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Self-efficacy, motivation, and use of digital resources in Secondary Education: A mediation analysis

Autoeficacia, motivación y uso de recursos digitales en educación secundaria: un análisis de mediación

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Abstract

This article examines the role of digital resources in teaching activities, considering self-efficacy and motivation as potential predictors of their use by teachers in secondary education. Specifically, it analyses whether teaching motivation –both autonomous and controlled– is a mediating variable between teachers' perceived self-efficacy and the level of integration of digital resources into their educational practice. A mediation analysis was conducted using the PROCESS macro, with the participation of 311 secondary school teachers. The results reveal that autonomous motivation partially mediates the relationship between self-efficacy and different types of digital resources (resources for accessing, searching for, and managing information; for creating and editing digital content; and for interaction and communication). Self-efficacy was found to be a direct positive predictor of autonomous motivation and an indirect predictor (through autonomous motivation) of digital resource use. Consequently, the study highlights the importance of implementing effective training and organisational measures that increase teachers' perception of their professional competence and their intrinsic motivation, thereby fostering an environment that supports pedagogical innovation and continuous professional development through the use of digital technologies.

Keywords: self-efficacy; motivation; educational technology; professional development; educational innovation; secondary education.

Resumen

Este artículo analiza el papel de los recursos digitales en la actividad docente, considerando la autoeficacia y la motivación como potenciales predictores de su uso por parte

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del profesorado de educación secundaria. En concreto, se analiza si la motivación docente, tanto autónoma como controlada, actúa como variable mediadora entre la autoeficacia percibida del profesorado y el nivel de integración de los recursos digitales en su práctica educativa. Para ello, se realizó un análisis de mediación mediante la macro PROCESS, con la participación de 311 docentes de educación secundaria. Los resultados revelan que la motivación autónoma media parcialmente la relación entre la autoeficacia y las distintas tipologías de recursos digitales (recursos de acceso, búsqueda y gestión de la información; creación y edición de contenidos digitales; e interacción y comunicación), de tal modo que la autoeficacia se confirma como un predictor positivo directo de la motivación autónoma, y un predictor indirecto (vía motivación autónoma) del uso de los recursos digitales. En consecuencia, el estudio subraya la importancia de implementar medidas formativas y organizativas eficaces que refuercen la percepción de la competencia profesional del profesorado y su motivación intrínseca, facilitando así un entorno que favorezca su capacidad de innovación pedagógica y su desarrollo profesional continuo a través del uso de tecnologías digitales.

Palabras clave: autoeficacia; motivación; tecnología educativa; desarrollo profesional; innovación educativa; educación secundaria.

1. Introduction

The scientific study of the role of digital resources in teaching practice has received considerable interest over recent decades, as these technologies have become established as a key element for improving student achievement and the efficacy of teaching and learning processes in secondary education (Álvarez-Flores, 2024; Cisneros-Barahona *et al.*, 2024; Riofrio Casa & Peñafiel Villareal, 2022; Wang *et al.*, 2024).

Education is no longer confined to a specific physical or temporal space, and it is recognised that people learn in different ways depending on their needs for accessing knowledge, while at the same time they create and strengthen new networks of communication and learning (Jacome Álvarez, 2021; López-Company, 2021). The appearance of information and communication technologies (ICT) has transformed the role of teachers, who have come to play a guiding role, positioning themselves alongside the students in a more horizontal plane with the aim of fostering meaningful learning and constructing more satisfactory practical experiences (Coll Salvador *et al.*, 2023; Gallego Díaz *et al.*, 2022; Nieto & Vergara, 2021; Otero-Agreda *et al.*, 2023). In this framework, it is possible to distinguish different types of technologies that together contribute to students' development of competences (González-Sanmamed *et al.*, 2020). On the one hand, technologies for accessing, searching for, and managing information enable students to select and critically evaluate various sources of knowledge. On the other hand, technologies for creating and editing content favour the active construction of digital content through the production of texts, images, videos, and presentations. Finally, interaction and communication technologies foster collaboration, teamwork, and the development of socioemotional skills. These three dimensions do not act in isolation, but instead mutually reinforce one another, favouring comprehensive, interactive, and contextualised education, in line with the demands of the current educational environment (Mayorga, 2020).

