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Assessing the willingness of Spanish pre-service secondary school teachers to use group dynamics techniques. Design and validation of an instrument

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Abstract

Nowadays, secondary school teachers are expected to adopt didactic methods that encourage student interaction and increase motivation. The Master's Degree in Secondary School Teaching prepares pre-service teachers to design and implement group-based teaching methods. To this end, the programme provides both theoretical and practical training, prioritising direct experience with group dynamics techniques for future application in the classroom. This study had two objectives: first, to develop and validate an instrument to assess pre-service teachers' willingness to use group dynamics techniques; and second, to examine the influence of sex on the instrument's factorial structure. A mixed-methods approach was applied, structured in two phases: content validity was established through expert judgement, followed by statistical analyses to assess internal structure. The results demonstrated adequate expert agreement, strong internal consistency and a good model fit. Additionally, multigroup analysis supported factorial invariance across sexes. The instrument serves as a valuable tool to assess the willingness of Master's students to employ group techniques. Findings from this assessment can help tailor support for trainees with different profiles during initial training and inform selection and guidance processes. Moreover, it gauges pre-service teachers' preparedness to adopt active methodologies, offering a means to measure the programme's effectiveness in promoting methodological change.

Keywords: Teacher training, Group dynamics, Active learning, Assessment

1 Introduction

Initial training for secondary school teachers has undergone a major transformation internationally in recent decades, with a general tendency to extend the duration of the courses, increasing their complexity and practical focus to better prepare future teachers (Darling-Hammond & Lieberman, 2012). One of the most significant changes brought by the implementation of the European Higher Education Area has been the introduction of active learning methodologies, based on a student-centred teaching approach that aims to make teachers in their initial training protagonists of their own professional training process (Korthagen, 2016; Kramer et al., 2020; Navarro & Pérez, 2020). These

changes are in line with the teacher competencies framework of the European Commission (European Commission, 2005; 2012), which addresses the need to train teachers to manage and dynamise group processes. Thus, training programmes increasingly incorporate group didactic methods that compel pre-service teachers to reflect on the teaching profession (Weber et al., 2023), the value of the methodologies applied in secondary education and the importance of developing their own interpersonal competence (Mansfield & Volet, 2014; Theelen et al., 2020).

In Spain, this process has crystallised in the implementation of the Master's Degree in Secondary School Teaching (MFPS, for the acronym in Spanish), launched in the 2009/2010 academic year (Martínez et al., 2021; Viñao, 2013). Ministerial decree ECI/3858/2007—which regulates the requirements for university degree courses that qualify to teach at this stage—formally acknowledges the need to develop future teachers' competence in planning and developing didactic group methods, as well as in managing interaction and communication processes in the classroom in a socially skilled manner. These competences are typically developed using a cross-disciplinary approach in the different subjects throughout the MFPS¹ course, but also in a specific way in the subjects that cover content related to didactic methods and group dynamics.

Cartwright and Zander (1976) offered three definitions—now considered classic—for “group dynamics”. The first definition describes it as the combination of forces operating within a group that influence individuals' behaviour; these forces, in turn, constitute a field of research focused on understanding the nature of groups and the laws governing their development. The second definition refers to a set of techniques that leverage group interaction to improve existing intragroup relationships and should include the most frequently applied dimension of group dynamics. The third definition views group dynamics as a method for social and political transformation that nurtures values such as equality and co-operation as well as the social skills required for the exercise of democracy through group interaction and reflection. This third definition is connected to the training groups designed by Kurt Lewin and action research methodology (Adelman, 1993).

Although publications on the use of active methodologies in university education do not typically employ the keyword “group dynamics”, they do frequently refer to traditional techniques such as teamwork, case study, role-playing or co-operative learning (Baloche & Brody, 2017; Gil, 2015; Santos & Valente, 2022). In fact, numerous proposals aim to stimulate group dynamics in higher education through specific techniques such as co-operative learning (Fittipaldi, 2020; Gordy et al., 2020).

Current trends in the initial training of pre-service secondary school teachers are well-aligned with Lewin's approach in prioritising the use of active methods that stimulate critical thinking and motivation, based on experiences involving group interaction (Duangmanee & Waluyo, 2023; Johnson & Kim, 2021; Pescarmona, 2017). Techniques such as role-playing or case study are regarded as ideal learning experiences to develop pre-service teachers' skills in resolving the complex problems of the real educational world (Lombardi, 2007).

¹ Master's Degree in Secondary School Teaching (MFPS, for the acronym in Spanish).

