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Using Community Detection in Adolescent Media Multitasking Research. An Exploratory Study

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ABSTRACT. In this exploratory study, we used the community detection approach to complex networks analysis to analyze temperamental and executive functioning profiles of media multitaskers in early adolescence. Media multitasking is particularly intense in adolescence (Smahel et al., 2020), with implications for short- and long-term functioning (van der Schuur et al., 2015, 2020). Temperament and executive functioning are central for self-regulation and adaptation during adolescence (Rothbart et al., 2011; Blakemore & Choudhury, 2006; Atherton et al., 2019) and are related to media multitasking (van der Schuur et al., 2015; Rogobete et al., 2021, 2024). Participants were a group of early adolescents (11 - 14.5 years old). Community detection yielded 3 distinct groups of individuals, characterized by various combinations of media multitasking frequency, temperamental traits and executive functioning problems. Relevant similarities and differences have been identified between these groups using further quantitative analyses. Results are discussed in terms of the dynamics between temperament, executive functioning and media multitasking behavior during adolescence – an important period for the development of self-regulation and the formation of media habits. Importantly, this exploratory study offers preliminary evidence supporting the usefulness of community detection in complex network analysis for investigating the dynamics of media multitasking behavior.

Keywords: complex network analysis, media multitasking, early adolescence, temperament, executive functioning

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INTRODUCTION

In this study we aimed to use a data-driven approach that is novel in media use studies - community detection in complex networks - to explore the temperamental and executive functioning (EF) profiles of media multitaskers in early adolescence. We wished to illustrate how this method can be used to uncover media multitasking (MM) profiles characterized by a *combination* of individual traits while avoiding bias associated with generating a-priori MM based on continuous MM scores (e.g., Ophir et al., 2009; Shin et al., 2020). By observing how these characteristics and MM co-occur in less biased, naturally emerging groups, we might identify EF and temperamental profiles that are likely to accompany high levels of MM, believed to have a potential negative effect on adolescent functioning (e.g., Baumgartner et al., 2018; van der Schuur et al., 2020), and facilitate timely intervention. Identifying distinct profiles that accompany low/moderate MM levels might also help us gain insight into factors that favor positive media habits, thus informing adequate digital education and prevention of problematic behaviors. Last, by analyzing how temperament and EF vary with MM scores between groups, we might gain some insight into a potential dynamic between these characteristics and MM, as they change within individuals.

Media Multitasking, Temperament and Executive Functioning

MM involves performing two or more activities simultaneously, out of which at least one entails a media device/content (Parry & Roux, 2021). MM generally involves multiple media activities (M-MM; e.g., playing video-games while watching YouTube) or multiple media and non-media activities (e.g., listening to music while eating; Parry & Roux, 2021). When non-media activities involve school tasks, we speak about academic MM (A-MM; e.g., watching TV during homework; van der Schuur et al., 2020). While it has been studied at various ages (Baumgartner & Sumter, 2017; van der Schuur et al., 2015), MM is particularly intense in adolescence (Smahel et al., 2020). This makes media a pervasive environmental factor during a period of increased neuroplasticity and environmental permeability (Galván, 2021), with potential implications for adolescent short- and long-term functioning and development (Baumgartner et al., 2018; van der Schuur et al., 2015, 2020) - thus, an important target for research.

Regardless of age, MM emerges within a complex system shaped by interconnected factors, often studied separately in relation to MM to assess their

unique contributions. Many of these factors have distinct yet interrelated dimensions (Miyake et al., 2000), which can be linked to MM in various ways (predictors, outcomes or both). Temperament (e.g., Sanbonmatsu et al., 2013) and EFs (e.g., May & Elder, 2018; van der Schuur et al., 2015) are two important examples of such factors.

Temperament refers to biological differences in motor, emotional and attentional reactivity to internal and external stimuli, as well as in the processes involved in self-regulating this reactivity (Putnam et al., 2001). It has been shown to be quite stable across development (Atherton et al., 2019; Rothbart et al., 2011) and related to overall functioning in numerous domains (Vohs & Baumeister, 2016; including MM, Sanbonmatsu et al., 2013). Temperamental characteristics influence self-regulation (Rothbart et al., 2011) and motivation for behavior (Atherton et al., 2019), which are likely to further influence behavioral choices. This relationship is likely to be relevant for media behavior during adolescence, as access to personal media devices increases and parental monitoring decreases (Top, 2016), leaving adolescents more in charge of their media habits.

Temperament might be relevant for MM in several ways. Firstly, MM may be used by individuals with increased temperamental negative affectivity as a way of upregulating positive (Popławska et al., 2021) or downregulating negative emotions (García-Oliva & Piqueras, 2016; Popławska et al., 2021). Secondly, MM may be a way of creating physical or mental stimulation for individuals higher in sensation seeking or activity levels (Duff et al., 2014). Thirdly, individuals lower in temperamental effortful control (who display lower self-regulation), may MM more because they have more difficulties controlling media use, which might also make them more susceptible to problematic media behaviors/addiction (Li et al., 2016). Fourth, MM may be performed strategically by individuals with better effortful control, in an attempt to improve cognitive functioning (Kononova & Yuan, 2017; Popławska et al., 2021) or performance on school (Throuvala et al., 2019) or work tasks (Perks & Turner, 2019). Some evidence indicates a differential relationship between different temperamental traits and different types of MM during adolescence. In a recent study, lower effortful control significantly predicted greater A-MM (but not M-MM), while higher negative affectivity and lower sociability predicted more frequent M-MM in early adolescents (Rogobete et al., 2024).

Executive Functions are group of cognitive processes that support the top-down regulation of goal-directed behavior (Miyake et al., 2000). Inhibitory control, working memory (WM) and task shifting are the most frequently studied EFs (Miyake et al., 2000). During adolescence, these processes develop in tandem with a cognitive system that undergoes significant reorganization, under the joined influence of biological and environmental factors (Blakemore

& Choudhury, 2006). Given their role in self-regulation and their intertwinement with neural maturational processes, EFs might be factors that both shape and are shaped by media interaction. Thus, EFs have been widely studied in relation to various aspects of media use, including MM (May & Elder, 2018; van der Schuur et al., 2015). Findings point towards multiple potential roles of EFs for MM. Longitudinal results from adolescent samples show increased attentional and EF difficulties as *outcomes* of more frequent M-MM or A-MM (Baumgartner et al., 2018; van der Schuur et al., 2020). Meta-analyses reveal that more frequent MM is associated with worse cognitive outcomes, although effects sizes tend to be moderate or small (e.g., Parry & Roux, 2021). EFs can also constitute proximal *antecedent* factors that can trigger MM. On the one hand, individuals with better EFs, such as greater WM capacities (Murphy & Creux, 2021) and more effective task-switching abilities (Elbe et al., 2019), might be more confident in their ability to MM effectively and, thus, engage in this behavior more frequently, irrespective of their objective multitasking ability. On the other hand, MM may be the result of *situational lapses* in self-regulation that arise from *poor pre-existing EFs* (e.g., Minear et al., 2013), which might make individuals more vulnerable to intrusions from media related stimuli in the environment (Ophir et al., 2009). Thus, both temperament and EFs can contribute to and be affected differently by MM behavior.

It is important to note that MM behavior itself has been shown to be heterogenous (Wiradhany & Baumgartner, 2019). People are more likely to combine some activities when MM instead of others (Wiradhany & Baumgartner, 2019) and distinct types of MM are associated differentially with certain variables (Rogobete et al., 2024). For example, lower inhibitory control predicts more frequent M-MM, but not A-MM (Rogobete et al., 2024).

Since putting together these separate contributions to diverse types of MM and their outcomes into a coherent theory is challenging at this point, a useful approach might be to analyze relevant traits, their dimensions and MM behavior *collectively*, through profiles. This approach considers the contribution of multiple individual traits and explores how they coexist in relation to one another and to various MM types. The community detection approach in complex network analysis is a useful method of exploring such MM profiles.

Complex Network Analysis and community detection

A complex network is a graphic that contains nodes and a series of edges that connect them (Albert & Barabasi, 2001). Usually, nodes represent variables, and the edges reflect the relationships between them. Since it was introduced in psychological research (Borsboom & Cramer, 2013), Complex Networks

Analysis has been used to investigate intricate phenomena that involve dynamic relationships between variables: exploring the structure and interactions among psychological disorder symptoms (Borsboom & Cramer, 2013) and etiological factors (Isvoranu et al., 2017), applications of theoretical models in health psychology (Hevey, 2018), exploring changes in the structure of complex cognitive abilities (e.g., executive functioning) across the lifespan (e.g., Menu et al., 2024) or in varying populations (Karr et al., 2024), modelling personality structures and their correlates (e.g., Schouw et al., 2020). In media use studies, network analysis has been used to a lesser extent but yielded relevant results. It has proven useful in uncovering the most likely combinations of media activities when MM (e.g., Fisher et al., 2023; Wiradhany & Baumgartner, 2019), their relationship to various outcomes, such as attentional functioning (e.g., Fisher et al., 2023), as well as the structure of social networks on social media (Malik & Abid, 2022).

There are multiple ways of generating and organizing complex networks (Albert & Barabasi, 2001; Borsboom & Cramer, 2013). Of them, the *community detection approach* is adept at identifying sets of nodes that have aggregated into groups (i.e., communities) with specific common properties (Fortunato, 2010). When generating networks using this approach, individuals, rather than variables, constitute the nodes and the edges' characteristics reflect the *similarity* between them, as it emerges from various behavioral and individual measures. Thus, more similar individuals are positioned closer to each other in the network, have stronger and more frequent edges between them and, thus, constitute a community (Fortunato, 2010). In psychology, this approach has been used to extract and analyze psychiatric subtypes (Agelink van Rentergem et al., 2023), to study the structure and function of brain networks (Ashourvan et al., 2019) or to explore social networks characteristics (Bedi & Sharma, 2016). To our knowledge, it has not been employed so far in media use studies, except for some applications on social media networks (e.g., Naik et al., 2022).

Given the increasing sophistication and usefulness of network analysis and community detection in psychological research, our aim was to explore how this method could be used to generate profiles involving MM and its correlates during early adolescence. An important advantage of this approach it that it does not rely on specifying a-priori weights for the dimensions that drive community formation (Newman, 2006). Rather, the emerging communities reflect the underlying structure of the data along the specified dimensions. Thus, participants are expected to organize inside the network and into communities based on the underlying similarities in their responses on relevant measures that bear equal weight, rather than based on experimenter expectations or reasoning. In contrast, current MM studies often compare two- or three-MM

groups that have been generated based on their scores on a MM measure, using a cut-off chosen by the experimenter (e.g., first and last 10% of the Media Multitasking Index scores, Ophir et al., 2009). This method might lead to variable results because of inconsistency in application (e.g., quartile split, Shin et al., 2020 vs. over and below 1SD, Ophir et al., 2009) or sample characteristics (e.g., homogenous MM scores).

Thus, in the present study, we used the community detection approach to explore temperamental and EF profiles that accompany MM behavior in a sample of early adolescents. Provided that there are multiple MM user profiles, characterized by specific combinations of MM behavior, temperamental dimensions and EF challenges, we expected the analysis to yield multiple, fairly delimited communities, that differ in their levels of MM, EFs and temperamental characteristics.

