Revista Iberoamericana para la Investigación y el Desarrollo Educativo
ISSN 2007 - 7467

https://doi.org/10.23913/ride.v14i27.1598

Artículos científicos

Emprendimiento, innovación y gamificación en la Educación Media Técnico Profesional (EMTP)

Entrepreneurship, innovation and gamification in Secondary Technical Professional Education (EMTP)

Empreendedorismo, inovação e gamificação na Educação Profissional Técnica do Ensino Médio (EMTP)

Angélica Vera-Sagredo
Universidad Católica de la Santísima Concepción, Chile
avera@ucsc.cl
https://orcid.org/0000-0003-1657-2241

Jaime Constenla-Núñez
Universidad Católica de la Santísima Concepción, Chile
jconsten@ucsc.cl
https://orcid.org/0000-0002-3373-6888

Pilar Jara-Coatt
Universidad Católica de la Santísima Concepción, Chile
pilarjara@ucsc.cl
https://orcid.org/0000-0002-9975-8713

Resumen

En los últimos años, en Chile se ha observado un incremento en la Educación Media Técnico Profesional. No obstante, este aumento no ha significado necesariamente mejoras en los aprendizajes de los estudiantes; por eso, la importancia de potenciar este tipo de educación radica en la necesidad de apoyar la competitividad y la posibilidad de empleo de las personas para favorecer la movilidad social de quienes no continúan carreras universitarias. En este contexto, desarrollar competencias de innovación y emprendimiento a través de metodologías activas como la gamificación podría fortalecer los aprendizajes del alumnado. Esta investigación, por tanto, tuvo como objetivo determinar la percepción de los estudiantes sobre innovación,

emprendimiento y gamificación en Educación Media Técnico Profesional (EMTP). El estudio corresponde a un diseño no experimental, transversal con un enfoque cuantitativo de alcance descriptivo-correlacional. Participaron en la investigación 724 estudiantes de seis establecimientos de la región del Biobío, Chile. Para la recolección de datos se empleó una encuesta tipo escala Likert de percepción sobre emprendimiento, innovación y gamificación en educación (AEIGE) versión estudiante. Con la finalidad de cumplir con los objetivos del estudio se examinaron diferencias de medias a través de la prueba t de Student y Anova, y las posibles relaciones a través de la prueba estadística coeficiente de Pearson. Los principales resultados muestran que los estudiantes otorgan valoraciones positivas a aspectos relacionados con el uso del juego en el proceso de enseñanza y aprendizaje, así como algunas características de los profesores innovadores, como el humor y la empatía. Además, se evidencia que el alumnado presenta un rol poco activo en el desarrollo de las clases. Se concluye que las mujeres darían mayor relevancia a las competencias de emprendimiento y al uso del juego como estrategia de enseñanza aprendizaje, y que existiría una relación significativa entre innovación y emprendimiento, y entre emprendimiento y gamificación.

Palabras clave: emprendimiento, innovación, gamificación, Educación Media Técnico Profesional, aprendizajes.

Abstract

In recent years, Chile has seen an increase in Technical Professional Secondary Education. However, this increase has not necessarily meant improvements in student learning. The importance of promoting this type of education lies in the need to support individual's competitiveness and employability to promote the social mobility of those who do not pursue university degrees. In this context, developing innovation and entrepreneurship skills through active methodologies such as gamification could strengthen student learning. The objective of this study was to determine the students' perception of Innovation, Entrepreneurship and Gamification in High School Technical Professional Education (EMTP). The study corresponds to a non-experimental, cross-sectional design with a quantitative approach of descriptive-correlational scope. A total of 724 students from six establishments in the Biobío Region, Chile, participated in the study. A student version of a Likert scale survey of Perception of Entrepreneurship, Innovation and Gamification in Education (AEIGE) was used for data collection. In order to meet the study's objectives, mean differences were examined using the Student's t test and ANOVA, while the possible relationships were determined through the

Pearson coefficient statistical test. The main results show that students give positive assessments to aspects related to the use of games in the teaching-learning process as well as some characteristics of innovative teachers, such as humor and empathy. In addition, it is evident that the students have an inactive role in the development of the classes. It is concluded that women give greater relevance to entrepreneurship skills and the use of games as a teaching-learning strategy, and that there is a significant relationship between innovation and entrepreneurship and between entrepreneurship and gamification.

Keywords: Entrepreneurship; Innovation; Gamification; Professional Technical Secondary Education; Learnings.

Resumo

Nos últimos anos, o Chile tem visto um aumento na Educação Secundária Técnico-Profissional. No entanto, esse aumento não significou necessariamente melhorias no aprendizado dos alunos. A importância da promoção deste tipo de ensino reside na necessidade de apoiar a competitividade e a empregabilidade das pessoas para promover a mobilidade social daqueles que não prosseguem os estudos universitários. Nesse contexto, desenvolver habilidades de inovação e empreendedorismo por meio de metodologias ativas, como a gamificação, pode fortalecer o aprendizado dos alunos. O objetivo desta pesquisa foi verificar a percepção dos alunos sobre Inovação, Empreendedorismo e Gamificação na Educação Profissional Técnica do Ensino Médio (EMTP). O estudo corresponde a um desenho não experimental, transversal, com abordagem quantitativa de âmbito descritivo-correlacional. Participaram da pesquisa 724 alunos de seis estabelecimentos da região de Biobío, Chile. Para a coleta de dados, foi utilizada a escala Likert da pesquisa Perception of Entrepreneurship, Innovation and Gamification in Education (AEIGE) Student version. Para atender aos objetivos do estudo, as diferenças de médias foram examinadas por meio do teste t de Student e ANOVA e as possíveis relações por meio do teste estatístico de coeficiente de Pearson. Os principais resultados mostram que os alunos avaliam positivamente aspectos relacionados ao uso de jogos no processo de ensino-aprendizagem e algumas características de professores inovadores, como humor e empatia. Além disso, fica evidente que os alunos têm um papel inativo no desenvolvimento das aulas. Conclui-se que as mulheres dariam maior relevância às habilidades empreendedoras e ao uso de jogos como estratégia de ensino-aprendizagem e que haveria uma relação significativa entre inovação e empreendedorismo e entre empreendedorismo e gamificação.

