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Empowering (e)ducators, inspiring learners: a cross-cultural exploration for interprofessional development through the lens of the Capability Approach

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Abstract

The development of interprofessional capabilities has become a crucial strategy for addressing the multifaceted challenges of today's increasingly interconnected and volatile workplace environment. This study examines Martha Nussbaum's Capability Approach (CA) as a framework for cultivating key tangible outcomes—such as communication, critical reasoning, empathy, and collaboration—that are vital in the interprofessional context. Methodologically, the research adopts a quantitative approach to validate a life skills evaluation instrument and assess its effectiveness in diverse cultural settings. To achieve this, a Confirmatory Factor Analysis (CFA) was conducted on a dataset comprising 138 online instructors, complemented by statistical tests to identify significant cross-cultural differences in the prioritization and implementation of key skills. The main findings underscore the potential of e-learning practices, grounded in the CA framework, as a powerful tool for fostering the development of crucial capabilities essential for cultivating competent and well-rounded professional human beings. The findings of this study provided information on how to design teaching and learning for interprofessional development in the context of Pakistan, Portugal, Spain, and the United Kingdom.

KEYWORDS: Capability Approach, Cross-cultural, e-learning, Interprofessional development, Life skills.

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1. Introduction

Interprofessional development has emerged as a crucial strategy for addressing the multifaceted challenges of today's dynamic labor market, characterized by increasing complexity and rapid change. By promoting collaboration among professionals from diverse fields, interprofessional development fosters the integration of varied expertise, facilitating innovative solutions to the pressing issues facing society. While InterProfessional Education (IPE) has traditionally been emphasized in health care due to its multidisciplinary, team-oriented nature, the core principles of IPE -effective communication, collaboration, and respect for diverse perspectives-extend far beyond health care (Saragih et al., 2024; van Diggele et al., 2024). Fields such as business, law, engineering, and education increasingly recognize the importance of interprofessional skills in tackling interdisciplinary challenges, including sustainability, technological advancement, and policy

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development (Alexandru, 2018; Franklin et al., 2012; Rider et al., 2023; Watkins, 2016).

In light of this context, broadening research on IPE to include insights from diverse disciplines presents an invaluable opportunity to deepen our understanding of how interprofessional competencies can drive effective problem-solving and innovation within collaborative environments (Ganotice et al., 2023). This study contends that education plays a critical role in preparing future professionals for the interprofessional landscape, advocating for the integration of Martha Nussbaum's Capabilities Approach (CA) as a conceptual framework to realize this goal (Nussbaum, 2011). Originally formulated to address human development and social justice, Nussbaum's CA has been increasingly adapted to various fields, including education, where it has been widely recognized as a foundation for fostering essential life skills (Elkhayat, 2018; Garcia-Calvo et al., 2022; Lozano et al., 2012; Walker, 2003). Within the educational domain, Nussbaum's CA emphasizes a range of core capabilities – such as practical reasoning, communication, empathy, and the ability to work collaboratively – that resonate strongly with the competencies needed in interprofessional settings. These capabilities, by cultivating an orientation toward others and a capacity for reflective thought, provide a robust foundation for interprofessional engagement. Although existing literature underscores the importance of CA in shaping educational practices, discussions have largely remained theoretical, with limited exploration of its practical application within curricula, particularly in relation to IPE. This gap suggests an untapped potential for CA to inform and enhance IPE by providing a values-based framework that aligns with essential interprofessional skills, thus enabling educators to translate CA principles into actionable practices that foster the meaningful development of interprofessional competencies.

On the other hand, in today's globalized and interconnected landscape, multidisciplinary teams are increasingly composed of professionals from diverse international backgrounds, heightening the importance of technology as a critical facilitator for cross-border collaboration (Goodwin, 2017; Iacono, 2022; Morrison-Smith & Ruiz, 2020). Digital tools -including video conferencing, cloud-based platforms, and virtual workspaces- now play an essential role in enabling professionals to seamlessly integrate their expertise and address complex, shared challenges, regardless of geographical location. Within this context, e-learning environments are uniquely positioned to foster these interprofessional competencies, especially for adult learners who bring prior experiences and require flexible, technology-enhanced approaches to skills development. Through e-learning, adult learners can engage in practical, collaborative experiences that build proficiency in communication, teamwork, adaptability, and intercultural competence, laying a robust foundation for success in technology-driven, international, multidisciplinary projects (Hermasari et al., 2024; Peeters et al., 2024).

Considering the formation of multidisciplinary teams that increasingly rely on technology for effective cross-border collaboration, it becomes crucial to understand, from a cross-cultural perspective, how core capabilities essential for interprofessional development are being fostered. In light of this need, the present study investigates the potential of the CA framework through the lens of instructors in e-learning environments across four culturally distinct countries: Pakistan, Portugal, Spain, and the United Kingdom. This research pursues two primary objectives: first, to validate the instrument developed by Gómez-Rey et al. (2021) with diverse international samples, assessing its reliability and consistency in identifying key life skills critical for contemporary education. Second, it explores educators' perspectives on integrating these core capabilities into university curricula, providing valuable insights into the perceived effectiveness of current educational practices within different cultural contexts. By bridging the gap between theory and practice, this study contributes to a nuanced understanding of how the CA framework can be leveraged to enhance interprofessional competencies in the context of e-learning across varied cultural settings.

2. Theoretical Framework

The CA, following Martha Nussbaum's perspective, has been described by numerous scholars as an enriching framework that provides a comprehensive perspective for understanding and enhancing the teaching-learning process (Hedge & MacKenzie, 2012; MacKenzie et al., 2022; Walker, 2003; Walker & Unterhalter, 2007). By focusing on individual capabilities, this framework fosters a human-centered education that transcends the mere acquisition of information and technical skills.

Despite this recognition, only one study in the existing literature has, to our knowledge, operationalized Nussbaum's CA within online educational settings Gómez-Rey et al. (2021). This foundational work adapts Nussbaum's proposed capabilities to create an instrument to foster the development of life skills in online scenarios. The instrument development process began with the operationalization of Nussbaum's ten capabilities (Nussbaum, 2011). However, due to methodological considerations, the authors opted to use the term 'unidimensional constructs' instead of *capabilities* to define each dimension within the educational context. The central human capabilities, as well as its operationalization for online learning, are outlined below.