Nonetheless, despite the advantages of these technologies, integrating them into teaching practice still faces significant difficulties. Some studies have identified challenges such as loss of privacy, lack of training, and social isolation as the primary obstacles for teachers (Area Moreira, 2009; Gómez Trigueros & Yáñez de Aldecoa, 2023; Jordá Fabra *et*

al., 2023; Rodríguez Parrales *et al.*, 2021). In addition to this, there is internal resistance, such as negative attitudes or low confidence of teachers in their capacity to use technologies (Ardıç, 2021). This evidence underlines the importance of considering not only the technical resources available, but also the personal factors that influence teachers' openness towards pedagogical innovation mediated by technology.

In this context, it is necessary to identify the personal factors that would favour a greater willingness among teachers to incorporate technology into their teaching practice. Self-efficacy and motivation stand out among these factors. According to Bandura's cognitive theory (1977), self-efficacy is the conviction in one's own ability to plan and carry out the actions required to attain particular achievements. In the educational context, Marcos-Sánchez *et al.* (2023) interpret it as the teacher's capacity to promote the development of students within the classroom, which involves knowing how to recognise and benefit from the opportunities that the environment offers. Furthermore, teacher self-efficacy is associated with better professional performance (Aytaç, 2022). For its part, teacher motivation, understood as the process that stimulates and maintains the actions aimed at achieving objectives, is a key factor for quality and efficacy in teaching (Estévez *et al.*, 2021; Jean-Roch-Donald & Villanueva, 2025). According to organismic integration theory (Ryan & Deci, 2020), the more autonomous motivations (i.e., intrinsic motivation and identified regulation) favour professional satisfaction and well-being, while more controlled forms of motivation (i.e., external regulation and introjected regulation) can negatively affect engagement with work (Fernet *et al.*, 2012; In de Wal *et al.*, 2014; Ryan & Deci, 2020; Slemp *et al.*, 2020).

Various theoretical and empirical studies have explored the relationship between self-efficacy and motivation of secondary education teachers, finding a close interdependence (Canrinus *et al.*, 2012; Barni et al., 2019). In particular, it has been observed that secondary education teachers with intrinsic and altruistic motivations tend to display higher levels of self-efficacy, while motivations of an extrinsic character (i.e., controlled motivations) display a much weaker relationship with it (Calkins & Wiens, 2024; Roa & Prados, 2020). This relationship has also been observed in other educational stages. For example, in the university setting it has been found that professionals with a more autonomous motivation tend to perceive themselves as more effective and, conversely, those with greater self-efficacy display higher levels of motivation (Rodríguez *et al.*, 2009).

Similarly, the self-efficacy of the teacher is highly related to the use of technological resources in secondary education. Teaching professionals with greater teacher efficacy consider themselves more competent to integrate technology in the classroom and tend to display a greater command of pedagogical–technological knowledge, while those who feel less secure or insufficiently qualified make much more limited use of these tools (Bakar *et al.*, 2020; Barton & Dexter, 2020; Grimalt Álvaro, 2015).

Finally, the motivation of secondary school teachers is also significantly related to the integration of digital educational tools. Teachers with intrinsic motivation and adequate training in technology display a high predisposition to use digital resources in the classroom (Gómez-Fernández & Mediavilla, 2022; Guzey & Roehrig, 2012). In this sense, autonomous motivation has been identified as a key factor in the integration of technologies in teaching (Chiu, 2022), while controlled motivation did not display a significant relationship with the use of digital resources (Gorozidis & Papioannou, 2014). In turn, the technologies themselves can have a positive effect on teachers' motivation (Munguía Hoyo, 2013).

1.1. Objectives and hypotheses

The available evidence on self-efficacy identifies it as a possible personal resource with strong potential to favour both autonomous motivation and the use of digital resources by secondary education teachers. Furthermore, in view of the studies reviewed, the type of motivation appears to be related to the extent to which teachers engage with the use of

digital resources. Nonetheless, to the best of our knowledge, there is a lack of studies that jointly analyse the relationship between teachers' self-efficacy, motivation, and use of digital resources. This gap is especially significant in secondary education, given that at this stage there could be a greater need for digital literacy in teachers to meet current educational demands adequately (Sepúlveda *et al.*, 2022).

In this context, and based on prior research, the main aim of the present study is to analyse whether self-efficacy and motivation act as personal psychological resources that are significantly related to the use of digital resources by secondary education teachers. The following specific objectives are proposed: a) to examine the direct effect of self-efficacy on the use of different types of digital resources; b) to evaluate the direct effect of self-efficacy on teacher motivation; c) to explore the direct effect of motivation on the use of technological resources; d) to analyse the mediating role of autonomous motivation and controlled motivation on the relationship between self-efficacy and the use of digital resources. Based on prior research, the following hypotheses are formulated (see Figure 1):

H1: self-efficacy will display a direct positive effect on use of digital resources (accessing, searching for, and managing information; creating and editing content; and interaction and communication).