METHODS AND MATERIALS

Participants

Participants in this study were a group of early adolescents (N = 41) that come from middle-class families in three urban areas in Romania. The group consisted of 21 females and 20 males (N = 41), aged between 11 and 14.5 years-old (M = 12.43, SD = 0.93), for which parental consent was obtained. This group is part of a sample that participated in a larger study with additional measures (see *reference anonymized* for complete sample description).

Instruments

Media Multitasking. The Media Multitasking Measure – Short Form (Baumgartner et al., 2017; Rogobete et al., 2021 for Romanian translation) was used to measure time spent with technology (TT) and two types of MM – with other media activities (M-MM) and academic MM (A-MM). In Section 1 (TT) participants reported the time they spent watching TV, sending messages, and browsing social media sites on an average day in the last two weeks (1 - not at all, 8 - more than 5 hours). hours). Section 2 (MM) targets the four most frequently combined media activities in adolescence. Primary activities were watching TV, sending messages, and browsing social media sites, while listening to music was used only as a secondary activity. To measure M-MM, participants reported for each primary activity how often they engaged in the three other media activities at the same time (1 – never, 4 – very often). For A-MM, participants reported how

often they engaged in the four media activities above during school activities (1 – never, 4 – very often). The Media Multitasking Index for Media activities (M-MM, *α Cronbach* = .79) was the average of three sub-scores obtained by averaging the MM responses for each of the three primary media activities (average MM frequency across media activities). The same was done for the Media Multitasking Index for school activities (A-MM, *α Cronbach* = .65; average MM frequency during school activities such as online classes). See descriptive statistics and reliability indicators in Table 1 and correlations with other measures in Table 2.

Executive Functioning problems. Five subscales of the Behavior Rating Inventory of Executive Function—Self Report (BRIEF; Guy et al., 2004) were used to measure self-reported EF problems (overall *α Cronbach* = .94): Inhibition, Shifting, Emotional Control, Monitoring and Working Memory. Adolescents indicated how often during the last week they encountered specific problems in day-to-day aspects related to the five EF domains (1—never; 3—often). Separate sub-scale scores were obtained by averaging the values of each scales' corresponding items. Higher scores on these subscales indicate greater difficulties in their respective EF dimension (descriptives and correlations in Tables 1 and 2).

Temperament. The Early Adolescence Temperament Questionnaire (EATQ – SR; Ellis & Rothbart, 1999; translated by Țincaș et al., 2010) was used to measure four temperamental dimensions: Effortful Control (EC), Surgency (SUR), Negative Affectivity (NA) and Affiliativeness (AFF). Due to questionnaire length and time constraints, 10 of the 13 sub-scales were used (80 items): *EC*: Activation Control, Attention and Inhibitory Control; *SUR*: Activity Level and High Intensity Pleasure; *NA*: Fearfulness and Frustration; *AFF*: Affiliativeness, Low Intensity Pleasure and Perceptual Sensitivity. Participants reported how often each statement was true for themselves (1 - almost never true to 5 - almost always true). To calculate the scores, we first averaged the items corresponding to each sub-scale. The final score for each overall dimension was the average of the sub-scores for the corresponding sub-scales. Higher scores reflect a higher tendency to behave in line with each dimension's specificity (descriptives and correlations in Tables 1 and 2).

Control variables. Age and TT were used as control variables for group comparisons. TT represents the average amount of time spent with media activities in a typical day and was the average of participants' scores (1–8) for the three media activities included in Section 1 of the MUQ (descriptives and correlations in Tables 1 and 2).

Table 1. *Descriptive statistics and reliability indicators for all measures provided fc the whole sample and each emerging community in the complex network analysis.*

	LMM (*n* = 15)		**IMM** (*n* = 15)		**HMM** (*n* = 11)		**Whole sample** (*N* = 41)		
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***α Cronbach***
Age (months)	147.13	12.69	149.13	10.58	152.27	10.15	149.24	11.20	-
Time Technology (TT)	2.76	0.91	3.49	1.05	2.97	1.06	3.08	1.03	.57
M-MM	1.59	0.41	1.99	0.36	2.47	0.38	1.98	0.51	.79
A-MM	1.32	0.42	1.57	0.31	2.32	0.39	1.68	0.55	.65
EF-Inhibition	1.39	0.17	1.86	0.25	2.08	0.28	1.75	0.37	.81
EF-shifting	1.34	0.27	1.66	0.32	1.98	0.14	1.63	0.36	.80
EF-emotional control	1.41	0.20	1.79	0.30	2.10	0.43	1.73	0.41	.81
EF-monitoring	1.48	0.36	1.89	0.46	1.98	0.32	1.77	0.44	.72
EF-working memory	1.36	0.23	1.67	0.28	2.11	0.33	1.67	0.40	.87
T-EC	3.93	0.35	3.16	0.26	3.01	0.27	3.40	0.50	.82
T-SUR	3.09	0.61	3.71	0.52	3.22	0.42	3.35	0.59	.77
T-NA	3.03	0.36	3.46	0.37	3.79	0.35	3.39	0.47	.60
T-AFF	3.55	0.47	3.71	0.41	3.28	0.67	3.54	0.53	.81

Note. M-MM = media multitasking with other media activities; A-MM = academic media multitasking; EF = executive functioning; T = temperament; EC = Effortful Control; SUR = Surgency; NA = Negative Affectivity; AFF = Affiliation. LMM = light media multitaskers; IMM = intermediate media multitaskers; HMM = heavy media multitaskers.

Table 2. *Intercorrelations between the 11 measures and control variables in the whole sample*

	Age (months)	**Time Tech-nology (TT)**	**M-MM**	**A-MM**	**EF-In-hibi-tion**	**EF-shift-ing**	**EF-emo-tional control**	**EF-moni-toring**	**EF-WM**	**T-EC**	**T-SUR**	**T-NA**
Time Technology (TT)	-.156											
M-MM	.068	.351*										
A-MM	.211	-.045	.570**									
EF-Inhibition	.316*	.129	.636**	.526**								
EF-shifting	.165	.138	.588**	.429**	.641**							

	Age (months)	Time Tech-nology (TT)	M-MM	A-MM	EF-In-hibi-tion	EF-shift-ing	EF-emo-tional control	EF-moni-toring	EF-WM	T-EC	T-SUR	T-NA
EF-emotional control	.174	.355*	.548**	.394*	.615**	.700**						
EF-monitoring	.298	.194	.417**	.286	.668**	.557**	.537**					
EF-WM	.171	-.016	.629**	.674**	.757**	.725**	.545**	.527**				
T-EC	.102	-.151	-.457**	-.476**	-.660**	-.547**	-.526**	-.494**	-.545**			
T-SUR	.073	.269	.125	.098	.223	.199	.061	.154	.324*	-.102		
T-NA	-.168	.134	.512**	.210	.458**	.574**	.557**	.331*	.433**	-.576**	.002	
T-AFF	-.124	.098	-.251	-.238	-.237	-.097	.056	-.191	-.208	.066	.310*	.187

Note. See variable abbreviations in Table 1 note. ** - significant at the $p = 0.01$ level (2-tailed);
* - significant at the 0.05 level (2-tailed);

Procedure

Required ethical approval was obtained for this study in accordance with doctoral research requirements at Babeș-Bolyai University. Parents enrolled their child in the study and offered informed consent via an online link. Given questionnaires length (≈ 1.5h required in total), teenagers completed them online, in two different days that were programmed beforehand with the parent. Questionnaires were password protected and anonymized with individual codes to ensure data protection. If questionnaires were not completed by the end of the day, a reminder was sent the next day.

Data analysis

We first modelled the network and identified the emerging communities. To ascertain that the resulting groups were not a mere statistical artifact, we calculated modularity indicators for the network (i.e., how separate emerging communities are) and conducted a MANCOVA in which we compared all emerging groups on the 11 measures of EFs, Temperament and MM, controlling for age and TT.

Modelling the network. To model the network, we used 11 scores: 5 EF problems domains, 4 temperamental dimensions and 2 MM types. Each participant was coded as an entry in a Support Vector Machine[3] (SVM; Cortes & Vapnik, 1995), where it was represented as a vector that combined the 11 scores (considered coordinates). Based on the integration of these coordinates, the SVM model represented participants as nodes and positioned similar ones closer to each other in the vectorial space. The links between these nodes were based on the distance between the entries in the SVM space. A link between two nodes (A and B) was created if the SVM cosine distance between them was lower than the average distance between the first node (i.e., A) and all other close nodes. In this way, the generated complex network was pruned in such a way to contain only meaningful (i.e., close) links between the nodes and to exclude any link that may have been encoded for two nodes that are not meaningfully close to each other. The SVM model was generated using Python (version 3.8) framework *gensim* (Rehurek & Sojka, 2011) and was encoded as a complex network using *Networkx* (https://github.com/networkx/networkx). To extract and visualize the emerging communities, we applied the algorithm proposed by Lambiotte & Panzarasa (2009) from the Gephi tool (Bastian et al., 2009, March). To validate the quality and distinctiveness of the emerging communities we calculated the modularity score for the network Q = [-1,+1] (Newman, 2006). A positive modularity score indicates a strong network structure, with stronger interconnected nodes inside the community than expected by chance (i.e., high similarity between the participants in a group). A negative modularity score indicates poor network structure, with weaker interconnected communities than expected by chance (Newman, 2006). Initial descriptive statistics and MANCOVA were conducted using SPSS version 26.0.

RESULTS

Initial descriptive statistics show moderate levels of M-MM and relatively low levels of A-MM in the sample (Table 1). EF problems in all five domains

[3] An SVM is a machine learning technique, based on optimization algorithms and linear algebra, that helps classify observations (or individuals) in large datasets into multiple classes, based on multiple *features* of those observations. It helps create a multi-dimensional virtual space onto which observations can be mapped (see Cortes & Vapnik, 1995 for details).

seem to reach a moderately high level and all temperamental dimensions are balanced across the sample. No outliers were found in the initial data screening. As for control variables, no gender differences were found for our target variables. Age was significantly correlated with EF problems in inhibition (r = 32, p = .04) and TT was significantly correlated with M-MM (r = .35, p = .02) and with EF problems in emotional control (r = .36, p = .02). Thus, analyses were only controlled for age and TT.

Community detection complex network analysis

Three distinct structures (communities; n_1=15, n_2=15, n_3=11) emerged in the networks analysis (see Figure 1 for a graphical representation of the network structure). The modularity score for the network was Q = 0.51, which reflects adequate distinctiveness between our three emerging communities (Newman, 2006).

Group descriptive profiles

Descriptive data for all three groups on the 11 dimensions and 2 control variables are presented in Table 1 (see also Figure 2). For ease of communication, the groups were termed based on their MM scores: group 1 - light MMs (LMMs), group 2 - intermediate MMs (IMMs) and group 3 - heavy MMs (HMMs). The three groups did not differ significantly in age (F (2, 38) = 0.658, p = .52), nor in TT (F (2, 38) = 2.101, p = .14).

