GAMIFICATION, TECHNOLOGY PROFICIENCY, AND SELF-EFFICACY IN ROMANIAN PRESCHOOL AND PRIMARY SCHOOL TEACHERS

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Abstract: *The aim of the present study was to analyze the associations between perceived usefulness of gamification, technology proficiency, teachers' self-efficacy and gamification usage and to investigate the possible predictive role of perceived usefulness of gamification, technology proficiency, teachers' self-efficacy for gamification usage among Romanian teachers. The study sample consists of 124 preschool and primary teachers, aged between 18 and 64 years old (M = 33.31; SD = 9.98), with an average of 7.00 years (SD = 9.54) of teaching experience. Participants filled out the questionnaires online. Results showed positive correlations between perceived usefulness of gamification, technology proficiency, teachers' self-efficacy and gamification usage. In addition, results from the regression analyses show that perceived usefulness of gamification, technology proficiency, and teachers' self-efficacy predicted 14% of gamification usage variance.*

Keywords: *gamification of education, preschool and primary teachers, technology proficiency, self-efficacy.*

Introduction

On a general level, gamification refers to the use of gaming principles and mechanics in different areas not specific to gaming (Deterding, Dixon, Kahled, & Nacke, 2011). While technology is being used in all the main domains in our lives, gamified experiences outside games are the most present in education (Koivisto & Hamari, 2019). Gamification's positive effects in the educational process have extensively been researched (Griffiths, 2002) and include the ease of implementing better assessment resources, autonomy in pupils' ability in setting and reaching learning objectives, enhancing students' attention and motivation in longer and more difficult tasks, engaging students in a playful

environment and facilitating the integration of students' personal characteristics in the educational process (Al-Azawi, Al-Faliti, & Al-Blushi, 2016). However, the links between perceived usefulness of gamification, teachers' technology proficiency level, teachers' self-efficacy and gamification usage were not previously analyzed. In order to cover this gap, we proposed to investigate these links. In addition, we also aimed to extend the gamification knowledge by examining the possible predictive role of perceived usefulness of gamification, technology proficiency, and teachers' self-efficacy for gamification usage among Romanian preschool and primary teachers.

The introduction is organized in three sections. The first section gives a brief overview of concept of perceived usefulness of gamification and emphasizes the results of previous studies where it was investigated the effects of gamification usefulness during the teaching-learning process on students' skills. The second section provides a definition of technology proficiency and summarizes the results of previous research on teachers' technology proficiency and gamification usage during the teaching-learning process. Finally, in the last section of introduction, teachers' self-efficacy is defined and the results of previous studies where the link between teachers' self-efficacy and gamification usage and gamification usefulness are presented.

Perceived usefulness of gamification

While previous research showed that teachers hold both positive and negative attitudes towards using gamification in the classroom as it may prove beneficial to various aspects included in the learning process, such as better socio-emotional skills, but also enhances a level of competition that may be difficult to manage (Martí-Parreño, Galbis-Córdova & Currás Pérez, 2019), the overall preference for gamified learning is well known (Mee Mee et al., 2020; Yildiz, Topçu & Kaymakci, 2021). For example, Ortega Sánchez & Gómez Trigueros (2019) reported that 82% of the trainee teachers regard gamification as useful in both formal and non-formal educational settings, since it has the potential of enhancing students' motivation, competitivity, collaboration, and attention. On a similar note, Pektas & Kepceoglu (2019) showed that teachers reported gamification's contribution to students' motivation, task optimization and creating more equity in the assessment process.

Technology proficiency and gamification usage

The ability to properly use digital or technological resources and tools in order to optimize one's activity is referred to as technology proficiency (Messina & Tabone, 2013), which proves to be an important skill in education (Christensen & Knezek, 2016). Some authors have previously emphasized the need for better computer skills if teachers were to implement more gamified learning strategies in the classroom (Lam & Tse, 2022). In support of this idea, in their study, Panagiotarou, Stamatiou and Pierrakeas (2020) showed that learners who had high levels of digital skills also had high levels of perceived usefulness, perceived ease of use and actual use of gamification, compared to participants with intermediate and basic digital skills. Furthermore, Hossein-Mohand and colleagues (2021) showed that gamified learning is scarcely used in teaching mathematics, but it is preferred mainly in information and communication technology (ICT) equipped classrooms. Similarly, teachers' confidence in their ability to properly use technology in the classroom leads to a better acceptance of technology oriented educational activities (Teo, 2011).

