

Article

Validating an Updated Creative Personality Scale (CPS) for Future Teachers: The Human Factor Facing Artificial Intelligence

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Abstract

The rise of artificial intelligence (AI) and classroom automation demands rethinking visual and arts education. To prevent learning standardization, it is imperative to cultivate a critical teacher profile capable of leading new digital ecologies. In this context, measuring the creative self-perception of future educators constitutes a fundamental pedagogical need. This instrumental study analyses the factor structure and internal consistency of the Creative Personality Scale (CPS), adapting it to contemporary technological challenges. It was administered to 90 pre-service teachers from the Early Childhood and Primary Education programmes at the University of Almería. Through an Exploratory Factor Analysis (EFA) using Principal Axis Factoring (PAF) with Oblimin rotation, the scale was refined to 17 items, confirming a robust three-dimensional structure: Imaginative Creativity, Behavioural Originality, and a Positive Attitude towards Challenges (explaining 44.17% of the variance; $\alpha = 0.862$). While not a direct measure of pedagogical performance, these dimensions capture the psychological dispositions hypothesized as necessary for educators to critically navigate AI integration and mitigate algorithmic standardization. In conclusion, the adapted scale provides an initial exploratory validation of a diagnostic framework. Its application provides a foundational metric for teacher education programmes, aiming to foster learning environments where technology integration is deliberately guided by human judgment and sensitivity.

Keywords: creativity; pre-service teachers; artificial intelligence; digital ecologies; psychometric validation

1. Introduction

The development of AI and virtual environments is profoundly transforming teaching and creative processes. Given this connection between art, technology and education, recognising creativity as a pivotal skill has led to its incorporation into teacher training. Consequently, future educators must not only cultivate their creative potential, but also prepare to function as technological mediators. They need to be adept at nurturing creative thinking and promoting the responsible use of digital tools (Beghetto, 2021; Feist, 2018; Patston et al., 2021; Sawyer & Henriksen, 2024).

Within this technological paradigm, pre-service teachers' creative self-perceptions are crucial, as they directly influence motivation, behaviour, and instructional practices (Feist, 2018; Freiberg-Hoffmann et al., 2019; Green et al., 2023). These self-beliefs form the psychological foundation required for future educators to conceptualise and implement collaborative, inclusive learning environments.



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The pervasive integration of AI into the educational landscape risks standardising pedagogical practices. Consequently, teacher creativity is no longer merely a desirable trait, but a critical competency required to counteract the mechanisation of visual and arts education. However, to effectively cultivate this competency, robust diagnostic tools are needed. By validating the CPS within this demographic, this study bridges the gap between theoretical demands for creative educators in digital ecologies and the practical necessity of measuring their self-perceived readiness. As recent research highlights, designing digital learning environments requires a profound transformation where teachers must actively integrate visual languages and ubiquitous learning strategies to foster critical thinking, rather than passively adopting automated solutions (González-Zamar et al., 2021). Thus, this validation transcends a purely instrumental exercise; it is conceptually vital. It provides a foundational understanding of how future educators perceive their own creative capacities, which is the first step toward potentially empowering them to become active designers of technological ecosystems, rather than mere consumers of AI-generated content (González-Zamar & Abad-Segura, 2021).

In response to this need, and aiming to strengthen teacher training for 21st-century challenges, the overall objective of this study is to analyse the factor structure and internal consistency of one of the most prominent instruments in this field: the CPS by Kaufman and Baer (2004). This study was conducted with a sample of students from the Early Childhood and Primary Education degree programmes at the University of Almería. The aim was twofold: firstly, to assess the psychometric validity of the tool, and, secondly, to explore its potential usefulness as a diagnostic instrument in the context of the challenges posed by emerging technologies.

The specific objectives of the present study are threefold: firstly, to identify the underlying structure of the instrument through EFA; secondly, to determine the emerging factors and their consistency with the original model; and thirdly, to assess the internal consistency of these factors using Cronbach's alpha. In summary, this research provides rigorous initial validation, thus helping to train teachers capable of sustaining innovative and humanised learning environments.

Therefore, the original contribution of this study lies in updating and adapting a classical psychometric instrument—the CPS—into a context-specific, preliminary diagnostic tool for the artificial intelligence era. Specifically, this research contributes to the literature on teacher training and digital pedagogies in three distinct ways. First, it addresses a critical gap by operationalising creative self-perception into an initial multidimensional framework tailored to digital educational ecologies, moving away from generalised, unidimensional traits. Second, it provides a contemporary metric to evaluate the specific human capacities—imaginative creativity, behavioural originality, and a positive attitude towards challenges—that may be required to mitigate the negative effects of algorithmic standardisation in future teaching practices. Third, the study offers immediate practical implications for teacher education programmes, providing university educators with a baseline to design targeted curricular interventions, such as specialised courses on digital pedagogy and AI literacy.

To operationalise these objectives and address the identified gaps in the context of digital educational ecologies, this study is guided by the following research questions:

- RQ1: What is the underlying factor structure of the adapted CPS when administered to pre-service teachers within contemporary digital education ecologies?
- RQ2: Does the refined scale exhibit adequate internal consistency and psychometric reliability across its extracted dimensions?
- RQ3: To what extent do the emerging latent factors conceptually align with foundational creative personality constructs while responding to the imperatives of AI-driven educational environments?

2. Theoretical Framework

2.1. Creative Personality

The psychometric utility of the CPS lies in its hybrid foundation, synthesizing social-occupational innovation from the Personality Inventory (Hogan & Hogan, 1995) with abstract cognitive dispositions from the Imagination dimension (Russell & Karol, 1994). In the current educational paradigm, this dual structure serves a critical function: it operationalises how future educators transition from internal ideation to overt, non-standardized instructional practices when confronting automated systems. In their pioneering study, Kaufman and Baer demonstrated the tool's validity by cross-referencing an overall score on the scale with performance in various specific domains.

Following its conception, the scale has been utilised and analysed by numerous researchers to evaluate its practical relevance in various contexts. At a cross-cultural level, Oral et al. (2007) replicated the study in Turkey, demonstrating that perceptions of one's own creativity maintain a certain consistency, but are strongly influenced by the environment. In their study, Rawlings and Locarnini (2007) validated the instrument by comparing its performance across groups of artists, scientists, and university students, thereby demonstrating its usefulness in distinguishing profiles in domains where art, science, and technology converge. Subsequently, Kaufman et al. (2009) expanded the study of these measures using structural equation modelling, reaffirming their construct validity. From a more recent and applied perspective, Ishiguro et al. (2022) have utilised the CPS, demonstrating empirically that beliefs about one's own imagination and problem-solving ability act as a significant predictor of actual achievements.