Revista Iberoamericana para la Investigación y el Desarrollo Educativo
ISSN 2007 - 7467

Palavras-chave: Empreendedorismo; Inovação; gamificação; Educação Profissional Técnica Secundária; Aprendizados.

Fecha Recepción: Enero 2023 **Fecha Aceptación:** Agosto 2023

Introduction

In recent years there has been an increase in the number of students pursuing secondary and university education. Research results show that in Chile, high school graduation rates have increased from 46% in 1995 to 83% in 2011, which shows that there has been a shift from education for a privileged group to education for all (Arias et al. al., 2015). However, the increase in enrollment has not precisely meant that students have improved their learning. This is especially true for Professional Technical Education1, since the empirical evidence indicates that the academic results in these modalities are lower.

One of the causes may be linked to the fact that students who pursue this type of education belong to low-income families, indicating that they would have fewer support networks for their academic achievements (Ministry of Education [MINEDUC], n.d.; Villalta and Saavedra, 2012). In addition, various precedents warn that the curriculum determined for these students could not be achieved by many educational establishments because the teachers would not be able to comply with the study programs (MINEDUC, s. f.). The importance of promoting this type of education lies in the need to improve the employability of people who will not continue their education and pursue a university degree.

In our country, MINEDUC (2016) points out that favoring the learning of students who are studying at a technical level allows for promoting key elements in entrepreneurship and innovation skills with the aim of training people who are able to perform dependent and independent jobs. Therefore, the learning objectives of this type of study indicate that students need to have appropriate skills to face their future worklife (MINEDUC, 2013).

Therefore, it is necessary to identify the perception that students have regarding variables that will affect their academic training and their professional future. In this case, the variables of entrepreneurship and innovation will be essential skills for their future employment.- It is important to understand how these can be enhanced through innovative methodologies such as gamification. Therefore, the following research objectives have been considered:

[1] Programas educativos orientados a desarrollar habilidades y destrezas para el trabajo (MINEDUC, s. f.).

- Analyze the perception that students of professional technical establishments have regarding entrepreneurship, innovation, and gamification.
- Identify possible differences in terms of sociodemographic variables (sex, age) regarding the dimensions of the scale.
- Examine the existing correlations between the dimensions of the scale (entrepreneurship, innovation and gamification) and sociodemographic variables reviewed in the study.

Entrepreneurship and innovation

In this scenario, the need to transform education by incorporating innovation skills has been recognized to strengthen entrepreneurial habits in the community (Fernández, 2011). In this regard, MINEDUC (2011) points out that students who have an entrepreneurial attitude can respond in advance to problematic situations. In this sense, an educational project that considers training for entrepreneurship must manage different actions and resources to solve different existing problems (Vera-Sagredo et al., 2020). According to Gomez et al. (2017), training for entrepreneurship must consider the search for tools that favor the willingness to undertake.

An entrepreneurial community must distinguish itself in entrepreneurial skills and in the generation of knowledge, which are forces that promote development for economic growth, job creation and market competitiveness (Audretsch, 2009). According to the United Nations Educational, Scientific and Cultural Organization [Unesco] (2006), secondary education's potential regarding the value of entrepreneurship lies in the need to promote entrepreneurial skills such as self-confidence, creativity, community well-being and readiness for the world of work. For this reason, it is essential that the training of students considers skills, attitudes, innovation and a culture of entrepreneurship, allowing these abilities to settle in young people through the curricular bases of Professional Technical Secondary Education (Ministry of Economy, Development and Tourism, 2015).

Some precedents on this topic indicate that women show superior attitudes in entrepreneurship and innovation. In other words, they adapt more effectively to the requirements of the environment and have a greater aptitude for management (Oliver-Germes et al., 2016; Oliver et al., 2016).

Therefore, it is necessary to strengthen the training of students of Professional Technical Secondary Education through educational innovations that allow for improving their levels of achievement in their study programs, since educational innovations are considered one of the fundamental pillars for training the students of this century. In this way, it is expected that by

using innovative methodologies, it will be possible to channel student learning through flexible actions aiming for solutions involving improvements in the school community's needs. This would be possible if students manage to provide solutions to their problems in an effective, flexible and continuous way (Manola et al., 2017). For Gil et al. (2018) educational communities require transformation processes that modify frequent behavior patterns in their beliefs, attitudes and customs.