Teachers' self-efficacy and gamification usage

The concept of self-efficacy was first introduced by Bandura (1977) and it refers to an individual's confidence in the ability of conducting a specific activity. In the educational context, previous research showed that teachers' self-efficacy has an indirect effect on behavioral interntions to use gamification in the classroom (Adukaite et al., 2017). In the educational context, teachers with a higher level of self-efficacy have a higher sense of feasibility for using technology in the classroom (Moghavvemi, 2015). More specifically, previous research showed that teachers' self-efficacy has an indirect effect on behavioral intentions to use gamification in the classroom (Adukaite et al., 2017). Furthermore, An and colleagues (2021) reported that teachers who had higher self-efficacy levels, also showed a higher preference for using gamification in the instruction process.

The present study

The objectives of the present study are two-fold: (a) to analyze the associations between perceived usefulness of gamification, technology proficiency, teachers' self-efficacy and gamification usage among preschool and primary teachers, and (b) to identify the gamification usage's predictors among preschool and primary teachers. In order to do so, we generated the following hypotheses: (a) perceived usefulness of gamification, technology proficiency, teachers' self-efficacy will positively correlate with gamification usage among preschool and primary teachers; (b) perceived usefulness of gamification, technology proficiency, teachers' self-efficacy will predict gamification usage among preschool and primary teachers.

Method
Participants

The initial sample comprised 136 preschool and primary teachers. The responses of twelve participants were eliminated from the analysis because they did not fill out all items from technology proficiency scale (see the Instruments section) (two participants) and because they said they are not familiarized with the concept of gamification (items from perceived usefulness of gamification) (ten participants). Thus, the final sample comprises 124 preschool and primary teachers, aged between 18 and 64 years old ($M =$ 33.31; $SD = 9.98$), with an average teaching experience of 7.00 years ($SD = 9.54$; min = a few months, max = 44 years). The majority of them are women (97%), half of them having graduated studies (bachelor degree, 52%), half of them teaching at preschool level (50%) and more than half (55%) are teaching in school from urban areas.

Instruments

Perceived usefulness of gamification was measured by the subscale developed by Gallego et al., 2008. This scale consists of 4 items, positively ordered, evaluated on a seven-Likert point scale (1 – totally disagree to 7 – totally agree). We added the option "8 – I am not familiarized with the concept of gamification" because we did not want to obligate the participants to choose an answer if they are not familiarized with this concept. Example of items are "Using gamification improves the quality of my work.", "Overall, gamification is useful for my work.".

Technology proficiency was measured by the Technology Proficiency Self-Assessment for 21st Century Learning Scale (TPSA C21; Christensen & Knezek, 2017). This scale consists of 4 items, positively ordered, evaluated on a five-Likert point scale (1 – strongly disagree to 5 – strongly agree). Example of items are "I feel confident that I can find a way

to use a smartphone in my classroom for student responses", "I feel confident that I can describe 5 software programs or apps that I would use in my teaching".

Self-efficacy was measured by Teachers' self-efficacy scale (TSE; Schwarzer, Schmitz, & Daytner, 1999). This scale consists of 10 positively ordered items, assessed on a four-point Likert scale (1 - strongly disagree) to 4 - strongly agree).

Gamification usage was measured by a scale developed by us. This scale consists of 6 positively ordered items assessing teachers' usage of gamification principles during their teaching process in the last 2 years. The six items were assessed on seven-Likert point (0 – never to 6 – always (almost every day)). Example of items: "I designed activities where students had the possibility to monitor each other's performance in a leaderboard in real time.", "I designed activities where students had the opportunity to be rewarded with points/tokens".

Procedure

Each participant signed an informed consent form and volunteered to take part in the study. This study is part of a larger research project with the goal to determine the status of gamification among teachers in Romanian schools. The questionnaire packet for the current study took roughly 10 minutes to complete. The questionnaire was completed online by each participant.