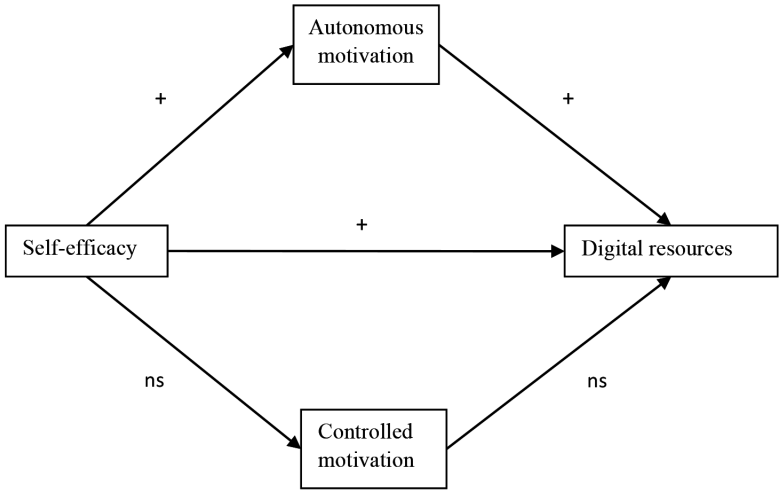
H2: self-efficacy will have a direct positive effect on autonomous motivation, while a significant relationship with controlled motivation is not expected.

H3: autonomous motivation will present a direct positive effect on the use of the three types of digital resources (accessing, searching for, and managing information; creating and editing content; and interaction and communication).

H4: controlled motivation will not have a significant effect on any of the different types of digital resources (accessing, searching for, and managing information; creating and editing content; and interaction and communication).

H5: autonomous motivation will partially mediate the relationship between self-efficacy and types of digital resources, while a mediating effect of controlled motivation is not expected.

FIGURE 1. Hypothesised Relationships between Self-Efficacy, Types of Motivation, and Use of Different Digital Resources (Accessing, Searching for, and Managing Information, Creating and Editing Content, and Interaction and Communication)



Note: ns = not significant.

2. Method

2.1. Participants

The research was conducted in A Coruña, a region located in the north of Spain, and it included the collaboration of 31 secondary schools. To select the participants, an exhaustive list of schools in the city that provide compulsory secondary education (ESO), Baccalaureate, and Vocational Training was first elaborated, considering them as primary sampling units. This list was organised according to the geographic areas officially established by the council of A Coruña (Xunta de Galicia, 2022). The aim was to obtain a representative sample of schools by area through a process of quota sampling. Each school was allocated a computer-generated random number, determining the order of contact. In this way, the management teams were invited in sequence to communicate the proposal for participation to the teachers (secondary sampling units).

However, problems with ensuring involvement by schools from all of the geographical areas resulted in the final sample being configured through non-probability convenience sampling, comprising the schools and teachers who voluntarily agreed to participate. To test whether the number of cases was adequate for the planned statistical analysis, a prior power analysis was done using the program G*Power 3.1 (Cárdenas & Arancibia, 2014). This calculation was based on a one-factor ANOVA with four groups (digital profiles), considering a medium effect size (f = 0.25), a significance level of α = .05, and a power of 95 %. The results indicated that at least 280 participants were required, a figure that the sample selected exceeded.

A total of 311 teachers participated in the study (57.88 % female), aged between 25 and 68 years (M = 48.07; SD = 9.37). As for the type of school, 67.5 % (n = 210) worked in public schools, 25.7 % (n = 80) in state-supported private schools, and 6.8 % (n = 21) in private schools that do not receive state support. Regarding the subjects they teach and the professional families to which they belong, 82.99 % (n = 258) taught subjects in the Obligatory Secondary Education or Baccalaureate stages, 16.05 % (n = 50) worked in Vocational Training, and 0.96% (n = 3) in Adult Education. The most common subject areas of the teachers in Obligatory Secondary Education and Baccalaureate were mathematics (13.18 %, n = 41), geography and history (9.32 %, n = 29), and physics and chemistry (7.72 %, n = 24).

2.2. Tools

To measure teachers' use of digital resources, the resources scale developed by González-Sanmamed *et al.* (2020) was used as a reference point. This instrument evaluates three principal dimensions: resources for accessing, searching for, and managing information (comprising 13 items, for example, "video tutorials"); resources for creating and editing content (8 items, such as "audio editing tools"); and resources for interaction and communication (6 items, such as "mobile messaging"). The responses were collected using a five-point Likert-type scale, where 1 indicated "never" and 5 "always". In the present study, the analyses of the questionnaire's internal consistency returned adequate values for all of its dimensions: α = .839 and Ω = .832 for access resources, α = .781 and Ω = .788 for creation resources, and α = .737 and Ω = .740 for interaction resources.