Despite these findings, the literature review highlights certain methodological limitations. As Silvia et al. (2012) observe in their work on self-perception measures, the psychometric behaviour and dimensionality of these instruments frequently vary depending on the factor extraction method and the characteristics of the sample. In this regard, it is important to note that the results obtained in general populations or among other professional groups cannot be directly extrapolated to the field of trainee teachers.

This specific group has specific requirements (Freiberg-Hoffmann et al., 2019; Córdoba-Pachón et al., 2021), particularly in light of the expectation that they will incorporate visual languages into their future pedagogical practices. Adapting to digital learning environments requires a multidimensional understanding of pre-service teachers' creative personality. This conceptual complexity underscores the need to empirically analyse how these latent factors are structured within this distinct demographic.

2.2. Creativity in Education

Driven by profound socio-technological shifts, creativity has emerged as a critical, cross-curricular competency. Within contemporary educational frameworks, cultivating these creative abilities empowers students to navigate dynamic contexts, address complex challenges, and actively construct knowledge in a meaningful and adaptive manner (Henriksen et al., 2021).

In accordance with the contributions of Runco (2018) and Kaufman and Glăveanu (2022), an ethical and transformative dimension is added to the process of learning creatively. The authors employ the concept of positive creativity, defined as a form of creativity oriented towards collective well-being, social engagement, and the improvement of the environment. Furthermore, it is asserted that the cultivation of creativity within educational settings is of paramount importance, particularly considering its inclusive and democratic character. Consequently, classrooms transform into spaces where students learn to solve problems effectively, applying solutions with a positive community impact. This perspective aligns with Vygotsky's zone of proximal development (Ness, 2022), positioning

creativity as a dynamic, socially constructed process driven by environmental interaction. From this standpoint, creativity assumes a pivotal function in human development, serving to nurture learning through dynamic interaction with the environment.

As [Morgan \(2021\)](#) explains, the different ways of learning are closely linked to Howard Gardner's theory of multiple intelligences. This standpoint acknowledges the heterogeneity of human capabilities and advocates for a variety of learning methodologies and knowledge dissemination pathways.

2.3. The Creative Teacher

[Henriksen et al. \(2016\)](#) and [Supena et al. \(2021\)](#) emphasise that the rapid pace of innovation necessitates a creative mindset to address the growing complexity of global challenges, particularly in educational contexts. This ability enables teachers to think beyond conventional solutions, fostering the adaptability and problem-solving skills needed to guide students in a constantly changing world. Consequently, the role of educators extends beyond the mere transmission of knowledge, as they are also charged with the responsibility of modelling creativity as a tool for navigating uncertainty and cultivating intellectual exploration. Furthermore, [Sternberg \(2019\)](#) posits that creativity is pivotal to leading pedagogical innovations.

From a contextual perspective, [Sawyer and Henriksen \(2024\)](#) emphasise that creativity emerges from the dynamic interplay between the individual, the environment, and the education system. However, educational institutions frequently prioritise the transmission of knowledge over the promotion of innovation, thereby impeding creativity in the classroom environment. Deviations from the prescribed curriculum are seldom acknowledged or valued. As stated by [Patston et al. \(2021\)](#), teachers are required to enhance their capacity to cultivate creativity by conducting a comprehensive analysis of the learning environment and the processes involved in learning. These practices have been shown to assist in the overcoming of misconceptions, such as the erroneous association of creativity with specific subjects, and the negative perception of pupils' creative behaviours.

3. Materials and Methods

3.1. Design

This study is quantitative in nature. The methodological choice is based on the need to analyse the internal structure of a psychometric instrument, and to describe the data obtained from a specific population. The study is therefore classified as an instrumental, descriptive, cross-sectional, and non-experimental investigation. Although the EFA approach, which uses correlations between items to identify underlying factors, has been chosen, the study is not considered to be correlational in a methodological sense. The objective is not to analyse the relationship between independent and dependent variables, but to search the structure and internal consistency of a psychometric instrument, an CPS. The data collected via the questionnaire are then analysed using standardised statistical techniques, with the aid of the Statistical Package for the Social Sciences (IBM SPSS Statistics, Version 30.0.0.0).

3.2. Study Sample

The study sample comprised a total of 90 students from the Education degree programmes at the University of Almería. The participants were selected on the criteria of accessibility, and were chosen on the basis of their willingness and availability to participate voluntarily in the study. Given that participation was voluntary and no randomisation criteria or stratified random sampling were applied, the sample cannot be considered representative of the total number of students on these degree programmes. Consequently, it is not possible to generalise the results obtained to the university population as a whole.

Nevertheless, it is considered adequate for the exploratory and instrumental purposes of the study, which are aimed at analysing the internal structure of the instrument used and identifying possible trends within the group analysed.

Although the sample size of 90 participants may initially appear limited for an EFA, it is methodologically acceptable for this initial exploratory phase, given that communalities are generally adequate (MacCallum et al., 1999). The specific and well-defined nature of the target population—pre-service teachers in a concrete educational context—allows for the capture of preliminary trends, rather than establishing definitive normative data. However, as this sample size poses inherent limitations regarding long-term psychometric stability and replicability, the extracted factor solution should be interpreted cautiously as a preliminary structural hypothesis. This establishes a conceptual foundation that necessitates cross-validation with larger samples in future confirmatory studies.

The sample size of 90 university students (see Table 1) ranged in age from 18 to 35 years (mean = 21.50; median = 21.00; mode = 21). With respect to gender distribution, 80% of the participants were female ($n = 72$), and 20% were male ($n = 18$).

Table 1. Sample size by degree programme and gender.

Degree Programme	Female (n)	Male (n)
Dual Degree in Early Childhood and Primary Education	5	
Degree in Early Childhood Education	1	
Degree in Primary Education	66	18
Total	72	18

With regard to the degree programme they are studying, the majority of participants are enrolled on the Bachelor's Degree in Primary Education (84 participants, 93.3%), followed by students on the Dual Degree in Early Childhood and Primary Education (5 participants, 5.6%), and, to a lesser extent, by students on the Bachelor's Degree in Early Childhood Education (1 participant, 1.1%).

Regarding their academic background, 70% of the students ($n = 63$) were drawn from the Humanities and Social Sciences discipline, 27.8% ($n = 25$) had previously pursued studies in the Science and Technology discipline, and 2.2% ($n = 2$) were from the General stream.

All participants were enrolled during the 2024/2025 academic year, and consented to participate in the study on a voluntary basis.