Several studies show that one of the key factors to improving teaching-learning processes corresponds to the innovation carried out in school contexts (Constenla et al., 2022; Manola et al., 2017; Vera-Sagredo et al. al., 2020). As pointed out by Parra et al. (2021), it is common for innovation in the classroom to be manifested by the need for change that teachers show in their professional work. In this context, it is assumed that the teacher becomes an agent of change when considering a critical and reflective attitude in their pedagogical practices, which allows them to reflect persistently on their work to find strategies for solving the identified needs. In other words, updating and improving educational quality is possible through innovative actions in educational practices (Nikolaevna, 2019).

Serdyukov (2017) points out that for a prosperous society to exist, it is necessary to revitalize the educational system by improving methodologies and the delivery of tools to students. That is, to generate autonomy, critical thinking, creativity and self-efficacy through innovative actions. For Zavala-Guirado et al. (2020) it is essential that the new methodologies consider the students' learning priorities, with actions that offer new proposals that promote deep, prolonged and sustainable changes. Therefore, to improve educational practices, radical optimization of the theory and practice of teaching-learning processes is required (Serdyukov, 2017).

On this matter, Deppeler and Aikens (2020) explain that innovative learning contexts have been shown to be more appropriate for the professional well-being of teachers, students and the school community. In this sense, school innovation becomes an intrinsic need for the praxis of teachers and the organization of educational centers (Vásquez-Cano et al., 2019).

For their part, Granados et al. (2020) point out that for innovation to make sense, it is necessary to consider aspects such as the environment and suitable resources, the students' characteristics, as well as determining the forms of monitoring and evaluation to know the process that is to be carried out in teaching the student body. In this way, it will be easier to identify the difficulties of making effective decisions that allow for transformation.

Gamification

In the context of innovation in education, gamification has been considered an important strategy in the teaching and learning processes of the student body. For Liberio (2019), gamification experiences promote motivation and social identification through play in order to achieve a greater commitment to learning from students. Perdomo and Rojas (2019) indicate that the methodologies involved in gamification involve emotion, motivation, and associative learning to improve the experience, promote behavioral change, and generate instant feedback.

The studies by Ortiz et al. (2018) highlight some benefits that can be obtained with this methodology, such as immersion to enable anticipation and planning of situations, socialization through interactivity and interaction, motivation and commitment to learning through different elements involved, which can therefore incite greater motivation in the student. In the same way, Lozano and Sánchez (2021) consider that this strategy could offer important advantages, such as a good climate in the classroom, contextualizing certain contents, as well as promoting desirable attitudes and behaviors in students during the proposed pedagogical activities.

Some recent studies explain that gamification strategies provide teachers with new active methodologies to support students in more active learning, and that they develop self-regulation skills for meaningful learning (Zambrano-Álava et al., 2020). Similarly, Castillo-Mora et al. (2022) point out that it is a very effective technique, since the student is able to visualize their progress, which motivates them to strive to achieve mastery of concepts.

Indeed, being able to design playful didactics allows students to be more active because it combines serious learning and fun (Prieto, 2022; Zepeda-Hernández et al., 2016). For their part, Sevilla-Sánchez et al. (2023) show that the use of this strategy increased student learning and improved social and affective behaviors. In addition to the above, the use of scores, rewards, classifications and badges have a positive effect on the teaching environment and on student motivation. (Bañolas and Ramos, 2022; Mendoza *et al*., 2022).

Methodology

The research was carried out with students from Professional Technical High Schools in the Biobío Region, Chile. The study corresponds to a non-experimental, cross-sectional design with a quantitative approach of descriptive-correlational scope.

Participants

724 students from six schools in the Biobío region, Chile participated., 422 (58.3%) were women and 302 (41.7%) were men. The ages of the participants ranged from 14 to 21 years, with an average age of 15 years. (M = 15.81; DE = 1.288).

Information on collection procedures and instruments

The application of the instrument was carried out massively and online with the students in the sample. Before collecting the data, informed consent was requested from parents and/or guardians for underage students, as well as the students' assent to participate in the study. Prior to data collection, we checked that all establishments had a computer lab and Internet access. The dates and times of application were coordinated with directors and teachers so as not to interfere with the students' school tasks.

The instrument used for data collection was called "Perception of entrepreneurship, innovation and gamification in education (AEIGE) student version", which was adapted by the Innovapedia® Center of the Universidad Católica de la Santísima Concepción, based on contributions from the authors Mazón et al. (2009), Rocha (2013), Traver-Martí and Fernández-Berrueco (2016), and validated through expert evaluation. The survey was used to determine the students' perception on the topics related to the study (entrepreneurship, innovation and gamification). The instrumeny consisted of 38 items and was measured using a five-point Likert scale —from totally disagree (1) to totally agree (5). The instrument items were grouped into three categories: (1) entrepreneurship (11 items), of the type It is necessary for students to develop entrepreneurial skills; (2) innovation (10 items), of the type The development of innovation in teaching practice contributes to the achievement of their learning; (3) gamification (17 items), of the type Teachers have incorporated the game to promote the development of skills or knowledge.

The confirmatory analysis of the three factors obtained a good adjustment and a greater proximity to the original theoretical construct. The values in AFC were $\chi 2$= 25047.599, p <.001, CFI (.95), TLI (.96) and RMSEA (.03). The reliability index of this version was adequate, Cronbach's alpha, (r_α= .979) (Hu and Bentler, 1999).