LMMs scored lowest on both MM types, all five EF problems domains and lowest on two temperamental dimensions: Surgency, Negative Affectivity. This group scored highest on the Effortful Control dimension and had moderate scores on Affiliativeness. IMMs were characterized by intermediate scores on both MM types, all EF problem domains and the Effortful Control and Negative Affectivity temperamental dimensions. This group scored highest on the Surgency and Affiliativeness temperamental dimensions. HMMs scored highest on both MM types and reported the most frequent EF problems on all 5 domains. They scored lowest on temperamental Effortful Control and Affiliativeness and highest on Negative Affectivity, while displaying moderate levels of Surgency.

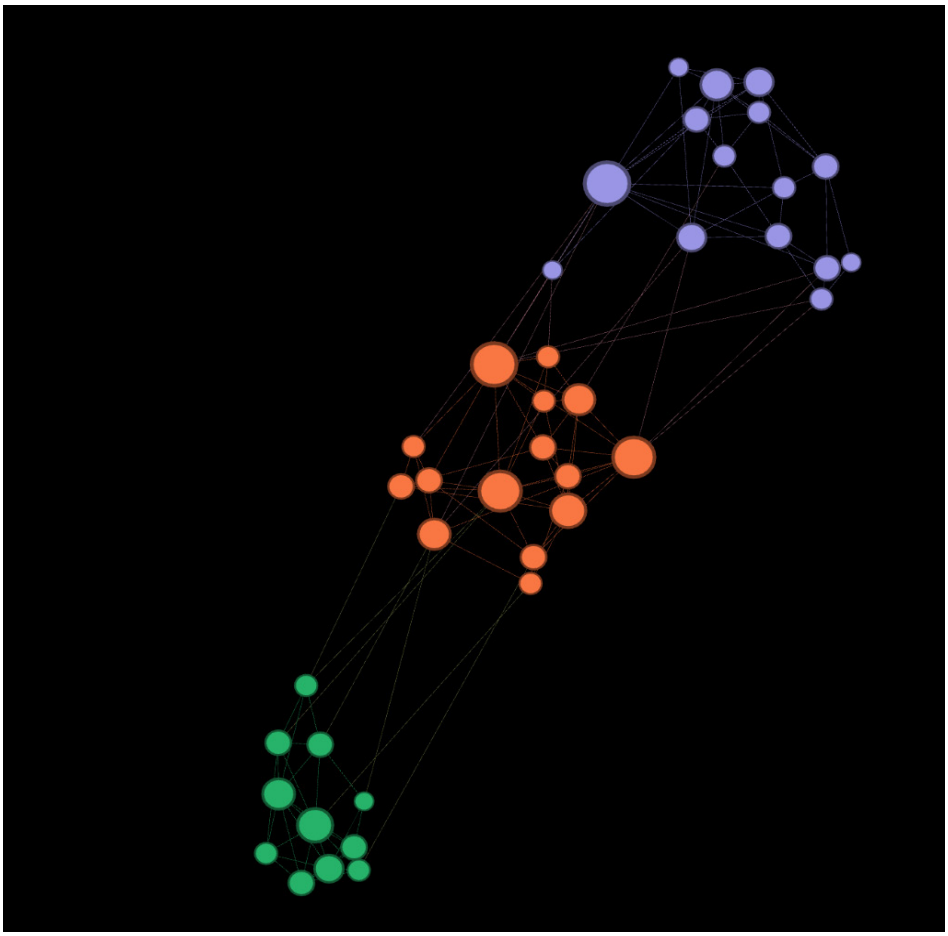

Figure 1. Visualization of the complex network structure and its three emerging communities.

Note. Green (bottom) = Heavy Media Multitaskers (HMMs); Orange (middle) = Intermediate Media Multitaskers (IMMs); Purple (top) = Light Media Multitaskers (LMMs)

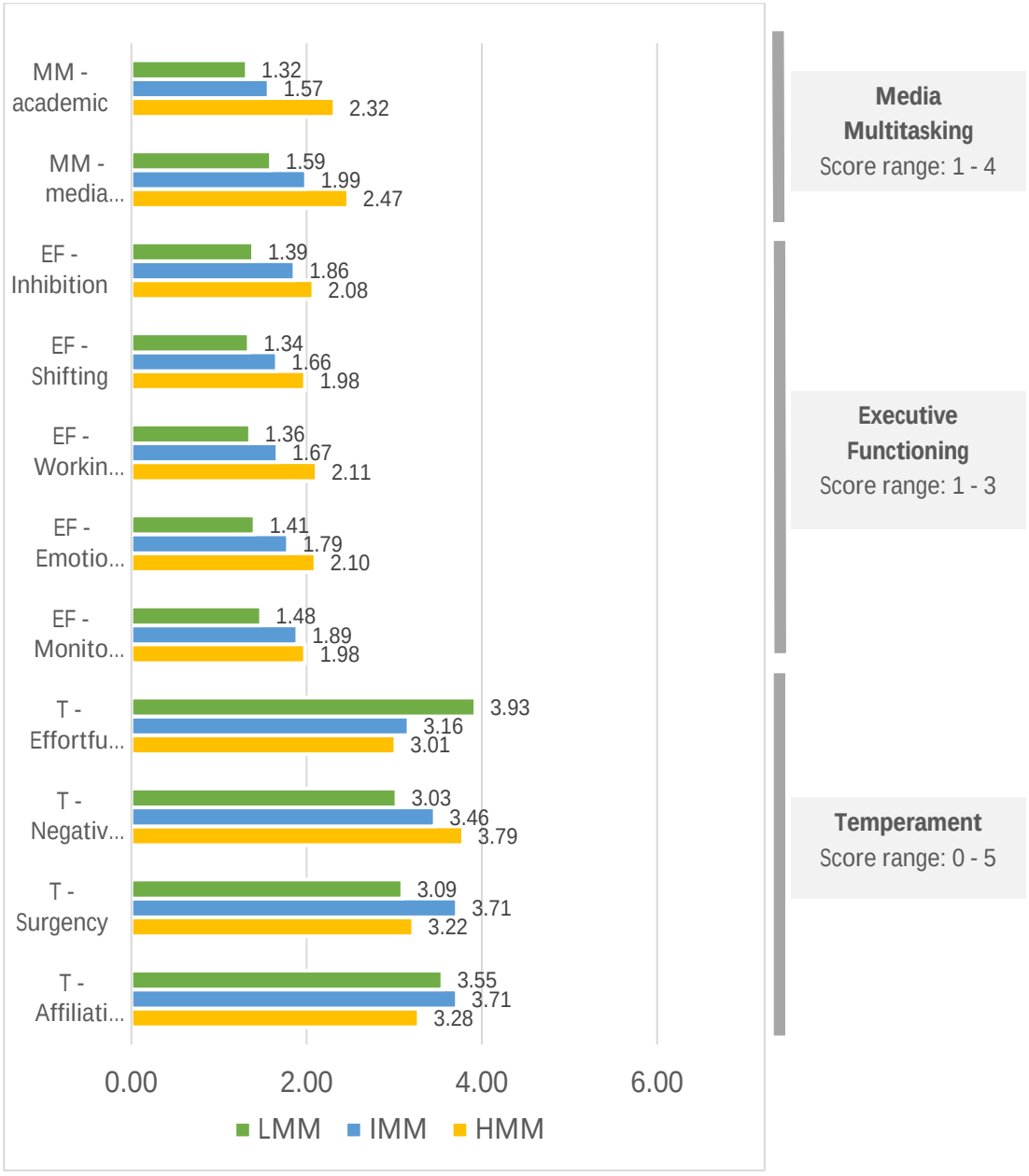

Figure 2. *Descriptive mean scores on the 11 dimensions that contributed to the community generation in the complex network analysis for each of the three emerging groups.*

MANCOVA

In the MANCOVA, the group to which each participant belonged, as indicated by the community detection algorithm, was the fixed factor (Complex Network Group) and the two MM Indexes, the five EF problems domains and the four temperament dimensions were the dependent variables. Age and TT were control variables. Multivariate analyses using Pillai's Trace showed a significant effect of Complex Network Group (V = 1.44, F (22, 54) = 6.255, p < .000, *partial* h^2 = .718). Significant between-subject effects were found for all dependent variables, apart from Affiliativeness (Table 3).

Table 3. *Results of between subjects effects test for the 11 variables used to aggregate the communities*

Score	F (2, 36)	p	*partial* h^2
M-MM	17.386	.000	.491
A-MM	21.722	.000	.547
EF-Inhibition	26.331	.000	.594
EF-shifting	16.145	.000	.473
EF-emotional control	14.785	.000	.451
EF-monitoring	4.640	.016	.205
EF-WM	22.389	.000	.554
T-EC	44.080	.000	.710
T-SUR	4.005	.027	.182
T-NA	17.512	.000	.493
T-AFF	1.927	.160	.097

Note. See variable abbreviations in Table 1 note.

Pairwise comparisons. To detangle the between-group differences, we conducted pairwise comparisons using Sidak test (Table 4**).** These analyses showed significant differences on M-MM between LMMs and HMMs (p < .000) and between IMMs and HMMs (p = .001), but not between LMMs and IMMs (p = .136). The same is true for A-MM ($p_{LMM-HMM}$ < .000, $p_{IMM-HMM}$ < .000, $p_{LMM-IMM}$ <.224). HMMs had significantly greater scores than LMMs and IMMs on both MM indexes.

Regarding EF problems, all three groups were significantly different from each other on Shifting ($p_{LMM-IMM}$ = .023, $p_{LMM-HMM}$ < .000, $p_{IMM-HMM}$ = .025) and WM ($p_{LMM-IMM}$ = .012, $p_{LMM-HMM}$ < .000, $p_{IMM-HMM}$ = .002). For both EF domains, HMMs scored highest, followed by IMMs and LMMs. For EF Inhibition,

LMMs reported significantly fewer problems than both IMMs and HMMs ($p < .000$). The difference between IMMs and HMMs was non-significant ($p = .111$). For EF Emotional Control, both LMMs ($p < .000$) and IMMs ($p = .012$) reported fewer problems than HMMs. For EF Monitoring, LMMs scored significantly lower than HMMs ($p = .023$), but not IMMs (p = .071). HMMs and IMMs did not differ significantly ($p = .919$).