LIFE (L): Nussbaum defined this capability as "being able to live to the end of a human life of normal length;

not dying prematurely, or before one's life is so reduced as to be not worth living" (Nussbaum, 2011, p. 33). Gómez-Rey et al., (2021) connect this multidimensional construct to (1) the length of a person's life (L_1), and (2) the quality of that life (L_2). The L_1 dimension pertains to personal and professional growth within the context of learning, while the L_2 dimension is associated with the development of core soft skills within the context of online scenarios (self-study, time management, computer literacy, digital communication, and web searches).

BODY HEALTH (BH): Nussbaum described this capability as "being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter" (Nussbaum, 2011, p. 33). Gómez-Rey et al., (2021) associated this unidimensional construct with the concept of sedentary behavior, a factor that is especially significant in online learning contexts.

BODY INTEGRITY (BI): Nussbaum outlined this capability as "being able to move freely from place to place; to be secure against violent assault, including sexual assault and domestic violence; having opportunities for sexual satisfaction and for choice in matters of reproduction" (Nussbaum, 2011, p. 33). Gómez-Rey et al., (2021) defined this unidimensional construct within the framework of cybersecurity.

SENSE, IMAGINATION AND THOUGHT (SIT): Nussbaum delineated this capability as:

> *Being able to use the senses, to imagine, think, and reason—and to do these things in a truly human way, a way informed and cultivated by an adequate education, including, but by no means limited to, literacy and basic mathematical and scientific training. Being able to use imagination and thought in connection with experiencing and producing works and events of one's own choice, religious, literary, musical, and so forth.*
>
> *Being able to use one's mind in ways protected by guarantees of freedom of expression with respect to both political and artistic speech, and freedom of religious exercise. Being able to have pleasurable experiences and to avoid non-beneficial pain. (Nussbaum, 2011, p. 33)*

Gómez-Rey et al. (2021) associated this multidimensional construct with (1) divergent thinking (SIT_1) and convergent thinking (SIT_2), emphasizing the importance of fostering learners' creativity.

EMOTIONS (E): Nussbaum defined this capability as:

> *Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by fear and anxiety. (Supporting this capability means supporting forms of human association that can be shown to be crucial in their development). (Nussbaum, 2011, p. 33-34)*

Gómez-Rey et al., (2021) linked this unidimensional construct to the significance of emotion in learning.

PRACTICAL REASON (PR): Nussbaum defined this capability as "being able to form a conception of the good and to engage in critical reflection about the planning of one's life (this entails protection for the liberty of conscience and religious observance)" (Nussbaum, 2011, p. 34). Gómez-Rey et al., (2021) pertain to the right to freedom of thought, conscience, and religion in learning process.

AFFILIATION (A): Nussbaum defined this capability as:

> *Being able to live with and toward others, to recognize and show concern for other humans, to engage in various forms of social interaction, to be able to imagine the situation of another; and being able to be treated as a dignified being whose worth is equal to that of others (having the social bases of self-respect and non-humiliation). This entails provisions of non-discrimination on the basis of race, sex, sexual orientation, ethnicity, caste, religion, national origin, and species. (Nussbaum, 2011, p. 34)*

Gómez-Rey et al., (2021) elucidated this unidimensional construct through the lens of students' social interactions and the creation of a sense of community.

OTHER SPECIES (OS): Nussbaum defined this capability as "being able to live with concern for and in relation to animals, plants, and the world of nature" (Nussbaum, 2011, p. 34). Gómez-Rey et al., (2021) articulated this unidimensional construct as central to fostering learners' environmental awareness.

PLAY (P): Nussbaum defined this capability as "being able to laugh, to play, to enjoy recreational activities" (Nussbaum, 2011, p. 34). Gómez-Rey et al., (2021) explained this unidimensional construct by focusing on balancing academic and recreational time.

CONTROL OVER ONE'S ENVIRONMENTS (COOE): Nussbaum defined this capability as:

> *Being able to participate effectively in political choices that govern one's life; having the right of political participation, protections of free speech and association; and being able to hold property (both land and movable goods), and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure. In work,*

> *being able to work as a human, exercising practical reason and entering into meaningful relationships of mutual recognition with other workers. (Nussbaum, 2011, p. 34).*

Gómez-Rey et al., (2021) connect this multidimensional construct to (1) political issues ($COOE_1$) and (2) material concerns ($COOE_2$). The $COOE_1$ dimension is associated with democratic processes, emphasizing the importance of student involvement in shaping their educational experiences and influencing broader societal contexts. In contrast, the $COOE_2$ dimension addresses accessibility and usability, highlighting the need for educational environments that are both inclusive and user-friendly.

Gómez-Rey et al., (2021) presented this operationalization as a practical example for developing an educational learning theory grounded in the CA framework for online learning environments. They also encouraged other researchers to further explore and expand upon this educational approach. The authors emphasized that their framework is not static but should be adapted to the specific characteristics of each educational context and the aims of the research. Each instructional designer or instructor should arrange and implement these dimensions to best suit the design and objectives of their learning environment. This is why no specific guidelines are provided for this process.

3. Materials and Methods

3.1 Procedures

The procedures employed in this study were systematically designed to ensure a robust and diverse data collection. Some of the authors of this research paper utilized their international network within the academic community to facilitate participant recruitment. This network, encompassing contacts from various online universities worldwide, was fundamental in distributing the formal invitation to participate in the research. The invitation clearly outlined the research objectives, with particular emphasis placed on ensuring that the invitation reached individuals affiliated with universities in different countries to enhance the geographical diversity of the sample.

Upon agreeing to participate, respondents received an email containing a link to the Google Form questionnaire, which also provided details on the allotted time for survey completion and an overview of the types of questions included. The questionnaire consisted of 54 Likert scale items, measured on a 5-point scale, along with demographic questions designed to gather background information. To ensure consistency and comprehension across the diverse international sample, the questionnaire was administered in English. The primary questions central to this research are available in the dataset file.

3.2 Participants

A total of 138 online instructors from diverse universities participated in this study, with the following distribution: 31 from Pakistan, 30 from Portugal, 41 from Spain, and 36 from the United Kingdom. In terms of gender, men made up the majority, comprising 50.72% of the sample (70 individuals), while women constituted 48.55% (67 individuals). One participant opted not to disclose their gender.

