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La competencia digital docente y el diseño de situaciones innovadoras
con TIC para la mejora del aprendizaje

*Digital competence in teaching and the design of innovative situations
with ICT to improve learning*

Francisco José Fernández Cruz, Fidel Rodríguez-Legendre y Vanesa Sainz
(editores invitados / *guest editors*)



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THE ROLE OF METACOGNITIVE STRATEGIES FOR THE DEVELOPMENT OF DIGITAL COMPETENCE IN STUDENTS OF COMPULSORY SECONDARY EDUCATION: MEDIA AND INFORMATION PROCESSING LITERACY

El papel de las estrategias metacognitivas para el desarrollo de la competencia digital en el alumnado de Educación Secundaria Obligatoria: alfabetización mediática y en el tratamiento de la información

BEATRIZ ORTEGA-RUIPÉREZ¹ AND ENRIQUE NAVARRO ASENCIO²

(1) *Universidad Internacional de La Rioja (España)*

(2) *Universidad Complutense de Madrid (España)*

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Autora de contacto / *Corresponding autor*: Beatriz Ortega-Ruipérez. E-mail: beatriz.ortega.ruiperez@unir.net

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INTRODUCTION. Media literacy and information processing is a fundamental part of students' digital competence. Teachers have the responsibility to develop students' digital competence and thus improve their use of the Internet for learning. This study aims to answer the question to what extent teachers' metacognitive strategies can predict students' use of these Internet skills for learning. **METHOD.** For this purpose, a structural model was carried out using confirmatory factor analysis. Data from the PISA 2018 questionnaire to 20,205 language teachers were used. First, three dimensions of a theoretical model were validated: learning support, metacognitive use for learning and metacognitive use in reading comprehension. These three dimensions of the theoretical model have been created on the basis of various items on the subject included in the PISA questionnaire for language teachers. Second, causal effects were studied with regression analysis and correlations between metacognitive factors. **RESULTS.** The results show that the model has a good fit and that the use of metacognitive strategies can explain 41.5% of the proper internet usage. The results show that teachers who use metacognitive strategies during their teaching are much more able to teach students to use the Internet appropriately so that they can develop media literacy. **DISCUSSION.** These results predict that teacher training should include the development of metacognitive strategies, such as sharing experiences and training in concrete strategies, so that teachers can improve

their teaching and achieve media literacy in students, so that they can take advantage of the use of the Internet for learning.

Keywords: *Media Literacy, Information Literacy, Metacognition, Self Management, Competency Based Teacher Training.*

Introduction

To achieve the development of digital competence in students, which has been established as area 6 of the Competencia Digital Docente (CDD) of the Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado (INTEF, 2022), one of the key competences is to achieve media literacy and information and data literacy. We consider that the acquisition of both media literacy and information and data literacy refer to the development of a basic competence in relation to making good use of the Internet, which would be the basis for the development of digital competence. It is therefore important to consider both media literacy and information and data literacy studies as part of what we call “making good use of the Internet”. Thus, both literacies should serve as a basis for the development of the other digital competences. To achieve this, teachers need to master the dynamics of innovation and educational renewal. One of these innovation dynamics is the mastery and inclusion of strategies for self-regulated learning, as significant correlations have been found between self-regulated learning and language performance (Seker, 2015). Furthermore, self-regulated learning is another of the competences set out in the new CDD framework, in this case belonging to area 3 of teaching and learning. Self-regulated learning (SRL) is a process composed of thoughts, emotions and planned actions aimed at achieving a personal goal, that is, a set of strategies that learners can activate when working towards their goals (Zimmerman, 2002). SRL enables students to manage their own learning process and has been shown to be an essential complex skill for learning in the 21st century (Graesser *et al.*, 2018). One of the fundamental components of self-regulated learning is metacognition. The proven relationship between metacognition and self-regulated learning includes processes such as goal setting, planning, progress monitoring and reflection (Azevedo and Gašević, 2019). *In this way, it can be seen how metacognition plays an indisputable role in domain-specific contexts, such as language learning (Krieger et al., 2022). Thus, as Teng and Zhang (2021) conclude, metacognitive regulation has a considerable effect on foreign language learning, which in turn is mediated by task conditions, vocabulary, and learner involvement.*

Regarding media literacy and information processing, the results obtained in studies focused on teaching listening comprehension strategies show the potential of using metacognitive intervention focused on strategies (Milliner and Dimoski, 2021), as do the results focused on communication (Sato and Dussuel-Lam, 2021). But undoubtedly the greatest effects of metacognition-focused intervention programmes are obtained in reading comprehension (Carretti *et al.*, 2014). By improving metacognitive knowledge in reading strategies, students’ reading comprehension is enhanced (Soodla *et al.*, 2016). According to the results of the 2018 Programme for International Student Assessment (PISA) in reading skills, one of the variables that has the most weight in explaining high or low results is the variable of the use of metacognitive strategies (Vázquez-López and Huerta-Manzanilla, 2021).