Table 4. *Results of pairwise comparisons between the three emerging groups on all 11 measures used to generate the complex network*

Dependent Variable	Compared groups		*Mean Difference*	*SE*	p_{Sidak}	CI_{Low}	CI_{Up}
M-MM	LMM	IMM	-.284	.138	.136	-.631	.063
		HMM	-.849**	.145	.000	-1.213	-.485
	IMM	HMM	-.565**	.145	.001	-.929	-.201
A-MM	LMM	IMM	-.263	.147	.224	-.630	.104
		HMM	-.990**	.154	.000	-1.375	-.605
	IMM	HMM	-.727**	.154	.000	-1.112	-.341
EF-inhibition	LMM	IMM	-.451**	.089	.000	-.674	-.228
		HMM	-.652**	.093	.000	-.886	-.418
	IMM	HMM	-.201	.094	.111	-.435	.033
EF-shifting	LMM	IMM	-.297*	.105	.023	-.560	-.033
		HMM	-.627**	.110	.000	-.904	-.351
	IMM	HMM	-.331*	.110	.015	-.607	-.054
EF-emotional control	LMM	IMM	-.278	.113	.055	-.561	.005
		HMM	-.645**	.119	.000	-.942	-.348
	IMM	HMM	-.367*	.119	.012	-.664	-.070
EF-monitoring	LMM	IMM	-.348	.148	.071	-.719	.022
		HMM	-.438*	.155	.023	-.827	-.049
	IMM	HMM	-.090	.155	.919	-.479	.299
EF-WM	LMM	IMM	-.332*	.108	.012	-.603	-.061
		HMM	-.761**	.114	.000	-1.046	-.476
	IMM	HMM	-.428**	.114	.002	-.713	-.144
T-EC	LMM	IMM	.810**	.109	.000	.538	1.082
		HMM	.977**	.114	.000	.691	1.262
	IMM	HMM	.167	.114	.391	-.119	.452
T-SUR	LMM	IMM	-.552*	.209	.036	-1.074	-.030
		HMM	-.082	.219	.976	-.630	.466
	IMM	HMM	.470	.219	.112	-.079	1.018
T-NA	LMM	IMM	-.462**	.134	.004	-.797	-.127
		HMM	-.824**	.140	.000	-1.175	-.472
	IMM	HMM	-.362*	.140	.042	-.713	-.010
T-AFF	LMM	IMM	-.165	.202	.805	-.670	.341
		HMM	.251	.212	.569	-.280	.781
	IMM	HMM	.415	.212	.164	-.116	.946

Note. See variable abbreviations in Table 1 notes. *CI* = Confidence Intervals for Mean difference, * p < .05, ** p < .01.

For Temperament, all three groups differed from each other on Negative Affectivity (LMM < IMM < HMM). On Effortful Control, LMMs scored significantly higher than both IMMs and HMMs, while IMMs and HMMs did not differ significantly. For Surgency, IMMs scored significantly higher than LMMs but not significantly different from HMMs. LMMs and HMMs did not differ significantly. For Affiliativeness, the groups did not differ significantly.

DISCUSSIONS

In this study we used a community detection approach to complex network analysis for the first time in media research to explore the temperamental and EF profiles of MMs in early adolescence. The analysis yielded three fairly well-delimited groups of participants, with profiles that present certain similarities and differences. This method offers certain advantages and disadvantages, that can be mitigated when used in conjunction with other established methods, as we will discuss below.

From a methodological perspective, the community detection approach we used allowed data to self-organize in patterns indicating temperamental and EF variations that co-occur with MM behavior without the need to constrain group structure or dimension weight a-priori. When using normative guidelines or convention-based criteria (e.g., Ophir et al., 2009; Shin et al., 2020), the resulting groups are often treated as being discreet, as if they are fundamentally different from one another and did not result from slicing a larger group at a certain cut-off point on one indicator. Community detection allows individuals to coagulate into groups based on multiple characteristics simultaneously and the differences between them are represented alongside the similarities. The calculated modularity score indicates how distinct the communities are. The links between individuals inside each community and between those in different communities indicate within and between community similarities. By analyzing these indicators, along with group scores on the variables of interest, one can perform a more nuanced analysis of the factors that might be relevant for group distinctiveness and those that are not.

When paired with quantitative methods that indicate the magnitude of the differences between groups, community detection might reveal how MM changes with temperament and EF difficulties. For example, self-reported inhibitory control problems increased significantly from LMM to IMM and remained similar from IMM to HMM. At the same time, both types of MM were similar between LMM and IMM but increased significantly between IMM and HMM.

Thus, it seems that the significant increases in inhibitory difficulties preceded relevant increases in MM behavior, potentially indicating that the former contributes to the latter. This progression might also be analyzed in the opposite direction. Inhibitory control still undergoes relevant development in early adolescence, which might translate into fewer self-reported difficulties, better abilities in controlling media-related signals or stimuli and, finally, lower MM levels. Thus, analyzing the synchronized and unsynchronized differences in individual traits and MM frequency across groups may help us understand their dynamics during important periods of change, such as adolescence, when both self-regulation abilities and media behavior are developing (Galvan, 2021). Given the exploratory nature of the present study, the type of analyses we performed and the small sample size, this interpretation remains speculative. However, such observations support the usefulness of complex network analysis and its community detection approach in capturing snapshots of such dynamics between media behavior and individual characteristics, as the person moves along these continue.

From a theoretical perspective, the differences and similarities we observed between LMMs and HMMs can also contribute to certain explanations of MM behavior. HMMs reported more time engaging in both types of MM, more frequent EF problems on all five domains, lower temperamental EC and higher NA than LMMs, who presented the opposite pattern of scores. These results tend to support the theoretical approach that paints HMMs not as strategic users, but as having difficulties monitoring and controlling media behavior and resisting interference from irrelevant stimuli or intense emotions (e.g., Ophir et al., 2009; Baumgartner et al., 2014). While it is probable that HMMs also engage in MM strategically, it seems more likely that a greater proportion of MM results from self-regulation lapses for HMMs than LMMs.

Last, the two types of MM occurred similarly frequently within each group. Our findings did not show that M-MM and A-MM co-occur with different combinations of temperament and EF difficulties, indicating that individuals who engage in MM more frequently tend to do so across context and regardless of activity combinations. Again, these results must be interpreted with caution.

Based on the group scores on temperamental Surgency (i.e., activity level) and Affiliation (i.e., sociability), we cannot speculate much about their possible relevance for MM behavior. First, Affiliativeness does not differ between the three groups, indicating that all adolescents have similar sociability needs and tendencies. This is likely a developmental characteristic that reflects the increased importance of socializing and creating meaningful relationships during adolescence (Lam et al., 2014). However, Surgency seems to be significantly higher in IMMs than LMMs, but no other differences have been observed. This difference may

partly explain the somewhat higher frequency of M-MM in IMMs as opposed to LMMs. This aligns with findings in the literature linking greater sensation seeking with more frequent MM (Duff et al., 2014). However, given that the difference in MM between LMMs and IMMs is not significant, we must take this explanation with caution.

Limitations and future directions

Although the main objective of the current exploratory study was to demonstrate the usefulness of community detection complex networks analysis for studying media use, there are some relevant limitations that pertain to interpreting the results. First, the study is underpowered, given the limited number of participants and increased number of measures. More participants would increase the chance of more reliable findings. Secondly, while the analysis resulted in three adequately distinct groups, as indicated by the modularity score and by the following MANCOVA, MM and EF problem scores were moderate in the sample and extreme scores were infrequent. An increase in score range and variability on these measures might lead to a different network structure and number of communities. Thus, given the reduced sample size, the structure of the network and its communities must be taken as preliminary. Third, given that data was collected at a single point in time and the type of analyses we conducted, we cannot support causal inferences. While we did speculate on some potential associations between the variables that contributed to the three emerging groups, the analyses we carried out do not support causal interpretations. However, our results can constitute a base for further studies.

For example, we speculated that the patterns of changes between the three emergent groups might reflect a dynamic between dimensions of temperament or EFs and MM as the individual moves along them. This possibility might be investigated in a larger, longitudinal study, that follows the same individuals across adolescence and monitors how temperament, EFs and MM change and what their relationship is in various points of development.

We must also keep in mind that the dynamic between individual traits, behavior and other factors depends on context. They might interact differently depending on context affordances, which might translate into different observed relationships and co-occurrences. For example, it has been previously shown that good self-monitoring predicts increased A-MM but not increased M-MM (Rogobete et al., 2024). In this case, it is likely that the task at hand and the context surrounding it played a role in determining how important certain characteristics are for modulating MM behavior. It follows that the networks and profiles we observe in one context might be different from those observed

in another. Further studies can aim to generate networks and explore communities in various (task) contexts.

Finally, complex networks analysis and community detection allow for multiple uses and might be combined with other types of methods, depending on the sample and the amount of available data. For example, they may be combined with qualitative methods that target the individual to extract more nuanced information about the characteristics of the emerging communities in the context of a limited sample.

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Data availability statement

Data is available at the following link:
https://figshare.com/s/449e1bbd032919eeb44c
Data analysis script is available upon request to the first author.

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Disclosure of interest

The present study is part of a PhD thesis, submitted and successfully defended by the first author in Cluj-Napoca, Romania. The first author assumed the responsibility of publishing all remaining results in the thesis after title attribution. The authors report there are no other competing interests to declare.

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The Role of Pet Attachment, Emotion Regulation and Perceived Parental Practices in Adults' Psychological Well-Being. A Pilot Study

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ABSTRACT. Psychological well-being is widely regarded as a robust indicator and precursor of mental health. It is shaped by personal (e.g., emotion regulation strategies) and interpersonal factors, as well as life experiences encountered during development (e.g., used parental practices, emotional climate in the family, quality of social ties, etc.). Supportive parenting in childhood promotes better life-long mental health, whereas controlling or neglectful parenting practices increase vulnerability. Adequate attachment to pets may buffer unmet needs of belonging and foster resilience. The major objective of the present pilot study was to investigate the relationship and explicative power in adult psychological well-being of remembered early parental practices, pet-related variables (childhood desire for pet, current pet ownership) and adult psychological mechanisms, such as cognitive emotion regulation strategies and current attachment to pets. A total of 196 female participants were included in the study and were assessed along the following dimensions: psychological well-being, remembered parental practices, cognitive emotion regulation strategies (CERQ), current pet attachment, childhood desire to have pets, current pet ownership. We conducted three 2x2x2 ANCOVAs examining the dichotomized version (low vs. high) of each of the three remembered parental practices (warmth, rejection, overprotection), childhood desire to have pets (desired and owned vs. desired and not owned), and current pet ownership (yes-no), with emotion regulation strategies and current pet attachment entered as covariates, on psychological well-being. Across the tested models, adaptive and maladaptive cognitive emotion regulation strategies emerged as the most powerful predictors of adult psychological well-being. We also found that pets may function as significant emotional resources, especially for those participants who remember to have experienced high levels of parental rejection in childhood. The results of this study may have valorous

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theoretical and practical implications by shedding further light on the relative importance of distal (remembered parental practices) and proximal factors (emotion regulation strategies, current pet ownership) in predicting psychological well-being.

Keywords: psychological well-being, parental practices, emotion regulation, pet ownership, pet attachment.

According to the global Burden of Disease Study (GBD, 2019), the investigation of mental health related factors has become increasingly important in the early 21st century. This growing scientific attention is partially attributable to observed increases in dysfunctions deriving from inadequate adaptation to the major changes in human life circumstances (e.g., better daily life-conditions in most parts of the world, more facile access to education and health-care, but also more frequent climate-change related stressors, economic insecurity and polarization, increases in job strain, social disconnection, health problems derived from intense digitization, secularization of value systems) (Fassi et al., 2024; Halman & van Ingen, 2015; Karanikolos et al., 2013; Man et al., 2022; Romanello et al., 2021; Van Daalen et al., 2024). As the rising trends in mental dysfunctions (stress, anxiety, depression) indicate, a significant number of individuals do not always employ the adequate means to efficiently confront these challenges (Kieling et al., 2024; McGorry et al., 2024; Mewes et al., 2021; Paul & Moser, 2009). Failure of successful confrontation with these provocations has significant consequences not only on the individual's physical/psychological/social functioning and quality of life, but also imposes significant costs on society (GBD, 2019; Greenberg et al., 2021; Zhang et al., 2023).