3.3. Data Collection Tool

For the present study, the CPS questionnaire was utilised, a tool that has been demonstrated to be both valid and reliable. This questionnaire was developed by Kaufman and Baer (2004), and its purpose is to assess individuals' perceptions of their own creativity across various domains, while addressing both specific and general aspects of creativity. In their 2004 publication, Kaufman and Baer underscored the subjective nature of creativity, emphasising the influence of individuals' self-perceptions on their assessments of their own creativity and that of others.

The scale is grounded in established psychological frameworks, including the Hogan Personality Inventory (Hogan & Hogan, 1995) and the Personality Factors Questionnaire (Russell & Karol, 1994), which specifically address the facets of creativity and imagination, respectively. These items were selected from the International Personality Item Pool (Goldberg, 1999) to ensure alignment with validated measures of personality traits (Kaufman & Baer, 2004).

The CPS contains a total of 20 items, formulated as statements that the respondent evaluates based on their personal identification, without the need to perform any creative tasks. In order to respond to each item, participants were required to utilize a five-point Likert scale, where 1 denotes 'strongly disagree', and 5 denotes 'strongly agree', thereby reflecting the degree of identification with the proposed creative characteristics (Kaufman & Baer, 2004). The questionnaire was administered to the participants in Spanish. For the purposes of this publication, the items in the results tables are presented in English, while the Spanish version used can be consulted in Appendix A.

Moreover, the questionnaire included an introductory section comprising sociodemographic questions (gender, age, academic year, and type of secondary school attended). These questions will facilitate future research in characterising the sample and conducting descriptive and comparative analyses, thereby providing a more comprehensive perspective on the creative profile of the participating students.

3.4. Procedure

The selected instrument was translated and adapted into Spanish following a rigorous expert panel approach. Initially, a panel of three bilingual experts in educational psychology translated the original English items into Spanish independently. Subsequently, the experts evaluated their individual translations and reached full consensus to establish a preliminary draft. To complete the forward-backward translation procedure and ensure semantic and conceptual equivalence, this draft was then translated back into English by an independent translator who was blind to the original instrument. To guarantee cultural resonance and clarity, a comprehensibility test was conducted. The preliminary Spanish version was administered to a pilot group of 5 pre-service teachers. This pilot testing identified minor comprehension barriers related to specific idioms; consequently, targeted linguistic adjustments were implemented—such as adapting these expressions to local pedagogical terminology—to ensure full clarity and cultural resonance prior to the final administration.

The data were collected via a digital questionnaire, which was distributed via a link that provided access to the Google Forms platform. This method fosters voluntary participation, preserves the anonymity of respondents, and facilitates rapid organisation of the data for statistical analysis. The data collected from the questionnaire is recorded in a Google spreadsheet, which facilitates subsequent analysis.

To ensure compliance with all ethical principles, student participation in this research was voluntary, anonymous and unpaid; throughout the process, participants were informed of the aims of the research. These measures ensure compliance with the principle of free and informed consent. Prior to accessing the questionnaire, participants were provided with comprehensive information regarding the study's objectives, the intended usage of their responses, and the strict confidentiality provisions. Furthermore, in accordance with the ethical standards for non-experimental research involving anonymous surveys, these terms were also clearly explained in the questionnaire and were deemed to have been accepted upon completion and submission of the form.

3.5. Data Analysis

This section delineates the procedure that was followed for the analysis of the data collected using the CPS by Kaufman and Baer (2004). Initially, the data were organised in an Excel file and subsequently imported into IBM SPSS Statistics (version 30.0.0.0), the software utilised for the statistical analysis. As some of the items (4, 8, 10, 13, 14, 16, 17, and 19) in the original instrument were phrased in negative terms, they were reverse-coded prior to both the factor analysis and the reliability estimation to maintain interpretative consistency (hereafter indicated as '[R]' within the text and tables). Additionally, there were

no missing data to report, as the digital form was configured to require a response for all items before submission.

The statistical analysis was divided into two main phases. Firstly, a descriptive analysis was carried out. Although the original questionnaire comprised 20 items, descriptive statistics are presented for the 17 items retained after the factor analysis to maintain conceptual focus on the validated construct. Secondly, an Exploratory Factor Analysis (EFA) was conducted to identify the underlying dimensions of the scale. Prior to its implementation, the assumptions of sample adequacy were verified using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity, justifying the applicability of the factor analysis technique.

Following the verification of the analysis's feasibility, the Principal Axis Factoring (PAF) extraction method with direct Oblimin rotation was employed. This oblique rotation is utilised to identify the correlation between factors, thereby facilitating a more realistic representation of psychological data. Initially, the EFA was run with all 20 items. Based on criteria of theoretical parsimony and visual inspection of the scree plot, which showed a clear point of inflection, the extraction was forced to three factors.

To ensure the psychometric robustness of the scale, an iterative refinement process was subsequently applied. In the first iteration, items 12 ('Know how things work') and 13 ('Am interested in theoretical discussions' [R]) were removed from the model due to primary factor loadings falling below the broadly accepted threshold of 0.30 (Hair et al., 2014). Upon recalculating the model without these items, a second iteration revealed that item 16 ('Enjoy interacting with complex people' [R]) also exhibited a weak loading (<0.30) due to the readjustment of the factor structure; consequently, item 16 was also excluded—see Appendix B for the detailed item-removal process. Conceptually, the elimination of these three items strengthened the construct's focus. Item 12 leans more heavily toward mechanical aptitude rather than creative ideation, while items 13 and 16 reflect general intellectual curiosity and social openness rather than specific creative traits. Removing them ensured that the retained items more accurately captured the proactive, imaginative, and disruptive dimensions required for educational innovation. Finally, the pattern matrix, the factor correlation matrix, and the factor loadings were analysed for the remaining 17 items, to group them meaningfully into the three definitive latent factors. To confirm the internal consistency of this refined scale, Cronbach's alpha coefficient was assessed, yielding a value of $\alpha = 0.862$ (95% CI [0.816, 0.900]), which indicates optimal reliability across the final 17 retained items. To provide a more robust estimation of reliability and address the limitations of tau-equivalence, McDonald's Omega (ω) was additionally calculated, demonstrating identical optimal internal consistency for the global scale ($\omega = 0.854$).

4. Results

4.1. Descriptive Statistics

A descriptive statistical analysis was conducted, utilising IBM SPSS Statistics software (Version 30.0.0.0), in order to explore the general trends in the responses obtained from the questionnaire. Although the original instrument consisted of 20 items, this analysis focuses on the 17 items retained after the iterative refinement process, detailed in the previous section. These items were analysed in terms of their minimum and maximum values, mean, median, mode, standard deviation, and skewness (see Table 2). This analysis enables the assessment of the distribution of responses, the consistency of the ratings, and the general trend among participants. The analysis of the descriptive statistics for the 17 items of the CPS, based on a 5-point Likert scale, reveals a general tendency among students towards moderately favourable responses regarding creative behaviours.