Teacher self-efficacy was measured using the teacher self-efficacy scale of Rodríguez *et al.* (2009) was used as a reference point. This is the version validated for the Spanish context of the *Ohio State Teacher Efficacy Scale* (Tschannen-Moran & Woolfolk, 2001). This scale comprises 23 items (for example, "help students to think critically"). A Likert-type response scale is used, ranging from 1 to 5 (1 = never and 5 = always). The analyses of internal consistency of the instrument evinced adequate levels of reliability: α = .933 and Ω = .934.

Finally, with the objective of evaluating teacher motivation, the Spanish version of the *Self-Regulation Questionnaire-Academic* scale was used (Ryan & Connell, 1989), validated by Rodríguez *et al.* (2009). This instrument evaluates two dimensions: autonomous motivation, which includes five items (e.g. "because it is an important objective in my life"); and controlled

motivation, which comprises five items (e.g. "because I am expected to do it"). The answers are graded on a Likert-type scale from 1 = disagree completely to 5 = agree completely. The internal consistency of the instrument was adequate in both dimensions: autonomous motivation (α = .747; Ω = .744); controlled motivation (α = .727; Ω = .760).

2.3. Procedure

Initial contact was made by emailing the different participating secondary schools. The schools' management teams acted as intermediaries in the distribution of the questionnaire, asking the teachers to complete the form that was sent to their institutional emails. This email detailed the objectives of the research as well as the conditions of participation, drawing special attention to its voluntary, anonymous, and confidential character, in accordance with the ethical principles of research with human beings. In addition, a link to an online form created in Google Forms was provided and an informed consent sheet was attached, guaranteeing compliance with the principles of the Declaration of Helsinki and the ethical guidelines established by the ethics committee of the Universidad de A Coruña (code 27/02/2019).

Given the low response levels initially obtained, it was decided to make in-person visits to the schools to invite teachers personally to collaborate in the study. During these visits, QR codes that gave direct access to the questionnaire were provided. The confidentiality of the data and anonymity of the participants were guaranteed at all times. The estimated time for completion of the form was between five and ten minutes.

2.4. Data analysis

As preliminary analyses, the descriptive statistics of the variables were first calculated (mean, standard deviation, skewness, and kurtosis). Similarly, Pearson's correlation coefficient analyses were performed to examine the associations between the variables. Prior to this, the assumption of normality of the data was tested by analysing the coefficients of skewness and kurtosis, the values of which were within the acceptable ranges to assume a normal distribution according to the criteria of Finney and DiStefano (2006). This testing justified the use of the Pearson correlation coefficient in the subsequent analyses.

Secondly, mediation analyses were carried out using the PROCESS macro in the SPSS statistics package. In accordance with the hypothesised measurement model (Figure 1), teacher self-efficacy was established as an independent variable, while the three types of digital resources (resources for accessing, searching for, and managing information; creating and editing content; and interaction and communication) were treated as dependent variables of the model. Autonomous motivation and controlled motivation were introduced as mediating variables of the effect of self-efficacy on the three types of digital resources.

3. Results

3.1. Preliminary analyses

Table 1 shows the descriptive statistics for the variables and their correlations. In general terms, the means for the variables that comprise the types of digital resources display relatively similar values. The skewness and kurtosis values reflect distributions without significant presence of outliers, in accordance with the criteria of statistical normality proposed by Finney and DiStefano (2006).

In the case of the personal variables, self-efficacy (M = 3.94) and autonomous motivation (M = 4.34) displayed higher means, while controlled motivation (M = 2.76) presented a similar value to resources for interaction. The skewness and kurtosis values were within the acceptable ranges to assume normality, according to the criteria mentioned.

All of the types of resources correlated positively and significantly with the self-efficacy and autonomous motivation variables ($p < 0.01$, in all cases), while controlled motivation only correlated significantly (positively) with autonomous motivation, and did not display relevant associations with use of digital resources.