Analysis of data

In order to know the perception of the students on the topics addressed in the study, we proceeded to carry out descriptive analyzes. In the same way,To review possible differences between the dimensions examined and sociodemographic variables, the means obtained through Student's t test for independent groups and Anova were analyzed. Similarly, the possible relationships between the different dimensions were examined using the Pearson test. To determine the types of tests necessary for the analyses, the assumptions of normality, homogeneity and independence were verified through different statistical tests (Kolmogorov-Smirnov, Levene). For all these analyses, the SPSS v. 21

Results

Descriptive results on entrepreneurship, innovation and gamification in education

The results of the descriptive analyzes show that, in general, students have a positive perception of the reviewed topics. It can be observed that the highest scores in the students' responses correspond to the statements that indicate that innovation could be carried out in any subject; game-based strategies allow skill development; students value the teacher's humor positively; and teachers appreciate the diversity of the student body.

On the contrary, the lowest scores of the students' responses were observed in the statements regarding knowledge of gamification and the key competencies of entrepreneurship. In addition, there is no clarity about the entrepreneurial skills that teachers should have and whether the years of service would be linked to innovation skills. It is also evident that students have an inactive role in the development of the classes (Table 1).

Table 1. Descriptive analysis of students' answers (Min, Max, Average, Standard deviation)

	MIN	MAX	AVG	SD
1. Innovation in the teaching practice contributes to learning achievement.	1.00	5.00	3.841	1.132
2. Your educational establishment is prepared for innovation.	1.00	5.00	3.838	1.102
3. Your educational establishment has developed innovative experiences.	1.00	5.00	3.639	1.111
4. Classes offer spaces for reflection on your training as a student.	1.00	5.00	3.752	1.137
5. The teacher fosters reflection-action activities as innovative classroom strategies.	1.00	5.00	3.734	1.131
6. It is necessary to develop innovative competencies during your education.	1.00	5.00	3.708	1.137
7. The methodological strategies used by the teacher includes innovation.	1.00	5.00	3.698	1.065
8. Your teachers are leaders in innovation.	1.00	5.00	3.549	1.087
9. Innovation can be included in any subject.	1.00	5.00	3.922	1.133
10. Competencies in innovation are related to years of teaching service.	1.00	5.00	3.270	1.146
11. You know what key entrepreneurial competencies are.	1.00	5.00	3.067	1.178
12. Your teacher must be an entrepreneur to develop this competency in their students.	1.00	5.00	3.214	1.168
13. Entrepreneurship provides more tools for resilience.	1.00	5.00	3.748	1.063
14. Entrepreneurial experiences have been developed in your educational establishment.	1.00	5.00	3.386	1.103
15. It is fundamental that training in entrepreneurship begins in early stages of one's education.	1.00	5.00	3.739	1.124
16. The development of entrepreneurial competencies enhances job opportunities.	1.00	5.00	3.819	1.114
17. It is necessary that students develop competencies in entrepreneurship.	1.00	5.00	3.686	1.100
18. Our country can improve productivity indicators through entrepreneurship.	1.00	5.00	3.896	1.147
19. The methodological strategies that are currently used by teachers consider the development of entrepreneurship.	1.00	5.00	3.540	1.059
20. Entrepreneurship can be included in any subject.	1.00	5.00	3.680	1.121
21. The development of competencies in entrepreneurship is related to years of teaching service.	1.00	5.00	3.291	1.110
22. You know what gamification is.	1.00	5.00	2.680	1.244
23. Learning strategies based on games allow for	1.00	5.00	3.870	1.108

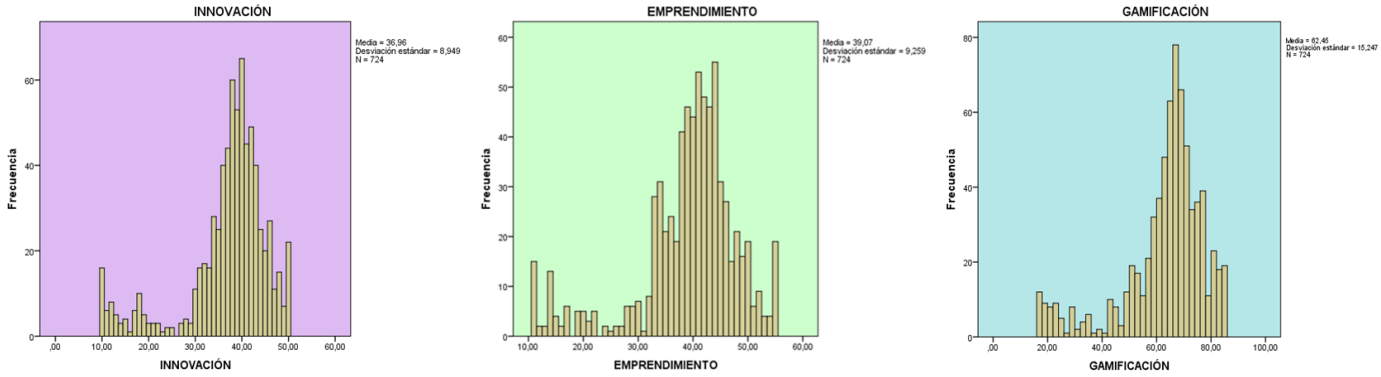
incorporating new knowledge.				
24. You know the game-based technological tools that allow for incorporating new knowledge.	1.00	5.00	3.505	1.156
25. Ludic strategies have a greater impact on your learning.	1.00	5.00	3.714	1.085
26. The ludic strategies used by your teacher improve the classroom climate.	1.00	5.00	3.777	1.120
27. Ludic elements enrich the classroom didactics.	1.00	5.00	3.698	1.090
28. Learning strategies based on gaming allow for developing skills.	1.00	5.00	3.918	1.108
29. You like to participate in class.	1.00	5.00	3.433	1.194
30. Gaming is useful at all educational levels for the development of learning.	1.00	5.00	3.866	1.154
31. Your teachers try to implement different strategies in the classroom.	1.00	5.00	3.780	1.177
32. The teachers use strategies that stimulate your participation in class.	1.00	5.00	3.768	1.161
33. You value your teachers' sense of humor.	1.00	5.00	3.922	1.159
34. The teachers consider mistakes as a learning experience.	1.00	5.00	3.861	1.163
35. Your teachers value student diversity.	1.00	5.00	3.942	1.135
36. You play an active role in classes.	1.00	5.00	3.263	1.153
37. Teachers have incorporated gaming to encourage the development of skills or knowledge.	1.00	5.00	3.669	1.149
38. There is a motivational environment in the classroom that facilitates collaborative and quality learning.	1.00	5.00	3.777	1.196

