

**WHAT ENDORSES TEACHERS TO USE GAMIFIED APPROACHES
IN THEIR CLASSROOMS: SELF-EFFICACY TECHNOLOGY PROFICIENCY,
AND PERCEIVED USEFULNESS**

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Abstract

Gamified approaches in the classroom gained more consideration in the recent years. Although the benefits of evolving technologies integrated in the teaching process are better recognized for the student population, what enhances the adoption of such technologies from the teachers' perspective is less investigated. The present study investigated the associations between self-efficacy, teachers' technology proficiency, perceived usefulness of gamification and behavioral intention to use gamification among 170 teachers, aged between 18 to 64 years old ($M = 34.9$; $SD = 9.69$), with a teaching experience ranging from almost one year to 44 years of experience ($M = 8.71$; $SD = 9.62$). Correlation analyses showed that there are associations between teachers' self-efficacy, teachers' technology proficiency, and perceived usefulness of gamification levels and behavioral intention to use gamification. Furthermore, the mediation analyses showed that technology proficiency level and perceived usefulness of gamification partially mediate the relationship between self-efficacy and the behavioral intention to use gamification among Romanian k-12 inservice teachers. These results advanced our knowledge about the relationship between self-efficacy and the behavioral intention to use gamification and its underlying mechanisms.

Keywords: *self-efficacy, k-12 inservice teachers, technology, gamification.*

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Introduction

Gamification was defined as "the use of design elements and game mechanics in non-game contexts to engage people and solve problems" (Su & Cheng, 2015, p. 269). In the educational context, gamification refers to incorporating features and game-like experiences into the learning process of any study domain. The aim is not only to promote learning, but also to develop transversal soft-skills and attitudes including teamwork, self-regulation of learning, and creativity (Caponettol & Ott, 2014; Dicheva et al., 2015). Previous studies analyzed teachers' familiarity with gamification and its actual use. Studies showed that although 82% of the pre-service teachers view gamification as useful in both formal and non-formal educational settings (Ortega Sánchez & Gómez Trigueros, 2019), only a small percentage (11%) of inservice teachers actually frequently use gamification in their classroom (Martí-Parreno et al., 2016). Nonetheless, Belda-Medina & Calvo-Ferrer (2022) showed that having contact with gamified teaching experiences increased the preference and perceived usefulness of gamified activities in pre-service teachers.

Other researchers investigated the links between several personal characteristics and gamification usage during the instructional process. These results showed that attitudes towards gamification, perceived usefulness of gamification and perceived social influence explained 51% of the behavioral intention of using gamification variance in a sample of Saudi female teachers (Asiri, 2019), while perceived playfulness, perceived curriculum fit, teachers' self-efficacy, computer anxiety, challenge and learning opportunities were able to explain 58.7% of teachers' variance of behavioral intention to advocate and use a gamified application in a South African sample (Adukaite et al., 2017). Additionally, results from a Romanian preschool and primary teachers sample suggested that perceived usefulness of gamification, technology proficiency, and teachers' self-efficacy predicted 14% of gamification usage variance (Cramariuc et al., 2022).

Self-efficacy and behavioral intention to use gamification

Self-efficacy was defined as a person's confidence in their capacity to carry out a particular activity (Bandura, 1977). Later on, Skaalvik and Skaalvik (2007) defined teacher self-efficacy as "individual teachers' beliefs about their own abilities to plan, organize, and carry out activities required to achieve given educational goals". Self-efficacy is one of the decisive factors leading to a higher acceptance and use of e-learning strategies in the classroom (Almaiah, 2020). Self-efficacy was previously regarded as a personal characteristic that enabled teachers to prefer and use information technology approaches in their classes (Zeng,

2020). More specifically, studies on the link between teachers' self-efficacy and the use of gamification as a didactic strategy showed positive associations between these variables (An et al., 2021).

The mediating role of technology proficiency and perceived usefulness

According to Hamari and Nousiainen (2015), the adoption of educational technological tools is influenced by teachers' perceptions information and communication technologies (ICT) and teaching compatibility, ICT self-efficacy, ICT organizational culture support, teachers' openness to ICT, and teachers' perceptions on the value of educational technological tools. Teachers' perceptions related to technology such as technology proficiency and their perceived level of usefulness of gamification prove to be important skills and attitudes in education (Christensen & Knezek, 2016). For instance, Panagiotarou et al. (2020) investigated whether different ICT skills level affected teachers' perception on the ease of use, usefulness and actual use of gamification in the classroom. Authors showed that there were significant differences in these groups, with advanced ITC skills group revealing a more positive perception on the ease, actual use and usefulness of gamified approaches during teaching.