Table 1. Descriptive and Correlational Statistics of the Variables

Variables	1	2	3	4	5	6
1AccessR	-					
2CreationR	.756**	-				
3InteractionR	.661**	.673**	-			
4SelfE	.234**	.312**	.287**	-		
5AutoM	.194**	.343**	.282**	.352**	-	
6ControlM	.042	.069	.068	.060	.160**	-
M	2.62	2.98	2.75	3.94	4.34	2.76
SD	.680	.760	.791	.50	.557	.81
Skewness	.398	.123	.394	-.238	-1.70	-.089
Kurtosis	.246	-.049	.065	.926	5.88	-.559

Note: AccessR = access resources; CreationR = creation resources; InteractionR = interaction resources; SelfE = self-efficacy; AutoM = autonomous motivation; ControlM = controlled motivation. **p ≤ .001.

3.2. Mediation analysis

The mediation effect of motivation was analysed using the bootstrapping estimation method. Following the guidelines of MacKinnon *et al.* (2004), a bootstrap sample of 5000 cases and a 95 % confidence interval were used, as, in general terms, estimates of indirect effects do not usually follow a normal distribution. Table 2 shows the direct, indirect, and total effects of the mediation analysis on the relationship between self-efficacy and use of access resources.

As Table 2 shows, self-efficacy positively predicts use of digital resources for accessing, searching for, and managing information ($b = .319$, $p < .001$, 95% CI [.170, .467]), with a moderate effect size ($d = 0.59$). When reviewing the indirect effects, the results indicated that autonomous motivation plays a significant mediating role in the relationship between self-efficacy and use of digital resources for accessing, searching for, and managing information ($b = .060$, 95% CI [.005, .120]), while controlled motivation did not play a significant mediating role ($b = .001$, 95% CI [-.016, .018]). In both cases, the effect size was small, with values of $d = 0.19$ and $d = 0.10$, respectively.

Likewise, self-efficacy showed a positive association with autonomous motivation ($b = .393$, $p < .001$, 95% CI [.276, .510]), but not with controlled motivation ($b = .098$, $p = .290$, 95% CI [-.084, .281]). In this case, the size of the effect was large for autonomous motivation ($d = 0.88$) and small for controlled motivation ($d = 0.22$). In turn, autonomous motivation directly contributed to resources for accessing, searching for, and managing information ($b = .153$, $p = .035$, 95% CI [.011, .296]), while controlled motivation did not show a significant direct effect ($b = .009$, $p = .853$, 95% CI [-.083, .100]). In both cases, the effect size was small, with values of $d = 0.36$ and $d = 0.12$, respectively.

These findings indicate that autonomous motivation partially mediates the relationship between perceived self-efficacy and use of resources for accessing, searching for, and managing information, as the direct effect continues to be significant including when considering the indirect paths ($b = .258$, $p = .002$, 95% CI [.100, .415]). The effect size was medium ($d = 0.49$).

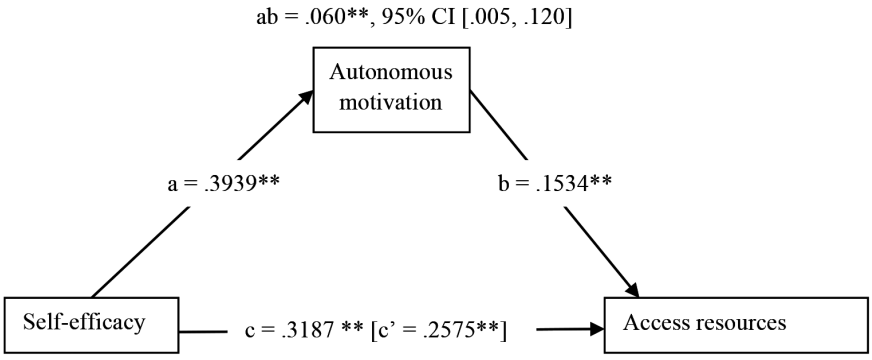
TABLE 2. Standardised Results of the Mediation Analysis

	Coef.	SE	*t*	*p*	*d*	LCI	UCI
Direct effect							
SelfE → AccessR	.258	.080	3.21	.002	0.49	.100	.415
SelfE → AutoM	.393	.060	6.60	.000	0.88	.276	.510
SelfE → ControlM	.098	.093	1.06	.290	0.22	-.084	.281
AutoM → AccessR	.153	.073	2.12	.035	0.36	.011	.296
ControlM → AccessR	.009	.047	.186	.853	0.12	-.083	.100
Indirect effect							
SelfE → AutoM → AccessR	.060	.029	—	—	0.19	.005	.120
SelfE→ ControlM → AccessR	.001	.007	—	—	0.10	-.016	.018
Total effect	.319	.075	4.23	.000	0.59	.170	.467

Note: SelfE = self-efficacy; AccessR = access resources; AutoM = autonomous motivation; ControlM = controlled motivation; IC = confidence interval (95 %); LCI = lower confidence interval; UCI = upper confidence interval.

