

A STUDY ON THE EFFECT OF GAMIFICATION ON USE-INTENTION AND PARTICIPATION IN LIBRARIES

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ABSTRACT. *Libraries should support child users to have various experiences and participate in activities in the library. To this end, we will apply the concept of “gamification” to children’s services and programs in the library. Gamification, in this regard, serves as a tool to generate attention and interest in library services and programs for children, so they may enjoy it. Therefore, the purpose of this study is to identify elements of library-based gamification and to analyze the effects of gamification on its use-intention and participation in libraries. For the empirical analysis, a survey was conducted with small libraries and elementary school users. The five elements of gamification derived from literature reviews are gameplay, achievement, communication, rewards, and virality. The results showed that achievement and virality factors influenced library use-intention and participation. Elementary school students prefer to participating in programs and services that are targeted and have a desire to achieve this. They are also interested in the information about the library’s programs and would want to share it with other people and use the library with their peers.*

Keywords: Small libraries, Gamification, Elementary school students, Use-intention, Participation

1. Introduction. Libraries continue to evolve responding to the needs of the present time and serving patrons. Therefore, libraries must be in tune with the latest technological trends and provide various types of information and services. Gamification is the introduction of game elements into non-game areas [1] and is a powerful tool with the ability to attract people’s attention, make them participate in activities, and influence their behavior [2]. According to the basic stage of child development at Queens Library in New York, children enjoy collecting things, having hobbies, and improving their self-learning skills as they go on to their next grade level in school [3]. Therefore, libraries need to provide a variety of activities, programs, and services that hold the interest of child users [4], so they can apply gamification so they may actively use the library. This study aims to identify the elements of gamification based on previous studies, ascertain how children, as users of the library, perceive elements of gamification and analyze how the library’s use of gamification affects use-intention and participation. Thus, this study can be a significant reference for research on library and information science and is meaningful by providing basic materials for the improvement and operation of library services in the library by empirically analyzing the influence of gamification factors on library use-intention and participation. This paper is structured as the mentioning. The Literature

Review defined the term and components of the gamification. Methodology described the tools and research processes. The Results discussed the statistical analysis results of the collected data. The Conclusion presented the results of this study.

2. Literature Review. Since the first Gamification Summit was held in January 2011 in San Francisco, USA, gamification has been actively researched and is a concept that has been applied to various products and services, online and offline. Deterding et al. [1] called it “the use of game design elements in non-game contexts”, and Zichermann and Cunningham [5] defined it as “the process of game-thinking and game mechanics to engage users and solve problems”. Gartner [6] introduced it as “the use of game mechanics to drive engagement in non-game business scenarios and to change behaviors in a target audience to achieve business outcomes”. In this study, the term “gamification” is synthesized with the aforementioned definitions by researchers and summarized as the use of positive game elements in non-game areas to create motivation for use and encourage continuous participation by users.

Wanda Meloni, founder, and CEO of M2 Research summarized the five characteristics of gamification as gameplay, creativity, communication, rewards, and virality [7]. By placing emphasis on the gamification characteristics summarized by Meloni [7], and referring to previous studies [9-13], this study seeks to identify gamification elements that apply to libraries. Among the characteristics outlined by Meloni, creativity is a basic function of the library as a “Lifelong Education Center”, which is in line with its role of providing supplementary support for learning and self-education activities [8]. Additionally, achievement, which Bunchball [9] described as working to achieve goals, and a motivating factor, is judged to be more appropriate from the library’s point of view. Thus, in this study, the elements of gamification are summarized as gameplay, achievement, communication, rewards, and virality, as shown in Table 1.