In Spain, several studies within the MFPS framework have assessed how pre-service teachers perceive the effects of participating in programmes based on group interaction. Thus, Carrasco and Giner (2011) observed that the students in this degree course gave a positive assessment of an experience based on co-operative learning and deemed it practical and useful. Gil (2015) reached similar conclusions, finding that students emphasised the meaningfulness of the learning acquired through group techniques and noted that they had overcome their initial scepticism towards cooperative learning. Villardón (2016) designed a teamwork experience and found that students considered it satisfactory, developed teamwork skills and increased their perceived self-efficacy. Other innovative methods that include group interaction, such as gamification, also have positive effects on motivation (López & Salas, 2019), group participation, reflection and emotional communication (Franco et al., 2021).

Research studies in this field typically use qualitative instruments, such as team log-books and/or group reports (Prieto et al., 2015; Sáez & Cortés, 2019), open-ended questionnaires (Carrasco & Giner, 2011; Domínguez et al., 2012; Gil, 2015) or individual items to assess the importance attributed to group dynamics (Serrano & Pontes, 2015). However, there is no evidence of an instrument that effectively assesses the perception of students undergoing their initial training and their willingness to apply this type of technique in their future professional practice.

The research studies found in the literature mainly focus on assessing student satisfaction with their involvement in these methodologies as learners. However, there is no standardised instrument to assess their interest or willingness to apply them in their future role as teachers.

Knowing pre-service teachers' willingness during their initial training to use group dynamics techniques is important for society, as they are expected to employ them in their future professional practice as secondary school teachers. The willingness of the MFPS students to use didactic group methods is influenced by their experiences as students and their previous beliefs about the role of teachers (Rivero & Souto, 2019). Therefore, further analysis of this question using standardised instruments to determine pre-service teachers' level of willingness would be valuable. Such instruments would not only increase the reliability of the research and enhance the generalisability of the results but also help tailor training to the dispositional profiles of the MFPS students. This approach would improve their preparation in using these techniques and foster greater interest in them.

The main objective of this study is to design and validate an instrument to measure MFPS students' willingness to use group techniques—beyond the context of a specific experience and/or technique—by assessing said willingness from three dimensions or perspectives: beliefs regarding the usefulness of group techniques; the emotional experiences with these techniques during initial teacher training; and their predisposition to apply these methods and behavioural engagement in using them with their future students. The reference adopted for this purpose will be the tripartite model of attitudes (Rosenberg & Hovland, 1960).

Previous studies have found significant differences in pre-service teachers' willingness to adopt certain active methods according to the sex variable (Palomero-Fernández et al., 2024; Sola et al., 2020; Rodríguez, 2021). Considering these differences, the second

objective of this study is to determine the influence of the sex variable on the factorial structure of the scale in order to estimate its degree of adequacy in assessing the construct in both men and women.

2 Methods

The present study employed a mixed-methods design structured in two complementary stages for the development and validation of the instrument. The first stage focused on designing the instrument through expert judgment to ensure content validity. To achieve this, the items were refined based on the judges' qualitative assessments, and their level of agreement was quantified using Aiken's *V*. The second stage involved gathering evidence of the instrument's reliability and validity through an instrumental study design (Cabrera-Tenecela, 2023). Classical test theory was applied to select the items and analyse reliability, while structural equation modelling was used to assess the fit of the model.

2.1 Participants

The design and development of the instrument involved a process of expert judgement. The panel of experts consisted of a sample of three lecturers at one Spanish university (a 51-year-old woman and two men, aged 57 and 54, respectively). Three experts were deemed sufficient due to the high standards required to be eligible for the panel, which reduced the number of potential candidates available to the researchers. Their selection was based on meeting at least four of the five previously defined criteria to guarantee their status as experts, considering the research objective: (criterion A) at least ten years' experience in educational psychology or in pedagogy; (criterion B) at least ten years' experience in team leadership; (criterion C) at least ten years' experience in university teaching; (criterion D) at least five years' experience in teaching the MFPS; and (criterion E) at least five years' research experience or scientific production in the areas under study. Table 1 shows how each of the experts met these criteria.

The instrument's validation process used a second sample consisting of 441 students (161 men and 280 women) enrolled on the MFPS course at a Spanish university. Participant selection was based on convenience or accidental sampling, offering all students who had enrolled in the 2020/2021 academic year the opportunity to respond. The data were collected during some of the regular classes on the MFPS course. Those who completed the scale represented 61.33% of the total number of students enrolled in the degree course (2020–2021 academic year). The mean age of the participants was 27.6 years (Standard deviation = 6.57), with an age range of 21 to 55 years old. The sample was particularly young, with 47.39% of the participants under 24 years old, having

Table 1 Criteria identified for each expert

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E
Expert 1	X	X	X	X	
Expert 2	X	X	X		X
Expert 3		X	X	X	X

recently completed their undergraduate degree courses. Only 24.26% of the participants had previous experience in managing group dynamics techniques (Appendix 1).