3.3 Data analysis

A quantitative methodology was employed to support this research. This study utilized CFA to assess the instrument developed and validated by Gómez-Rey et al. (2021) using data collected from instructors at open universities across four countries (Pakistan, Portugal, Spain, and the United Kingdom). The analysis concentrated on a series of observed variables, which were systematically grouped into 13 latent dimensions (L_1, L_2, BH, BI, SIT_1, SIT_2, E, PR, A, OS, P, $COOE_1$, and $COOE_2$). These latent dimensions were treated as the core constructs, with the observed variables acting as specific indicators reflecting these underlying constructs' characteristics. The primary objective was to validate the proposed factor structure and to examine the relationships between latent and observed variables within the model. MPlus software was employed for the analysis, allowing for a thorough assessment of construct validity and the measurement model using this specific dataset of instructors teaching online scenarios. This approach ensures the robustness and generalizability of the scale in a broader international context (Hoyle, 2000).

Subsequently, hypothesis tests were performed to identify significant differences across the various dimensions under investigation. The researchers evaluated the degree of implementation across 13 latent dimensions: L_1, L_2, BH, BI, SIT_1, SIT_2, E, PR, A, OS, P, $COOE_1$, and $COOE_2$. This assessment involved applying the coefficients derived from the confirmatory factor analysis (CFA) to the observed variables associated with each dimension. To ensure a fair comparison among the dimensions, the items were standardized, addressing the differences in the number of observed variables for each dimension. Given that the data were collected on a Likert scale, which does not meet the assumptions of normality, non-parametric tests were employed. Specifically, a non-parametric Nemenyi test was utilized to evaluate significant differences in the implementation levels among the dimensions. This test is well-suited for making comparisons across multiple groups, as it employs critical differences to determine statistical significance, thus highlighting dimensions that demonstrate

substantial variations in their levels of implementation (Liu and Chen, 2012).

4. Results

4.1 Confirmatory factor analysis

The validation process of the instrument proposed by Gómez-Rey et al., (2021) was conducted in two phases to ensure the development of a model with competitive statistical properties. Initially, a model incorporating all questionnaire items was tested. Subsequently, a final model was developed by removing items that did not meet the established minimum statistical thresholds. The robustness of the model for generalization was assessed by calculating estimates for the items associated with the latent variables. The initial model demonstrated strong fit indices, achieving a Comparative Fit Index (CFI) of 0.968, a Tucker-Lewis Index (TLI) of 0.965, and a Root Mean Square Error of Approximation (RMSEA) of 0.068, with a 95% Confidence Interval (CI) ranging from 0.063 to 0.074. Although the results associated with the initial model were promising, challenges were posed by variables I_2 (L_1) and I_{44} (P). Specifically, I_2 (L_1) exhibited a non-significant *p-value* of 0.068 and a negative coefficient of -0.160, while I_{44} (P) displayed a significant *p-value* of 0.001 with a coefficient of 1.021. Therefore, the first variable was eliminated due to its non-significant *p-value* and the negative sign of its coefficient, which did not align with the theoretical interaction expected between the variables. The second variable was also removed because its slope coefficient exceeded 1, which can lead to issues with interpretation and model fit. Consequently, the decision was made to exclude I_2 (L_1) and I_{44} (P) from the initial model, and the analysis was rerun to enhance the model's accuracy. The fit indices for the final model were as follows: CFI of 0.974, TLI of 0.972, and RMSEA of 0.064 (95% CI: [0.058, 0.069]). As observed, the removal of these variables resulted in an improved model. The values obtained for the final model are considered competitive and acceptable within the academic community, as the authors Hu and Bentler (1999) indicate that Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) values greater than 0.90 signify an acceptable model fit, while values exceeding 0.95 indicate a good fit. Furthermore, the study conducted by Schreiber et al. (2006) reinforces this notion by recommending that CFI and TLI values greater than 0.90 reflect a good fit of the model. The revised model, as presented in Table 1, now includes only statistically significant parameters that correspond with the expected theoretical correlations. The elements in the table are arranged in ascending order based on the t-statistic value (Est./S.E.).

Building on the previously presented information, the researchers find it valuable to include details regarding the correlations between latent variables. While Tables 1 and 2 assess the effectiveness of observed variables in representing conceptual dimensions or latent factors (measurement component). Table 3 emphasizes the structural component by highlighting the causal relationships among these factors. Only significant correlations between latent variables are reported, all of which possess a *p-value* of less than 0.001. Given that the instrument is holistic and measures the development of life skills, it is reasonable to expect the existence of interactions among these variables. The elements in the table are arranged in ascending order based on the t-statistic value (Est./S.E.).

4.2 Statistical tests

The following describes the implementation of life skills in the open universities under analysis. The scores for each dimension were calculated by applying weights to the instructors' reported performance on the items characterizing each dimension, with the weighting based on the respective factor loadings. Therefore, the score for the i-th dimension and the $n_{(a)}$-th instructor of the institution indexed in (a) (Pakistan, Portugal, Spain, and United Kingdom), $S^i_{n_{(a)},(a)}$, is obtained as:

$$S^i_{n_{(a)},(a)} = \frac{\sum_j w^i_j x^i_{n_{(a)},j}}{\sum_j w^i_j}, \quad (1)$$

where w^i_j is the j-th factor loading of the i-th dimension, and $x^i_{n_{(a)},j}$ is the output reported by the $n_{(a)}$-th instructor of the institution indexed in (a) (Spain, Portugal, Pakistan or United Kingdom) in the j-th item of the i-th dimension, with $n_{\text{Pakistan}}=\{1, ..., 31\}$, $n_{\text{Portugal}}=\{1, ..., 30\}$, $n_{\text{Spain}}=\{1, ..., 41\}$, $n_{\text{United Kingdom}}=\{1, ..., 36\}$; $i=\{1, 2, ..., 13\}$.

After normalizing the scores, the dimensions were ranked based on performance, with mean rankings calculated accordingly. A ranking of R=1 was assigned to the highest-performing dimension, while R=13 indicated the lowest-performing dimension. Table 4 gives information about the average results for each dimension across all instructors by country, including both the normalized Average Score (AS) and the Mean Ranking ($\overline{R}$) for each dimension. The table highlights notable findings regarding implementing the studied life skills (dimensions) in the selected context. It facilitates comparisons between the best effectively implemented dimensions and those with the worst implementation, while also revealing differences across the four selected countries. From a descriptive viewpoint, it can be perceived that each culture prioritizes different life skills. For instance, from instructors' perspectives, the best implemented life skills in online scenarios are the following: in Pakistan

Table 1 - Representation of the observed items within its dimension.