Metacognition training for media literacy is not new; we can already find some proposals focused on reflection and autonomy more than a decade ago (Jing, 2006; Lam, 2009). However, a search

in Web of Science and Google Scholar on metacognition and media literacy reveals little research with clear results. One intervention that has yielded very good results is the one conducted by Zhussupova and Kazbekova (2016) in which they used short stories to develop metacognitive reading comprehension strategies.

On the other hand, as we are in a digitalised context, we should take this into account to improve the training of our students. A good use of the Internet could be beneficial in learning, if media literacy and information processing are in place. By good use of the Internet, we therefore refer to the teaching of Information and Communication Technology (ICT) skills/literacy, including digital, media and communication skills.

It turns out that among the main problems in the use of the Internet as a resource for learning is students' lack of knowledge of what to read on the Internet, and, in general, students' lack of skills and knowledge in using the Internet for academic purposes (Al-Muwallad, 2020). Reading comprehension performance on paper is often superior to performance in digital format (Støle *et al.*, 2020), so we should take advantage of the improvement that metacognitive regulation can produce in the comprehension of digital texts, according to the first results Burin *et al.* (2020) in e-learning.

For this reason, following the findings of Burin *et al.* (2020), the development of these competences, especially media literacy competence, could be enhanced by the use of metacognitive strategies. As proposed by Fisher and Frey (2015), a key aspect of metacognition-focused interventions for reading comprehension is for teachers to analyse the complexity of texts and prepare lessons in advance. Another aspect to highlight is teacher support for the transfer of these metacognitive strategies from one domain to another (Schuster *et al.*, 2020), from reading comprehension to media literacy competence. Therefore, metacognitive strategies should be included explicitly so that students can integrate them into their learning process (Dignath and Veenman, 2021). In addition to explicit teaching to support learning, teachers should use child-centred instruction, as this type of instruction enhances self-monitoring (van Loon *et al.*, 2020).

As can be seen, cognitive mediation by teachers is an indispensable resource for students to advance in the processes of autonomy and metacognition, with the aim of achieving self-regulated learning (Ferreira *et al.*, 2019), which is why teachers act as metacognitive models (Wall and Hall, 2016). Teachers should focus on thinking skills, developing a culture of enquiry that promotes learning autonomy in their students (Dobber *et al.*, 2017).

A study by Soodla, *et al.* (2016) highlights the importance of teachers having good metacognitive knowledge to improve students' metacognitive knowledge. In addition, teachers' own beliefs about the benefits of applying strategies for self-regulated learning and students' ability to apply them are significant predictors of teachers' ability to apply these strategies (Yan, 2017).

As we can see, the need to study why teachers should be experts in metacognitive strategies to teach their students has long been called for (Duffy *et al.*, 2009). Teachers should start applying self-regulated learning strategies to improve their students' learning and competences (Panadero, 2017). The relationships that have been demonstrated in numerous studies between metacognition and improved outcomes call for the need to include some specific policies and practices in initial teacher education (Perry *et al.*, 2019). One practice that can help initial teacher education in metacognitive strategies is for experienced teachers to share their teaching experiences (Lee *et*

al., 2010), although in some cases experienced teachers are also unable to identify the benefits of learning strategies (Halamish, 2018), as they use more cognitive than metacognitive strategies to improve learning (Dignath and Büttner, 2018).

Therefore, teacher trainings should include concrete strategies for managing self-regulated learning through metacognition, as these trainings enhance self-efficacy for fostering self-regulated learning and its perception in practice (Dignath, 2021). It is also important to take into account developments in learning theories to design teacher trainings well to include metacognitive practices (Muijs *et al.*, 2014), as evidence suggests that not all trainings can be successful (Corcoran and O'Flaherty, 2017).

Working on media literacy and information processing skills is now a priority. The use of digital resources and the Internet has increased in language teaching in recent years. Examples include the use of immersive technologies (Blyth, 2018), games with Kinect-like sensor technology (Yükseltürk *et al.*, 2018), digital storytelling (Fu *et al.*, 2021), or even the use of artificial intelligence in voice chatbots (Petrović and Jovanović, 2021). In fact, it is increasingly common to find approaches to the design of apps and video games related to language skills (e.g., see Casañ-Pitarch, 2018). Smartphones are one of the resources that have increased the most, although many of the studies that have been conducted to demonstrate the effectiveness of these devices show limitations (Klímová, 2018). The most common conclusions focus on mobile apps being an ideal resource for improving motivation in learning, for example, languages, and that they appear to be effective in learning (Kacetyl and Klímová, 2019). However, no concrete evidence is found on what the use of these resources should look like in relation to the actual improvement of learning.

Teachers' attitude towards using ICT and creating Personal Learning Environments (PLE) that facilitate learning (Lim and Newby, 2021) is influenced by the use of metacognitive strategies, along with knowledge of digital tools. In addition, the use of metacognition also favours the development of their teaching under the Technological-Pedagogical-Content Knowledge TPACK model (Huang *et al.*, 2020), which allows for the appropriate integration of technology to facilitate learning, because technological knowledge cannot be independent of a specific discipline and pedagogy (Gómez-Trigueros and Bustamante, 2023).