In terms of fields of knowledge of the participants, there was a clear prevalence of Arts and Humanities (49.65%). Social and Legal Sciences (16.09%), Engineering and Architecture (15.41%) and Sciences (12.24%) presented similar percentages, while Health Sciences (6.57%) had the lowest representation.

2.2 Instruments

The “Willingness of Pre-Service Secondary School Teachers to Use Group Dynamics Techniques” instrument (“DTDG”, for its acronym in Spanish) was developed to assess pre-service secondary school teachers’ interest in group dynamics techniques and their willingness to implement them. The design and validation process of the instrument is described in the following sections and involved different versions resulting from the expert judgement process. Appendix 2 presents the changes made to the different versions of the instrument following the development and validation process (i.e. an initial version developed on the basis of the theoretical foundation; a trial version resulting from the expert judgement process and used in the field research; and a final version following the validation analysis). All the versions included a Likert-type response format with five options based on the participants’ level of agreement with each statement presented, with 1 being “*completely disagree*” and 5 “*completely agree*”.

The sociodemographic data were collected using a questionnaire prepared by the author, which compiled data on the following variables: age, sex, previous degree course, speciality and prior experience in managing group dynamics techniques.

2.3 Procedure and data analysis

2.3.1 Development of the first version of the instrument

The process of developing and validating the instrument took place between November 2019 and February 2021, and was based on the standardised procedure by Muñoz and Fonseca (2019).

Prior to the development of the instrument, a theoretical review and a literature search were conducted, which confirmed the social need to assess the construct and the lack of standardised instruments that would make this possible, as explained in the introduction.

The reference adopted for the development of the instrument was the tripartite model of attitudes proposed by Rosenberg and Hovland (1960), which distinguishes between three dimensions: beliefs, emotions and behaviours. This theoretical model was selected for its analytical clarity and strong empirical support in psychosocial research, as evidenced by recent studies (Jiang & Yukio, 2024; Kotzur et al., 2022; Liu et al., 2023; Ordoñez & Romero, 2022; Otto, 2021). Specifically, the tripartite model of attitudes has been widely applied in the development of measurement instruments to assess teachers’ attitudes towards various topics (Bethere et al., 2023; Kelly et al., 2022; Soares et al., 2024).

Therefore, the instrument developed included three subscales designed to assess the dimensions related to the willingness to use group dynamics techniques. Firstly, a

subscale to assess the beliefs of the pre-service teachers concerning the usefulness of the group dynamics techniques (called Perceived Usefulness). Secondly, an attitudinal or assessment subscale (called Emotional Experience) designed to evaluate the emotions aroused by the use of group dynamics techniques during the initial training. Lastly, a behavioural subscale (called Behavioural Engagement) focusing on assessing the interest in developing behaviours aimed at programming and developing group techniques. The first version of the instrument included 12 items—four items for each of the three subscales—to be answered using a Likert-type response format with five options based on the level of agreement.

2.3.2 Development of the second version of the instrument following expert judgement

Once the first version had been developed, evidence of its content validity was obtained based on expert judgement, following the procedure outlined by Galarraga et al. (2023).

The experts selected were first invited to participate via an e-mail that explained the objectives, purpose and context for the development of the instrument. Once they gave their consent, they received a link to an assessment questionnaire on Google Forms so that they could perform their task remotely.

The process of expert judgement required two stages with an identical procedure: the first focused on conducting an initial assessment process of the first version of the instrument; and the second on confirming the degree of validity and agreement among the experts on the changes made to the instrument after the first stage (i.e. on the field research version).

In both stages, the experts' assessments were based on four criteria (Escobar & Cuervo, 2008): adequacy of each subscale, and clarity, coherence and relevance of each item. The experts assessed the degree of adequacy of each criterion using a Likert-type scale ranging from 1 (completely inadequate) to 4 (completely adequate). There was also an open-ended question where they could provide a qualitative assessment of each item and subscale.

2.3.3 Data collection

Once the instrument was ready for use (field research version), a request for assessment of the study was presented to the Research Ethics Committee for the Autonomous Region of Aragón (CEICA for its acronym in Spanish), which obtained a favourable decision (PI 20/359, Certificate No. 16/2020).

The application of the scale to validate the instrument was conducted between November and December 2020. In this stage, data collection was performed by computer using Google Forms, with a form containing the instructions for the participants, the informed consent, the sociodemographic questionnaire and the DTDG instrument.