Dimensions	Items	Estimate (Est.)	Standard Error (S.E.)	Est./S.E.	*p-value*
L_1	I_3	0.657	0.051	12.960	p <0.001
	I_1	0.711	0.046	15.513	p <0.001
	I_4	0.798	0.042	18.890	p <0.001
	I_5	0.841	0.034	24.829	p <0.001
L_2	I_{11}	0.897	0.026	34.437	p <0.001
	I_7	0.893	0.024	36.922	p <0.001
	I_9	0.920	0.021	44.585	p <0.001
	I_8	0.921	0.020	46.636	p <0.001
	I_6	0.929	0.020	46.826	p <0.001
	I_{10}	0.937	0.019	48.573	p <0.001
BH	I_{12}	0.911	0.047	19.327	p <0.001
	I_{15}	0.853	0.027	32.086	p <0.001
	I_{14}	0.922	0.022	41.007	p <0.001
	I_{13}	0.934	0.022	42.594	p <0.001
BI	I_{19}	0.855	0.031	27.395	p <0.001
	I_{16}	0.838	0.029	28.745	p <0.001
	I_{17}	0.936	0.019	50.522	p <0.001
	I_{18}	0.926	0.018	50.651	p <0.001
SIT_1	I_{23}	0.890	0.024	36.712	p <0.001
	I_{20}	0.929	0.020	46.403	p <0.001
	I_{21}	0.940	0.018	51.399	p <0.001
	I_{22}	0.961	0.017	57.255	p <0.001
SIT_2	I_{24}	0.703	0.048	14.683	p <0.001
	I_{27}	0.910	0.045	20.360	p <0.001
	I_{25}	0.916	0.043	21.546	p <0.001
	I_{26}	0.835	0.037	22.753	p <0.001
E	I_{28}	0.947	0.015	62.711	p <0.001
	I_{29}	0.938	0.012	76.733	p <0.001
	I_{31}	0.958	0.008	113.188	p <0.001
	I_{32}	0.982	0.007	141.392	p <0.001
	I_{30}	0.979	0.006	150.704	p <0.001
PR	I_{35}	0.941	0.019	50.741	p <0.001
	I_{34}	0.930	0.016	56.741	p <0.001
	I_{36}	0.953	0.015	62.173	p <0.001
	I_{33}	0.966	0.013	71.939	p <0.001
A	I_{39}	0.872	0.022	39.521	p <0.001
	I_{37}	0.924	0.022	42.363	p <0.001
	I_{38}	0.923	0.018	51.375	p <0.001
OS	I_{43}	0.866	0.028	30.527	p <0.001
	I_{41}	0.912	0.025	36.742	p <0.001
	I_{40}	0.962	0.022	44.724	p <0.001
	I_{42}	0.931	0.017	53.948	p <0.001
P	I_{45}	0.908	0.024	37.812	p <0.001
	I_{46}	0.955	0.024	39.956	p <0.001
$COOE_1$	I_{49}	0.834	0.029	28.388	p <0.001
	I_{50}	0.913	0.022	40.935	p <0.001
	I_{47}	0.963	0.023	42.156	p <0.001
	I_{48}	0.910	0.020	44.618	p <0.001
$COOE_2$	I_{51}	0.813	0.032	25.714	p < 0.001
	I_{52}	0.875	0.026	33.880	p < 0.001
	I_{53}	0.896	0.019	46.381	p < 0.001
	I_{54}	0.937	0.018	50.874	p < 0.001

Table 2 - Linear relationships between latent variables.

Dimensions	Variables	Estimate (Est.)	Standard Error (S.E.)	Est./S.E.	*p-value*
L_2	L_1	0.912	0.026	35.540	p < 0.001
BH	L_1	0.326	0.078	4.158	p < 0.001
	L_2	0.316	0.071	4.472	p < 0.001
BI	BH	0.483	0.063	7.624	p < 0.001
	L_1	0.725	0.045	16.011	p < 0.001
	L_2	0.797	0.033	23.980	p < 0.001
SIT_1	BH	0.421	0.069	6.065	p < 0.001
	BI	0.742	0.042	17.839	p < 0.001
	L_1	0.848	0.032	26.394	p < 0.001
	L_2	0.876	0.020	43.030	p < 0.001
SIT_2	BI	0.310	0.080	3.889	p < 0.001
	L_2	0.345	0.080	4.297	p < 0.001
	SIT_1	0.439	0.070	6.239	p < 0.001
	BH	0.608	0.057	10.606	p < 0.001
E	SIT_2	0.332	0.073	4.556	p < 0.001
	BH	0.462	0.067	6.939	p < 0.001
	L_1	0.751	0.044	16.889	p < 0.001
	SIT_1	0.746	0.037	20.304	p < 0.001
	L_2	0.795	0.033	23.846	p < 0.001
	BI	0.835	0.029	28.847	p < 0.001
PR	SIT_2	0.316	0.078	4.052	p < 0.001
	BH	0.318	0.076	4.197	p < 0.001
	L_1	0.896	0.031	29.044	p < 0.001
	BI	0.839	0.029	29.250	p < 0.001
	E	0.841	0.027	31.466	p < 0.001
	SIT_1	0.844	0.026	32.324	p < 0.001
	L_2	0.862	0.024	35.959	p < 0.001
A	SIT_2	0.416	0.071	5.832	p < 0.001
	BH	0.580	0.056	10.323	p < 0.001
	L_1	0.763	0.043	17.899	p < 0.001
	SIT_1	0.811	0.37	21.804	p < 0.001
	PR	0.777	0.035	22.045	p < 0.001
	L_2	0.795	0.034	23.727	p < 0.001
	BI	0.855	0.032	26.859	p < 0.001
	E	0.851	0.029	29.500	p < 0.001

the L_2 dimension (AS_{L_2}=4.318 and $\overline{R}_{L_2}$=3.645), in Portugal the BH dimension (AS_{BH}=3.682 and $\overline{R}_{BH}$=3.633), in Spain the SIT_2 dimension (AS_{SIT_2}=3.125 and $\overline{R}_{SIT_2}$=4.109), and in the United Kingdom the dimension L_1 (AS_{L_1}=2.007 and $\overline{R}_{L_1}$=4.444). On the other hand, the worst implemented life skills in online scenarios are the following: in Pakistan the P dimension (AS_P= 3.260 and $\overline{R}_P$=9.435), in Portugal and Spain the PR dimension (AS_{PR}=2.083 and $\overline{R}_{PR}$=9.533 / AS_{PR}=1.755 and $\overline{R}_{PR}$=10.000, and in the United Kingdom the dimension A (AS_A=1.626 and $\overline{R}_A$=8.416).

