self-Driven Reinforcement	5	.857 -.692
	Socially-Driven Reinforcement	5	.816 -.515

- Verifying the hypothetical factor structure of QIGC

	CFI	TLI	RMSEA (90% CI)	Chi-square	df	CMIN/df
CFA model	.904	.897	.049 (.046 to .052)	1745.269	800	2.182

- Internal consistency

Constructs	Factors	# of Items	Cronbach's α
Design and Structure	Game Management	10	.848
	Degree of Freedom	9	.839
	Sound and Graphic	3	.793
Reinforcement Systems	Basic Reinforcement	7	.812
	Flexibility in Reinforcement	4	.618
	Punishment	2	.674
Natural Reinforcement	Self-Driven Reinforcement	5	.913
	Socially-Driven Reinforcement	5	.837

Discussion

- The result of this study expands the theoretical application of operant conditioning, a comprehensive theory on behavior of organism, to gamification field, a new academic field which are getting spotlight recently.
- As confirmed by analytical results, QIGC covers diverse aspects of game elements, such as Design and Structure, Reinforcement Systems, and Natural Reinforcement.
- According to the results, QIGC could be used as valid and reliable scale in investigating diverse game elements considering human game play behavior.

References

- Boberg, M., Karapanos, E., Holopainen, J., & Lucero, A. (2015, October). PLEXO: Towards a playful experiences questionnaire. In *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play* (pp. 381-391).
- Deterding, S., Sicart, M., Dk, M., Nacke, L., O'hara, K., & Dixon, D. (2011). Gamification: Using Game Design Elements in Non-Gaming Contexts. In *CHI'11 extended abstracts on human factors in computing systems* (pp. 2425-2428). ACM.
- Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of human-computer studies*, 74, 14-31.
- Skinner, B. F. (1953). *Science and human behavior* (No. 92904). Simon and Schuster.