The Ethical Committee of the university where the study was conducted gave its approval to the study's procedure.

Results

Preliminary analyses

Table 1 displays the descriptive statistics and bivariate correlations between the study variables.

In general, the means for teachers' gamification perceived usefulness, teachers' level of technology proficiency, teachers' self-efficacy and level of gamification's principle usage are rather high.

The results from the correlation analyses show that the first hypothesis of the study was confirmed. The perceived usefulness of gamification ($r = .29$, $p < .001$) technology proficiency $r = .31$, $p < .001$), and teachers' self-efficacy ($r = .24$, $p = .006$) positively correlate with gamification usage among Romanian preschool and primary teachers.

Table 1. Descriptive statistics and bivariate correlations between study's variables

	M	SD	1	2	3	4
1. Teachers' perceived usefulness	4.99	1.24	-			
2. Teachers' technology proficiency level	3.77	.80	.34***	-		
3. Teachers' self-efficacy	3.43	.43	.39***	.31***	-	
4. Gamification usage	4.01	1.47	.29***	.31***	.24**	-

***p < .001, **p < .05

In order to test the second hypothesis, a multiple linear regression in SPSS was conducted with perceived usefulness of gamification, technology proficiency, teachers' self-efficacy as predictors and gamification usage as criteria. The results showed that perceived usefulness of gamification, technology proficiency, teachers' self-efficacy predict 14% of gamification usage variance among Romanian preschool and primary teachers. The model has the following indices: $F_{(3,120)} = 6.909$, $p = .000$.

Discussion

This study provides original evidence on the associations between perceived usefulness of gamification, technology proficiency, teachers' self-efficacy and gamification usage among Romanian preschool and primary teachers. In addition, the results of the present study emphasize the predictive role of perceived usefulness of gamification, technology proficiency, teachers' self-efficacy demonstrated for gamification usage among Romanian preschool and primary teachers.

The present study shows that our hypotheses were confirmed, which comes in line with previous research. Our results show that there positive significantly correlations between perceived usefulness of gamification, technology proficiency and teachers' self-efficacy and gamification usage. In addition, the results showed that perceived usefulness of gamification, technology proficiency, teachers' self-efficacy predict 14% of gamification usage variance. This is consistent with previous findings on the perceived utility of gamification and the preference for gamification usage in teachers (Martí-Parreño, Galbis-Córdova & Currás Pérez, 2019; Yildiz, Topçu, & Kaymakci, 2021). Moreover, our results are similar to the previous findings concerning technology proficiency (Panagiotarou, Stamatiou and Pierrakeas, 2020; Teo, 2011) and teachers' self-efficacy (Adukaite et al., 2017; An et al., 2021; Moghavvemi, 2015) in relation to gamification usage.

These findings contribute to the gamification literature in several ways. First, we analyzed the links between perceived usefulness of gamification, technology proficiency, teachers' self-efficacy and gamification usage among preschool and primary teachers. Second, the results add additional findings on the predictive role of perceived usefulness of gamification, technology proficiency, teachers' self-efficacy for gamification usage among preschool and primary teachers. Third, we collected data from Romanian teachers, a Latin-Eastern European country, which is a population not focused on, as the majority of the studies were conducted in Western Europe, Western or Arabic cultures.

In addition to its strengths, the presents study has some limitations. As we already mentioned, we used a cross-sectional design. Additional knowledge on the predictive role of perceived usefulness of gamification, technology proficiency, teachers' self-efficacy for gamification usage could come from daily reports of using gamification or from analyzing the role of other institutional-based variables (such as organizational climate, school resources) or personal variables such as personality traits or work engagement. Another limitation is related to the usage self-report scales. Additional knowledge could come from observational studies where the actual usage of gamification can be quantified and its effects analyzed.

In conclusion, this study provides preliminary evidence of the predictive role of perceived usefulness of gamification, technology proficiency, teachers'self-efficacy for gamification usage among Romanian preschool and primary teachers.

REFERENCES

ADUKAITE, A.; VAN ZYL, I.Er.Ş., & CANTONI, L., (2017), "Teacher perceptions on the use of digital gamified learning in tourism education: The case of South African secondary schools", in *Computers & Education*, 111, pp. 172-190.