Figure 2 displays the proposed mediation model graphically, including the coefficients of the direct and indirect paths estimated through mediation analysis.

FIGURE 2. Multiple mediation analysis estimated through bootstrap regression



Note. **p < .001; c = total effect; c' = direct effect; ab = indirect effects; *95% CI* = 95 % confidence intervals.

Regarding the use of resources for creating and editing content, as Table 3 shows, this variable also saw a significant direct effect of perceived self-efficacy (b = .331, p < .001, 95% CI [.164, .498]), with a medium effect size (d = 0.56). As in the previous model, autonomous motivation was a significant mediator in the relationship between self-efficacy and resources for creating and editing content (b = .141, 95% CI [.074, .221]), while controlled motivation did not play a relevant role (b = .001, 95% CI [-.013, .019]). The effect size, in both cases, was small (d = 0.29 and d = 0.10, respectively).

Similarly, self-efficacy displayed a direct positive effect on autonomous motivation (b = .393, p < .001, 95% CI [.276, .510]), but not on controlled motivation (b = .098, p =

.290, 95% CI [-.084, .281]). The effect size observed was large in the case of autonomous motivation (d = 0.88) and small for controlled motivation (d = 0.22). Furthermore, only autonomous motivation directly predicted the use of resources for creating and editing content (b = .360, p < .001, 95% CI [.208, .510]), while controlled motivation did not display a significant relationship with this variable (b = .013, p = .793, 95% CI [-.084, .110]). The size of the effect was medium for autonomous motivation (d = 0.66) and small for controlled motivation (d = 0.13).

The total effect of self-efficacy on resources for creating and editing content was significant (b = .473, p < .001, 95% CI [.312, .635]) with an effect size very close to the values indicating a large size (d = 0.78). These results confirm that autonomous motivation partially mediates the relationship between self-efficacy and use of digital resources for creating and editing content.

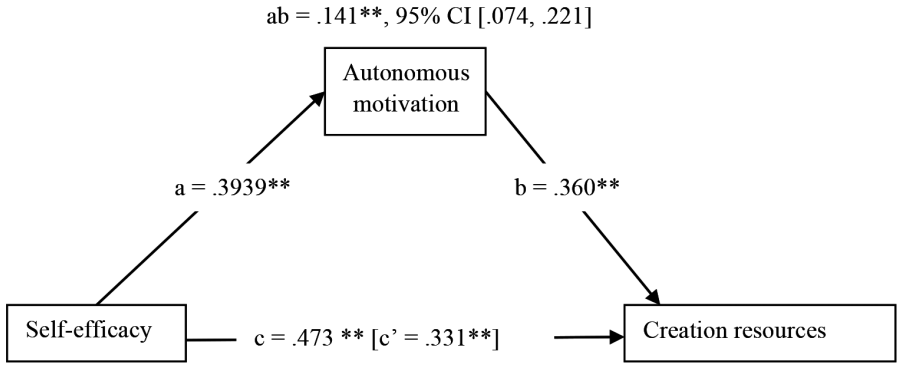
Table 3. Standardised Results of the Mediation Analysis

Variables	**Coef.**	**SE**	***t***	***p***	***d***	**LCI**	**UCI**
Direct effect							
SelfE → CreationR	.331	.085	3.90	.000	0.56	.164	.498
SelfE → AutoM	.393	.060	6.60	.000	0.88	.276	.510
SelfE → ControlM	.098	.093	1.06	.290	0.22	-.084	.281
AutoM → CreationR	.360	.077	4.68	.000	0.66	.208	.510
ControlM → CreationR	.013	.049	.263	.793	0.13	-.084	.110
Indirect effect							
SelfE → AutoM → CreationR	.141	.038	—	—	0.29	.074	.221
SelfE→ ControlM → CreationR	.001	.008	—	—	0.10	-.013	.019
Total effect	.473	.082	5.76	.000	0.78	.312	.635

Note: SelfE = self-efficacy; CreationR = creation resources; AutoM = autonomous motivation; ControlM = controlled motivation; CI = confidence interval (95 %).

Figure 3 shows the proposed mediation model, with the coefficients corresponding to the direct and indirect routes obtained through the mediation analysis.

Figure 3. Multiple mediation analysis estimated through bootstrap regression



Note. **p < .001; c = total effect; c' = direct effect; ab = indirect effects; 95% CI = 95 % confidence intervals.