The application of instruments was conducted in the context of a regular class of the MFPS. Those interested in participating gave their informed consent and responded anonymously and altruistically using their own devices.

2.3.4 Data analysis

The process of expert judgement began by establishing a minimum mean score of 3 in each of the criteria analysed for the validation of the items and subscales. Inter-expert agreement was determined by calculating Aiken's V content validity coefficient and confidence intervals (Aiken, 1985) using specific software (Merino & Livia, 2009) and setting the acceptance criterion at a minimum value of .69 (Aiken, 1985). The experts' observations were also subjected to a qualitative analysis.

Once the field research version of the scale had been applied to the sample of MFPS students, several analyses were conducted to obtain evidence of reliability and validity. Cronbach's alpha (α) and McDonald's omega (ω) coefficients were used to estimate the reliability of the scale in terms of internal consistency, taking into account that the former is the most common estimator in social sciences and the latter is the most suitable for ordinal scales (Hayes & Coutts, 2020). In parallel, the value provided by each of the items on the scale was analysed using the item-total correlation, considering a value of .300 as the minimum value for an item to be deemed optimal (Costello & Osborne, 2005; Frias-Navarro, 2021).

Subsequently, measurements of sampling adequacy (Bartlett's sphericity test and KMO) were obtained and a confirmatory factor analysis (CFA) was performed on the previously proposed three-subscale theoretical model, calculating the goodness of fit indices, namely CFI, TLI and RMSEA. CFI and TLI values over .90 were interpreted as indicators of an optimal fit (Flores et. al, 2017) and RMSEA values below .07 were considered adequate, with recent studies commonly using this as a criterion (Cancino-Santizo et al., 2023).

Finally, a multigroup analysis was conducted to verify whether the sex variable caused significant differences in the dimensions assessed by the instrument. The estimation method employed was maximum likelihood estimation, comparing the goodness of fit of the different models using the χ^2 test, the χ^2/df ratio and the CFI, TLI and RMSEA indices. The standardised regression weights for each item and the correlations between factors were calculated for each model.

The statistical processing of the data identified was conducted using the Jamovi software (The Jamovi Project, 2022), IBM SPSS Statistics 24, and AMOS Statistic 25.

3 Results

3.1 Expert judgement. Content validity in the development of the instrument

In the first stage of the expert judgement process (see Table 2), the experts assessed the 12 items in the initial version of the instrument and gave mean scores of over 3.3 in all of them for the three criteria proposed (coherence, relevance and clarity). Inter-expert agreement was estimated using Aiken's V coefficient with adequate results for all items according to the criteria set by Aiken (1985); ten items showed optimal performance according to Bulger and Hournner's criteria (Bulger & Hournner, 2007).

However, regarding the estimated adequacy criterion for each of the three subscales (Perceived Usefulness, Emotional Experience and Behavioural Engagement), although the mean score obtained was over 3 in all of them, the V coefficient values for inter-expert agreement were unsatisfactory according to Aiken (1985).

Table 2 Criteria for adequacy and inter-expert agreement for the first version of the DTGD instrument

Items	Coherence	Relevance	Clarity	Adequacy	Inter-expert agreement	
	M(SD)	M(SD)	M(SD)	M(SD)	Aiken's V	CI
Item 1	3.3(0.58)	3.7(0.58)	4.0(0.00)		0.88	0.83–0.91
Item 2	3.3(0.58)	3.0(0.0)	3.7(0.58)		0.77	0.71–0.82
Item 3	3.3(0.58)	3.3(0.58)	3.7(0.58)		0.81	0.75–0.85
Item 4	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
S1. UP				3.0(1.00)	0.66	0.60–0.72
Item 5	3.7(0.58)	3.7(0.58)	4.0(0.00)		0.92	0.87–0.94
Item 6	4.0(0.00)	3.7(0.58)	3.7(0.58)		0.92	0.87–0.94
Item 7	3.7(0.58)	3.7(0.58)	3.7(0.58)		0.88	0.83–0.91
Item 8	3.3(0.58)	3.3(0.58)	4.0(0.00)		0.85	0.80–0.89
S2. EE				3.0(1.00)	0.66	0.60–0.72
Item 9	3.3(0.58)	3.3(0.58)	4.0(0.00)		0.85	0.80–0.89
Item 10	3.7(0.58)	3.7(0.58)	4.0(0.00)		0.92	0.87–0.94
Item 11	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 12	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
S3. BE				3.0(1.00)	0.66	0.60–0.72

Note: M Mean, SD Standard deviation, CI Confidence interval, S1. PU Subscale 1. Perceived Usefulness, S2. EE Subscale 2. Emotional Experience, S3. BE Subscale 3. Behavioural Engagement

This result was consistent with the qualitative observations made by two of the experts, who expressed the need to modify some items or to introduce others to increase the adequacy of the subscales. For example, expert 1 indicated that the first subscale focused excessively on the content and recommended adding an item related “...to participation, engagement and collaboration, focusing on the students”.