As can be seen, teachers who master metacognitive strategies do a better job of integrating technology into their classes, as they know how to introduce it (TPACK) and which tools to use at any given moment (PLE use). Thus, these teachers should also be able to teach their secondary school students how to use the Internet in order to develop digital literacy and information processing skills. For these reasons, it was considered essential to demonstrate here the relationship between the use of metacognitive strategies by language teachers, who need to work on media literacy and information processing skills as part of reading comprehension in the digital world, and the teaching of good use of the Internet, defined here as the teaching of digital, communicative and media skills.

This study is to empirically test an explanatory model of teaching good Internet use through the use of metacognition and self-regulated learning. In order to work with a complete model, three dimensions of metacognition are established: use of metacognitive strategies related to learning, use of metacognitive strategies related to reading comprehension, and use of learning support strategies. This last dimension is related to teachers' abilities to teach students to employ competences for good use of the Internet.

The aim is to find out the relationship between teachers' use of metacognitive strategies and teaching good Internet use. Our intention is to be able to predict the teaching of good internet use based on a theoretical model that includes learning support, metacognitive use for learning, and metacognitive use in reading comprehension.

Method

Participants

The participants were 20,205 language teachers who participated in the 2018 PISA tests. For the case selection procedure of teachers participating in the PISA study, only those teachers who took the language teachers' test. Only responses from these teachers were used because they answered specific questionnaires on learning support, metacognitive use for learning and metacognitive use in reading comprehension. These teachers accounted for 25.4% of all teachers who participated in the 2018 PISA tests.

The analysis included teachers from the different nationalities participating in the PISA study, in order to ensure representativeness and to be able to generalise the findings.: European countries (Spain, Portugal, Germany), Anglo-Saxon countries (United States, United Kingdom), Asian countries (Chinese Taipei, Hong Kong, Korea, Macau) and Latin American countries (Brazil, Chile, Dominican Republic, Peru).

Instruments and materials

The items of the PISA 2018 language teacher questionnaire (OECD, 2017) were used. Of all the items included in the questionnaire, those that are relevant to answer the research questions were selected. The items used in this study belong to the same dimensions that were validated in the PISA tests and can be consulted in the corresponding document (OECD, 2017).

On the one hand, to know whether teachers teach their students how develop media literacy, three indicators were used:

- The item "Assessing credibility of information available on the Internet" within the section of questions related to how often they teach aspects of reading comprehension in their lessons (TC155Q06HA). This item has four response options, with 1 being that you never use it in your lessons, and 4 being that you use it in every session.
- The item "Searching and selecting relevant information on the Internet", belonging to the same section as the previous one: how often do they teach this aspect to improve reading comprehension (TC155Q07HA). Likewise, this item has four response options, with 1 being that they never use it in their lessons, and 4 that they use it in every session.
- The third item (TC166QHA) is one created from the sum of seven items that correspond to good teaching practices on the use of the Internet. These seven items have two response options: Yes/No (Yes = 1, No = 2). A scale of 0 to 7 has been created to determine the degree of use of good practices, with 0 meaning that none of these practices have been used and 7 meaning that all of them have been used. For this purpose, the value 2 (No) has been

recoded to a new value 0, to facilitate the sum of all the items. The items are: (1) How to use keywords when using a search engine such as <Google©>, <Yahoo©>, etc. (TC166Q01HA); (2) How to decide whether to trust information from the Internet (TC166Q02HA); (3) How to compare different web pages and decide what information is more relevant for the students' schoolwork (TC166Q03HA); (4) To understand the consequences of making information publicly available online on <Facebook©>, <Instagram©>, etc. (TC166Q04HA); (5) How to use the short description below the links in the list of results of a search (TC166Q05HA); (6) How to detect whether the information is subjective or biased (TC166Q06HA); and (7) How to detect phishing or spam emails (TC166Q07HA).

On the other hand, the latent constructs correspond to the factors created, and they are composed of different variables:

- Learning support is composed of nine observed variables: from TC202Q01HA until TC202Q09HA, which are items in PISA questionnaire. Each item has four response options: 1 being “never or almost never” and 4 being “every lesson or almost every lesson”. The nine items are: (01) I tailor my teaching to meet the needs of my students; (02) I provide individual help when a student has difficulties understanding a topic or task; (03) I change the structure of my lesson on a topic that most students find difficult to understand; (04) I provide individual support for advanced students; (05) I tell students how they are performing in my course; (06) I give students feedback on their strengths in my course; (07) I tell students in which areas they can still improve; (08) I tell students how they can improve their performance; (09) I advise students on how to reach their learning goals.
- Metacognitive use for learning is composed of four observed variables: from TC171Q01HA until TC171Q04HA, which are items in PISA questionnaire. Each item has four response options: 1 being “every lesson” and 4 being “never or hardly ever”. To make the scale similar to the rest of the questionnaire, the answers have been recoded. Thus, 1 corresponds to “never” and 4 corresponds to “every lesson”, the answer “most lesson” is now 3 (instead of 2) and the answer “some lesson” is now 2 (instead of 3). The four items are: (01) I set clear goals for the students' learning (02) I ask questions to check whether students have understood what was taught (03) At the beginning of a lesson, I present a short summary of the previous lesson, and (04) I tell students what they have to learn.
- Metacognitive use in reading comprehension is composed of five observed variables: from TC155Q02HA until TC155Q05HA, which are items in PISA questionnaire. Each item has four response options: 1 being “never or almost never” and 4 being “every lesson or almost every lesson”. The five items are: (02) Summarizing strategies (03) Connecting text with prior content knowledge (04) Monitoring comprehension (05) Adapting the mode of reading depending on reading purposes.