Finally, in relation to the use of digital resources for interaction and communication, Table 4 again shows a direct and positive effect of self-efficacy (b = .340, p < .001, 95% CI [.162, .519]), with a medium size (d = 0.55). As for the indirect effects, autonomous motivation was found to have a significant positive mediating effect on this relationship (b = .113, 95% CI [.049, .193]), while controlled motivation did not display a relevant impact, as its effect did not achieve statistical significance (b = .002, 95% CI [-.013, .023]). In both cases, the effect size was small (d = 0.244 and d = 0.10, respectively).

Similarly, self-efficacy was positively associated with autonomous motivation (b = .393, p < .001, 95% CI [.276, .510]), and did not have a significant relationship with controlled motivation (b = .098, p = .290, 95% CI [-.084, .281]). The effect observed was large for autonomous motivation (d = 0.88) and small in the case of controlled motivation (d = 0.22). In turn, only autonomous motivation predicted use of digital resources for interaction and communication (b = .288, p = .006, 95% CI [.126, .449]), while controlled motivation did not display a significant link (b = .022, p = .681, 95% CI [-.082, .125]). Specifically, the effect size was medium for autonomous motivation (d = 0.52) and small for controlled motivation (d = 0.14).

Finally, it was confirmed that the total effect of self-efficacy on resources for interaction and communication was also significant (b = .456, p < .001, 95% CI [.285, .626]). The effect size was medium, with a value of d = 0.72. Taken together, these findings indicate that autonomous motivation acts as a partial mediator in the relationship between self-efficacy and the use of digital resources for interaction and communication.

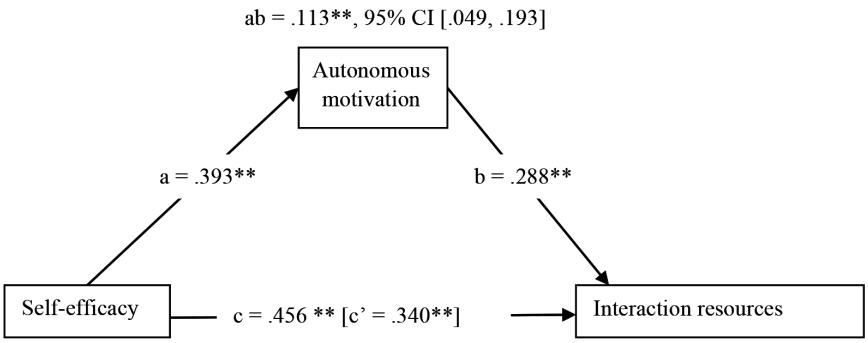
TABLE 4. Standardised Results of the Mediation Analysis

Variables	Coef.	SE	t	p	d	LLCI	ULCI
Direct effect							
SelfE → InteractionR	.340	.091	3.75	.000	0.55	.162	.519
SelfE → AutoM	.393	.060	6.60	.000	0.88	.276	.510
SelfE → ControlM	.098	.093	1.06	.290	0.22	-.084	.281
AutoM → InteractionR	.288	.082	3.50	.006	0.52	.126	.449
ControlM → InteractionR	.022	.053	.411	.681	0.14	-.082	.125
Indirect effect							
SelfE → AutoM → InteractionR	.113	.036	—	—	0.24	.049	.193
SelfE→ ControlM → InteractionR	.002	.008	—	—	0.10	-.013	.023
Total effect	.456	.087	5.27	.000	0.34	.285	.626

Note. SelfE = self-efficacy; InteractionR = interaction resources; AutoM = autonomous motivation; ControlM = controlled motivation; CI = confidence interval (95 %).

Figure 4 illustrates the proposed mediation model, including the estimated coefficients for the direct and indirect paths through mediation analysis.

FIGURE 4. Multiple mediation analysis estimated through bootstrap regression



Note. **p < .001; c = total effect; c' = direct effect; ab = indirect effects; *95% CI* = 95% confidence intervals.

Discussion and conclusions

The aim of the present research was to analyse the relationship between self-efficacy, types of motivation, and the use of digital resources in secondary education teachers. Specifically, it explored the potential mediating role of autonomous motivation and controlled motivation on the relationship between self-efficacy and the use of digital resources.

In line with the first hypothesis, the results obtained indicate that self-efficacy exercises a direct positive effect on use of digital resources for accessing, searching for, and managing information, creating and editing content, and interaction and communication. In other words, the greater teachers' perceived personal competence, the greater the frequency and diversity with which they use digital resources in their educational practice. These findings agree with the research of Bakar *et al.* (2020), Barton and Dexter (2020), and Grimalt Álvaro (2015), who highlight the positive and significant impact of self-efficacy on the use of the different types of digital resources.