The significance of the experimental findings was assessed through non-parametric statistical methods, due to the rejection of the normality and equality of variances assumptions based on a prior assessment of the average scores from the dimensions. In particular, the Friedman and Nemenyi tests were employed for this analysis. The Friedman test is utilized to determine whether significant differences exist within the group of results. In contrast, the Nemenyi test identifies which pairs among the comparisons exhibit significant differences. The Friedman test indicated statistically significant variations in the average rankings among the dimensions, with results reaching a 5% significance level. Specifically, in the case of Pakistan, the confidence interval for the Friedman statistic is C_0= (0, $F_{0.05}$= 1.779), while the computed F-value is F*=5.438, which lies outside this interval. Consequently, the null hypothesis, which asserts that all dimensions have equal mean rankings, is rejected. The same conclusion applies to the other countries, although the reported results vary. In Portugal, C_0=(0, $F_{0.05}$=1.780) and F-value is F*=9.879. In Spain, C_0= (0, $F_{0.05}$=1.772) and F-value is F*=14.160. and, in the United Kingdom, C_0= (0, $F_{0.05}$=1.775) and F-value is F*=3.411.

Table 3 - Linear relationships between latent variables.

Dimensions	Variables	Estimate (Est.)	Standard Error (S.E.)	Est./S.E.	*p-value*
OS	SIT_2	0.507	0.063	8.005	$p < 0.001$
	L_1	0.544	0.063	8.844	$p < 0.001$
	L_2	0.593	0.053	11.271	$p < 0.001$
	SIT_1	0.616	0.055	11.269	$p < 0.001$
	PR	0.646	0.047	13.851	$p < 0.001$
	E	0.675	0.045	14.961	$p < 0.001$
	BH	0.730	0.043	16.983	$p < 0.001$
	BI	0.743	0.042	17.632	$p < 0.001$
	A	0.823	0.033	25.181	$p < 0.001$
P	L_1	0.205	0.089	2.294	$p < 0.001$
	L_2	0.282	0.085	3.297	$p < 0.001$
	PR	0.299	0.084	3.542	$p < 0.001$
	SIT_1	0.334	0.083	4.043	$p < 0.001$
	BI	0.435	0.075	5.797	$p < 0.001$
	E	0.427	0.072	5.962	$p < 0.001$
	SIT_2	0.571	0.065	8.771	$p < 0.001$
	A	0.560	0.059	9.443	$p < 0.001$
	OS	0.701	0.053	13.122	$p < 0.001$
	BH	0.873	0.022	38.877	$p < 0.001$
$COOE_1$	SIT_2	0.349	0.072	4.827	$p < 0.001$
	BH	0.416	0.066	6.357	$p < 0.001$
	P	0.440	0.069	6.416	$p < 0.001$
	L_1	0.650	0.052	12.543	$p < 0.001$
	OS	0.662	0.046	14.351	$p < 0.001$
	SIT_1	0.705	0.043	16.237	$p < 0.001$
	E	0.727	0.040	18.056	$p < 0.001$
	BI	0.722	0.040	18.196	$p < 0.001$
	A	0.754	0.039	19.316	$p < 0.001$
	PR	0.748	0.037	20.191	$p < 0.001$
	L_2	0.782	0.036	22.030	$p < 0.001$
$COOE_2$	SIT_2	0.401	0.075	5.370	$p < 0.001$
	BH	0.463	0.063	7.400	$p < 0.001$
	P	0.497	0.063	7.842	$p < 0.001$
	L_1	0.747	0.048	15.712	$p < 0.001$
	SIT_1	0.768	0.038	20.043	$p < 0.001$
	BI	0.785	0.038	20.401	$p < 0.001$
	OS	0.749	0.035	21.169	$p < 0.001$
	E	0.792	0.036	21.788	$p < 0.001$
	L_2	0.824	0.030	27.737	$p < 0.001$
	PR	0.835	0.029	28.420	$p < 0.001$
	A	0.838	0.028	29.703	$p < 0.001$
	$COOE_1$	0.869	0.024	36.919	$p < 0.001$

Following the previous rejection, the Nemenyi post hoc test was employed to examine significant differences in the rankings of life skills dimensions across each country. This test determines whether a dimension is significantly different based on whether its mean rank varies by at least the Critical Difference (CD). The results of the Nemenyi tests for $\alpha=0.05$ across the four studied countries are illustrated in Figure 1, which includes both the CD and the mean rankings for each dimension. Differences are considered significant when the mean ranks of two dimensions exceed the CD.

In the context of Pakistan, based on the Nemenyi test ($\alpha=0.05$), instructors perceive no significant differences in the level of implementation among the L_2, SIT_1, PR, E, and OS dimensions, which are ranked the highest. The second-ranked group includes the SIT_1, PR, E, OS, BI, $COOE_2$, A, L_1, SIT_2, and $COOE_1$ dimensions. Additionally, a third group comprises the PR, E, OS, BI, $COOE_2$, A, L_1, SIT_2, $COOE_1$, and BH dimensions. Lastly, the fourth group, representing the least effectively implemented dimensions, consists of E, OS, BI, $COOE_2$, A, L_1, SIT_2, $COOE_1$, BH, and P.

Table 4 - Statistical results by dimension based on instructors' perceptions.

Dimensions	Pakistan		Portugal		Spain		United Kingdom	
	AS	$\overline{R}$	AS	$\overline{R}$	AS	$\overline{R}$	AS	$\overline{R}$
L_1	3.649	7.645	2.408	8.150	2.002	8.500	**2.007**	4.444
L_2	**4.318**	3.645	2.087	9.450	1.886	9.182	1.740	6.902
BH	3.448	8.645	**3.682**	3.633	2.862	4.243	1.785	6.833
BI	3.544	7.161	2.427	6.966	2.083	7.365	1.811	5.236
SIT_1	*4.226*	5.161	2.249	8.600	2.003	8.585	1.693	8.138
SIT_2	3.763	7.677	3.329	4.566	**3.125**	4.109	1.788	6.930
E	3.812	6.483	2.299	8.266	2.286	7.524	1.670	8.111
PR	4.112	5.516	2.083	9.533	1.755	10.000	1.708	7.791
A	3.592	7.500	2.664	6.800	2.151	7.829	1.626	8.416
OS	3.628	6.870	2.944	5.683	2.370	6.731	1.721	7.611
P	3.260	9.435	*3.413*	4.150	*2.936*	3.731	*1.861*	6.138
$COOE_1$	3.484	7.967	2.325	8.083	2.483	5.914	1.726	7.444
$COOE_2$	3.658	7.290	2.495	7.116	2.224	7.280	1.759	7.000

Bold face indicates best performance. Second best results are in italic.
AS: Average Score; $\overline{R}$: Mean Ranking.