Source: Prepared by the authors

Regarding the descriptive analyzes by dimension and according to the number of items, it is observed that innovation would be the dimension most valued by students (M = 36.96; DE = 8.949), followed by gamification (M = 62.45; DE = 15,247), and finally by entrepreneurship (M = 39.07; DE = 9,259) (Figure 1).

Revista Iberoamericana para la Investigación y el Desarrollo Educativo
ISSN 2007 - 7467

Figure 1. Descriptive analysis by dimension (average and standard deviation)



Source: Prepared by the authors

Differential results between the variables examined and sociodemographic data (t student and Anova)

Differences between the studied topics according to students' gender

One of the purposes of the study was to find possible differences between the variables analyzed in terms of the students' gender. Regarding this, it was observed that there were statistically significant differences in two of the items: one belonging to the entrepreneurship dimension and the other to the gamification dimension, both in favor of the female group (Table 2). In other words, the group of women give greater importance to the development of entrepreneurial skills in students and the use of games as a learning strategy, independent of the educational level at which the are studying.

Table 2. Analysis of difference in terms of students' gender and examined scale. T Test and size of effect

Items	Women		Men		t	d
	AVG	SD	AVG	SD		
It is necessary that students develop competencies in entrepreneurship.	3.765	1.096	3.576	1.099	2.288**	.177
Gaming is useful at all educational levels for the development of learning.	3.945	1.102	3.755	1.217	2.195**	.163

** The difference is significant at the 0.01 level

Source: Prepared by the authors

Differences between the studied topics according to the students' age and educational level

Regarding the differences in the students' responses according to age, it can be observed that in the item *Know the key competencies of entrepreneurship* there are statistically significant differences (F (7.716) = 3.332, p<.5, η2=.03). Multiple comparisons would indicate that differences were found between students aged 14 and 15, in favor of the younger age group. Similarly, statistically significant differences were observed in the statement that entrepreneurship experiences have been developed in educational establishments (F (7.716) = 2.343, p<.5, η2=.02). In multiple comparisons, this difference can be seen between students aged 17 and 20, in favor of the older group.

Lastly, there were also differences regarding age in the statement that through entrepreneurship our country would improve its productivity indicators (F (7.716) = 2.126, p<.5, η2=.02). In this case, the multiple comparisons indicate that the differences are found between the group of students aged 17 and 19, in favor of the younger group. Regarding the educational level of the students, no significant differences were found in any of the items examined.

Analysis of relationships between the scale examined on all the studied variables

To obtain results regarding the possible relationships between the dimensions of the scale and the characteristics of the participants, the Pearson correlation test was performed (Table 3). The results show the existence of significant correlations between the dimension of innovation with entrepreneurship (r = .869, p < .005) and between entrepreneurship with gamification. (*r* = .891, p < .005).

Table 3. Relationship between the different studied variables

	Innovation	Entrepreneurship	Gamification	Sex	Age
Innovation	-----	,869**	,891**	-,027	-,010
Entrepreneurship		-----	,878**	-,047	,045
Gamification			-----	-,028	-,017
Sex				----	-,023
Age					----

*. Correlation is significant at the 0.05 level (bilateral).
**. Correlation is significant at the 0.01 level (bilateral).

Source: Prepared by the authors

Discussion

The study considered three research objectives: (1) analyze the perception that students from professional technical establishments have regarding entrepreneurship, innovation and gamification; (2) identify possible differences in terms of sociodemographic variables (sex, age) regarding the dimensions of the scale; (3) examine the existing correlations between the dimensions of the scale (entrepreneurship, innovation and gamification) and sociodemographic variables reviewed in the study.

In light of the obtained results , it was possible to show in the descriptive analyses that there would be a higher valuation in some dimensions. It was observed that the highest scores in the students' responses correspond to the fact that educational innovations could be carried out in any subject, the strategies based on the game allow skills to be developed, the students positively value the teacher's humor and the teachers appreciate the diversity of the student body.