With regard to the second subscale, expert 2 suggested “(...) somehow introducing the context and the prospective teacher’s specific history as regards their relationship to group dynamics (...)”. This expert also remarked that the emotional experience related to the group dynamics techniques could be measured by variables that had not been considered, such as perceived self-efficacy regarding professional use of these techniques in the future.

Experts 1 and 2 noted the lack of adequacy in the third subscale, Behavioural Engagement. Thus, expert 2, for example, indicated that “(...) the control perceived by the prospective teacher in terms of the possibility of using these dynamics, [Sic.] is an extremely important variable, owing to the direct influence on behaviour, and, despite this, it has a rather negligible presence in the questionnaire”. Furthermore, in relation to item 11, this expert commented that behavioural intention “(...) should be an outcome of the questionnaire, instead of being a specific question”.

Regarding the wording of the items, expert 1 drew attention to the clash between emotions and content in item 7, considering that it was potentially reductionist; expert 3 also suggested reducing its length. Lastly, expert 1 considered that the appearance of negative emotions relating to the difficulty in expressing oneself in front of a group could be overlooked in the overall subscale. Finally, item 12 raised the concerns of expert 1, who noted the importance of correcting the dichotomy in this item.

Several changes to the instrument were made based on the experts’ observations (Appendix 2); these changes are explained below. Due to the extent of these modifications, a second round of expert judgement was conducted in order to re-assess the instrument after applying the changes. First, two new items were added aimed to improve the adequacy of the Perceived Usefulness subscale, including the variables “participation” and “learning assessment”; the four items from the first version remained intact. As regards the second subscale (Emotional Experience), some changes were made to the wording of the first two items (items 5 and 6 in the first version), framing them in the context of the group techniques in which the prospective teachers had participated during the MFPS. The wording of the third item was also reviewed and shortened, and two new items were added covering experiential nuances that had not been considered in the initial version. Finally, items 11 and 12 of the Behavioural Engagement subscale were completely reworded and two new items were added to improve adequacy.

The experts conducted then the second stage of the validation process. The results for the second version of the instrument exhibited a notable improvement, both in the mean scores and the level of inter-expert agreement (Table 3).

In terms of inter-expert agreement, all the items obtained values of over.71 in the lower bound of the confidence interval—including the new items. The level of general agreement was considerably high, given that 16 items presented values of over.80 in

Table 3 Criteria for adequacy and inter-expert agreement for the second version of the DTG instrument

Items	Coherence	Relevance	Clarity	Adequacy	Inter-expert agreement	
	M(SD)	M(SD)	M(SD)	M(SD)	Aiken’s V	M(SD)
Item 1	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 2	3.7(0.58)	3.7(0.58)	3.3(1.15)		0.85	0.80–0.93
Item 3	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 4	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 5*	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 6*	3.3(0.58)	3.7(0.58)	3.7(0.58)		0.85	0.80–0.93
S1. PU				3.7(0.88)	0.88	0.83–0.91
Item 7	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 8	3.7(0.58)	4.0(0.00)	3.7(0.58)		0.92	0.87–0.94
Item 9	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 10	3.7(0.58)	3.7(0.58)	4.0(0.00)		0.92	0.87–0.94
Item 11*	3.3(1.15)	3.3(1.15)	3.7(0.58)		0.81	0.75–0.85
Item 12*	3.3(1.15)	3.3(1.15)	4.0(0.00)		0.85	0.80–0.93
S2. EE				3.3(0.77)	0.77	0.71–0.82
Item 13	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 14	3.7(0.58)	3.7(0.58)	4.0(0.00)		0.92	0.87–0.94
Item 15	3.0(1.73)	3.0(1.73)	4.0(0.00)		0.77	0.71–0.82
Item 16	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 17*	4.0(0.00)	4.0(0.00)	4.0(0.00)		1	0.98–1
Item 18*	3.7(0.58)	3.7(0.58)	4.0(0.00)		0.92	0.87–0.94
S3. BE				4.0(0.00)	1	0.98–1

Note: M Mean, SD Standard deviation, CI Confidence interval, S1. PU Subscale 1. Perceived Usefulness, S2.EE Subscale 2. Emotional Experience; S3.BE Subscale 3. Behavioural Engagement. * New items

the lower bound of their confidence interval and nine of them were close to the maximum value. The level of agreement relating to the adequacy of each of the three subscales was also satisfactory, thereby correcting the deficit identified in the first version of the questionnaire. Furthermore, an optimal total value of .93 was obtained for the instrument overall.