Technology proficiency was defined as an ability to employ digital, technological resources or tools with the aim to maximize one's activity (Messina & Tabone, 2013), while gamification perceived usefulness refers to how useful is seen by teachers during the instructional process (Gallego et al., 2008). Studies showed that familiarity with information and communication technologies and positive attitudes towards technology increase the likeliness to use such tools during the educational process (Fiel, 2020; Gaboy et al., 2020; Mustafina, 2016). Additionally, results from one qualitative study showed that technology illiteracy represents one of the reasons for which teachers do not use gamified applications in the classroom (Pektaş & Kepceoglu, 2019). Moreover, some authors previously stated that even when teachers are familiarized with the use of technology and gamified approaches in the classroom, they are still reticent to their usefulness (Rozhenko et al., 2021).

Another study showed that playfulness fully mediated the link between teachers' self-efficacy and their behavioral intention to use gamification for their teaching activities (Adukaite et al., 2017). These mediated results were reported by other studies showing that self-efficacy is an important variable for the use of gamified approaches in the classroom. For instance, self-efficacy was strongly associated with technology proficiency (Minsheew & Anderson, 2015), which resulted in promoting the integration of such technologies in the teaching process (Williams, 2023). These previously presented results suggest that teachers with higher levels

of self-efficacy, with a high level of technology proficient and teachers who perceived gamification as useful, are the ones who introduce pedagogical technological innovations in their classrooms, such as gamification.

The present study

This study aimed to examine the associations between self-efficacy, technology proficiency, perceived usefulness of gamification and behavioral intention to use gamification among k-12 school teachers. To do so, we proposed the following hypotheses: (a) teachers' self-efficacy would have a direct effect on technology proficiency, perceived usefulness of gamification and behavioral intention to use gamification; (b) technology proficiency and perceived usefulness of gamification would have a direct effect on behavioral intention to use gamification; (c) technology proficiency and perceived usefulness of gamification would mediate the relationship between self-efficacy and behavioral intention to use gamification among k-12 inservice school teachers.

Method

- **Participants**

The initial sample consists of 207 k-12 school teachers, living in Bukovina region, the North-Eastern region of Romania. Thirty-seven participants were eliminated because they said that they were not familiarized with the concept of gamification when they filled out the items from usefulness of gamification scale and behavioral intention to use gamification (see measures section). Thus, the final sample consists of 170 k-12 teachers, aged between 18 to 64 years old ($M = 34.9$; $SD = 9.69$), with a teaching experience ranging from under one year to 44 years of experience ($M = 8.71$; $SD = 9.62$). The majority of them are women (92.4%). Of the total number of teachers, half of them (52.4%) were teaching in schools situated in urban areas. Related to the level of school where they were teaching to, thirty-five percent of these participants were kindergarten teachers, 30% were primary school teachers, 28% were secondary school teachers, and 7% were high school teachers.

- **Measures**

Self-efficacy. In order to assess teachers' self-efficacy, A Romanian translation of Teachers' Self-Efficacy Scale (TSE; Schwarzer, Schmitz, & Daytner, 1999) was used. TSE is formed by 10 items, evaluated on a four-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Example of items: "I know I can motivate my students to participate in innovative projects". The Cronbach's alpha of this scale was .93.

Usefulness of gamification. In order to evaluate teachers' perceived usefulness of gamification during the teaching process, the Romanian translation of the scale developed by Gallego and colleagues in 2008 was used. This scale consists of 4 items, assessed on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). We took into consideration that some teachers may not be familiarized with gamification, thus we added another answer option, 8 – I am not familiarized with the concept of gamification. Example of items: “Using gamification improves the quality of my work.”. The Cronbach's alpha of the scale in this study was .87.

Technology proficiency. A Romanian translation of Technology Proficiency Self-Assessment for 21st Century Learning Scale (TPSA C21; Christensen & Knezek, 2017) was used to assess teachers' perceptions of their technology proficiency level. This scale comprises of 4 items, assessed on five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Example of items: “I feel confident that I can integrate mobile technologies into my curriculum.”. The Cronbach's alpha of the scale in this study was .84.