Table 2. Descriptive statistics for the 17 items retained in the refined CPS ($n = 90$).

Item *	N	Mean	Median	Mode	Std. Deviation	Skewness	Min.	Max.
1	90	2.48	2.00	2	1.06	0.43	1	5
2	90	3.52	4.00	4	1.07	−0.39	1	5
3	90	3.36	3.00	3	1.16	−0.12	1	5
4	90	2.24	2.00	2	0.95	0.85	1	5
5	90	3.63	4.00	4	1.05	−0.45	1	5
6	90	2.88	3.00	3	1.07	0.14	1	5
7	90	3.30	4.00	4	1.27	−0.45	1	5
8	90	3.53	3.50	3	1.00	−0.20	1	5
9	90	2.93	3.00	3	1.10	−0.12	1	5
10	90	3.74	4.00	4	1.07	−0.32	2	5
11	90	3.59	4.00	4	1.09	−0.29	1	5
14	90	3.62	4.00	4	1.10	−0.45	1	5
15	90	2.53	3.00	3	0.95	0.02	1	5
17	90	3.18	3.00	3	1.13	−0.31	1	5
18	90	3.20	3.00	3	1.05	−0.18	1	5
19	90	3.68	4.00	4	1.18	−0.61	1	5
20	90	3.83	4.00	3	0.90	−0.22	1	5

* For the full text of each item in both English and Spanish, please refer to Appendix A.

The items with which the students most strongly identify are: item 2 ('Like to get lost in thought'), item 5 ('Love to daydream'), item 7 ('Like to solve complex problems'), item 10 ('Frequently get lost in thought' [R]), item 11 ('Have a vivid imagination'), item 14 ('Frequently daydream' [R]), item 19 ('Have a good imagination' [R]), and item 20 ('Love to think up new ways of doing things'). They show means ranging from 3.30 (standard deviation: 1.27) to 3.83 (standard deviation: 0.90), with medians of 4, indicating that at least 50% of participants responded with 'agree' or 'strongly agree'. A slight variation is observed in items 3 ('Enjoy wild flights of fantasy') and 8 ('Am not interested in abstract ideas' [R]), which exhibit high means (3.36 and 3.53, respectively), but present a median of 3 and 3.5. The distribution of these highly rated items exhibits a negative skew, indicating a concentration of responses at the upper end of the scale. In practical terms, this finding is indicative of a substantial proportion of students identifying with statements pertaining to imagination, divergent thinking, and a propensity to embrace challenges.

As demonstrated in item 17 ('Seek out difficult reading material' [R]) and item 18 ('Do unexpected things'), there is a marginal propensity to concur with the statements, with means of 3.18 (standard deviation: 1.13) and 3.20 (standard deviation: 1.05), respectively, and medians of 3. These items also exhibit negative skewness. Although the means are slightly above 3, there is a possible ambivalence or lack of clarity in the students' self-perception regarding aspects such as a taste for challenging reading or originality in behaviour.

Conversely, item 1 ('Do things that others find strange'), item 4 ('Do things my own way' [R]), item 6 ('Swim against the current'), item 9 ('Love to read challenging material'), and item 15 ('Take deviant positions') demonstrate positive skewness (with the exception of item 9, which exhibits a slight negative skew of −0.12), indicating an aggregation of responses towards the lower end of the scale. The means for this group ranged from 2.24 (standard deviation: 0.95) to 2.93 (standard deviation: 1.10), with medians of 3 in most cases. This tendency may be interpreted as an impartial posture towards challenging intellectual material (as seen in item 9). However, items 1 and 4 exhibited the lowest median, equivalent to 2. This pattern suggests that participants tend to refrain from identifying with behaviours that are more disruptive or, conversely, strictly rule-bound.

From a broader perspective, the median coincides with the mode in the vast majority of the 17 items, with a clear concentration on the values 3 and 4: eight items have a mode of 3, reflecting a tendency towards a neutral stance, whilst seven items show a mode of 4, indicating a leaning towards agreement. It is noteworthy that a mere two items (1 and 4) exhibit a mode of 2, suggesting the presence of a modicum of disagreement among the participants. The absence of extreme values in this pattern indicates a propensity towards a neutral-to-positive stance, although certain items do exhibit more pronounced responses.

The results indicate a predominantly neutral to favourable trend in the responses of the participants, with a concentration around the mid-range values on the scale, and a slight tendency towards higher values on some items. Consequently, the participants' responses to the questionnaire statements range from indifference to agreement, reflecting a moderately favourable self-perception regarding creative personality. However, not all participants have a fully defined sense of identification with the traits associated with this type of profile, suggesting possible doubts or ambivalence in their perception.

4.2. Factor Analysis

In order to assess the suitability of the EFA, the KMO measure of sample adequacy and Bartlett's test of sphericity were applied (see Table 3). The KMO value obtained was 0.786, which is considered good (Galindo-Domínguez, 2020), and Bartlett's test was significant ($p < 0.001$), indicating that the correlations between the items are sufficiently adequate to apply an EFA.

Table 3. KMO and Bartlett's test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.786
Bartlett's test of sphericity	Approx. Chi-Square	854.532
	df	136
	Sig.	0.000

In consideration of the ordinal nature of the data, and in accordance with prevailing psychometric recommendations, the PAF method was employed, incorporating an oblique rotation (direct Oblimin with Kaiser normalisation). In an initial unrestricted extraction based on Kaiser's criterion (eigenvalues greater than 1), the analysis resulted in an initial 6-dimensional solution, presenting an over-extraction of factors with residual saturations and groupings of fewer than three items. This compromises the empirical and theoretical stability of the model. Consequently, in accordance with the parsimony rule and the visual analysis of the sedimentation plot (Figure 1), a second extraction was forced, fixed at three dimensions.