The judges' qualitative observations were consistent with the statistical values obtained and they did not make any suggestions regarding changes or modifications. Therefore, the content validity was sufficient to use the second version of the instrument as a field research version.

3.2 Reliability

The two coefficients used to determine the instrument's reliability showed satisfactory values ($\alpha = .853$; $\omega = .870$). However, in the analysis of the items, in line with the recommendations by Costello and Osborne (2005), items 6, 9 and 10 obtained inadequate values of under .300 (Table 4), which indicated that these items did not add value to the scale's internal consistency and were, therefore, removed from the instrument.

Subsequently, reliability was recalculated without these three items, with the 15 items exhibiting an acceptable item-total correlation (Table 4). The results confirmed an overall good internal consistency of the instrument ($\alpha = .871$; $\omega = .883$), with a considerable improvement in reliability after removing these items; they also verified the acceptable reliability of the three subscales with values of over .700 (Table 5). Table 5 provides descriptive information on the scores obtained in the subscales.

Table 4 Item-total correlations for the instrument

Items	Item-total correlation	
	Version with 18 items	Version with 15 items
Item 1	0.597	0.617
Item 2	0.506	0.495
Item 3	0.537	0.552
Item 4	0.460	0.443
Item 5	0.606	0.616
Item 6	0.148	Item removed
Item 7	0.568	0.590
Item 8	0.623	0.633
Item 9	0.162	Item removed
Item 10	0.279	Item removed
Item 11	0.451	0.474
Item 12	0.576	0.573
Item 13	0.328	0.301
Item 14	0.590	0.619
Item 15	0.588	0.606
Item 16	0.433	0.420
Item 17	0.705	0.717
Item 18	0.325	0.324

Table 5 Descriptive statistics and reliability coefficients

	S1.PU	S2.EE	S3.BE
<i>i</i>	5	4	6
<i>N</i>	441	441	441
<i>M</i>	20.9	15.5	23
<i>SD</i>	2.89	3.17	3.88
<i>Min</i>	5	4	11
<i>Max</i>	25	20	30
<i>Asym</i>	− 1.57	− 0.78	− 0.66
<i>Kurt</i>	4.63	0.66	0.29
α	0.745	0.748	0.705
ω	0.758	0.756	0.737

Note: *i* Item number, *N* Number of participants, *M* Mean, *SD* Standard deviation, *Min.* Minimum score, *Max.* Maximum score, *Asym.* Asymmetry, *Curt.* Kurtosis, α Cronbach's alpha, ω McDonald's omega, *S1.PU* Subscale 1. Perceived Usefulness, *S2.EE* Subscale 2. Emotional Experience, *S3.BE* Subscale 3. Behavioural engagement

3.3 Validity based on the internal structure

Using the 15-item version, evidence was obtained of the construct validity based on the internal structure of the instrument. The sampling adequacy measures indicated a good fit of the variables for a CFA ($KMO = 0.915$; $X^2 = 2229$; $p = 0.001$). The results of the CFA indicate an adequate goodness of fit for the data to the three-factor model ($CFI = 0.929$; $TLI = 0.914$; $RMSEA = 0.063$), according to the criteria set by Flores et al. (2017). Figure 1 shows the structure of the factorial model.

3.4 Multigroup analysis

In order to analyse the influence of the sex variable on the factorial structure of the instrument, four models were tested: unconstrained, measurement weights, structural covariances and measurement residuals. The comparison of the CFI, TLI and RMSEA indices for each model indicates that the “measurement weights” model provides the best fit to the data (Table 6).

This model assumes that the weight of the items on each factor is the same for both groups. Thus, the regression weights of each item and of each factor were found to be statistically significant, for both men and women. These data support the hypothesis of invariance between groups. A comparison of the two groups in greater detail revealed correlations between the instrument factors of over.797 for women, and over.829 in the case of men. The estimated regression weights of each item on the corresponding factor were also similar, although slightly higher in the case of men. In conclusion, the evidence indicates that the instrument is valid for the assessment of the three factors that make up the construct for both men and women.