AL-AZAWI, R.; AL-FALITI, F., & AL-BLUSHI, M., (2016)., "Educational gamification vs. game-based learning: Comparative study", in *International journal of innovation, management and technology*, 7 (4), pp. 132-136.

AN, Y., ZHU, M., BONK, C. J., & LIN, L., (2021), "Exploring instructors' perspectives, practices, and perceived support needs and barriers related to the gamification of MOOCs", in *Journal of Computing in Higher Education*, 33 (1), pp. 64-84.

BANDURA, A., (1977), "Self-efficacy: toward a unifying theory of behavioral change", in *Psychological review*, 84(2).

CHRISTENSEN, R., & KNEZEK, G., (2017), "Validating the technology proficiency self-assessment questionnaire for 21st century learning (TPSA C-21)", in *Journal of Digital Learning in Teacher Education*, 33 (1), pp. 20-31.

DETERDING, S.; DIXON, D.; KHALED, R., & NACKE, L., (2011), "From game design elements to gamefulness: defining *gamification*", in *Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments*, September, pp. 9-15.

GALLEGO, M.D.; LUNA, P., & BUENO, S., (2008), "User acceptance model of open source software", in *Computers in Human Behavior*, 24 (5), pp. 2199-2216, available online: https://doi.org/10.1016/j.chb.2007.10.006.

GRIFFITHS, M. D., (2002), "The educational benefits of videogames", in *Education and health*, 20 (3), pp. 47-51.

HOSSEIN-MOHAND, H.; TRUJILLO-TORRES, J. M.; GÓMEZ-GARCÍA, M.; HOSSEIN-MOHAND, H., & CAMPOS-SOTO, A., (2021), "Analysis of the use and integration of the flipped learning model, project-based learning, and gamification methodologies by secondary school mathematics teachers", in *Sustainability*, 13 (5), p. 2606.

KOIVISTO, J., & HAMARI, J., (2019), "The rise of motivational information systems: A review of gamification research", in *International Journal of Information Management*, 45, pp. 191-210, available online: https://doi.org/10.1016/j.ijinfomgt.2018.10.013

LAM, P., & TSE, A., (2022), "Gamification in Everyday Classrooms: Observations From Schools in Hong Kong", in *Technology-Assisted Learning: Honing Students' Affective Outcomes*.

MARTÍ-PARREÑO, J.; GALBIS-CÓRDOVA, A., & CURRÁS-PÉREZ, R., (2021), "Teachers' beliefs about gamification and competencies development: A concept mapping approach", in *Innovations in education and teaching international*, 58 (1), pp. 84-94.

MESSINA, L., & TABONE, S., (2013), "Technology proficiency, TPACK and beliefs about technology: A survey with primary school student teachers", in *Research Education Media*, 5 (1), pp. 11-29.

MOGHAVVEMI, S., (2015), "Impact of perceived self-efficacy and capability to use IT innovation on individual use behaviour", in *Available at SSRN 2561739*.

ORTEGA SÁNCHEZ, D., & GOMEZ TRIGUEROS, I. M., (2019), "Gamification, social problems, and gender in the teaching of social sciences: Representations and discourse of trainee teachers", in *Plos one*, 14 (6), e0218869.

PANAGIOTAROU, A.; STAMATIOU, Y.C.; PIERRAKEAS, C., & KAMEAS, A., (2020), "Gamification acceptance for learners with different E-skills", in *International Journal of Learning, Teaching and Educational Research*, 19 (2), pp. 263-278.

PEKTAS, M., & KEPCEOGLU, İ., (2019), "What Do Prospective Teachers Think about Educational Gamification?", in *Science education international*, 30 (1), pp. 65-74.

SCHWARZER, R.; SCHMITZ, G.S., & DAYTNER, G.T., (1999), *The teacher self-efficacy scale*.

TEO, T., (Ed.), (2011), *Technology acceptance in education*, Springer Science & Business Media.

YILDIZ, İ.; TOPÇU, E., & KAYMAKCI, S., (2021), "The effect of gamification on motivation in the education of pre-service social studies teachers", in *Thinking Skills and Creativity*, 42, 100907.