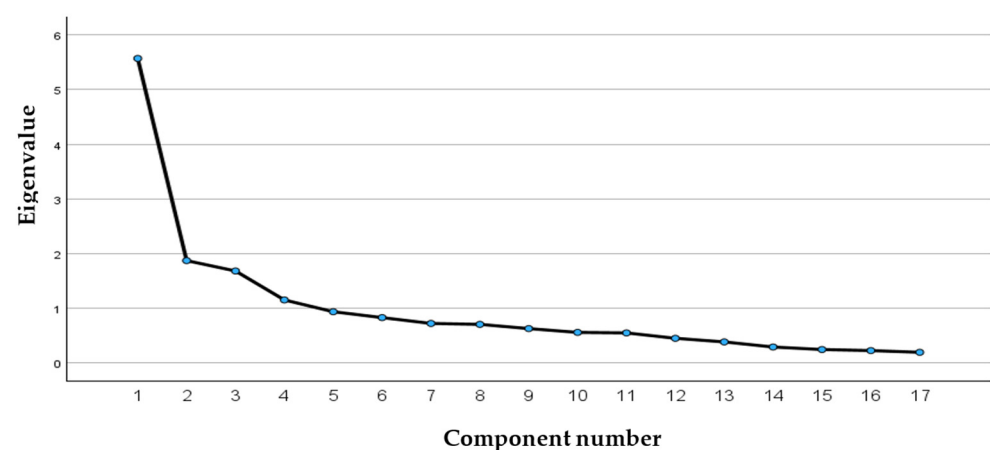


Figure 1. Sedimentation plot.

The sedimentation plot, alternatively referred to as the eigenvalue plot, utilises the drop-off criterion to evaluate the dimensionality of the construct. In order to define multidimensionality, it is necessary to demonstrate an elbow shape in the plot, representing a sharp drop in the variance explained by a given factor. Factors occurring at or beyond the elbow are considered as factors that no longer add value and typically represent errors or unique components (Mejía Trejo, 2023). Consequently, the threshold beyond which negligible fluctuations emerge is identified in component 3 (see Figure 1), denoting the presence of three distinct clustering factors.

To robustly support this decision and address advanced factor-retention criteria, complementary statistical procedures were consulted. While simulation-based methods such as Parallel Analysis are widely recognized, their tendency to yield overly conservative estimates in smaller samples ($n = 90$) can prematurely obscure meaningful latent structures. Therefore, the adequacy of the three-factor structure was rigorously cross-verified through the analysis of the reproduced correlation matrix in SPSS. The residual analysis revealed that only 43% of the non-redundant residuals had absolute values greater than 0.05. Given that this value falls well below the standard 50% threshold, it mathematically demonstrates that the three extracted factors replicate the original correlation structure with high accuracy, confirming the robustness of the current model and proving that additional factors would be statistically redundant.

Although the iterative exclusion of items 12, 13, and 16 resulted in a slight reduction in the total variance explained compared to the initial 20-item model (from 46.91% to 44.17%), this refined three-dimensional solution provides a cleaner, more parsimonious, and psychometrically robust structure, strictly adhering to the recommended threshold for factor loadings (>0.30). Furthermore, this refined structure was found to be theoretically consistent with the original underlying model of the scale, as developed by Hogan and Hogan (1995) and Russell and Karol (1994). While this resulting variance of 44.17% (see Table 4) may be considered moderate in the context of exact sciences, within the domain of social sciences—particularly in the realm of self-perception scales—it signifies an acceptable and rigorous percentage. As Hair et al. (2014) observe, in psychological and educational research, percentages of explained variance between 40% and 50% are considered acceptable, particularly when analysing complex and multifaceted constructs such as creative personality.

Table 4. Total variance explained by the three extracted factors.

Factor	Initial Eigenvalues *		
	Total	% of Variance	Cumulative %
1	5.042	29.660	29.660
2	1.353	7.956	37.617
3	1.114	6.555	44.172

* Extraction Method: PAF.

The factor matrix (Table 5) demonstrates that the 17 retained items were distributed appropriately across the three expected dimensions, with minimal cross-saturation and factor loadings greater than 0.30 on their principal factor. As detailed in the methodology section, items 12, 13, and 16 were systematically excluded from the model to secure the construct validity and empirical stability of the final instrument. Consequently, the three factors were delineated as follows: Imaginative Creativity (Factor 1), Behavioural Originality (Factor 2), and Positive Attitude towards Challenges (Factor 3). Based on their semantic content, these three dimensions not only reflect classical creative traits but also emerge

as essential human cognitive competencies for future teachers to critically navigate and co-design learning experiences in increasingly AI-driven educational ecologies.

Table 5. Pattern matrix displaying factor loadings, communalities (h^2), and Cronbach's alpha reliability coefficients for the final 17-item three-factor solution.

	Factor 1	Factor 2	Factor 3	Communalities³ (h^2)
Dimension 1: Imaginative Creativity¹				
14. Frequently daydream [R] ²	0.819	0.092	−0.075	0.667
2. Like to get lost in thought	0.690	−0.029	0.084	0.519
5. Love to daydream	0.678	−0.017	0.073	0.499
10. Frequently get lost in thought [R]	0.626	0.001	0.003	0.393
3. Enjoy wild flights of fantasy	0.490	0.210	0.179	0.455
Dimension 2: Behavioural Originality				
15. Take deviant positions	−0.237	0.741	−0.022	0.519
18. Do unexpected things	0.055	0.581	0.205	0.475
4. Do things my own way [R]	0.177	0.564	−0.053	0.373
1. Do things that others find strange	0.357	0.477	−0.011	0.428
6. Swim against the current	0.126	0.372	0.327	0.386
Dimension 3: Positive Attitude towards Challenges				
7. Like to solve complex problems	−0.202	0.000	0.666	0.376
11. Have a vivid imagination	0.301	−0.092	0.634	0.607
9. Love to read challenging material	−0.015	0.208	0.595	0.459
20. Love to think up new ways of doing things	0.240	0.001	0.548	0.464
19. Have a good imagination [R]	0.239	0.016	0.525	0.439
8. Am interested in abstract ideas [R]	0.218	−0.098	0.465	0.319
17. Seek out difficult reading material [R]	−0.041	0.027	0.366	0.130
Cronbach's alpha ⁴ (α)	0.827	0.739	0.784	

¹ Column headers are presented in bold for structural clarity. Bold values within the matrix indicate primary factor loadings above the 0.30 threshold. ² [R] indicates items that have been reworded in a positive direction for theoretical clarity. The original negative phrasing can be found in Appendix A. ³ Extraction Method: PAF. h^2 denotes extraction communalities representing the proportion of variance in each item accounted for by the three-factor solution. ⁴ Cronbach's alpha coefficients represent the internal consistency reliability computed independently for each extracted dimension.

Regarding the extraction communalities (h^2) reported in Table 5, the majority of the 17 items exhibited values well above the widely accepted social sciences threshold of 0.30, indicating that the extracted factors explain a substantial proportion of the items' variance.