Statistical analysis

The main objective was to test the relationship between appropriate teaching of Internet use and teachers' use of metacognitive strategies in the classroom. Thus, a structural model has been proposed in the research design.

To achieve this objective, partial objectives were established as part of the confirmatory factor analysis. First, the dimensions of the theoretical model were validated. Secondly, we proceeded to study the causal effects, i.e., the relationships between the teaching media literacy and the three constructs related to the use of metacognitive strategies in the classroom (learning support, metacognitive use for learning, and metacognitive use in reading comprehension), with this study we intend to know if we are able to predict the teaching media literacy, or an appropriate use of the Internet, considering the three dimensions.

In the structural model, latent constructs can play the role of independent and dependent variables, causes and effects of other variables. Therefore, the study design is non-experimental with explanatory purpose, as it tries to test the relationships between constructs that have been perceived from the literature reviewed.

Firstly, for the configuration of the variables, SPSS software was used. However, to carry out the structural model tests and confirmatory analyses, the Jamovi software, version 2.3.26, was used. To carry out the statistical analysis, as will now be explained in more detail, different tests were carried out: structural equation modelling (SEM) and the analysis of different fit and global indices.

Procedure and data analysis

First, the necessary variables were recoded to be able to work with the final file and use SEM. On the one hand, the responses of the TC166Q01HA-07HA variables were recoded (Yes = 1; No = 0) and the TC166QHA variable was created as the sum of the seven previous variables. On the other hand, the responses of the variables TC171Q01HA-04HA were recoded so that they had the same scale as the rest of the items used (Never = 1, Some lesson = 2, Most lesson = 3, Every lesson = 4).

For the analysis of the model data, we included factor loadings, relationships between constructs and error terms for its correct interpretation. The model was evaluated based on factor loadings (measurement model) and regression (structural model) to point out the effects between variables.

On the other hand, different fit indices were analysed to determine the quality of the model, both global fit and incremental fit. The global fit indices directly measure the ability of the defined model to reproduce the observed data by comparing the estimated variance-covariance matrix with the empirical one. If the difference equals zero, a perfect fit is obtained. The incremental fit indices evaluate the model fit by comparing it with an alternative reference model, so it is a relative fit. This alternative model is usually a null model, which assumes that there is no correlation between the observed variables.

The four main indices have been used for the global evaluation of the models, two of them are global fit indices and two are incremental fit indices.

The global fit indices used were the root mean square error of approximation (RMSEA). The RMSEA reports how well the model fits the reference population. Lower values show a better fit, and it is considered acceptable if this index is between 0.05 and 0.08, considered a good fit if it is less than 0.06. The incremental fit indices used were the Tucker-Lewis Index (TLI) and the comparative fit index (CFI). The TLI and CFI compare the fit of a hypothetical model with that of a

reference model; 0.95 is established as the cut-off point for considering a good fit. The fit is assessed by combining the different indicators: RMSEA, TLI and CFI (Hu and Bentler, 1999).

To respond to the objective and validate the theoretical model created for the study, we opted for a confirmatory factor analysis of polychoric correlations for robust estimators to calculate the values of the different parameters of the models (WLSMV), since we are dealing with ordinal data. In this analysis, a score greater than 0.5 is considered an acceptable fit, since it indicates that it is explaining more than 25% of the variance, the variability of the responses. And greater than 0.7 is a good index, although all the factor weights of the dimension should be evaluated together.

In the case of the second objective, it is assumed that the structural model in structural equation analysis estimates the effects with regression, this is, to determine the causal effects. In this way, we could confirm the predictive value of the constructs created on the teaching media literacy. In this case, the regression effect of the three dimensions on the teaching media literacy, on the one hand, and the correlations between factors, on the other hand, were calculated. Finally, the regression model was calculated to know what percentage of the teaching media literacy is explained by the three dimensions. In a regression model there are two parts, the effects, and their importance and significance. They are interpreted with the Betas (of the regression equations) and their significance was interpreted. The significance was assessed with the intensity, the standardized coefficients could be compared with each other, the higher the value, the more significant the effect. Thus, the effects of the dimensions could be compared with each other, these coefficients indicate when the score on the teaching media literacy increases or decreases as a function of the metacognition dimensions. Coefficient of determination (R2) was the global adjustment used when the models are regression models.