In Portugal, results from the Nemenyi test (α=0.05) indicate that instructors do not perceive statistically significant differences in implementation levels across the highest-ranked dimensions: BH, P, SIT_2, OS, and A. A second grouping, perceived at a slightly lower level of implementation, includes dimensions P, SIT_2, OS, A, BI, and $COOE_2$. The third group, positioned lower in implementation, encompasses OS, A, BI, $COOE_2$, $COOE_1$, L_1, E, and SIT_1. Finally, the fourth group, indicating the least effectively implemented dimensions, comprises A, BI, $COOE_2$, $COOE_1$, L_1, E, SIT_1, L_2, and PR.

For Spain, the Nemenyi test (α=0.05) indicates that instructors perceive similar implementation levels for the highest-ranked dimensions, specifically P, SIT_2, BH, and $COOE_1$, without significant differences. Following this, the next grouping in implementation levels includes SIT_2, BH, $COOE_1$, and OS. At a lower level, a third group emerges, comprising $COOE_1$, OS, $COOE_2$, BI, E, A, L_1, and SIT_1. An additional set, perceived at an even lower level of implementation, includes OS, $COOE_2$, BI, E, A, L_1, SIT_1, and L_2. Finally, dimensions with the lowest observed levels of implementation are $COOE_2$, BI, E, A, L_1, SIT_1, L_2, and PR.

In the United Kingdom, the Nemenyi test (α=0.05) shows that instructors view the implementation of certain dimensions as similarly high, with no significant differences detected among them (L_1, BI, P, BH, L_2, SIT_2, $COOE_2$, and $COOE_1$). A second set of dimensions with slightly lower implementation ratings includes BI, P, BH, L_2, SIT_2, $COOE_2$, $COOE_1$, OS, PR, E, and SIT_1. Finally, dimensions considered to have the lowest levels of implementation are P, BH, L_2, SIT_2, $COOE_2$, $COOE_1$, OS, PR, E, SIT_1, and A.

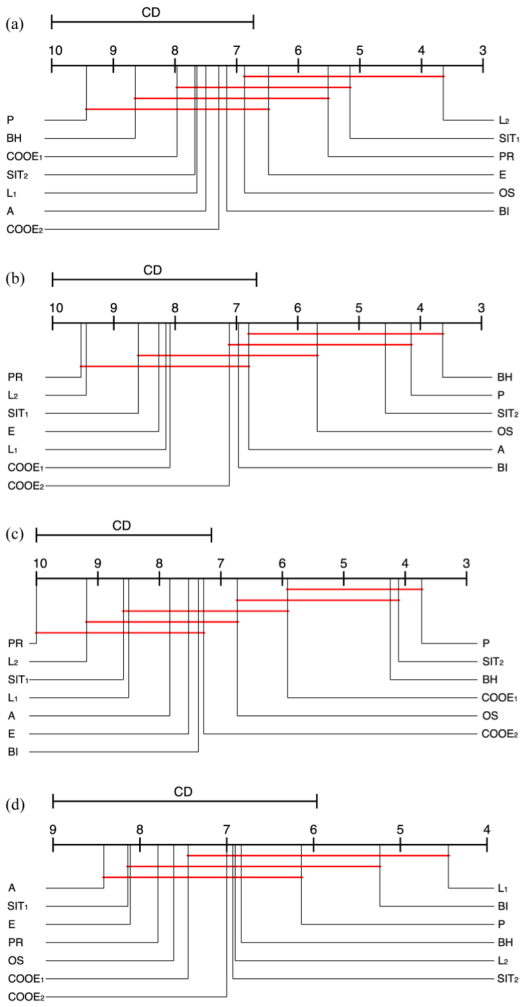

Figure 1 - Educators' perspectives on the implementation of studied dimensions across different countries: (a) Pakistan, (b) Portugal, (c) Spain, and (d) the United Kingdom.

5. Discussion and Conclusions

5.1 Confirmatory factor analysis

In this analysis, the relationships with the highest Est./S.E. values are presented in Table 2. The five most significant relationships are (i) SIT_1 and L_2 (43.030), (ii) P and BH (38.877), (iii) $COOE_2$ and $COOE_1$ (36.919), (iv) PR and L_2 (35.959), and (v) L_2 and L_1 (35.540). The relationships selected for further analysis -(i) SIT_1 and L_2, (ii) P and BH, and (iii) PR and L_2- were chosen because they involve pairs of variables that do not belong to the same higher-order dimension, unlike L_1 and L_2, or $COOE_1$ and $COOE_2$. These relationships reveal more meaningful, cross-dimensional connections, offering insights beyond the within-dimension correlations and aligning with the underlying theoretical structure identified through CFA.

The results of this study demonstrate the combined potential of SIT_1 (divergent thinking) and L_2 (development of core soft skills in online environments) to significantly enhance students' learning experiences and outcomes in online education, which is directly relevant to interprofessional development. Divergent thinking enhances problem-solving abilities and critical thinking, while core soft skills provide practical tools for efficient research, communication, and time management. This synergy increases student engagement and motivation, fostering a more dynamic and effective learning process. In this regard, the study by Eccott et al. (2012) incorporates a scenario-based learning perspective to promote innovative problem-solving in authentic interprofessional contexts, embedding activities that strengthen key soft skills such as teamwork and communication.

This study underscores the correlation between the dimensions of P and BH, emphasizing their impact on student well-being and academic performance in online education. The balance between academic and recreational time (P) is essential for mental health and stress reduction, while addressing sedentary behavior (BH) is crucial in screen-intensive learning environments. In this regard, Fadda (2020) emphasizes that the online learning community should incorporate game-based learning strategies. These strategies enhance student engagement, reduce stress, and simulate real-world interprofessional scenarios, fostering student collaboration and teamwork.

The correlation between practical reason (PR) and soft skills (L_2) can be understood through their complementary roles in supporting both individual autonomy and effective social engagement, which is particularly relevant in the context of interprofessional development and e-learning. Practical reason involves the ability to make reasoned, ethical decisions based on critical reflection, particularly in complex or uncertain contexts. In this sense, it is closely intertwined with soft skills which are necessary for navigating interpersonal interactions. Educators can cultivate more thoughtful, responsible, and collaborative learners, well-prepared for the demands of interprofessional development, by fostering both practical reason and soft skills simultaneously (Pien et al., 2018). These mutually reinforcing skills enable individuals to make informed, ethical decisions and execute them effectively in social and professional contexts, contributing to holistic personal and professional growth within the framework of interprofessional education and e-learning.