A singular exception was observed for item 17 ('Seek out difficult reading material' [R]), which yielded a low communality value ($h^2 = 0.130$). However, its primary factor loading on its respective dimension is 0.366, which satisfies the established exploratory threshold (>0.30) and exhibits a clean unifactorial allocation with no significant cross-loadings. Despite this reduced contribution to the shared variance, a decision was made to retain the item within the final structure. This retention is conceptually justified by its theoretical relevance to the Positive Attitude towards Challenges construct, ensuring semantic representation of intellectual engagement and academic persistence. Furthermore, iterative reliability analyses confirmed that deleting item 17 would not substantively improve the dimension's internal consistency ($\alpha = 0.784$), thereby preserving the scale's content validity without compromising its psychometric integrity. In early-stage scale adaptation, retaining conceptually critical items despite low communality prevents the premature narrowing of the theoretical construct. Thus, while retained to preserve domain coverage in this exploratory phase, item 17 remains flagged for rigorous re-evaluation or potential rewording in subsequent confirmatory studies.

The first factor, which is labelled ‘Imaginative Creativity’ (factor loadings ranging from 0.819 to 0.490), comprises items that describe an active internal life, such as ‘Frequently daydream’ [R] (item 14), ‘Like to get lost in thought’ (item 2), ‘Love to daydream’ (item 5), ‘Frequently get lost in thought’ [R] (item 10), and ‘Enjoy wild flights of fantasy’ (item 3). This set of items reflects an inherent tendency towards internal cognitive processes, characterised by a propensity to generate mental images, engage in daydreaming, and derive pleasure from immersing oneself in the realm of fantasy and contemplation. This dimension aligns with the ‘Imagination’ facet described in classical personality models (Russell & Karol, 1994). In the context of artificial intelligence, this dimension highlights the value of unstructured, intrinsic human ideation within increasingly automated environments. While generative AI models operate on probabilistic structures and pattern recognition, this factor indexes the subjective, psychological space where original pedagogical visions emerge. Cultivating this internal imaginative capacity may prove fundamental for future educators, ensuring they can conceptualise divergent instructional strategies prior to deploying digital or automated tools.

Behavioural Originality (Factor 2), with principal factor loadings ranging from 0.741 to 0.372, comprises statements reflecting unconventional actions. These include ‘Take deviant positions’ (item 15), ‘Do unexpected things’ (item 18), ‘Do things my own way’ [R] (item 4), ‘Do things that others find strange’ (item 1), and ‘Swim against the current’ (item 6). The aforementioned statements evince an inclination towards unconventional behaviours and a propensity to defy established norms. Collectively, these factors reflect the individual’s propensity to act in an unanticipated manner, adopt alternative stances, and operate independently, without strict adherence to instructions. This aspect of creative personality can therefore be considered the most practical, disruptive, and visible (Hogan & Hogan, 1995). Faced with the projected risk of algorithmic standardization in automated educational contexts, this factor highlights the future educator’s disposition to exercise cognitive non-conformity. While our empirical data capture self-perceptions rather than direct behavioural resistance to automation, a robust disposition toward behavioural originality may serve as a psychological precursor for introducing necessary pedagogical disruptions in predictable digital landscapes.

Finally, the ‘Positive Attitude towards Challenges’ (Factor 3), with loadings ranging from 0.666 to 0.366, comprises items denoting intellectual engagement. This includes ‘Like to solve complex problems’ (item 7), ‘Have a vivid imagination’ (item 11), ‘Love to read challenging material’ (item 9), ‘Love to think up new ways of doing things’ (item 20), ‘Have a good imagination’ [R] (item 19), ‘Am interested in abstract ideas’ [R] (item 8), and ‘Seek out difficult reading material’ [R] (item 17). This dimension is characterised by a proclivity for problem-solving, an affinity for challenging and abstract reading material, and a propensity to formulate novel methodologies. It is noteworthy that items 11 and 19 (vivid imagination) are grouped here, suggesting an ‘applied imagination’ used as an active mental tool for overcoming intellectual challenges. Empirically, this factor directly underpins the critical and analytical mindset required for ‘AI literacy’. A teacher scoring high in this dimension possesses the intellectual curiosity and problem-solving drive necessary to critically evaluate AI-generated content, design complex prompts, and actively manage technological challenges rather than passively consuming automated solutions.

In order to assess the internal consistency of the scale under this new three-dimensional structure, both Cronbach’s alpha and McDonald’s Omega were calculated. The analysis yielded an overall reliability rating of $\alpha = 0.862$ and $\omega = 0.854$ for the complete 17-item scale, indicating excellent reliability. When each factor was analysed in isolation, the Imaginative Creativity dimension (Factor 1) proved to be the most robust, achieving high internal consistency ($\alpha = 0.827$, $\omega = 0.822$). Similarly, the Positive Attitude towards Challenges

dimension (Factor 3) demonstrated a strong reliability index ($\alpha = 0.784$, $\omega = 0.774$). Finally, the Behavioural Originality dimension (Factor 2) exhibited a satisfactory and adequate value ($\alpha = 0.739$, $\omega = 0.736$). Considering the broadly accepted threshold of 0.70 for exploratory research in the social sciences, these indices confirm the psychometric solidity of all three subscales. It is particularly noteworthy that Factor 2 maintains this reliable level of consistency, despite comprising a smaller set of items that capture a broad and semantically diverse range of disruptive behaviours (ranging from ‘do things that others find strange’ to ‘swim against the current’).

Finally, an analysis of the factor correlation matrix (Table 6) obtained following Oblimin rotation reveals that the three identified dimensions exhibit positive correlations of low to moderate strength. The strongest correlation is observed between Imaginative Creativity (Factor 1) and Positive Attitude towards Challenges (Factor 3), with an r value of 0.400. This is followed by the relationship between Behavioural Originality (Factor 2) and Positive Attitude towards Challenges (Factor 3), with an r value of 0.287. The correlation between Factors 1 and 2 is the weakest ($r = 0.232$). The figures indicate that, although the three factors share portions of variance as they form part of the same overall construct, they generally explain distinct dimensions of self-perceived creativity. These results are consistent with theoretical predictions when analysing a complex and multifaceted construct, such as creative self-perception, in trainee teachers.

Table 6. Factor correlation matrix.

Factor	1. Imaginative Creativity	2. Behavioural Originality	3. Positive Attitude Towards Challenges
1. Imaginative Creativity	1.000		
2. Behavioural Originality	0.232	1.000	
3. Positive Attitude towards Challenges	0.400	0.287	1.000

In summary, this iterative refinement into a 17-item, three-factor structure provides a highly parsimonious, reliable, and theoretically coherent interpretation of the construct. The resolution of the fragmentation issues observed in the initial, unrestricted extraction confirms that this model constitutes an optimal and robust framework. Crucially, it recontextualises creative self-perception not merely as a general psychological trait, but as a set of essential cognitive competencies—imaginative ideation, pedagogical disruption, and critical challenge-seeking—that future educators need to successfully navigate and design increasingly AI-integrated learning environments, thereby paving the way for targeted future lines of research.