Regarding the first item, related to educational innovation, several authors have pointed out that it is necessary for teachers to become generators of change through a critical and reflective attitude that allows them to constantly think about their academic work and the students' needs. (Nikolaevna, 2019; Parra et al., 2021). These activities, as indicated by the students, could be carried out in any curricular activity. Another aspect that was positively valued was the strategies based on games. Liberio (2019) and Perdomo and Rojas (2019) point out that these are associated with emotion and motivation, and this is probably why students value them so positively. As explained by González-Grandón et al. (2021), gaming brings us closer to effectiveness and possible stimuli. Reactions and responses are experienced from the individual or collective imaginary universe, which can lead students to reflect and experience emotions in their teaching-learning processes that are generally positive.

In the same way, students give greater importance to the teacher's humor, an item associated with gamification. For Lozano and Sánchez (2021), this type of strategy has the advantage of stimulating the work climate, since it promotes desirable attitudes and behaviors in the classroom with interesting potential to improve learning.

The items with the lowest ratings had to do with the lack of knowledge of the students about the characteristics of gamification and entrepreneurship skills. In addition, the little active role that the students present in the classes was evidenced. In the same way, it was observed that the students value the items of the innovation and gamification dimensions more than entrepreneurship. Probably, these results are associated with the lack of knowledge on the definitions and competencies to undertake.

Regarding the results related to the study's objective 2, statistically significant differences were observed in two items: one belonging to the entrepreneurship dimension and the other to the gamification dimension, both in favor of the group of women. In other words, they would give greater relevance to the development of entrepreneurship skills and the use of games as a learning strategy. As in the studies by Oliver Germes et al. (2016), women would adapt more easily to the demands of the environment, would be trained, and would show greater passion and management skills.

On the other hand, statistically significant differences were found regarding students' age in issues related to key entrepreneurship competencies, development of entrepreneurial experiences, and improvements in productivity indicators through entrepreneurship. In this sense, younger students place a higher value on the knowledge of key entrepreneurship skills (14 and 15 years) and productivity indicators would improve through entrepreneurship (17 and 19 years). On the other hand, older students indicated that they have evidenced entrepreneurial experiences in their educational establishments (17 and 20 years). Regarding the educational level, no statistically significant differences were observed in any of the instrument's dimensions and items.

As for Objective 3, an interesting and statistically significant relationship was perceived between the dimensions of innovation and entrepreneurship, and between entrepreneurship and gamification. In the case of the first relationship, it could be said that the student links concepts of entrepreneurship with the need to innovate. In this sense, Vélez-Romero and Ortiz (2016) point out that there is evidence attributed to these variables and largely to the coincidence between both. In the same way, they state that when talking about innovation and entrepreneurship, leadership, investment, politics, projects, challenges and opportunities that encourage the idea of entrepreneurship and innovation should inevitably be discussed. In the case of the second relationship, it is evident that the use of gaming could be an interesting aspect to understand the competencies of entrepreneurship; for example, by pointing out that playful elements enrich classroom teaching or that game-based learning strategies allow skills to be developed.

In short, gamification is a practical possibility that allows simulation through activities, which stimulates the emergence of entrepreneurial attitudes, the strengthening of soft skills, as well as the cognitive foundations linked to student learning. (Vargas-Morúa, 2022).

Conclusions

Entrepreneurship is a top priority on political agendas around the world, as it presents a means to promote economic growth, fight unemployment and create social capital (Vargas-Morúa, 2022). In this sense, using didactic methodologies that support the teaching-learning process of entrepreneurship through entrepreneurial skills and competencies are plausible alternatives, since students could acquire greater motivation towards more significant learning than that promoted in traditional teaching.

As for this study's limitations, its cross-sectional quantitative nature naturally stands out, with the application of the instrument in a single moment, which could mean a bias in the measurement. Assuming these limitations and its non-experimental nature, the possibility of proposing interventions with longitudinal pre-experimental and quasi-experimental designs that consider the topics addressed is projected. In the same way, proposals in the school system that allow strengthening skills in entrepreneurship and innovation through the use of gamification should be examined.

Finally, the methodology and scope of this study could be replicated in other educational contexts, such as subsidized establishments and/or private schools to determine if the analysis of the variables examined responds in a similar or different way than the sample of this study.

Future lines of research

It would be interesting if the study of the students' perceptions on the topics addressed considered a mixed study. In this sense, some of the evidenced findings could be understood in depth through a qualitative approach; for example, the fact that women present greater competencies in aspects related to entrepreneurship or that younger students have greater knowledge of these competencies. In the same way, it would be interesting to analyze the competences that the teachers of these institutions possess, since the findings obtained account for the assessment that students give to some characteristics of the teaching staff, such as the use of innovative strategies and support for the diversity of the student body.

Acknowledgements

The authors would like to thank the Biobío Regional Government for financing this 2020 Innovation Fund for Competitiveness Project (Project FIC-R 40026765-0) called "Gamification for innovation and entrepreneurship in High School Technical Professional Education (EMTP)".

References

Arias, E., Farías, M., González-Velosa, C. y Rucci, G. (2015). *Educación Técnico Profesional en Chile.* Banco Interamericano de Desarrollo. https://publications.iadb.org/publications/spanish/document/Educaci%C3%B3n-t%C3%A9cnico-profesional-en-Chile.pdf

Audretsch, D. (2009). The Entrepreneurial Society. *Journal of Technology Transfer*, *34*(3), 245-254.