Mental health, both a necessity and a "basic human right" (WHO, 2022, p. xiv), encompasses (*i*) the absence of symptoms (e.g., anxiety, depression), and (*ii*) the presence of positive functioning (emotional, psychological and social well-being) (Westerhof & Keyes, 2009), and it becomes highly important for individual functioning and for national economies as well. Under the present life-conditions, a salient question concerns what constitutes a well-lived life. A key component involved both in the experiencing and maintenance of mental health and optimal functioning is represented by the concept of well-being, mostly conceptualized as a combination of emotional, psychological and social well-being (Keyes & Lopez, 2002; Keyes et al., 2020; Ryff, 2023). Emotional well-being usually is associated with the presence of positive and absence of negative emotions, as well as satisfaction with life (Kahneman et al., 1999). On the other hand, psychological (eudaimonic: purpose, autonomy, personal growth) and social (integration, coherence) well-being go beyond the ephemeral experiences

of positive affective states. In research they may be considered both as indicators of positive mental health and mechanisms that build and sustain capabilities necessary for long-term optimal functioning (Pedrotti et al., 2025; Ryff, 2014).

Adult well-being is closely related to how people remember the emotional climate of their childhood. The way individuals recall their parents' behavior toward them during childhood shapes the way mental health develops across the lifespan. Research indicates that supportive parenting practices foster healthier emotional functioning, while controlling or neglectful practices increase long-term vulnerability (Harris et al., 2017; Lan & Wang, 2023; Orth et al., 2015). Empirical evidence also suggests that unmet belonging needs may be buffered by adequate attachment to pets in childhood, as animal companions may provide secure, comforting relationships that may support resilience in adulthood (Beetz et al., 2012; Hawkins et al., 2022; Lindsey, 2021).

INTRODUCTION

Psychological well-being

Many contemporary approaches to psychological well-being (PWB) draw on Aristotle's (2014) view of eudaimonia (i.e., the highest human good), conceived as activity in accordance with human virtues, distinguishing these endeavors from momentary states of pleasure (Ryan & Deci, 2001; Ryff, 2014). Based on the analysis and points of consensus of the prior literature on this topic (e.g., Erikson, 1959; Maslow, 1968; Rogers, 1961), Ryff (1989) proposed a theory-driven, six-dimensional model of psychological (eudaimonic) well-being (Ryff et al., 2021). Each of the six dimensions (positive relations with others, purpose in life, personal growth, self-acceptance, autonomy, environmental mastery) represents capacities needed to adapt to challenging situations in which people try to thrive (Ryff et al., 2021). The dimension of *positive relations with others* has to do with the capacity to understand the importance of trust and reciprocity in human relationships, and to act with empathy and affection to build and maintain close relationships. This component of PWB usually functions as a protective factor in adverse confrontations as well (Acoba, 2024; Wang et al., 2021). Those who score high on this component of PWB usually report superior psychological and social functioning (Mertika et al., 2020; Ryff, 2023). *Purpose in life* reflects one's capacity to find direction, sense and meaning in past and present life, thus facilitating the development and maintenance of objectives and motivation even in harsh circumstances. This component of PWB was found to be associated with better psychological functioning (Boreham & Schutte,

2023; Sutin et al., 2024). *Personal growth* encompasses the feeling that one can continuously develop, being important in trying to reach one's potential. Those people who frequently experience personal growth have the conviction that improvement is always possible. This makes them more open to new experiences, which in turn foster mental health (Ryff, 2023). *Self-acceptance* refers to the non-judgmental acceptance of oneself, i.e., the integration of positive and negative qualities and development of a positive attitude towards the self, thus facilitating positive feelings about one's past life. Higher levels of self-acceptance are usually associated with better mental and emotional functioning (Cordaro et al., 2024; Huang, 2025; Ruan et al., 2023). *Autonomy* represents one's capacity to regulate emotions and behaviors from within, according to personal standards. Those who score high on this component of PWB are more resistant to the pressures of society, thus being able to function well independently, with self-determination (De-Juanas et al., 2020; Ryff, 2023). *Environmental mastery* refers to one's competence to create and manage personal environment and effectively use forthcoming opportunities in accordance with personal values (Misuraca et al., 2024; Nezlek et al., 2025; Ryff et al., 2021). Research indicates that those persons who report higher levels of environmental mastery, personal growth and autonomy tend to react more adaptively during hardships (De-Juanas et al., 2020; Ryff, 2014).

A plethora of research demonstrates a significant relationship between psychological well-being and emotion regulation strategies (Aka & Gencoz, 2014). Individuals who habitually use adaptive emotion regulation strategies (e.g., positive reappraisal, acceptance) report higher life satisfaction, greater optimism, and fewer symptoms of mental illness (Garnefski & Kraaij, 2006; Troy et al., 2010). In contrast, those who heavily rely on maladaptive emotion regulation strategies (e.g., rumination, catastrophizing) tend to experience more intense negative affect, decreased well-being, and greater vulnerability to psychopathology (Aldao et al., 2010). Aldao et al. (2010) further found that emotion regulation strategies account for a substantial amount of variance in mental health outcomes, suggesting that the way people manage emotions matters as much as the confrontation with the adverse events themselves.

Several studies indicate that the capacity to adequately manage affective states is a critical predictor of well-being (Balzarotti et al., 2016; Sanchez-Sanchez et al., 2025), while other research suggests that greater baseline well-being fosters the use of more adaptive emotion regulation strategies (Gross & John, 2003; Keyes et al., 2002; Ryff & Singer, 2008). More recent longitudinal studies document a bidirectional relationship and provide support for the existence of a positive feedback loop between psychological well-being and emotion regulation strategies (Schwarzer et al., 2024).

Emotion regulation strategies

According to Gross and Thompson (2007), emotion regulation (ER) strategies refer to those processes through which people influence when and which emotions they have, and how they experience and manifest them, thus including the capacity to monitor, evaluate and change emotional reactions. ER strategies may be both conscious and automatic and can manifest before (antecedent-focused) or after (response-focused) the emotion arises.

From a theoretical standpoint, models such as Gross's Process Model of Emotion Regulation (1998) provide a framework for understanding how individuals engage with emotions across a timeline, from situation selection and modification to attentional deployment, cognitive change, and response modulation. These stages help illustrate why early and flexible engagement with emotions is more effective than late-stage suppression, which often worsens emotional outcomes. Despite increased awareness, emotion regulation is not equally developed across individuals or supported within societal systems. Furthermore, cultural norms often discourage open emotional expression, especially among certain genders or communities, reinforcing maladaptive strategies like avoidance or internalization (Gross & Thompson, 2007).

Another approach to ER strategies is that of Garnefski and colleagues (Garnefski et al., Garnefski & Kraaij, 2006; Kraaij & Garnefski, 2019) who propose a 9-dimensional cognitive and a 5-dimensional behavioral ER model. The same authors have also developed psychometrically sound instruments to measure both major types of strategies (CERQ-Cognitive Emotion Regulation Questionnaire, and BERQ-Behavioral Emotion Regulation Questionnaire).

Cognitive emotion regulation strategies were defined as "*the cognitive way of managing the intake of emotionally arousing information*" (Garnefski et al., 2001, p. 1313), and identify nine major cognitive emotion regulation strategies that were grouped on theoretical considerations in two groups: (i) *adaptive/functional* (*acceptance* = reconciliation with the confrontation and implications of the adverse event; *positive refocusing* = the capacity to focus on other events in order to distract thinking from the present confrontation; *refocus on planning* = the ability to identify actions that could facilitate the confrontation with the negative event; *positive reappraisal*= finding positive aspects in an adverse confrontation, thus sustaining personal growth; *putting into perspective* = reducing the gravity of an event by comparing it to other, more important situations), and (ii) *maladaptive/dysfunctional* (*self-blame* = blaming oneself for the occurrence of the negative event; *rumination* = repetitive thoughts and feelings related to the adverse confrontation; *catastrophizing* = exaggerating the implications of the stressful situation and/or its consequences;

other-blame = attributing the causes of the adverse event and/or its consequences to others) strategies. Research indicates that adaptive strategies are related to better adjustment, resilience and psychological well-being, while maladaptive strategies may lead to serious psychological dysfunctions (anxiety, depression, distress) (Domaradzka & Fajkowska, 2018; Kraiss et al., 2020; Nolen-Hoeksema et al., 2008; Sanchez-Sanchez et al., 2025; Schäfer et al., 2017; Yu & Liu, 2025).

The way adults regulate their emotions is highly dependent on their emotion regulation current competences as well as early childhood experiences, particularly the emotional climate of the household. Parents, siblings, friends, society, but also animal companions may participate in the process of emotion regulation and co-regulation (Hawkins et al., 2022; Lindsey, 2021). Families offering supportive caregiving foster adaptive emotion regulation strategies, while rejection and overprotection was found to be linked to frequent use of emotion regulation strategies that thwart adaptation both in short- and long-term (Chaplin & Mauro, 2022). In the case of children and adolescents who live in emotionally unstable and inconsistent families, the presence of a companion animal may be a significant source of comfort and security, participating in the process of emotion co-regulation (Beetz et al., 2012).

Next, we will present in more detail the concepts of parental practices and pet-attachment and their relationship with psychological well-being and emotion regulation strategies**.**

Parental practices

Parenting appears to be a pivotal factor in shaping children's cognitive, emotional and social development, influencing their well-being and personality all throughout their lifespan (Belsky & Cassidy, 1994; Chaplin & Mauro, 2022). Parental practices are mostly defined as a set of behaviors involving caring for, guiding and educating children, to prepare them for the roles they will play both in society and their personal lives (Alwin, 2004). From birth, early interactions with caregivers lay the foundation for affect regulation, cognitive schemas and behavioral patterns, as well as form internal working models that influence later interpersonal relationships and psychological functioning (Bowlby, 1982; Rohmalimna et al., 2022).

Parental practices are often conceptualized along specific dimensions, including emotional warmth, rejection, and overprotection (Arrindell et al., 1999). While these practices may exist within broader parenting styles, each dimension exerts distinct and measurable effects on developmental outcomes (Goagoses et al., 2023).

Parental emotional warmth, as described by Liu and Wang (2021) and Tani et al. (2017), encompasses admiration, approval, unconditional affection, and consistent responsiveness to a child's needs. This emotional warmth manifests in parental behaviors such as praise, interest in the child's activities, and emotional availability (Buckley et al., 2024). It facilitates secure attachment relationships, which in turn promote self-regulation, empathy, and resilience (Pastorelli et al., 2021; Parsons et al., 2010). Furthermore, it serves as a protective factor against adverse experiences, fostering trust, reciprocity, and a positive self-concept (Anthony et al., 2019; Pinquart & Gerke, 2019).