Results

Theoretical model validation

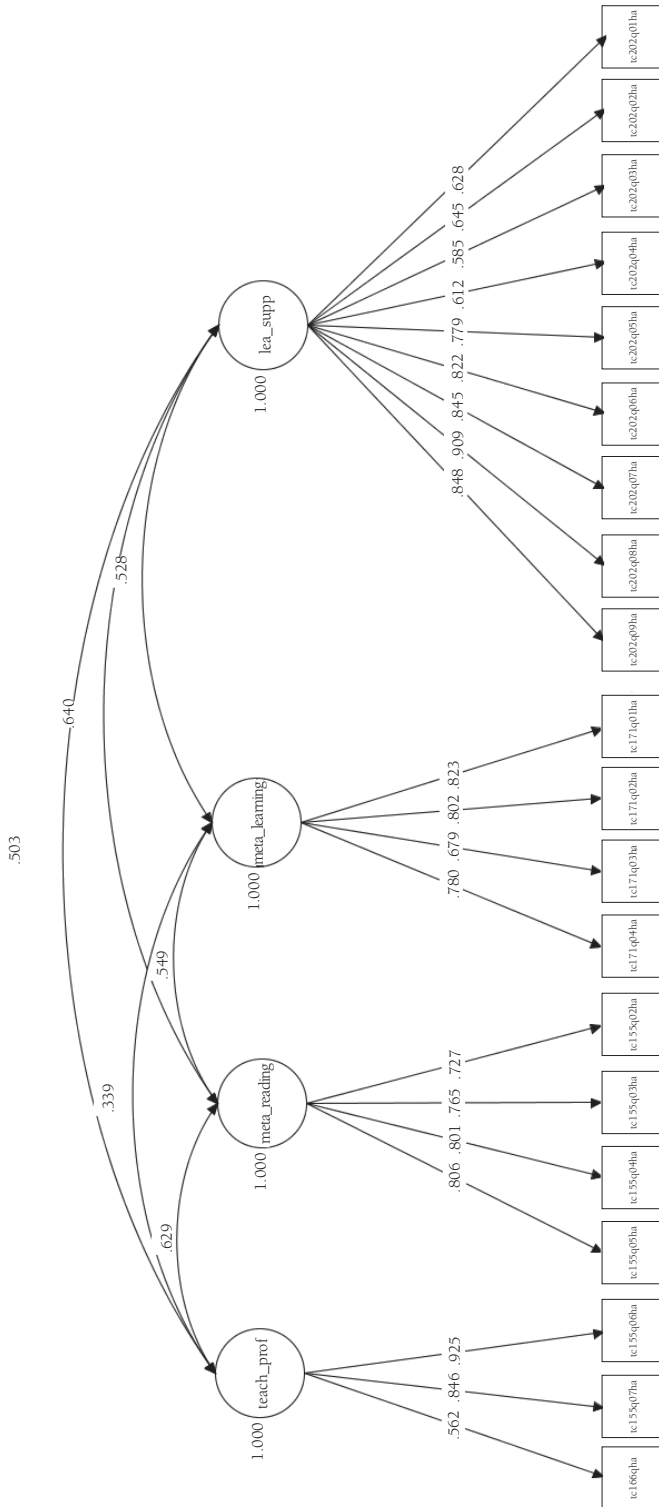
The fit indices show a higher result for the first model (Table 1). The global fit indice, RMSEA obtains a low score, which shows a good fit. Regarding the incremental fit indices, both TLI and CFI show values above 0.9, so we can consider that the intermediate model and the model have a good fit.

TABLE 1. Fit indices for the first model

	CMIN	DF	P	TLI	CFI	RMSEA
Model 1	19 041.273	164	0	0.951	0.958	0.076

Regarding the confirmatory factor analysis of polychoric correlations (Figure 1), the items that compose each factor have a score higher than 0.5, which is considered a good fit, since it indicates that it is explaining more than 50% of the variability of the responses, and most of them have a score higher than 0.7, which indicates a very good fit.

FIGURE 1. Confirmatory factor analysis for validation of the theoretical model



Note. Above: values of polychoric correlations between factors. Below: values of polychoric correlations of the items related to each factor (from left to right): teaching media literacy (teach_prof), metacognitive use in reading comprehension (meta_reading), metacognitive use for learning (meta_learning), and learning support (lea_supp).

In the case of the correlations between factors, almost all exceed the score of 0.5, so a good fit of the model can be confirmed. A single exception can be found in the correlation between the teaching media literacy and metacognitive use for learning.

With these results, in which a good fit has been obtained, the validation of the theoretical model can be confirmed. This validation allows us to continue with the rest of the structural analyses to verify the relationships between dimensions and the teaching media literacy.

Table 2 shows the results of the multigroup analysis. The differences in CFI are 0.014, but in TLI and RMSEA are 0.005. Thus, it is assumed that the initial measurement model is better (items and dimensions and the construction of those dimensions from those factorials and IRT parameters).