Bañolas, I. y Ramos, E. (2022). Tendiendo puentes hacia la gamificación en educación física: una experiencia en el aula de primaria. *Acción Motriz*, (29), 126-140.

Castillo-Mora, M., Escobar-Murillo, M., Barragán-Murillo, R., y Cárdenas-Moyano, M. (2022). La gamificación como herramienta metodológica en la enseñanza. *Polo del Conocimiento*, *7*(1), 686-701. http://dx.doi.org/10.23857/pc.v7i1.3503

Constenla, J., Vera Sagredo, A. y Jara Coatt, P. (2022). Actitudes y capacidades de los docentes hacia la innovación educativa. La mirada de los estudiantes. *Revista Pensamiento Educativo, 59*(1), 1-15. https://doi.org/10.7764/PEL.59.1.2022.7.

Deppeler, J. and Aikens, K. (2020). Responsible innovation in school design – a systematic review. *Journal of Responsible Innovation*, *7*(3), 573-597. https://doi.org/10.1080/23299460.2020.1809782.

Fernández, M. (2011). *Global Entrepreneurship Monitor: Reporte Nacional Bolivia 2010*. La Paz: UCB.

Gil, A., Antelm, A. y Cacheiro, M. (2018). Análisis de la capacidad de innovación escolar desde la perspectiva del profesorado de educación secundaria. La escuela como organización que aprende. *Educar*, *54*(2), 449-468.

Gómez, L., Llanos, M., Hernández, T., Mejía, D., Heilbron, J., Martín, J., Mendoza, J. y Senior, D. (2017). Competencias emprendedoras en Básica Primaria: hacia una educación para el emprendimiento. *Pensamiento y Gestión*, 43, 150-188.

González-Grandón, X., Chao, C. y Patiño, H. (2021). El juego en la educación: una vía para el desarrollo del bienestar socioemocional en contextos de violencia. *Revista Latinoamericana de Estudios Educativos*, *51*(2), 233-270. https://www.redalyc.org/journal/270/27065158006/html/

Granados, J. F., Vargas Pérez, C. V. y Vargas Pérez, R. A. (2020). La formación de profesionales competentes e innovadores mediante el uso de metodologías activas. *Universidad y Sociedad*, *12*(1), 343-349.

Hu, L. and Bentler, P. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives Structural Equation Modeling. *A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Liberio, X. P. (2019). El uso de las técnicas de gamificación en el aula para desarrollar las habilidades cognitivas de los niños y niñas de 4 a 5 años de Educación Inicial. *Revista Conrado*, *15*(70), 392-397. http://conrado.ucf.edu.cu/index.php/conrado

Lozano, O. y Sánchez, A. (2021). Diseño, aplicación y resultado de una estrategia de ludificación como actividad de cierre en clases de química. *Educación Química*, *32*(4). http://dx.doi.org/10.22201/fq.18708404e.2021.5.78989.

Manola, J., Reiban, R. y Letamendi, C. (2017). Innovación en la educación superior. *Revista Publicando*, *11*(1), 719 -731.

Mazón, J., Martínez, J. y Martínez, A. (2009). La evaluación de la función docente mediante la opinión del estudiante. Un nuevo instrumento para nuevas dimensiones: *COED. Revista de la Educación Superior*, *38*(149), 113-139.

Mendoza, M. A., Patiño Robles, T. A. y Armijos Moreta, J. F. (2022). Estrategias de gamificación en Educación Superior en la Carrera de Odontología. *Revista Conrado*, *18*(S3), 470-476.

Ministerio de Economía, Fomento y Turismo (2015). *Pilotos para la incorporación de habilidades de innovación y emprendimiento en el sistema escolar* (informe 3). http://www.economia.gob.cl/wp-content/uploads/2015/07/Emprendimiento-escolar.pdf

Ministerio de Educación (MINEDUC) (2013). *Bases curriculares. Formación diferenciada técnico-profesional: especialidades y perfiles de egreso*. Santiago de Chile. http://www.tecnicoprofesional.mineduc.cl/wp-content/uploads/2016/03/Bases-formacion-Descripci%C3%B3n-de-las-Especialidades.pdf

Ministerio de Educación (MINEDUC) (2016). *Política nacional de formación técnico-profesional*. Decreto exento 848/2016. Santiago de Chile. https://bibliotecadigital.mineduc.cl/bitstream/handle/20.500.12365/2168/mono-9000.pdf?sequence=1&isAllowed=y

Ministerio de Educación (MINEDUC) (s. f). *Educación Técnica profesional en Chile: antecedentes y claves de un diagnóstico*. Santiago de Chile. https://bibliotecadigital.mineduc.cl/bitstream/handle/20.500.12365/548/MONO-466.pdf?sequence=1&isAllowed=y

Ministerio de Educación (MINEDUC) (2011). *La cultura del emprendimiento en los establecimientos educativos: orientaciones generales*. Bogotá: Servicios Creativos.