The use of gamification can be seen in a variety of examples that actively engage users by utilizing the attributes of the game for maximum effectiveness and benefit [14]. Bigdeli et al. [15] conducted a game-making study of library websites based on a ‘self-determination theory’ and ‘flow theory’. It was said that the method for inducing interest and users is a very important approach to attracting users, and that gamification with outstanding potential may help the library to become more enjoyable for users. Valerie [16] identified this effectiveness by using Minecraft games to help develop information literacy in elementary school libraries. Students have shown high participation in learning information literacy elements and their motivation has also been shown to be high. A study by Nand et al. [17] found that children participate more when they learn, including several functions of gamification. Therefore, it is expected that if gamification is applied to overall library services and programs, it will have a significant effect on users’ use of library and participation, and therefore, the effects of gamification are analyzed in this study.

3. Methodology.

3.1. Study subject. The purpose of this study was to analyze the effects of gamification elements on library use-intention and participation. For the empirical analysis, children for ‘elementary school students’ were selected. Elementary school children, aged 8 to 13 years, were selected because they could participate in the programs without a parent or guardian, and libraries currently run a variety of programs for them.

3.2. Research hypotheses and research methods. The research hypotheses are as follows:

Hypothesis 1. Elements of gamification (gameplay, achievement, communication, reward, virality) will have a significant effect on use-intention in libraries.

TABLE 1. Summary of elements of gamification

Elements of gamification	Explanation	Researcher
Gameplay	Enjoying the game through rule-based competition.	Meloni [7]
	The gameplay is a voluntary activity, and it makes us feel satisfied with the experience we find enjoyable. Therefore, the gameplay is an autonomous activity in which we can choose to enjoy games or stop playing.	Deterding [10]
Achievement	To accomplish and be motivated to achieve one's goals.	Bunchball [9]
	Everything that gives the player a sense of progress.	Radoff [11]
Communication	Expressing yourself, communicating and interacting with others.	Meloni [7]
	Social exchange and interaction with friends induces voluntary participation and the relationship with friends makes it hard to stop playing.	Kim [12]
Reward	Giving points such as scores, leaderboards, and prizes to motivate players.	Meloni [7]
Virality	Sharing and rapid dissemination through the web or social networks.	Meloni [7]
	"Viral marketing as word-of-mouth communication in situations where positive network effects prevail and where the role of the influencer is active due to positive network effects".	Vilpponen et al. [13]

Hypothesis 2. Elements of gamification (gameplay, achievement, communication, reward, virality) will have a significant effect on participation in libraries.

Literature reviews have shown that the elements of gamification are interesting and motivating. Therefore, this study hypothesized that all elements of gamification will affect use-intention and participation. In this study, dependent variables are use-intention and participation (Y) while gameplay (X_1), achievement (X_2), communication (X_3), reward (X_4), virality (X_5) were independent variables.

To test the hypotheses, a questionnaire was constructed based on Table 2, and a survey was conducted.

3.3. Research process. The surveyed libraries, with consent by the students to conduct the survey, included 2 small libraries in Seoul, 4 church libraries in Seoul, an elementary school "A" in Seoul, 3 small libraries in Incheon, and 1 church library in Gangwon province. The survey was conducted for 3 weeks from August 16th, 2019 to September 7th, 2019, with a total of 213 students participating in the survey. The procedure for surveying elementary school students was the following. First, the purpose of the research and intention of the survey were explained. After obtaining consent, the respondents were asked to start answering the survey. Before filling out the questions on gamification elements, students were requested to watch an example video that the researcher had edited separately, which lasted 30 seconds. The video had been compiled with the help of content found on the Internet with the search term, "gamification". The downloaded images were edited to help the students understand the questionnaire.

TABLE 2. Survey structure

Classification	Survey contents	Number of items	Measure	
I. User characteristics	Gender	1	Nominal	
	Grade	1		
	Library visits (per week)	1		
	Time spent in the library (per visit)	1		
	The main purpose of visiting the library (multiple answers possible)	1		
II. Extent to which the elements of gamification are viewed to be important	Gameplay	Mission	1	Likert 5-point scale
		Ranking	1	
		Fun environment	1	
		Programs and services with play	2	
	Achievement	Goal setting programs and services	2	
		Step-by-step programs and services	2	
		Achievement (satisfaction)	1	
	Communication	Communication when participating in programs and services	2	
		Organization of clubs	1	
	Reward	Badge collection	1	
		Prize money (product)	1	
	Virality	Provide notifications and help on programs and services	2	
		Word of mouth	1	
III. Survey on Use-Intention and Participation	Use-Intention	Interest in programs and services	2	
		Participate in programs and services	4	
		Program and service recommendations	2	
	Participation	Change in number of visits to the library	1	
		Changes in time spent in the library	1	
Total		33		