TABLE 2. Indices for the multigroup analysis

	Same structure of items and dimensions (means and variances) equal	Equal factorial weights and equal IRT parameters; means and variances are different factors
	Configuration	Scale
Chi-Square		
Value	14051,367*	20789,037*
Degrees of Freedom	584	752
P-Value	0	0
RMSEA	0,068	0,073
90 Percentil I.C L.I	0,067	0,072
L.S	0,069	0,074
P-Value	0	0
CFI/TLI		
CFI	0,969	0,955
TLI	0,964	0,959

Effect of the three metacognitive dimensions on the teaching media literacy

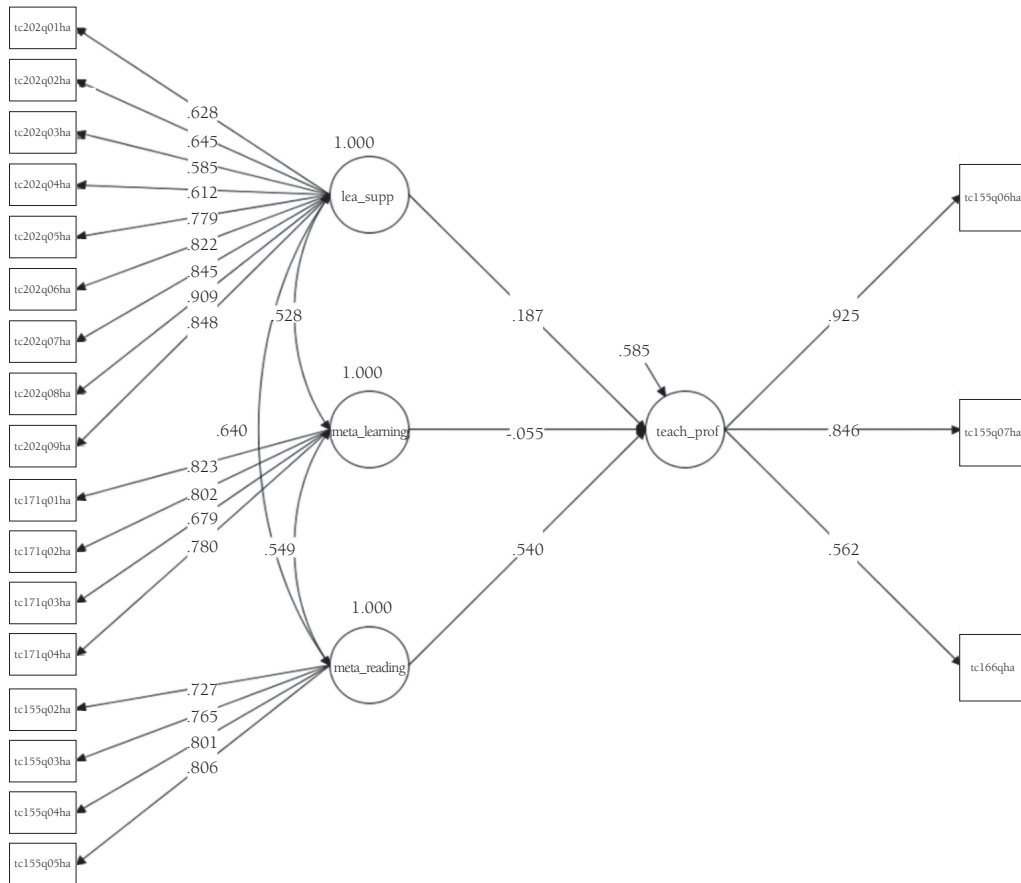
The fit indices show a higher result for the second model (Table 3). The global fit indice, RMSEA obtains a low score, which shows a good fit. Regarding the incremental fit indices, both TLI and CFI show values above 0.9, so we can consider that the intermediate model and the model have a good fit.

TABLE 3. Fit indices for the second model

	CMIN	DF	P	TLI	CFI	RMSEA
Model 2	19 041.272	164	0	0.951	0.958	0.076

The regression analysis (Figure 2) shows that metacognitive use in reading comprehension is the dimension that best predicts the teaching media literacy (0.540). Learning support also has a significant effect in predicting the teaching media literacy (0.187), while it could be said that metacognitive use for learning does not affect the consideration of the teaching media literacy, since it does not have a significant effect because it does not even explain 0.1 (-0.055). It should be noted that the result, although not significant, shows a negative relationship, which would indicate that the less metacognitive strategies used by the teacher, the better the teaching of a good use of the Internet. Finally, it should be noted that, in all three cases, the associated probability is 0.000.

FIGURE 2. Regression analysis to test the effect of dimensions on the teaching of the media literacy



Note. Left: regression values of the items of each factor: learning support, metacognitive use for learning, and metacognitive use in reading comprehension (from top to bottom). Center: regression values of the factors with the teaching media literacy factor. Right: regression values of the teaching media literacy items.

The correlations between metacognitive factors indicate that it actually has theoretical sense by correlating at that average level. On the one hand, the correlation between metacognitive use for learning and learning support being the lowest (0.528). On the other hand, the correlation between metacognitive use for learning and metacognitive use in reading comprehension being

slightly higher (0.549). Finally, the correlation between metacognitive use in reading comprehension and learning support being the most significant (0.640).

When finding that the correlation between metacognitive use for learning has a correlation higher than 0.5 with both metacognitive use in reading comprehension and learning support, it can be considered that, although metacognitive use for learning does not directly affect the consideration of teaching media literacy, there may be an indirect effect through other variables.

The model, with the three dimensions introduced as predictors, has a high R-Square (0.415) and can explain 41.5% of the observed variability. This means that 41.5% of the teaching media literacy is explained using metacognitive strategies.