5.2 Statistical tests

This subsection analyzes and interprets the findings by comparing them with previous studies in the literature, with particular emphasis on how each of the countries studied is implementing life skills at the university level in online scenarios. The authors analyzed Table 3, focusing specifically on the column containing AS and $\overline{R}$ values. The discussion centers primarily on the best-implemented dimensions, with at least one from the top three AS and $\overline{R}$ values. Conversely, for the least-implemented dimensions, the analysis includes at least one from the bottom three AS and $\overline{R}$ values. To enhance clarity, Figure 2 visually represents the data across all dimensions.

To begin with, Pakistan shows one of its best results regarding life skills implementation in the L_2 dimension. This assertion is supported by quantitative data, mainly through the AS (4.318) and the $\overline{R}$ (3.645), both of which highlight Pakistan's performance in this area. In interprofessional contexts, the ability to manage time effectively and engage in self-directed learning is crucial for professionals from different fields to collaborate efficiently. In this study, L_2 dimension is linked to self-study and time management, among other soft skills in this study. Our findings align with Khan et al. (2018), who demonstrated that Pakistani online instructors carefully design their teaching strategies to foster student autonomy. Specifically, the study emphasized the importance of providing students with resources to assist them when they encounter challenges with new concepts or experience difficulty in understanding. Participants reported that e-learning offered valuable guidance in the professor's absence, fostering self-directed learning and enabling more effective study.

Pakistan has one of the lowest scores for implementing life skills within the P dimension, with an AS of 3.260 and a $\overline{R}$ of 9.435. However, it's important to note that this dimension still has a score above 3 on a 1-5 scale, suggesting that teachers don't consider it poorly implemented, despite rating it lower than others. The P dimension focuses on balancing academic and personal time, which is particularly relevant in the context of interprofessional development. One challenge in this dimension is the unclear boundary between academic and personal time, a critical issue for students and

professionals in interprofessional settings. Studies conducted within the context of Pakistani culture provide insights into these issues. For instance, the pervasive nature of communication in online education exacerbates these challenges, creating additional pressures and blurring the lines between personal and professional life (Abid et al., 2023). The study highlights how personal privacy is affected, as educators often use parts of their homes for recording classes, which intrudes on personal space. In contrast, Shuja et al. (2019) approaches the issue from a more positive perspective, emphasizing mobile learning. This approach enhances flexibility, allowing students to blend leisure and learning more effectively and engage in autonomous learning outside of formal class settings. The widespread use of smartphones fosters interaction and access to diverse information sources.

Similarly to Pakistan, the results from Portugal show consistently high performances overall. However, different from this country, the distribution of the results was more uneven across dimensions, following a pattern very similar to the one found in Spain (Figure 2). In fact, three dimensions stand out from the rest. In two of them (BH and P), the scores are the highest registered in the study. The best performance in Portugal concerns the BH dimension with an AS of 3.682 and a $\overline{R}$ of 3.633. This is not surprising as the importance of designing healthy learning environments has become paramount for online educators in recent years. In the aftermath of the COVID-19 pandemic, attention to mental health issues has been highlighted in the literature worldwide, drawing from the lessons learned in that context (Al-Kumaim et al., 2021). Nuryana et al. (2023) identified as many as 1456 articles published on student stress and mental health topics related to online learning in this period. In Portugal, the concern with student burnout was shared by teachers and parents alike (Seabra et al., 2021). This has led to a shared awareness amongst online learning teachers and designers on the importance of the BH dimension and how it should be fully developed in online learning design.

The second-best result is obtained in the P dimension with an AS of 3.413 and a $\overline{R}$ of 4.150. This is less surprising as it corresponds to a more typical concern in online educational design good practices. As Lasfeto (2020) demonstrates, there is a significant relationship between students' self-directed learning readiness and their social interaction. Therefore, creating social interaction spaces for online learners to meet, network, and share, allowing them to balance academic and recreational time, is a major factor in the successful design of online learning experiences. The third dimension with the highest performance in Portugal is SIT_2. Differently from what was found in Pakistan, Portuguese participants in the study consider convergent thinking to be more implemented in online education practices.

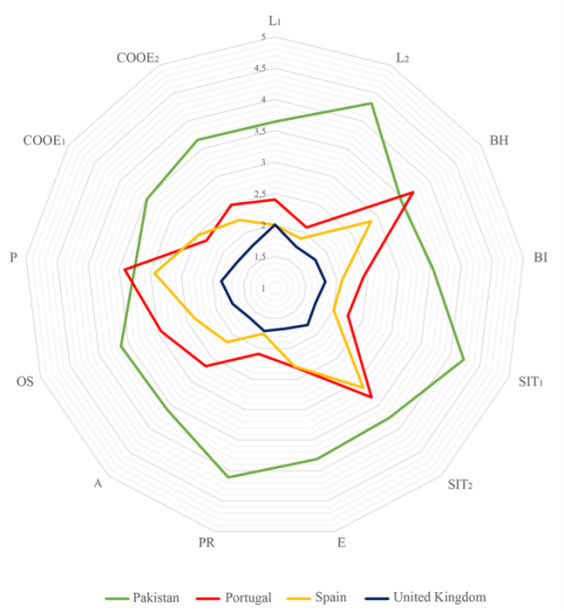

Figure 2 - Implementation of studied dimensions across countries from educators' perspectives.

This results from the combination of two perceptions. One is that online learning is already perceived in Europe as a part of mainstream educational practices. By contrast, in Asian countries, online learning is mostly identified as an innovative and disruptive form of learning. Secondly, resulting from the poor pedagogical practices of Emergency Remote Teaching (ERT) during the COVID-19 pandemic, most of the current practices relate to passive learning methodologies and not to the ones fostering learners' creativity. This finding is supported by the result from the PR dimension, which we address below. It is interesting to note, though, that Portuguese educators are also the participants in the study, which gives the second highest score to SIT_1. However, the difference between the scores given to divergent and convergent thinking (represented respectively by the SIT_1 and SIT_2 dimensions) is quite substantial.

It is also worth mentioning that the score given in Portugal is related to the OS dimension. The potential of online learning to foster learners' environmental awareness, namely by reducing the carbon footprint, has been demonstrated by Otto et al. (2019), Perbandt et al. (2021) and other studies.