In contrast, *parental rejection* is characterized by inattentiveness, criticism and emotional unavailability. This often leads to emotional deprivation and psychological maladjustment (Rohner et al., 2005; Wu et al., 2023). From the sociometer theory of self-esteem (Leary, 2012), rejection signals interpersonal devaluation, diminishing self-esteem, and increasing vulnerability to internalizing problems. Empirical research links perceived rejection to lower resilience (Parental Acceptance-Rejection Theory; Rohner et al., 2005), reduced emotional intelligence, and higher risk for negative self-schemas (Campos et al., 2013; Jopling et al., 2020).

Parental overprotection involves excessive control, intrusion, and restriction of a child's autonomy beyond their developmental needs (Bernstein & Triger, 2010; Parker et al., 1979). While often motivated by concern for safety, overprotection can limit opportunities for competence-building and independent problem-solving (Ungar, 2009). Manifestations of overprotection include excessive monitoring, disapproval of friendships, unsolicited assistance, and overindulgence (Gumber et al., 2024). Theoretical perspectives, such as Self-Determination Theory, suggest that thwarting autonomy and competence needs can impair motivation, resilience and emotional adjustment (Ryan & Deci, 2001). Empirically, overprotection has been associated with increased internalizing problems (Segrin et al., 2013) and, in some cases, elevated antisocial behaviors (Arslan et al., 2023).

Parenting dimensions operate within diverse cultural, familial, and contextual frameworks. For instance, in families affected by paternal alcoholism, children often report lower parental warmth and higher rejection (Suneel et al., 2022). Cultural context also shapes the meaning and impact of parenting practices. In collectivist societies, gender norms may influence differential treatment, with girls receiving more warmth and boys experiencing stricter discipline (Barnhart et al., 2013; Craig, 2006). Across contexts, maternal and paternal roles may differ in emotional involvement and behavioral expectations, though some studies find parallel patterns of overprotection and warmth across parents (Fagan et al., 2014). Furthermore, developmental outcomes associated with these practices extend beyond childhood. Longitudinal evidence suggests

that warmth predicts higher self-esteem and psychological well-being into adolescence and adulthood (Harris et al., 2017; Orth et al., 2015), while rejection forecasts poorer mental health and maladaptive coping (Lan & Wang, 2023). The long-term effects of overprotection remain inconsistent, with some evidence for short-term impacts on internalizing symptoms but weaker longitudinal associations (De Roo et al., 2022). Nonetheless, empirical evidence suggests that parental practices are strongly associated with emotion regulation. For instance, a warm and supportive parent-child relationship establishes a secure relational context that promotes optimal emotion regulation and empathic capacities (Pastorelli et al., 2021). Conversely, parental overprotection constrains children's autonomy, reducing self-efficacy and limiting their ability to acquire adaptive coping strategies (Segrin et al., 2013).

Empirical findings indicate that unmet needs for belonging in childhood may be buffered by adequate attachment to pets, as animal companions can offer secure and comforting relationships that foster resilience and well-being into adulthood (Beetz et al., 2012; Hawkins et al., 2022; Lindsey, 2021).

Pet attachment

Human-animal relationships have existed for millennia, evolving from primarily utilitarian roles to emotionally significant bonds, with companion animals, such as dogs and cats, holding a special place in these relationships (le Roux & Wright, 2020). Archaeological and anthropological evidence demonstrates that these relationships have served functional purposes across cultures for thousands of years (Boonzaier, 1997; le Roux & Wright, 2020), whereas, in modern contexts, pets are frequently viewed as family members, while their owners constantly invest considerable time, money, and emotional energy in their care (Adrian et al., 2009).

The concept of pet attachment explores the emotional bond between humans and their companion animals, mirroring elements found in human-human relationships (Blanchard et al., 2024). This bond includes proximity seeking, a secure base, a safe attachment figure, and separation distress (Zilcha-Mano et al., 2011). Pets can serve as attachment figures, providing comfort, security and emotional support, especially during stressful times (Zilcha-Mano et al., 2012). Attachment theory (Bowlby, 1982) has been applied to human-animal relationships as well, suggesting that secure attachment to pets may enhance well-being (Teo &Thomas, 2019). However, insecure attachment, characterized by anxiety or avoidance, may influence owner behavior and emotional responses differently (Zilcha-Mano et al., 2011). Measuring these bonds is crucial and tools such as the Lexington Attachment to Pets Scale (LAPS)

(Johnson et al., 1992) operationalize these attachment relationships, enabling research on cultural, demographic, and psychological correlates. Johnson et al. (1992) define pet attachment as a reciprocal interaction and emotional connection between family members and their pets. This relationship involves mutual attention and dependence between the owner and their pet. The LAPS proposes that pet attachment comprises three dimensions: *general attachment* (e.g., feeling happy near pets, spending time with them and believing they understand emotions); *people substituting* (e.g., the role of pets in the owner's life); and *animal rights/animal welfare* (e.g., the status of pets in the owner's home, expressed through individual knowledge and views on their rights and welfare).

Empirical research has shown a considerable, but not systematic link between human-pet attachment and various psychosocial benefits. These benefits include emotion regulation, increased social support, reduced loneliness, as well as physiological changes such as decreased blood pressure and cortisol, and increased levels of oxytocin (Barker et al., 2010; Friedmann et al., 2011; Hawkins et al. 2022). Pets can also enhance owners' self-esteem, life satisfaction, and coping capacity (Crawford et al., 2006; Hart & Yamamoto, 2015), although findings are not universally consistent. For instance, while some studies suggest a positive association between higher attachment and lower perceived stress (Lee & Chai, 2015; Wu et al., 2018), others have found no significant relationship between pet attachment and stress levels (Koontz, 2009; Wen Li et al., 2017). Beyond the direct benefits, attachment to pets indirectly promotes well-being through enhanced social connectedness (Brooks et al., 2018). Pets serve as social catalysts, aiding individuals in forming new human connections and fostering community engagement. Research found that pet ownership increases the likelihood of interactions within neighborhoods, facilitating friendships and informal social networks (Wood et al., 2015). Enhanced social support systems, fostered indirectly by pets, represent protective factors against depression, anxiety, and loneliness (McConnell et al., 2011). Nonetheless, pet attachment provides adults with an accessible, practical, and emotionally fulfilling way of managing daily stressors, contributing to a more balanced and emotionally stable life.

Demographic factors appear to influence pet attachment, although results are inconsistent across studies. Women often report higher attachment scores with pets than men do, possibly due to socialized caregiving roles (Andreassen et al., 2013; Martens et al., 2016). Single individuals and those without children frequently demonstrate higher attachment, sometimes viewing pets as fulfilling nurturing roles (Bodsworth & Coleman, 2001; Peterson & Engwall, 2019). Species differences are also noted: dogs generally elicit higher attachment scores than cats, possibly due to their behavioral responsiveness

and sociability (Sandøe et al., 2023). Cultural variations further shape pet attachment patterns. For example, in France, adapting the LAPS revealed that household composition, education, and gender influenced attachment differently compared to other countries, reflecting localized meanings of "pet" and varying norms of animal care (Blanchard et al., 2024). Lastly, although human-animal bond research has proliferated, findings on the influence of pet attachment on mental health are mixed. Some studies emphasize clear therapeutic benefits, such as reduced loneliness, lower depression, and enhanced social support (Beetz et al., 2012; Borgi et al., 2020; Ein et al., 2018), whereas others caution that excessive pet dependency may reflect or exacerbate underlying attachment insecurities (Zilcha-Mano et al., 2011). Despite substantial evidence of positive associations between pet attachment and psychosocial well-being, findings remain mixed, indicating the need for context-sensitive research. Variability in outcomes may depend on the interplay between attachment style, cultural expectations, demographic characteristics, and the specific role the pet plays in the owner's life.

The prerequisites of mental health – such as adaptive psychological reactions (e.g., emotion, behavior regulation) and well-being – are mostly shaped by the emotional climate in the family one is raised, with parenting practices playing a pivotal role in this process across development (Morris et al., 2007). Recent research shows that all around the world, the way adults consider the quality of the relationship they had in childhood with their parents and caregivers has a life-long importance in contouring their mental health (Rothwell & Davoodi, 2024). Parenting appears to be a pivotal factor in shaping a child's cognitive, emotional and social development, influencing their well-being and personality all throughout their lifespan (Belsky & Cassidy, 1994; Chaplin & Mauro, 2022). Furthermore, one of the most fundamental human motivations, the need to belong, is also experienced and shaped within the family context (Baumeister & Leary, 1995). Warm, responsive parental reactions help children develop appropriate emotion regulation strategies and sustain well-being, while harsh, controlling or neglectful parental practices increase long-lasting vulnerability for psychological maladjustment (Cui et al., 2014; Cui et al., 2022; Morris et al., 2007). In this way, parents, with the specific actions, strategies and behaviors they use in daily interactions can satisfy or undermine their children's need to belong (Allen & Miga, 2010). Literature indicates that thwarted needs may have significant long-term consequences for interpersonal relationships and mental health across the life-span (Allen & Tan, 2016; Cui et al., 2020). Fortunately, our needs to belong may not exclusively be met by humans. Along evolution, companion animals, religious, cultural practices (e.g., through shared identity by group belonging), etc. (Allen & Tan, 2016; Chen & Li, 2021; Herzog, 2014;

Lu, 2025; McCornell et al., 2011) proved to be useful substitutes for satisfying belonging. More specifically, companion animals in childhood may help children develop social and emotional skills that foster better adaptation in adulthood (Wanser, 2019). Thus, owning pet(s) in childhood may offer secure relationships based on trust, a sense of meaningful connection, and emotional comfort and may become significant attachment figures (Kurdek, 2009). Consistent retrospective and longitudinal research indicate that adequate (i.e., secure) attachment to pets may have a buffering role in stressful situations, thus enhancing mental health and well-being (Beetz et al., 2012; Northrope et al., 2025; Zilcha-Mano, et al., 2011).

OBJECTIVES

The major objective of the present pilot study was to investigate the relationship and explicative power in adult psychological well-being of remembered early parental practices, pet-related variables (childhood desire for pet, current pet ownership) and adult psychological mechanisms, such as cognitive emotion regulation strategies and current attachment to pets.

STUDY

Design

The current study employed a cross-sectional, correlational design with three analyses of covariance. The dependent variable consisted of psychological well-being, independent variables were parental practices (parental emotional warmth, parental rejection, and parental overprotection), childhood desire for pet and current pet ownership, and covariates were cognitive emotion regulation (adaptive and maladaptive), and pet attachment (general attachment, and people substituting).

Procedure

The research protocol of the present study was approved by the Ethics Committee of the Babes-Bolyai University, Cluj-Napoca, Romania [Research Ethics Approval No. 356/26.03.2025). Data was collected via an online questionnaire consisting of the instruments presented in the Materials section and administered through Google Forms. The link was disseminated by posting an invitation on social media platforms (such as Facebook and Instagram) and

university-affiliated groups (WhatsApp), encouraging participants to share the link with others. Upon accessing the survey link, participants first saw a brief introduction explaining the purpose of the study and what the participation entailed. Afterwards they were presented with a consent form. Those who agreed to participate (by checking the consent box) proceeded to the questionnaire pages. Next, participants answered a set of demographic questions regarding age, gender, area of residence, current pet ownership status, etc. After demographics, participants completed the set of psychological measures. On average, the survey took about 25-30 minutes to complete. The research was conducted in accordance with the ethical principles and with relevant data protection regulations.