4 Discussion

Current models of initial teacher training consider that pre-service teachers in this training stage should develop competences to provide active guidance for their future students' learning processes using group didactic methods (Darling-Hammond & Lieberman, 2012; Escudero, 2019; Korthagen, 2016). Research has linked active

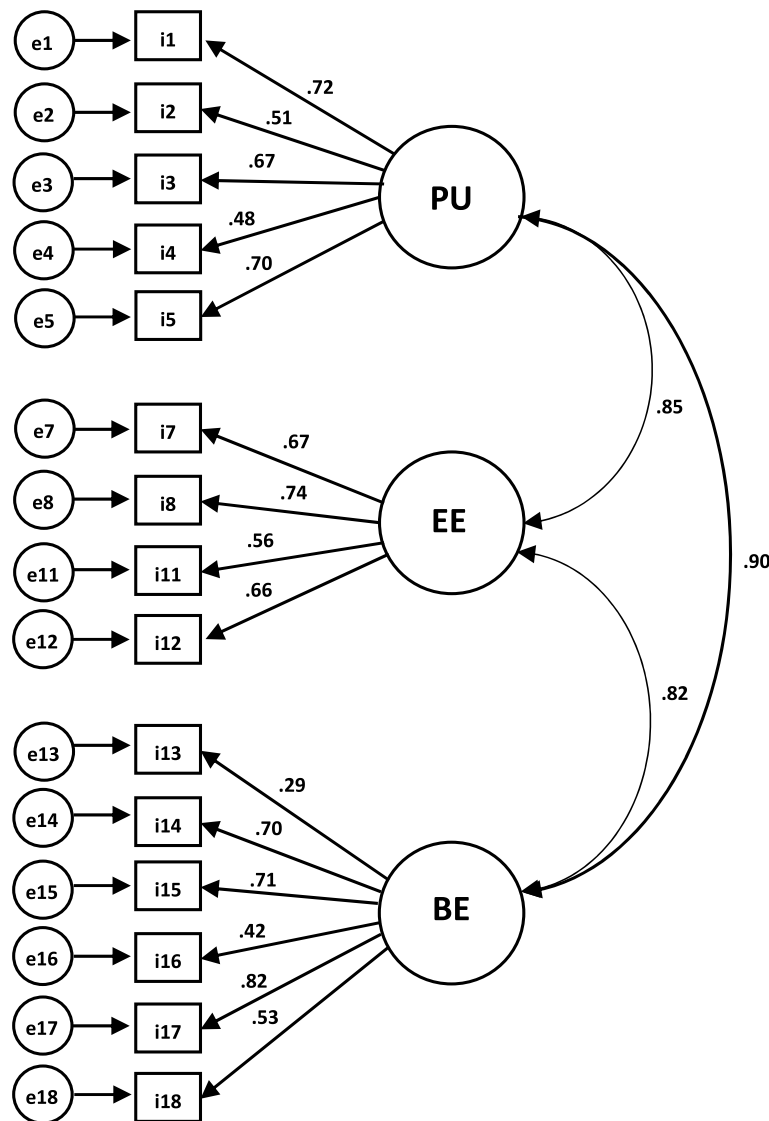


Fig. 1 Factorial structure of the instrument (standardised estimates). Note: *PU* Perceived Usefulness, *EE* Emotional Experience, *BE* Behavioural Engagement

Table 6 Estimates of goodness of fit for the structural equation models

Model	CMIN	DF	P	CMIN/DF	TLI	CFI	RMSEA
Unconstrained	324,671	174	,000	1,866	0.910	0.925	0.044
Measurement weights	336,910	186	,000	1,811	0.915	0.925	0.043
Structural covariances	367,543	192	,000	1,914	0.904	0.913	0.046
Measurement residuals	394,339	207	,000	1,905	0.905	0.907	0.045

learning with traditional group dynamics techniques, such as teamwork or role playing (Dominguez et al., 2012; Franco et al., 2021; Fittipaldi, 2020; Gil, 2015; Gordy et al., 2020; Villardón, 2016), but few studies have examined the willingness of secondary school

teachers still in their initial training to use this type of techniques. This study aims specifically to develop an instrument for the assessment of this issue with sufficient psychometric soundness.

The development of the DTDG instrument was based on the group psychology theory (Canto, 2019) and the tripartite model of attitudes (Rosenberg & Hovland, 1960). A process of expert judgement helped improve and refine the instrument before applying it, which resulted in optimal content validity from the development process. The high mean scores obtained for the items and subscales in the four criteria assessed by the expert judges (i.e., clarity, relevance, coherence and adequacy) and the high level of inter-expert agreement are particularly noteworthy. According to Muñiz and Fonseca (2019), use of expert judges and exhaustive literature review are necessary procedures to guarantee content-based validity evidence.