On the contrary, the lowest performances in Portugal are found in the L_2 and the PR dimensions. Regarding the first case, the result is the opposite of what has been found in Pakistan but is closer to the situation in Spain. This result confirms the critical importance of developing students' digital skills and competencies for successful online learning. As to what concerns the right to freedom of thought, conscience, and religion in the learning process, the result found in Portugal, like the one found in Spain in this respect, shows a

perception amongst teachers and designers that online learning pedagogy should further explore learner's critical thinking and other higher-order skills.

The results obtained in Spain, particularly in the P dimension, highlight the effective implementation of balancing academic and personal time, which is highly relevant to interprofessional development. Spain's strong performance in this dimension, with the second-highest position in AS (2.936) and the top position in $\overline{R}$ (3.731), indicates that educators in Spain prioritize the integration of academic responsibilities with personal time, a critical factor in fostering well-being and collaboration in interprofessional contexts. However, the flexibility of e-learning, as noted in the scientific literature within the Spanish context does not offer conclusive evidence on this matter. For instance, the study of Xavier and Meneses (2022) suggests that the flexibility of e-learning benefits some students by enabling them to balance personal and academic responsibilities effectively. Conversely, the same study highlights that other students face challenges in establishing clear boundaries, resulting in the encroachment of academic tasks into their personal time. It is important to note that P, which focuses on balancing academic and recreational time, is ranked the lowest in Pakistan and the highest in Spain. This discrepancy may be attributed, in part, to cultural and structural differences in both countries. In Pakistan, the prioritization of academic success and the societal pressure on students to perform may limit opportunities for recreational activities, leading to a reduced emphasis on balancing study with leisure. Conversely, in Spain, the cultural value placed on work-life balance and well-being, along with a more supportive infrastructure for extracurricular activities, likely facilitates a healthier integration of academic and recreational time. These factors may contribute to the relative rankings observed between the two countries.

On the other hand, the PR dimension, which focuses on practical reasoning, is the lowest rated by Spanish educators in terms of implementation (AS=1.755 and $\overline{R}$=10.000), indicating that this area may require more attention, particularly in interprofessional development and e-learning. Practical reasoning is critical in interprofessional settings, where professionals from different fields must make ethical and informed decisions collaboratively. This finding aligns with other researchers suggesting that Spanish instructors should prioritize enhancing this dimension. For instance, the study of Olcott et al. (2015) presents a code of ethics that outlines several principles for using technologies, emphasizing the importance of respecting the plurality of societal values in digital educational processes. Consistent with the low scores in life skills implementation, the L_2 dimension in Spain also point to a need for improvement in preparing students for interprofessional collaboration (AS=1.886 and $\overline{R}$=9.182). This dimension pertains to the development of soft skills. Within the Spanish context, Galindo-Domínguez and Bezanilla (2021) stress the significance of implementing programs designed to enhance higher education students' digital competencies. These programs specifically aim to improve self-management abilities and promote overall well-being. By equipping students with the necessary tools, these initiatives enable them to manage their academic responsibilities more effectively while also fostering a healthy balance in their personal lives. Finally, with an AS of 2.002 and a $\overline{R}$ of 8.500, the L_1 dimension ranks among the lowest in life skills implementation, highlighting the need for greater emphasis on lifelong learning, particularly in the context of interprofessional development and e-learning. This dimension focuses on personal and professional growth in learning contexts. Recommendations should align with literature from the Spanish context, which advocates for continued development due to the observed correlation between lifelong learning and securing employment contracts, as highlighted by Martínez-Cerdá and Torrent-Sellens (2017).

In the United Kingdom, educators identify the L_1 dimension as the most effectively implemented, as evidenced by quantitative results, with an AS of 2.007 and a $\overline{R}$ of 4.444. It should be noted that, despite the privileged position in terms of dimensions ranking, from the educators' point of view, quantitative data does not indicate a highly competitive value. In this study, L_1 is understood as personal and professional growth within the educational context. This subject has garnered attention in educational research within the United Kingdom context. For example, the study of Tuckett (2017) emphasizes that fostering a culture of lifelong and life-wide learning requires supportive measures at the sub-regional level, necessitating government investment. Also, the study of Eynon and Malmberg (2021) suggest that lifelong learning is a crucial tool for addressing social inequalities. However, it must be structured to ensure equitable access for all, not just those with more resources. Additionally, the BI dimension, which relates to cybersecurity issues in this study, is also highlighted as one of the best-implemented life skills. Again, despite its favorable arithmetic average, the AS of 1.811 and the $\overline{R}$ of 5.236 may not indicate substantial or meaningful outcomes. This finding is consistent with the results of studies carried out in the United Kingdom context. Literature suggests that students generally possess only a basic understanding of online privacy and security (Almekhled and Petrie, 2023). Moreover, the same study reveals that only a third are aware of their university's policies on these matters, and a mere 2.5% have yet to receive any training on the subject.

In contrast, the low scores for the A dimension (AS=1.626 and $\overline{R}$ =8.416) in the United Kingdom context highlight challenges in fostering social interactions and a sense of community in online

learning environments, which are critical for interprofessional development and e-learning. In interprofessional settings, collaboration requires strong social bonds and effective communication, which are often hindered when digital interactions fall short of expectations. The study of Xu and Rees (2016) provides valuable insights into this finding within the context of the United Kingdom. They explain that digital interactivity, while facilitated by technology, falls short of the expected quality. This shortcoming is attributed to the absence of opportunities for students to explore ideas with instructors beyond the virtual classroom setting. The study also reveals that the absence of face-to-face interaction allows students with learning difficulties to remain unnoticed by teachers until assessment time. Finally, the E dimension is also identified by educators from the United Kingdom as one of the least effectively implemented areas, as reflected in quantitative measures, with an AS of 1.670 and a $\overline{R}$ of 8.111. This study's dimension is associated with the importance of emotions in the learning process. A possible explanation for this finding aligns with the research of Reid et al. (2016), who suggest that British students often experience negative emotions in online learning due to low-quality teaching materials, adversely affecting their learning outcomes. To enhance interprofessional development, educational strategies should prioritize improving digital interactivity and addressing the emotional needs of learners, ensuring that both social and emotional dimensions are effectively integrated into online environments.

To conclude, this study significantly advances academic research on interprofessional development by exploring how cultural contexts and educational practices influence the development of diverse skill sets in university environments. It further enriches the literature by applying the CA framework to evaluate core interprofessional competencies within culturally diverse e-learning contexts. Finally, based on empirical data from four countries (Pakistan, Portugal, Spain, and the United Kingdom) this research provides strong evidence of the essential role universities play in developing students' interprofessional skills, enabling them to thrive in dynamic and multidisciplinary professional settings.

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