5. Discussion

The findings of this study outline a robust, three-dimensional framework of creative self-perception among trainee teachers, comprising three factors: Imaginative Creativity, Behavioural Originality, and a Positive Attitude towards Challenges. This framework addresses the issues of fragmentation observed in previous classifications and is, in turn, strongly supported by recent research analysing the components of creativity from various psychological and educational perspectives.

This multidimensionality represents a significant departure from the original unidimensional conception of the CPS. Rather than a generalised creative ‘spark,’ pre-service teachers perceive creativity as a segmented competency. This clear distinction between internal imagination and external action is crucial for navigating modern, complex learning environments (González-Zamar et al., 2021).

The dimension of Imaginative Creativity, characterised by fantasy, daydreaming, and the generation of novel mental images, aligns with the concept of fluency in divergent

thinking. As [Weiss et al. \(2021\)](#) emphasise, fluency—defined as the capacity to generate multiple ideas—is a pivotal component of creativity. [Shaw and Yu \(2023\)](#) explore this aspect further by noting that creativity driven by traits such as active imagination involves free, playful, and symbolically rich production. For future teachers, [Thornhill-Miller et al. \(2023\)](#) highlight that generating original ideas represents a cornerstone of 21st-century skills. In the contemporary context, this skill is imperative for the development of novel digital learning strategies. A rich and fluid imagination appears essential for educators aiming to create truly innovative virtual and hybrid learning environments. These findings lend support to [Feist's \(2018\)](#) functional model of creative personality, specifically with regard to his grouping of cognitive traits.

The distinction between internal imagination and external action is exemplified by the second factor, 'Behavioural Originality', defined by unconventional behaviours and a predisposition to act independently. From a theoretical perspective, while generative AI can increasingly simulate imaginative processes by rapidly producing content, behavioural originality remains a crucial human counterpart. It represents the potential for the intentional and pedagogical application of creative ideas within unpredictable classroom settings. [Lebuda et al. \(2021\)](#) support the view that openness to disruption predicts creative achievements. Similarly, challenging cultural norms is associated with heightened innovative potential ([Abu Raya et al., 2023](#)), which aligns with items in this dimension such as 'doing unexpected things' and 'swimming against the current'.

Conventionally, this non-conformity has been identified as a primary catalyst for innovation ([Feist, 2018](#)). In the contemporary era of AI, human originality is undergoing a resurgence in value. Recent research ([Cropley, 2024](#)) indicates that generative models tend to reproduce standardised, predictable patterns. In light of this automation, the teacher's capacity for disruption and innovation becomes vital. Their role involves breaking away from conventional methodologies to ensure that visual learning is not merely a technical product, but a critical, surprising, and, above all, deeply human and creative process ([Boden, 2007](#); [Cunningham et al., 2025](#); [Zhou & Kawabata, 2023](#)).

Finally, the third factor, 'A Positive Attitude towards Challenge', involves a willingness to engage in intellectual effort and an affinity for abstract, complex problem-solving. This dimension is directly linked to the demands of the modern classroom. [Jirásek and Sudzina \(2020\)](#) demonstrated that openness to experience fosters creativity in contexts requiring intellectual curiosity. In this regard, the data obtained reinforce the model proposed by [Freiberg-Hoffmann et al. \(2019\)](#). Their framework posits that a fascination with complex challenges engenders an active and resilient attitude. This robust standalone dimension also corroborates the framework proposed by [Thornhill-Miller et al. \(2023\)](#). These authors position creativity alongside critical thinking and resilience as vital 21st-century skills.

In current educational landscapes, the perpetual phenomenon of technological disruption has become a predominant challenge. Within this context, cultivating this emotional-conative component is vital. It reflects a true willingness to embrace complexity and view disruption as an opportunity for creative redesign. Consequently, developing this positive disposition ensures that prospective educators do not perceive automated systems as a threat. On the contrary, it empowers them to utilise technology as a mechanism for adapting and transforming their environment ([Glăveanu et al., 2019](#)). This paradigm requires higher education to shift from teaching purely technical AI skills. Instead, institutions must focus on fostering a resilient mindset capable of leading the transformation of digital visual languages ([González-Zamar & Abad-Segura, 2021](#)).

When considered as a whole, these findings are consistent with research highlighting the multifaceted nature of creative personality. Furthermore, they serve to reinforce the empirical utility of [Kaufman and Baer's \(2004\)](#) CPS, aligning with recent studies such as that

by Ishiguro et al. (2022), which demonstrate that creative self-perception is a key predictor of an individual's actual achievements. The validation of this three-factor structure emphasises the necessity of assessing creativity as an interaction of imaginative, behavioural, and cognitive processes. In conclusion, the utilisation of a validated instrument such as this one is indispensable. The ability to comprehend these self-perceptions provides a vital foundation for guiding future educators in the creation of collaborative imagination environments (Glăveanu et al., 2025).

Crucially, because AI-related competencies and resistance to algorithmic standardization were not directly measured in this study, the connections drawn between the extracted creative dimensions and future pedagogical performance in digital ecologies serve strictly as theoretical implications rather than empirical conclusions. In sum, this multidimensional restructuring of the CPS shifts the empirical focus from a generalised creative potential to the specific psychological resources demanded by contemporary educational landscapes. By demonstrating that creative self-perception operates as a dynamic combination of cognitive, behavioural, and conative traits, these findings suggest that cultivating these dimensions provides a foundational psychological resource, empowering pre-service teachers to exercise active pedagogical agency rather than passively submitting to technological homogenisation.

6. Conclusions

The primary contribution of this study is the provision of an initial exploratory validation of a 17-item framework for assessing creative self-perception among trainee teachers. In addressing RQ1, the exploratory analysis refined the adapted CPS into a robust three-dimensional architecture (Imaginative Creativity, Behavioural Originality, and Positive Attitude towards Challenges). Regarding RQ2, the scale demonstrated high psychometric reliability across all dimensions, confirming its viability as an initial diagnostic tool. Finally, addressing RQ3, these latent factors conceptually align with foundational creative personality constructs while providing a contemporary theoretical framework for digital educational ecologies.

Within this theoretical landscape, measuring self-perception does not index direct performance against artificial systems. Instead, these three dimensions outline psychological dispositions that may help future educators mitigate the negative effects of algorithmic standardization. Specifically, imaginative creativity is hypothesized to support diverse ideation, while behavioural originality and a positive attitude towards challenges are tentatively suggested to provide a potential counterweight to passive technological assimilation and foster the resilience needed for innovation.