The results also confirm the second hypothesis, according to which self-efficacy was expected to have a positive effect on autonomous motivation, while no significant relationship was established with controlled motivation. These findings are in line with prior evidence regarding the relationship between self-efficacy and different types of motivation (Calkins & Wiens, 2024; Roa & Prados, 2020, Rodríguez *et al.*, 2009). It seems, then, that while self-efficacy is related to teachers' perception of autonomy and inner satisfaction, it is not necessarily linked to being involved in teaching for extrinsic reasons.

The third hypothesis of the present study was that autonomous motivation would have a direct positive effect on use of the different types of digital resources. The results obtained ratified this expectation, with teachers who are involved in their profession for personal interest (e.g. Improving as teachers) tending to integrate the different types of technological resources more frequently. In line with the findings of other studies (Chiu, 2022; Gómez-Fernández & Mediavilla, 2022; Guzey & Roehrig, 2012; Munguía Hoyo, 2013), the key role of autonomous motivation in use of digital resources appears to be confirmed, consolidating itself as a determining factor in the teaching–learning process.

The fourth hypothesis was also confirmed, as no significant effect on types of digital resources was found for controlled motivation, in line with the research by Gorozidis and Papioannou (2014). This result suggests that use of these resources driven by external pressure, institutional rules, or other people's expectations does not necessarily result in less integration of them in teaching practice. Therefore, the idea that motivation driven by intrinsic factors is more determinative than controlled motivation in this context is reinforced.

Finally, the fifth hypothesis was confirmed, as a mediation effect of autonomous motivation in the relationship between self-efficacy and the use of the different classes of digital resources was found. To the best of our knowledge, this finding is unprecedented among secondary education teachers. Specifically, it was observed that teachers with greater self-efficacy tend to develop more solid autonomous motivation and, in turn, more frequently integrate technologies for searching for, managing, and accessing information, creating and editing content, and social interaction and communication.

From a theoretical position, the results obtained appear to support the argument that teacher self-efficacy is related to teachers experiencing autonomous motivation, and both factors (self-efficacy and autonomous motivation) are personal elements linked to high use of technological resources in the classroom. This suggests that the teachers who perceive themselves more competent at doing their job tend to experience greater autonomous motivation and so more often integrate digital tools for creation, interaction, and access into their teaching practice. Nonetheless, self-efficacy did not display a significant relationship with controlled motivation, which also did not display a significant relationship with the use of these resources. Therefore, when external factors motivate teachers to use technology, this does not necessarily result in more or less frequent use of digital resources, nor is it associated with a greater or lesser perception of efficacy. Similarly, it has been observed that self-efficacy is directly related to use of technological resources, suggesting that this construct is a factor that directly and indirectly – mediated by autonomous motivation – has an effect on the integration of digital technologies. In other words, teachers who perceive themselves as more capable in the performance of their professional role not only strengthen their intrinsic motivation, but more actively use a variety of digital tools.

From a practical standpoint, if the aim is to promote use of technological resources in the field of education, the results suggest that fostering teacher self-efficacy would be an effective means as it has a positive effect on autonomous motivation and, ultimately, on the use of these technologies. Consequently, it is necessary to implement training and organisational measures that improve teachers' perception of their professional competence (e.g. designing training experiences that integrate digital resources across the curriculum and permit teachers to choose and personalise their learning), thus creating an environment that favours both their personal development and their pedagogical innovation (Grant *et al.*, 2024; Palacios-Rodríguez *et al.*, 2025).

Although the results of this research offer relevant contributions from the theoretical and practical perspectives, it is important to recognise some limitations that make it advisable to interpret the findings cautiously. One of the main limitations is the sample size and the procedure used to select the participants. Accordingly, it would be recommendable for future studies to attempt to replicate these results using larger and more representative samples of teachers. It would also be advisable to expand the scope of the research into other stages of the education system. Another aspect to consider is the cross-sectional nature of this study's design, which makes it difficult to establish causal relations between the variables involved. Therefore, longitudinal research studies should be carried out that allow for examination of the evolution of self-efficacy and teacher motivation over time and their possible impact on the degree of involvement with technological resources. Finally, the use of self-report instruments could introduce measurement biases. Consequently, the inclusion of qualitative methodological focuses – such as in-depth interviews or direct observations – could offer a richer vision of the role of motivational factors in teachers' participation in continuous training processes.

Author contributions

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