Discussion

First, the proposed model is validated. The three dimensions constructed, to test the relationship between metacognitive strategies to support learning and the teaching of an adequate use of the Internet, are constructed through different items that show a good fit, mostly a very good fit. These items had been chosen because they belonged to the PISA test battery for teachers, so their fit had been previously checked (OECD, 2019).

In addition, we have been able to validate that the teaching of an adequate use of the Internet is related to the three dimensions or factors created: metacognitive use in reading comprehension, metacognitive use for learning, and learning support. This relationship shows that to teach how to use the Internet appropriately, so that students know how to use technological tools and how to identify reliable information. Thus, teachers must have mastered the regulation of learning through metacognitive strategies, that allow the planning and monitoring of learning. These results are according to Panadero (2017) and the study of Soodla *et al.* (2016), so that they can teach their students to use these strategies.

Therefore, the results show that the three dimensions chosen explain 41.5% of the teaching of the appropriate use of the Internet. The weight of metacognitive strategies in teaching of the appropriate use of the Internet is very high and significant. This indicates that mastery of these strategies explains almost half of teaching of the appropriate use of the Internet. Thus, it allows us to affirm that teachers who master metacognitive strategies will be able to teach their students to use the Internet appropriately, while teachers who do not master these strategies will not be successful. These results are in line with the findings of Lim and Newby (2021) and Huang *et al.* (2020).

It has also been found that, among the three dimensions studied, the most significant effect on the teaching of the appropriate use of the Internet is the use of metacognitive strategies for reading comprehension, a fundamental dimension when dealing with language teachers. This means that using and teaching metacognitive strategies of reflection on reading, which facilitate reading comprehension, as predicted by Carretti *et al.* (2014), Soodla *et al.* (2016) and Vázquez-López and Huerta-Manzanilla (2021), which is essential to use the Internet in an appropriate way due to the large amount of information that we can find on the Internet. Therefore, our results are in line with previous studies.

The main conclusion of the study is that to teach students how to use the Internet properly, it is very important to master metacognitive strategies for learning and reading comprehension, and learning support strategies, so that they can teach how to employ these strategies in their use of the Internet, especially metacognitive strategies for reading comprehension.

These findings highlight the importance of training teachers in metacognitive strategies that they can master and subsequently apply with their students. Teacher training programs, both for pre-service teachers and lifelong learning programs, do not usually include teaching modules related to self-regulated learning and more specifically to metacognitive strategies. However, as we have seen, these strategies are essential not only to improve their learning process, but also to use the Internet appropriately, and teaching media literacy to the students.

Therefore, given the need to teach students media literacy for learning, and the lack of scientific knowledge about the key aspects to achieve a good design of courses that promote this good use, the results obtained here call for an urgent reflection to incorporate these strategies in teacher training.

As proposed in the literature, we must teach trainee teachers to apply metacognition in their teaching under the Technological-Pedagogical-Content Knowledge TPACK model (Huang *et al.*, 2020), as it enables the appropriate integration of technology to facilitate learning, from a new, more inclusive, social perspective of technologies (Gómez-Trigueros and Bustamante, 2023).

For the design of teacher training strategies, two main types of training have been highlighted. On the one hand, experienced teachers share teaching experiences with pre-service teachers (Lee *et al.*, 2010), and on the other hand, training in concrete strategies for managing self-regulated learning through metacognition (Dignath, 2021). This also improves their ability to perceive self-efficacy, which is essential for teaching these strategies appropriately.

Some of these specific strategies that we should include in teacher education courses are:

- Acting as metacognitive models (Wall and Hall, 2016), focusing on thinking skills with a culture of enquiry (Dobber *et al.*, 2017) and performing cognitive mediation (Ferreira *et al.*, 2019).
- Supporting the teacher in enabling students to transfer metacognitive strategies from one domain to another, i.e. from reading comprehension to media literacy (Schuster *et al.*, 2020).
- Prepare lessons in advance to be able to analyse the complexity of texts and work on them appropriately during the lesson (Fisher and Frey, 2015), thanks to the support that enables the transfer of mastery from reading comprehension to media literacy.
- Use innovative activities to develop metacognitive reading comprehension strategies, such as the use of short stories (Zhussupova and Kazbekova, 2016).

One limitation of the study is that it was not possible to confirm how it affects the use of metacognitive strategies for learning, since the results suggest that the relationship of this dimension with the teaching of the appropriate use of the Internet is indirect, through other dimensions. However, it has not been possible to confirm how much it affects through the rest of the dimensions. In the future, complementary analyses should be carried out to determine this relationship.

Another limitation has to do with the self-reported response format used in PISA, rather than using tests that directly measure the constructs under study. This, together with the cross-sectional nature of the study, may not be the most suitable for predicting a theoretical model. Thus, in the future we will try to complement the type of tests and studies that allow us to confirm the model.

Finally, it should be noted that an important limitation is about the result of metacognitive use for learning does not affect the consideration of the teaching proper use of the internet, since it does not have a significant effect. However, if it were significant, it seems to indicate that the relationship would be negative. This result requires further investigation to confirm whether the trend is correct.