Use of gamification. In order to assess teachers' behavioral intention to use gamification during the teaching process, A Romanian translation of Behavioral Intention to Use Gamification Scale (Gardner & Amoroso, 2004) was used. This scale includes 3 items, evaluated on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). As previously stated, an additional answer option was added, 8 - I am not familiar with the notion of gamification. This was decided because some of our respondents may not know what gamification is and it would be impossible for them to evaluate the use of it. Example of items: “I always try to use the gamified application in/on as many cases/occasions as possible.”. The Cronbach's alpha of the scale in this study was .88.

- **Procedure**

All participants agreed to voluntarily participate at this study and signed an informed consent. This study is part of a larger research project with the aim of identifying the status of gamification among k-12 Romanian school teachers. The time required to complete the questionnaire packet for the current study was about 10 minutes. All participants filled out the questionnaire online.

The protocol of the study was approved by the Ethical Committee of the university where the study took place.

Results

- **Preliminary analyses**

Our correlational hypotheses are confirmed (see Table 1). More specifically, teachers' self-efficacy positively correlated with teachers' technology proficiency, teachers' perceived usefulness of gamification and teachers' behavioral intention to use gamification. Teachers' technology proficiency positively correlated with teachers' behavioral intention to use gamification, while teachers' perceived usefulness of gamification during the teaching process was positively correlated with teachers' behavioral intention to use gamification. All these results are small to medium (Cohen, 2013).

Table 1. Descriptive statistics and bivariate correlations between study variables

Variables	Mean	SD	1	2	3	4
1. Teachers' self-efficacy	3.37	.46				
2. Teachers' technology proficiency level	3.77	.72	.28**			
3. Teachers' perception of gamification usefulness	5.12	1.18	.39**	.35**		
4. Behavioral intention to use gamification	5.61	1.25	.49**	.47**	.54**	-

** $p < .001$

All our correlational hypotheses were confirmed, therefore we investigated whether teachers' technology proficiency level and teachers' perceived usefulness of gamification during the teaching process mediated the effect of teachers' self-efficacy on teachers' behavioral intention of using gamification during the teaching process. In order to test these mediational analyses, the macro PROCESS in SPSS (Hayes, 2013), model 4 was used.

We utilized 5000 bootstrap samples to determine the predictor's indirect effect, and biases were corrected at 95% confidence intervals (CI). If the confidence interval (CI) for the indirect effect did not include zero, the indirect effect was significant at $p < 0.05$ (Shrout & Bolger, 2022).

Direct effects

Teachers' self-efficacy had a direct effect on teachers' technology proficiency ($b = .99, p < .001$) and on teachers' perceived usefulness of gamification ($b = .43, p = .002$). In addition, teachers' technology proficiency level had a direct effect on teachers' behavioral intention of using gamification in their teaching activities ($b = .43, p < .001$), and teachers' perceived usefulness of gamification during the teaching process had a direct effect on teachers' behavioral intention of using gamification ($b = .58, p < .001$).

Indirect effects

We hypothesized that teachers' technology proficiency level and teachers' perceived usefulness of gamification during the teaching process would explain the influence of teachers' self-efficacy on their behavioral intention to use gamification. The findings indeed showed that

both, teachers' technology proficiency level ($b = .43$; CI: .194; .722), and teachers' perceived usefulness of gamification during the teaching process ($b = .27$; CI: .100; .495) partially mediated the effects of teachers' self-efficacy on their behavioral intention to use gamification.

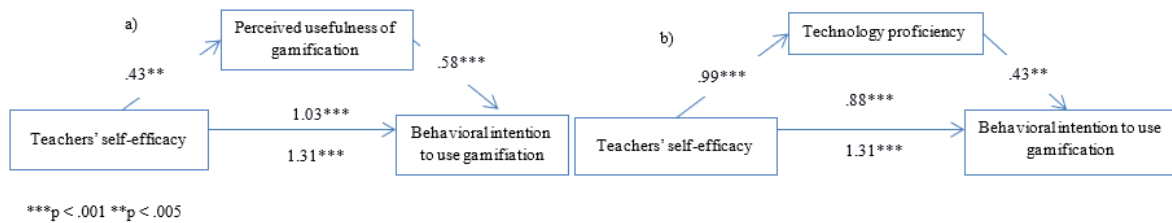


Figure 1. Mediating effect of teachers' perceived usefulness of gamification during the teaching process (Fig 1a), teachers' technology proficiency level (Fig 1b) between teachers' self-efficacy and teachers' behavioral intention of using gamification during the teaching process