Participants

A total number of 286 individuals initially accessed the online form. Since the number of male participants was very low, and we intended to keep a more homogenous sample, the final group investigated consisted of 196 female participants from Romania, with ages ranging between 18 to 63 years (M = 24.06, SD = 9.73). The majority, 74% (N = 145), resided in urban areas while 26% (N = 51) lived in rural areas. Of the 196 participants 145 wished for a pet in childhood and did have one (74%), while 51 wished for, but did not have (24%).

Based on this information, we constituted two groups (1= wished and had in childhood; 2=wished but did not have in childhood). Related to pet ownership in the present, 65% of our participants reported to own a pet, and 35% that they do not own one.

Due to the exploratory nature of the present study and the relatively reduces sample size, in order to maintain consistency with our design and enhance the interpretability of the interactions between parental practices and pet-related variables, each dimension of parental practices was dichotomized into two groups, namely: low vs. high parental warmth, low vs. high parental rejection, and low vs. high parental overprotection. In this way, we could provide more stable and interpretable estimates in the same time maintaining the consistency with the study's conceptual framework.

In order to estimate the minimum sample size, an a priori power analysis was conducted using G*Power 3.1.9.7 (Faul et al., 2013) for a between-subjects 2x2x2 ANCOVA. Assuming a small to medium effect size ($f^2 = 0.25$), $\alpha = .05$, power $(1-\beta) = 0.95$, the analysis indicated a minimum N = 153. Our obtained sample thus exceeded this threshold, providing adequate statistical power. A relatively high desired power (95%) was chosen to reduce the risk of Type II errors and ensure sensitivity to detect differences in psychological well-being.

Instruments

Perceived parenting practices were assessed with the modified version of the EMBU scale (EMBU-A, Egna Minnen Beträffande Uppfostran - Adult version, Castro et al., 1993; Muris et al., 2003). The EMBU-A measures perceptions of adolescents and adults regarding their upbringing by mother and father. The original scale was developed by Perris et al. (1980) and contains 81 items, each rated on a Likert-type scale (e.g., 1 = "No, never" to 4 = "Yes, always"), administered separately for each parent. These items yield four key dimensions of perceived parental rearing: *emotional warmth*, *rejection*, *overprotection*, and *favoring subject* (Perris et al., 1980; Arrindell et al., 1999). The current study used a Romanian version of the EMBU-A. An abbreviated 40-item version regarding both mother and father was administered, preserving the core content of the four EMBU-A dimensions. Participants were instructed to recall their childhood experiences with each parent and rate each statement accordingly. Higher scores on each of the subscales indicate greater perceived frequency of that specific set of parenting behavior (for example, a high *rejection* score means the participant recalls a high degree of parental rejection in childhood). In the current sample, the EMBU-A demonstrated adequate psychometric properties, with a strong internal consistency, Cronbach's α ranging from .77 to .95 on the four dimensions. Since most participants did not have siblings, we did not take into consideration the *favoring subject* subscale of the EMBU.

Psychological well-being was measured using Ryff's Psychological Well-Being Scale (Ryff, 1989). This instrument assesses six dimensions of positive psychological functioning: *autonomy*, *environmental mastery*, *personal growth*, *positive relations with others*, *purpose in life*, and *self-acceptance*. We employed a 44-item Romanian version of the scale, each item rated from 1 ("Strongly disagree") to 6 ("Strongly agree") (Kállay & Rus, 2014). The scale presents well-established psychometric properties, with Cronbach's α ranging from .80 to .91.

Cognitive emotion regulation strategies were assessed using the Cognitive Emotion Regulation Questionnaire (CERQ, Garnefski et al., 2002). The CERQ is a 36-item self-report measure that encompasses nine distinct cognitive coping strategies people use after experiencing negative life events. These strategies include adaptive (*positive reappraisal*, *positive refocusing*, *planning*, *acceptance*, *rumination)* and maladaptive ones (*catastrophizing*, *self-blame*, *other-blame*, and *putting into perspective)*, each item rated on a 5-point Likert

scale (1 = "Almost never" to 5 = "Almost always"). The present study used a Romanian version of the CERQ (Perţe & Miclea, 2011), which has shown overall satisfactory psychometric characteristics in Romanian samples. Several studies (Kállay & Visu-Petra, 2014; Kállay & Cheie, 2022) further suggested the exclusion of the *acceptance* dimension from the adaptive strategies, since it demonstrated poor correlation with the other dimensions. In the current dataset, the CERQ also demonstrated good properties. The individual CERQ subscales in our data had Cronbach's α ranging from .66 to .91, indicating adequate internal consistency (with slightly lower reliability for certain subscales).

Attachment to pets was measured by using the Lexington Attachment to Pets Scale *(*LAPS, Johnson et al., 1992). The LAPS consists of 23 items that assess emotional attachment to companion animals. Each item is a statement about feelings or behaviors exhibited by owners towards their pets. Respondents indicate their agreement on a 4-point Likert scale (1 = "Strongly disagree" to 4 = "Strongly agree"), with higher scores reflecting stronger bond with their pet. The LAPS incorporates three subscales: *general attachment*, *people substituting* and *animal rights*, although often the total score is used as an overall indicator of pet attachment (Johnson et al., 1992). Participants who currently owned a pet filled out the LAPS with reference to their pet, whereas those without one were instructed to skip these items. In the current study, the scale yielded a high reliability, Cronbach's α ranging from .86 to .93. The study used a Romanian version of the LAPS (the scale was translated and back-translated, as well as peer-reviewed for this research). Two items (item 8 and item 21) were reverse-coded during data processing so that higher scores consistently indicated greater attachment. Participants with missing values were excluded from the study.

RESULTS

Data were analyzed using IBM SPSS Statistics (Version 26) (IBM Corp, 2019). Table 1 presents means/medians, standard deviation, minimum-maximum scores, and indicators of internal consistency for all the assessed variables.

Table 1. Means/medians, standard deviation, minimum-maximum scores, and indicators of internal consistency for all the assessed variables

Variables	Cronbach's α	Mean/Median	SD	Min	Max
1. EMBU-Warmth	.95	85.83/90.00	18.98	35	112
2. EMBU-Rejection	.92	52.35/49.90	15.31	22	100
3. EMBU-Overprotection	.77	30.01/30.00	6.58	14	45
4. Psychological Well-being	.96	211.78/216.50	31.77	109	264
5. CERQ-Adaptive	.91	58.99/60.00	10.91	26	80
6. CERQ-Maladaptive	.82	46.42/46.00	8.77	25	74
76. LAPS	.93	70.60/75.00	16.48	26	92

Next, we conducted three separate univariate ANCOVA analyses, with psychological well-being as dependent variable. In each model we entered as a primary predictor one of the parental practices (high-low, warmth, rejection, overprotection) as dichotomous variable (high-low), along with the childhood desire to own a pet in (1 = desired and owned, 2 = desired but did not own), and current pet ownership (1 = own, 2 = not own). Adaptive and maladaptive emotion regulation strategies and adult pet attachment were included as covariates.

Table 2. Means and standard deviations of psychological well-being depending on parental warmth (low-high), childhood desire for pets (wished and had, wished and did not have), and current pet ownership (yes-no)

Dependent Variable: PWB				
EMBU-Warmth	**Childhood desire for pet**	**Current Pet Ownership**	**Mean**	**SD**
Low Warmth	Wished and had	NO	217.13	30.25
Low Warmth	Wished and had	YES	194.58	35.87
Low Warmth	Wished NOT had	NO	194.50	35.42
Low Warmth	Wished NOT had	YES	210.50	36.90
High Warmth	Wished and had	NO	217.90	26.51
High Warmth	Wished and had	YES	219.98	26.89
High Warmth	Wished NOT had	NO	203.00	48.56
High Warmth	Wished NOT had	YES	215.88	33.14

Thus, in the first step, we conducted a 2 x 2 x 2 ANCOVA in order to examine the effects of parental warmth (low vs. high), childhood desire for pet (wished and had vs. wished and not had), and current pet ownership (yes vs. no) on psychological well-being, controlling for adaptive and maladaptive emotion regulation strategies, and adult pet attachment (general attachment and people substituting). Levene's test was not significant, $F(7, 162) = 1.18$, $p = .317$, indicating that the assumption of homogeneity of variance was met. Results are presented in Tables 2 and 3.

Table 3. Effects of parental warmth, childhood desire for pet, current pet ownership, and covariates (emotion regulation strategies and pet attachment) on psychological well-being

	Adj. mean	SE	95% CI lower	95% CI upper	F	p	η^2p
CERQ-ADAPTIVE					43.88	<.001	.217
CERQ-MALADAPTIVE					14.27	<.001	.083
LAPS General attachment					5.38	.022	.033
LAPS People substitution					.96	.329	.006
EMBU Warmth					.00	.98	.000
EMBU Warmth Low	212.70	4.43	203.93	221.46			
EMBU Warmth High	212.86	4.76	203.45	222.26			
Childhood desire for pet					0.08	.76	.001
Wished and had	213.72	2.65	208.48	218.96			
Wished and did not have	211.83	5.87	200.24	223.43			
Current pet ownership					0.60	.43	.004
Yes	215.33	5.92	204.09	226.57			
No	210.22	3.17	203.95	216.50			
Main effects							
EMBU-Warmth-Categ					.00	.980	.000
Childhood desire for pet					.08	.769	.001
Current Pet Ownership					.60	.438	.004
Two-way Interactions							
EMBU-Warmth-Categ* Childhood desire for pet					1.52	.219	.010
EMBU-Warmth-Categ* Current Pet Ownership					.22	.638	.001
Childhood desire for pet* Current Pet Ownership					1.11	.294	.007
Three-way interactions							
EMBU-Warmth-Categ* Childhood desire for pet* Current Pet Ownership					.003	.954	.000

Note: Model Total R^2=.352, Error df=158

Our results indicated no significant main effect of parental warmth on psychological well-being was found, whilst controlling for the covariates, $F(1, 158) = .00$, $p = .980$, partial $\eta^2 = .00$. Similarly**,** no significant main effect of childhood desire for pet on psychological well-being was found, whilst controlling for the covariates, $F(1, 158) = .08$, $p = .769$, partial $\eta^2 = .00$. Neither was the main effect of current pet ownership on psychological well-being, whilst controlling for the covariates, $F(1, 158) = 0.60$, $p = .438$, partial $\eta^2 = .00$.

As for the two-way interactions, no significant one emerged between parental warmth and childhood desire for pet, $F(1, 158) = 1.52$, $p = .219$, partial $\eta^2 = .01$, nor did between warmth and current pet ownership, $F(1, 158) = 0.22$, $p = .638$, partial $\eta^2 = .00$, whilst controlling for the covariates. The effect of the interaction between childhood desire for pet and current pet ownership on psychological well-being was also not significant, whilst controlling for the covariates $F(1, 158) = 1.11$, $p = .294$, partial $\eta^2 = .00$.