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Resumen

El papel de las estrategias metacognitivas para el desarrollo de la competencia digital en el alumnado de Educación Secundaria Obligatoria: alfabetización mediática y en el tratamiento de la información

INTRODUCCIÓN. La alfabetización mediática y el tratamiento de la información resultan fundamentales como parte de la competencia digital del alumnado. El profesorado tiene la responsabilidad de desarrollar la competencia digital del alumnado y así mejorar el uso de Internet para el aprendizaje. Este estudio pretende responder a la pregunta de hasta qué punto las estrategias metacognitivas del profesorado pueden predecir el uso que hace el alumnado de estas competencias en Internet para el aprendizaje. **MÉTODO.** Para ello, se ha llevado a cabo un modelo estructural mediante un análisis factorial confirmatorio. Se han utilizado datos del cuestionario PISA 2018 a 20.205 profesorado de idiomas. En primer lugar, se validaron tres dimensiones de un modelo teórico: apoyo al aprendizaje, uso metacognitivo para el aprendizaje y uso metacognitivo en la comprensión lectora. En segundo lugar, se estudiaron los efectos causales con un análisis de regresión y correlaciones entre factores metacognitivos. **RESULTADOS.** Los resultados muestran que el modelo tiene un buen ajuste y que el uso de estrategias metacognitivas puede explicar el 41,5% de la enseñanza del uso adecuado de Internet. Los resultados muestran que el profesorado que utiliza estrategias metacognitivas durante su enseñanza es mucho más capaz de enseñar a su alumnado a utilizar Internet de forma adecuada. **DISCUSIÓN.** Estos resultados predicen que la formación del profesorado debería

incluirl el desarrollo de estrategias metacognitivas, como compartir experiencias y formar en estrategias concretas, para que puedan mejorar su enseñanza y conseguir la alfabetización mediática en el alumnado, para que estos puedan aprovechar el uso de Internet para el aprendizaje.

Palabras clave: *Alfabetización Mediática, Alfabetización Informacional, Metacognición, Autorregulación, Formación del Profesorado Basada en Competencias.*

Résumé

Le rôle des stratégies métacognitives dans le développement des compétences numériques des élèves de l'enseignement secondaire obligatoire : éducation aux médias et traitement de l'information

INTRODUCTION. L'éducation aux médias et la maîtrise de l'information sont des éléments fondamentaux de la compétence numérique des élèves. Les enseignants ont la responsabilité de développer les compétences numériques des élèves et donc d'améliorer leur utilisation d'Internet pour l'apprentissage. Cette étude vise à répondre à la question de savoir dans quelle mesure les stratégies métacognitives des enseignants peuvent prédire l'utilisation de la part les élèves de ces compétences Internet pour l'apprentissage. **MÉTHODE.** À cette fin, un modèle structurel a été réalisé au moyen d'une analyse factorielle confirmatoire. Les données du questionnaire PISA 2018 auprès de 20 205 enseignants de langues ont été utilisées. Premièrement, trois dimensions d'un modèle théorique ont été validées : le soutien à l'apprentissage, l'utilisation métacognitive pour l'apprentissage et l'utilisation métacognitive dans la compréhension de la lecture. Deuxièmement, les effets causaux ont été étudiés avec une analyse de régression et des corrélations entre les facteurs métacognitifs. **RÉSULTATS.** Les résultats montrent que le modèle est bien ajusté et que l'utilisation de stratégies métacognitives peut expliquer 41,5% de l'enseignement de l'utilisation appropriée d'Internet. Les résultats montrent que les enseignants qui utilisent des stratégies métacognitives lors de leur enseignement sont beaucoup plus à même d'apprendre à leurs élèves à utiliser Internet de manière appropriée. **DISCUSSION.** Ces résultats prédisent que la formation des enseignants devrait inclure le développement de stratégies métacognitives, telles que le partage d'expériences et la formation à des stratégies concrètes, afin qu'ils puissent améliorer leur enseignement et atteindre l'éducation aux médias chez les élèves de sorte qu'ils puissent tirer parti de l'utilisation d'Internet pour l'apprentissage.

Mots-clés : *Education aux médias, Education à l'information, Metacognition, Autorégulation, Formation par compétences des enseignants.*

Perfil profesional de los autores

Beatriz Ortega-Ruipérez (autora de contacto)

Profesora contratado doctor en la Universidad Internacional de La Rioja (UNIR). Profesora asociada en la Universidad Rey Juan Carlos. Consultora experta en innovación y tecnología educativa. Sus líneas de investigación incluyen la innovación educativa con tecnología y el aprendizaje autorregulado.

ORCID: <http://orcid.org/0000-0002-3822-5745>

Correo electrónico de contacto: beatriz.ortega.ruiperez@unir.net

Enrique Navarro

Profesor titular en la Universidad Complutense de Madrid, coordina el Máster en Investigación en Educación de la UCM. Se ha especializado en métodos de investigación en educación y medición educativa. Sus principales líneas de investigación tratan sobre la evaluación del rendimiento académico y sus factores asociados y el estudio de la calidad de los instrumentos de medida.

ORCID: <http://orcid.org/0000-0002-3052-146X>

Correo electrónico de contacto: enriquen@ucm.es