4. **Results.** Statistical analysis for this study was performed using SPSS 26.0. Out of the total of 213 surveys collected, 27 responses were excluded because they were deemed inadequate for statistical analysis, and so, 186 (87.3%) valid surveys were analyzed. Distributing the survey by gender, there were 90 males (48.4%) and 96 females (51.6%). Distributing the survey by grade level, there were 11 first graders (5.9%), 22 second graders (11.8%), 24 third graders (12.9%), 26 fourth graders (14%), 89 fifth graders (47.9%), and 14 sixth graders (7.5%), with the most notable factor being the fifth-graders that accounted for the highest percentage. While checking whether there was a difference by gender or grade, it was found that there were no statistically significant differences in the number of visits to the library and the length of time spent there. However, it was found that older elementary students (3rd grade and above) spent more time doing homework and studying than reading and borrowing books, which seemed to be because students in higher grades concentrate more on their studies.

The validity and reliability verification results are show in Table 3. The component extraction method used the principal component analysis method, and the factor rotation method used the varimax rotation. When constructing the questionnaire, five gamification elements were defined through literature review, so five elements were specified to perform element analysis. The results of the factor analysis, excluding variables not bound by elements among the 18 questions items, are shown in Table 3. The Kaiser-Meyer-Olkin measure of sample adequacy was 0.853, while in Bartlett's test of sphericity, the approximate chi-square was 1344.844, the degree of freedom was 120, and the significance probability was $p < 0.001$, indicating that the overall correlation matrix was

TABLE 3. Validation results

Measurement variables	Elements				
	Achievement	Gameplay	Virality	Communication	Reward
Achievement: Step-by-step service	0.801	0.206	0.174	0.178	0.173
Achievement: Step-by-step program	0.795	0.230	0.202	0.125	0.007
Achievement: Goal setting service	0.794	0.207	0.130	0.169	0.090
Achievement: Goal setting program	0.744	0.237	0.272	0.005	0.064
Gameplay: Program with play	0.209	0.791	0.015	0.267	0.163
Gameplay: Service with play	0.269	0.778	0.028	0.142	0.147
Gameplay: Mission	0.198	0.618	0.368	0.058	-0.304
Gameplay: Ranking	0.169	0.541	0.040	0.043	0.263
Gameplay: What makes the library fun	0.189	0.436	0.298	-0.050	0.290
Virality: Program information	0.264	0.144	0.771	0.162	0.151
Virality: Information transfer	0.124	0.011	0.753	0.148	0.086
Virality: Service information	0.337	0.158	0.646	0.285	0.114
Communication: Conversational program	0.146	0.152	0.215	0.866	0.143
Communication: Conversational service	0.184	0.150	0.229	0.849	0.113
Reward: Product	0.075	0.211	0.020	0.144	0.853
Reward: Collect badge	0.133	0.141	0.308	0.136	0.756

suitable for factor analysis. Also, since each element showed a Cronbach’s alpha value of 0.7 or more, it was judged that the internal consistency was sufficiently secured. The Cronbach’s alpha value for all 26 items was 0.927, indicating high reliability.