Despite these promising findings, several limitations must be acknowledged to properly contextualise the results. First, a pronounced gender imbalance exists (80% female), which reflects typical enrolment in early childhood and primary education programmes. Second, the sample size is relatively small ($n = 90$) and relies on a convenience sample from a single institution. These constraints restrict the broader generalisability of the findings, and potentially affect the long-term psychometric stability and replicability of the factor structure. Nevertheless, given the exploratory nature of this initial validation, these preliminary data provide a coherent baseline structure.

Crucially, the exclusive reliance on self-report measures introduces inherent methodological vulnerabilities, primarily social desirability bias and the potential subjective inflation of creative capacities. Pre-service teachers may conflate idealised professional aspirations with their actual cognitive dispositions. Consequently, while the refined CPS demonstrates robust internal validity, its scores must be viewed as indices of creative self-efficacy, as opposed to objective behavioural proxies for classroom innovation. Accordingly,

this study offers an initial exploratory validation rather than a definitive psychometric assessment. To build upon these foundational insights, future research must employ larger, multi-institutional samples to conduct Confirmatory Factor Analysis (CFA), testing for measurement invariance across diverse demographics and establishing robust convergent and discriminant validity.

Additionally, future research should implement multi-method designs. Triangulating self-reported scales with performance-based tasks (e.g., divergent thinking tests) would provide deeper empirical insights. Incorporating standardised classroom observation protocols within AI-integrated environments is also recommended. Furthermore, future cross-cultural research should explore how different regional pedagogical traditions influence creative self-perceptions. At present, this refined instrument is proposed primarily for research purposes, though, with further normative validation, it holds clear potential for educational diagnostic applications within teacher training programmes.

Education in the age of algorithms necessitates human judgement and creative sensitivity. The empirical identification of these three dimensions forms an essential, albeit preliminary, foundation for guiding educators. By understanding these self-perceptions, higher education institutions can design targeted, practical interventions. For instance, diagnostic results could help tailor instructional design courses: students scoring lower in 'Behavioural Originality' might benefit from practical workshops on visual education that encourage breaking away from standard templates. Conversely, those needing a boost in 'Positive Attitude towards Challenges' could be guided through scaffolded AI literacy seminars to build confidence in prompt engineering and algorithmic critique. Ultimately, these practical applications aim to ensure that the teachers of the future are visionary leaders of innovative learning environments, rather than mere operators of AI.

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Institutional Review Board Statement: Ethical review and approval were waived for this study due to the anonymous and non-interventional nature of the questionnaire. The study was conducted within the context of educational research at the University of Almería (Spain) and consisted of an anonymous, voluntary, and non-interventional survey administered to university students. No biomedical procedures, clinical interventions, or sensitive personal data were involved. According to the Spanish legal framework applicable to this type of non-biomedical educational research, formal approval from an Ethics Committee was not required. In particular, the study does not fall within the scope of Law 14/2007, of 3 July, on Biomedical Research ("Ley 14/2007, de Investigación Biomédica"), since no biomedical experimentation or processing of sensitive health-related data was conducted. In addition, all data were collected anonymously and processed in accordance with Regulation (EU) 2016/679 (General Data Protection Regulation, GDPR) and the Spanish Organic Law 3/2018 on Personal Data Protection and Guarantee of Digital Rights. Participation was entirely voluntary, and participants were informed about the objectives of the study, the anonymous treatment of data, and the confidentiality of the information collected before completing the questionnaire.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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Abbreviations

The following abbreviations are used in this manuscript:

AI	Artificial intelligence
CPS	Creative Personality Scale
EFA	Exploratory Factor Analysis
KMO	Kaiser–Meyer–Olkin
PAF	Principal Axis Factoring
RQ	Research question
SPSS	Statistical Package for the Social Sciences

Appendix A

Table A1. Original English and Spanish translation of the CPS questionnaire items.

Item	English Version *	Spanish Version
1	Do things that others find strange	Hago cosas que los demás consideran extrañas
2	Like to get lost in thought	Me gusta perderme en mis pensamientos
3	Enjoy wild flights of fantasy	Disfruto de los viajes por el mundo de la fantasía
4	Do things by the book	Hago las cosas siguiendo las instrucciones
5	Love to daydream	Me encanta soñar despierto
6	Swim against the current	Voy contra la corriente
7	Like to solve complex problems	Me gusta resolver problemas complejos
8	Am not interested in abstract ideas	No me interesan ideas abstractas
9	Love to read challenging material	Me encanta leer material desafiante
10	Seldom get lost in thought	Rara vez me pierdo en mis pensamientos
11	Have a vivid imagination	Tengo una imaginación muy viva
12	Know how things work	Sé cómo funcionan las cosas
13	Am not interested in theoretical discussions	No me interesan discusiones teóricas
14	Seldom daydream	Rara vez sueño despierto
15	Take deviant positions	Adopto posturas descarriadas
16	Try to avoid complex people	Intento evitar a las personas complicadas
17	Avoid difficult reading material	Evito material de lectura difícil
18	Do unexpected things	Hago cosas inesperadas
19	Do not have a good imagination	No tengo una buena imaginación
20	Love to think up new ways of doing things	Me encanta idear nuevas formas de hacer las cosas

* Source: Kaufman and Baer (2004).

Appendix B

To improve transparency and replicability, the following table details the original items excluded during the iterative refinement of the EFA, along with the empirical and conceptual rationale for their removal.

Table A2. Original factor structure and item-removal process.

Elimination Step	Item	EFA Metrics *	Rationale for Removal
Iteration 1 (Initial 20-item model)	Item 12 (‘Know how things work’)	Target factor: 3 Primary loading: 0.258 $h^2 = 0.071$	The primary loading fell below the strict threshold of <0.30 (Hair et al., 2014) with a negligible shared variance. Conceptually, it measures mechanical/technical aptitude rather than creative ideation.
	Item 13 (‘Am interested in theoretical discussions’ [R])	Target factor: 2 Primary loading: −0.171 $h^2 = 0.034$	The loading was significantly below the <0.30 threshold alongside an extremely low communality value. It reflects general intellectual curiosity and abstract debate rather than specific creative traits.
Iteration 2 (After removing items 12 and 13)	Item 16 (‘Enjoy interacting with complex people’ [R])	Target factor: 3 Primary loading: 0.276 $h^2 = 0.098$	Originally borderline (0.305), its loading dropped below <0.30 after removing items 12 and 13 due to variance recalculation. Communality remained highly insufficient, and it conceptually reflects social openness rather than disruptive behaviour.

* Factor 1 = Imaginative Creativity; Factor 2 = Behavioural Originality; Factor 3 = Positive Attitude towards Challenges; h^2 = extraction communality.

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