Discussion

The aim of the present study was to assess the underlying mechanisms of the relationship between self-efficacy and behavioral intention to use gamification among k-12 inservice teachers. In order to do so, we hypothesized that (a) teachers' self-efficacy will have a direct effect on technology proficiency, perceived usefulness of gamification and behavioral intention to use gamification; (b) technology proficiency and perceived usefulness of gamification would have a direct effect on behavioral intention to use gamification; (c) technology proficiency and perceived usefulness of gamification will mediate the relationship between self-efficacy and behavioral intention to use gamification among k-12 inservice school teachers.

Firstly, we conducted correlation analysis between all study's variables. The results showed that teachers' self-efficacy was positively and significantly associated with teachers' technology proficiency, teachers' perceived usefulness of gamification and teachers' behavioral intention to use gamification. Additionally, teachers' behavioral intention to use gamification was positively and significantly associated with teachers' technology proficiency and with teachers' perceived usefulness of gamification during the teaching process. The same pattern of results was found in previous studies. For instance, research on teachers showed that there is a link between self-efficacy and positive attitudes toward integrating technology in the classroom (Abbitt, 2011; Almaiah, 2020; Zeng, 2020). More specifically, teachers with higher

self-efficacy levels, also tend to see gamified approaches as useful (Alsamawi & Kurnaz, 2023) and actually use it more in their activities (Adukaite et al., 2017; Alsamawi & Kurnaz, 202; An et al., 2021; Turan et al., 2022).

This study also showed significant and positive correlations between teachers' self-efficacy and technology proficiency. Although the research is limited on this relationship, these results come in line with previous studies showing that higher levels of self-efficacy in teachers associated with higher perceptions on their technology proficiency levels (Cramariuc et al., 2022; Minshew & Anderson, 2015). Additionally, previous studies showed that using technological tools during the teaching process is determined by teachers' perceptions on the value of educational tools (Hamari & Nousiainen, 2015). The results of the present study are consistent with this pattern, showing that high level of perceived usefulness of gamification during teaching process is associated with a high level of behavioral intention of using gamification in teaching at primary, secondary and high-school level.

Our principal aim was to test whether perceived usefulness and technology proficiency mediate the relationship between teachers' self-efficacy and their behavioral intention to use gamification. Our hypotheses were confirmed by suggesting a direct effect of teachers' self-efficacy on perceived usefulness, technology proficiency and behavioral intention to use gamification. An indirect effect of perceived usefulness and technology proficiency for the link between teachers' self-efficacy and behavioral intention to use gamification. The mediation analysis showed a significant direct effect of teachers' self-efficacy on behavioral intention to use gamification when the mediation was introduced in the analysis which suggest a partial mediation. Putting differently, without helping teachers to develop their abilities related to using technology and to perceive to utility of ICT tools, teachers' efficacy will influence teachers to use gamification during teaching process only in a smaller manner. One recent study uncovered four major obstacles that can stop instructors from implementing gamification in their classes (Sánchez-Mena & Martí-Parreño, 2017). From all four, one is valid for this study: teachers' opinions about whether gamification is appropriate for the subjects they teach. It is suggested one more time that when teachers perceive gamification as useful, they tend to use it during the teaching process. Thus, the results suggest that increasing teachers' technological skills through participating to technological course may lead to making the teaching process more enjoyable, more interactive and easier to learn for children.

Although this study emphasized the importance of the mediated relationship between self-efficacy and the behavioral intention to use gamification in teachers, the interpretation of these results comes with several limitations. The analyzed data originated from a transversal design,

thus it is difficult to examine the extent to which changes occurred in participants` technology proficiency and perceived usefulness of gamification would imply significant changes in the self-efficacy - behavioral intention to use gamification relationship. Furthermore, because these results are based on a convenience sample and the majority of participants are female, we can not infer the extent to which they will maintain in a more gender equilibrated samples. Finally, as the present relationships are suggested for the k-12 teachers, we do not know if they would replicate on university teachers, hence future studies should investigate these hypotheses on other teacher populations.

Conclusion

In conclusion, the results of the present study added new insights by showing that teachers with a high level of self-efficacy tend to perceive gamification as more useful and have higher technological skills, which indicated not only they will use more diverse and rich repertoire of teaching practices, but also that they have a higher behavioral intention to use gamification in the teaching process.

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