Nikolaevna, N. (2019). Major factors of teachers' resistance to innovations. *Ensaio: aval. pol. públ. Educ.*, 1- 21. https://doi.org/10.1590/S0104-40362019002701807

Oliver Germes, A., Galiana Llinares, L., Calatayud, P. y Piacentini, G. (2016). Medida del emprendizaje: adaptación y validación de la escala de actitudes emprendedoras EASS en profesores españoles. *Búsqueda*, *3*(16), 41-52. https://doi.org/10.21892/01239813.167

Oliver, A., Galiana, L. y Gutiérrez, M. (2016). Diagnóstico y políticas de promoción del emprendimiento en estudiantes. *Anales de Psicología*, *32*(1), 183-189. http://dx.doi.org/10.6018/analesps.32.1.186681

Ortiz, A., Jordán, J. y Agredal, M. (2018). Gamificación en educación: una panorámica sobre el estado de la cuestión. *Educ. Pesqui., São Paulo*, 44, e173773.

Parra, L. R., Menjura, M. I., Pulgarín, L. E. y Gutiérrez, M. M. (2021). Las prácticas pedagógicas. Una oportunidad para innovar en la educación. *Revista Latinoamericana de Estudios Educativos*, *17*(1), 70-94. https://doi.org/10.17151/rlee.2021.17.1.5

Perdomo, I. y Rojas, J. (2019). La ludificación como herramienta pedagógica: algunas reflexiones desde la psicología. *Revista de Estudios y Experiencias en Educación*, *18*(36), 161-175. https://doi.org/10.21703/rexe.20191836perdomo9.

Prieto, J. M. (2022). Revisión sistemática sobre la evaluación de propuestas de gamificación en siete disciplinas educativas. Teoría de la Educación. *Revista Interuniversitaria*, *34*(1), 189-214. https://doi.org/10.14201/teri.27153.

Rocha, R. (2013). Escala de opinión de los estudiantes sobre la efectividad de la docencia (EOEED) en Educación Superior. *Formación Universitaria*, *6*(6), 13-22. https://doi.org/10.4067/S0718-50062013000600003.

Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning*, *10*(1), 4-33. https://doi.org/10.1108/JRIT-10-2016-0007

Sevilla-Sánchez, M., Dopico, X., Morales, J., Iglesias-Soler, E., Fariñas, J. y Carballeira, E. (2023). La gamificación en educación física: efectos sobre la motivación y el aprendizaje. *Retos*, *47*, 87-95.

Traver-Martí, J. y Fernández-Berrueco, R. (2016). Construcción y validación de un cuestionario de actitudes hacia la innovación educativa en la universidad. *Perfiles Educativos*, *38*(151), 86-103. https://doi.org/10.22201/iisue.24486167e.2016.151.5 4917

United Nations Organization for Education, Science, and Culture Organization (Unesco) (2006). *Towards an entrepreneurial culture for the twenty-first century: Stimulating entrepreneurial spirit through entrepreneurship education in secondary schools*. International Labour Office-ilo.

Vargas-Morúa, G. (2022). Educación emprendedora y gamificación como estrategia de aprendizaje. *Revista Espiga*, *21*(43), 126-146. https://www.redalyc.org/journal/4678/467869603007/467869603007.pdf

Vásquez-Cano, E., Sevillano, M. y De Pedro, F. (2019). Análisis de propuestas de innovación educativa en el prácticum del grado en pedagogía. *Contextos Educativos*, *23*, 11-29. http://doi.org/10.18172/con.3555.

Vélez-Romero, X., y Ortiz, S. (2016). Emprendimiento e innovación: una aproximación teórica. *Revista Dominio de las Ciencias*, *1*(4), 346-369.

Vera-Sagredo, A. J., Constenla-Núñez, J., Jara-Coatt, P. y Lassalle-Cordero, A. (2020). Emprendimiento e innovación en educación técnico profesional: percepción desde los docentes y directivos. *Revista Colombiana de Educación*, *1*(79). https://doi.org/10.17227/rce.num79-8605

Villalta, M. y Saavedra, E. (2012). Cultura escolar, prácticas de enseñanza y resiliencia en alumnos y profesores de contextos sociales vulnerables. *Universitas Psychologica*, *11*(1), 67-78.

Zambrano-Álava, A., Luque-Alcívar, K., Lucas-Zambrano, M. y Lucas-Zambrano, A. (2020). La gamificación: herramientas innovadoras para promover el aprendizaje autorregulado. *Dom. Cien.*, *6*(3), 349-369. http://dx.doi.org/10.23857/dc.v6i3.1402

Zavala-Guirado, M., González-Castro, I. y Vázquez-García, M. (2020). Modelo de innovación educativa según las experiencias de docentes y estudiantes universitarios. *RIDE*, *10*(20). https://doi.org/10.23913/ride.v10i20.590

Zepeda-Hernández, S., Abascal-Mena, R. y López-Ornelas, E. (2016). Integración de gamificación y aprendizaje activo en el aula. *RA XIMHAI*, *12*(6), 315-325.

Rol de Contribución	Autor (es)
Conceptualización	Jaime Constenla-Núñez
Metodología	Angélica Vera-Sagredo
Software	Angélica Vera-Sagredo
Validación	Angélica Vera-Sagredo
Análisis Formal	Angélica Vera-Sagredo
Investigación	Pilar Jara-Coatt
Recursos	Jaime Constenla-Núñez
Curación de datos	Angélica Vera-Sagredo
Escritura - Preparación del borrador original	Pilar Jara-Coatt
Escritura - Revisión y edición	Pilar Jara-Coatt
Visualización	Angélica Vera-Sagredo
Supervisión	Jaime Constenla-Núñez
Administración de Proyectos	Jaime Constenla-Núñez
Adquisición de fondos	Jaime Constenla-Núñez