Multiple regression analysis using stepwise selection method was conducted to determine how the constituent elements of gamification affected library use-intention. The results indicate in Table 4, and the model containing only two factors, achievement and virality, was selected. The Durbin-Watson value was 1.695, which is close to 2, showing that no autocorrelation existed, while $R^2 = 0.342$ was indicating that the explanatory power of this regression model was 34.2%.

$$Y = 1.237 + 0.316X_2 + 0.363X_5 \tag{1}$$

As shown in Table 4, the achievement factor was found to have a positive (+) relationship with use-intention, as it showed a non-standardization coefficient $B = 0.316$ and

TABLE 4. Elements of gamification that affect use-intention (stepwise selection method)

Classification (element)	Non-standardized coefficient		Standardized coefficient	t	Significance probability	Collinearity statistics	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	1.237	0.273		4.534	0.000		
Achievement	0.316	0.071	0.317	4.448	0.000**	0.706	1.416
Virality	0.363	0.074	0.349	4.892	0.000**	0.706	1.416

$R^2 = 0.342$, Adjusted $R^2 = 0.335$, $F = 47.658$, $D-W = 1.695$

** $p < 0.001$

significance probability $p < 0.001$. The virality factor was also found to have a positive (+) relationship with use-intention, as it showed a non-standardization coefficient $B = 0.363$ and a significance probability $p < 0.001$. In sum, achievement and virality factors had a statistically significant effect on use-intention in libraries.

Multiple regression analysis using stepwise selection method was conducted to determine how the constituent elements of gamification affected library participation. The results are shown in Table 5, and the model containing only two factors, achievement and virality, was selected. The Durbin-Watson value was 1.906, which is close to 2, showing that no autocorrelation existed, while $R^2 = 0.221$, was indicating that the explanatory power of this regression model was 22.1%.

$$Y = 1.76 + 0.324X_2 + 0.258X_5 \quad (2)$$

TABLE 5. Elements of gamification that affect participation (stepwise selection method)

Classification (element)	Non-standardized coefficient		Standardized coefficient	t	Significance probability	Collinearity statistics	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	1.76	0.318		5.533	0.000		
Achievement	0.324	0.083	0.303	3.905	0.000**	0.706	1.416
Virality	0.258	0.087	0.231	2.98	0.003*	0.706	1.416
$R^2 = 0.221$, Adjusted $R^2 = 0.213$, $F = 26.015$, $D-W = 1.906$							

* $p < 0.05$, ** $p < 0.001$

As shown in Table 5, the achievement factor was found to have a positive (+) relationship with participation, as it showed a non-standardization coefficient $B = 0.324$ and significance probability $p < 0.001$. The virality factor was also found to have a positive (+) relationship with participation, as it showed a non-standardization coefficient $B = 0.258$ and a significance probability $p < 0.05$. In sum, achievement and virality factors had a statistically significant effect on participation in libraries.

As the hypothesis test showed that achievement and virality factors affect library use-intention and participation, ways to actively utilize this finding can be considered. It is necessary to provide specific goals related to library programs or services to elementary school students and induce them to achieve them, thereby arousing their interest in libraries. It is also necessary to engage in more active promotional activities using various platforms from a marketing perspective since awareness about library services and other students' library experiences affect the use of libraries. It is expected that such efforts will increase use-intention and participation in libraries.

5. Conclusion. In recent times, gamification has been used in various fields to promote work efficiency, products, and health through the use of game mechanisms. In the library field, ways to induce use-intention and participation have continuously been considered, and thus the concept of gamification was applied to libraries.

Among the elements of gamification that affect elementary school students' use of libraries, achievement and virality were shown to be the factors that affect use-intention and participation in libraries. The achievement was found to have a significant effect on use-intention and participation because it appears that the developmental characteristics of children are important in the process of achieving set goals. As for virality, noting that shared information on libraries affects the use and oral intention-to-use of library users, it appears that information obtained through libraries or the experiences of libraries conveyed orally and delivered amongst users affect use-intention and participation in libraries.

Additionally, the use of a combination of the elements of gamification will even intensify the effects. Incorporating the attributes of “gameplay”, “communication”, and “rewards” elements into “achievement” and “virality” elements, if the goals are presented and leaderboards are utilized or rewards points are given, it can create a fun experience for users. Alternatively, users may be further motivated to use the library by receiving instant rewards such as badges, points, and coupons if they use the library or share information about the library. It is expected that the use of libraries will be further expanded through such efforts.

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