Following these same authors' guidelines, once the instrument had been applied to the sample of interest (e.g. pre-service secondary school teachers), the psychometric properties of the instrument's scores were analysed, namely, item analysis, reliability estimate of the scores and collection of validity evidence. After removing three items that did not add any value to the scale, optimal reliability values were obtained, both in the scale and the subscales. Likewise, the construct validity based on the internal structure—which was obtained by CFA—revealed an adequate fit of the data to the model with the three dimensions initially proposed as subscales (e.g. Perceived Usefulness; Emotional Experience; and Behavioural Engagement), based on the tripartite model of attitudes. These results are consistent with those of previous studies on teachers' attitudes towards various topics (Gauthier et al., 2020; Kelly et al., 2021; Soares et al., 2024), further supporting the empirical robustness of Rosenberg and Hovland's (1960) tripartite model.

As prior studies had reported a greater willingness to use active methodologies among women compared to men (Palomero-Fernández et al., 2024; Sola et al., 2020; Rodríguez, 2021), a multigroup analysis was conducted using this variable as a reference. The results obtained demonstrate the invariance of the instrument's factorial structure for both men and women.

In conclusion, this research provides evidence of the instrument's reliability and validity, demonstrating its adequacy, with a clear, well-defined social purpose. The DTDG instrument is designed to improve initial teacher training. Below, the most relevant implications of its use for teacher training policy are outlined.

Firstly, it could be used in guidance processes and/or selection of candidates for the MFPS course, according to experts' recommendations (Egido, 2021; Martínez et al., 2021). The use of this instrument, along with other tests such as interviews, could help optimise the processes of attracting, recruiting and selecting candidates to be trained as better qualified secondary school teachers, in line with the recommendations of the OECD (2018) and the European Commission (2012), thereby contributing to the improvement in the results of the education system and the status of the teaching profession.

Secondly, the instrument also provides interesting information to refine the instructional design of this degree course, thus favouring the identification of different dispositional profiles. This information could be useful for the proper adjustment of the teaching-learning process involved in this type of techniques, thus aiding pre-service

teachers to become aware of their own perception of these techniques, their emotional experience and their interest in using them in the future. Therefore, the information provided by the instrument could be used to stimulate pre-service teachers' emotional self-awareness (Anttila et al., 2016), reflection on the advantages and disadvantages of using group dynamics techniques in secondary education (Sáez & Cortés, 2019) and solving of problems related to the teaching profession through communicative interaction (Lam, 2006).

Finally, as teachers are currently expected to use innovative, didactic methods that encourage group interaction, this new instrument could be employed in pre-post research design, applying it before the MFPS course begins and also when it ends, thereby assessing the effectiveness of the degree course for the training of pre-service teachers with the skills and attitudes to use active methodologies in their future teaching work who, in short, can meet the expectations of the ongoing process of methodological change.

This study, however, also has certain limitations. Firstly, some limitations are linked to the characteristics of the sample. Although it is large enough to perform the validation, the incidental selection process and the fact that all the subjects are students from the same university may limit the generalisability of the results. It would be of interest to replicate the results with more representative, nationwide samples of pre-service secondary school teachers in their initial training. The impact of self-selection bias should also be considered, as it may lead to the under-representation of less engaged MFPS students. Similarly, the over-representation in the sample of students from the Arts and Humanities should be noted. To address these limitations, future research should adopt random sampling methods to ensure a more balanced representation of the various areas of knowledge. It would also be valuable to explore the instrument's application to other sociodemographic groups—such as in-service teachers—and to analyse its factorial invariance with respect to variables like prior experience. Finally, as this is a newly developed instrument, it is important to highlight the provisional nature of the results and the need for further research to provide additional evidence of construct validity. This could be accomplished through methodological approaches such as those proposed by Lloret-Segura et al. (2014), including Exploratory Structural Equation Modelling (ESEM) or semi-specified (Procrustean) rotations.

Despite these limitations, the instrument offers valuable opportunities for further assessing prospective teachers' willingness to use didactic methods based on group techniques.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1007/s44322-025-00037-w>.

Supplementary Material 1

Supplementary Material 2

Authors' contributions

Pablo Palomero-Fernández and Eva Vicente-Sánchez contributed to the study conception and design. Material preparation, data collection and analysis were performed by Pablo Palomero-Fernández. The first draft of the manuscript was written by Pablo Palomero-Fernández and reviewed by Eva Vicente-Sánchez. The two authors read and approved the final manuscript.

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Data availability

The data on which this research is based is protected and not available due to data privacy laws.

Declarations**Ethics approval and consent to participate**

Obtained from the Research Ethics Committee for the Autonomous Region of Aragón (CEICA for its acronym in Spanish).

Consent for publication

Students provided consent to participate and for publication.

Competing interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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