The three-way interaction among parental warmth, childhood desire for pet, and current pet ownership, was not significant $F(1, 158) = .00$, $p = .954$, partial $\eta^2 < .00$**.**

Among covariates, adaptive emotion regulation, $F(1, 158) = 43.88$, $p < .001$, partial $\eta^2 = .21$, maladaptive emotion regulation, $F(1, 158) = 14.27$, $p < .001$, partial $\eta^2 = .08$, and general attachment, $F(1, 158) = 5.38$, $p = .022$, partial $\eta^2 = .03$) were significant predictors of well-being, while people substituting was not ($p = .329$).

The model explained 35.2% of the variance in psychological well-being (R^2=.352).

Next, a 2 x 2 x 2 ANCOVA was conducted in order to examine the effects of parental rejection (low vs. high), childhood desire for pet (wished and had vs. wished and not had), and current pet ownership (yes vs. no) on psychological well-being, while controlling for adaptive and maladaptive emotion regulation, and pet attachment, respectively general attachment and people substituting. Although Levene's test was significant, indicating unequal variances [$F(7, 162) = 2.42$, $p = .022$], the ANCOVA could be considered robust enough to proceed. Results are presented in Tables 4 and 5.

Table 4. Means and standard deviations of psychological well-being depending on parental rejection (low-high), childhood desire for pets (wished and had, wished and did not have), and current pet ownership (yes-no)

Dependent Variable: Psychological Well-Being (PWB)				
EMBU-rejection	**Childhood desire for pet**	**Current Pet Ownership**	**Mean**	**SD**
Low rejection	Wished and had	NO	216.90	27.25
Low rejection	Wished and had	YES	225.50	22.39
Low rejection	Wished NOT had	NO	183.00	32.52
Low rejection	Wished NOT had	YES	234.50	28.00
High rejection	Wished and had	NO	218.64	29.42
High rejection	Wished and had	YES	194.91	34.56
High rejection	Wished NOT had	NO	204.20	41.55
High rejection	Wished NOT had	YES	204.88	34.31

Table 5. Effects of parental rejection, childhood desire for pet, current pet ownership, and covariates (emotion regulation strategies and pet attachment) on psychological well-being

	Adj. mean	SE	95% CI lower	95% CI upper	F	p	η^2p
CERQ-ADAPTIVE					41.96	<.001	.210
CERQ-MALADAPTIVE					6.36	.013	.039
LAPS General attachment					6.47	.012	.039
LAPS People substitution					1.45	.230	.009
EMBU rejection					0.57	.45	.004
EMBU rejection Low	215.91	5.59	204.87	226.95			
EMBU rejection High	210.74	3.88	203.06	218.42			
Childhood desire for pet					0.14	.70	.001
Wished and had	214.62	2.54	209.60	219.63			
Wished and did not have	212.03	6.26	199.67	224.39			
Current pet ownership					0.01	.89	.000
Yes	212.88	5.96	201.10	224.65			
No	213.77	3.30	207.23	220.39			
Main effects							
EMBU-Rejection -Categ					.57	.451	.004
Childhood desire for pet					.14	.702	.001
Current Pet Ownership					.54	.897	<.001
Two-way Interactions							
EMBU-Rejection -Categ* Childhood desire for pet					.54	.460	.003
EMBU-Rejection -Categ* Current Pet Ownership					5.71	.018	.035
Childhood desire for pet* Current Pet Ownership					3.44	.065	.021
Three-way interactions							
EMBU-**R**ejection -Categ* Childhood desire for pet* Current Pet Ownership					1.07	.301	.007

Note: Model Total R^2=.395, Error df=158

After adjusting for covariates, no significant main effects on psychological well-being were found for parental rejection [$F(1, 158) = .57$, $p = .451$, partial $\eta^2 = .00$], childhood desire for pets[$F(1, 158) = .14$, p = .702, partial $\eta^2 = .00$], or current pet ownership [$F(1, 158) = .54$, $p = .897$, partial $\eta^2 < .00$].

The two-way interaction between parental rejection and current pet ownership interaction was observed, $F(1, 158) = 5.71$, $p = .018$, partial $\eta^2 = .03$. Further analyses indicated that among individuals with lower scores of perceived parental rejection, current pet owners reported lower well-being (Madj = 197.56), compared to non-owners (Mean = 214.84). Conversely, among those high in

parental rejection, current pet ownership (Mean = 226.37) was associated with slightly higher well-being compared to those who do not currently own a pet (Mean = 214.08). Next, a trend level interaction was observed between childhood desire for pet and current pet ownership, $F(1, 158) = 3.44$, $p = .065$, partial $\eta^2 = .02$. Among those participants who wished for and had a pet in childhood, current non-pet owners (Mean= 217.58) indicated slightly higher levels of psychological well-being than current owners (Mean = 211.68). Conversely, for those who wished but did not have a pet in childhood, current pet ownership (Mean = 212.61) was associated with somewhat higher levels of psychological well-being than no pet ownership (Mean = 198.14). Lastly, no significant two-way interaction emerged between parental rejection and childhood desire for pet, $F(1, 158) = 0.54$, $p = .460$, partial $\eta^2 = .00$.

As for the three-way interaction between parental rejection, childhood desire for pet, and current pet ownership, the effect on well-being, whilst controlling for covariates did not reach significance, $F(1, 158) = 1.07$, $p = .301$, partial $\eta^2 = .00$.

Significant covariate effects emerged for adaptive emotion regulation [$F(1, 158) = 41.96$, $p < .001$, partial $\eta^2 = .21$], maladaptive emotion regulation [$F(1, 158) = 6.36$, $p = .013$, partial $\eta^2 = .03$], and general attachment [$F(1, 158) = 6.47$, $p = .012$, partial $\eta^2 = .03$], while people substituting was not significant ($p = .230$).

The model explained 39.5% of the variance in psychological well-being ($R^2 = .395$).

Table 6. Means and standard deviations of psychological well-being depending on parental overprotection (low-high), childhood desire for pets (wished and had, wished and did not have), and current pet ownership (yes-no)

Dependent Variable: PWB				
EMBU-Overprotection	**Childhood desire for pet**	**Current Pet Ownership**	**Mean**	**SD**
Low Overprotect	Wished and had	NO	218.70	25.31
Low Overprotect	Wished and had	YES	217.20	31.10
Low Overprotect	Wished NOT had	NO	205.60	39.46
Low Overprotect	Wished NOT had	YES	210.00	37.88
High Overprotect	Wished and had	NO	215.33	33.08
High Overprotect	Wished and had	YES	205.72	32.71
High Overprotect	Wished NOT had	NO	179.50	37.47
High Overprotect	Wished NOT had	YES	216.00	32.01

Finally, we conducted a 2 x 2 x 2 ANCOVA in order to examine the effects of parental overprotection (low vs. high), childhood desire for pet (wished and had vs. wished but did not have), and current pet ownership (yes vs. no) on

psychological well-being, while controlling for adaptive and maladaptive emotion regulation, and pet attachment (general attachment and people substituting). Levene's test was not significant [$F(7, 162) = 1.16$, $p = .328$], indicating that the assumption of homogeneity of variance was met. Results are presented in Tables 6 and 7.

Table 7. Effects of parental overprotection, childhood desire for pet, current pet ownership, and covariates (emotion regulation strategies and pet attachment) on psychological well-being

	Adj. mean	SE	95% CI lower	95% CI lower	F	p	η^2p
CERQ-ADAPTIVE					52.45	<.001	.249
CERQ-MALADAPTIVE					16.66	<.001	.095
LAPS General attachment					5.58	.019	.034
LAPS People substitution					1.38	.241	.009
EMBU Overprotection					0.29	.58	.002
EMBU Overprotection Low	212.93	3.90	205.21	220.65			
EMBU Overprotection High	216.76	5.85	205.20	228.32			
Childhood desire for pet					0.01	.96	.000
Wished and had	215.02	2.73	209.62	220.41			
Wished and did not have	214.68	6.46	201.90	227.45			
Current pet ownership					0.84	.36	.005
Yes	218.17	6.42	205.48	230.86			
No	211.52	3.13	205.33	217.71			
Main effects							
EMBU- Overprotect -Categ					.29	.587	.002
Childhood desire for pet					.00	.961	.000
Current Pet Ownership					.84	.360	.005
Two-way Interactions							
EMBU- Overprotect -Categ* Childhood desire for pet					.73	.392	.005
EMBU- Overprotect -Categ* Current Pet Ownership					.61	.434	.004
Childhood desire for pet* Current Pet Ownership					.36	.547	.002
Three-way interactions							
EMBU- Overprotect -Categ* Childhood desire for pet* Current Pet Ownership					.02	.874	.000

Note: Model Total R^2=.342, Error df=158

No significant main effects on psychological well-being were found for parental overprotection[$F(1, 158) = .29$, $p = .587$, partial $\eta^2 = .00$], childhood desire for pet [$F(1, 158) = .00$, $p = .961$, partial $\eta^2 < .00$], and **c**urrent pet ownership [$F(1, 158) = .84$, $p = .360$, partial $\eta^2 = .00$], whilst controlling for the covariates.

As for the two-way interactions, no significant interaction emerged between parental overprotection and current pet ownership [$F(1, 158) = .61$, $p = .434$, partial $\eta^2 = .00$], parental overprotection and childhood desire for pet [$F(1, 158) = .73$, $p = .392$, partial $\eta^2 = .01$], and between childhood desire for pet and current pet ownership [$F(1, 158) = .36$, $p = .547$, partial $\eta^2 = .00$].

The three-way interaction among parental overprotection, childhood desire for pet, and current pet ownership was not statistically significant [$F(1, 158) = .02$, $p = .874$, partial $\eta^2 = .00$].

Significant covariate effects emerged for adaptive emotion regulation [$F(1, 158) = 52.45$, $p < .001$, partial $\eta^2 = .24$], maladaptive emotion regulation [$F(1, 158) = 16.66$, $p < .001$, partial $\eta^2 = .09$], and general attachment [$F(1, 158) = 5.58$, $p = .019$, partial $\eta^2 = .03$], while people substituting was not significant ($p = .241$).

The model explained 34.2% of the variance in psychological well-being (R^2=.324).

DISCUSSION

Psychological well-being has emerged as a central construct in contemporary mental health research (Ryff, 2014). Exploring the factors that may be associated with psychological well-being is particularly relevant given the increasing burden of mental health difficulties globally (GBD, 2019). Research has consistently emphasized the role of early parenting, emotion regulation strategies, and close relational bonds, including those with companion animals, as factors associated with patterns of well-being across the lifespan. It is well known that parental practices represent a pivotal developmental context through which individuals tend to develop emotion regulation skills and internal working models of relationships (Belsky & Cassidy, 1994; Rohmalimna et al., 2022). Warm and supportive caregiving is associated with secure attachment, empathy, and resilience (Pastorelli et al., 2021), while rejection and overprotection are associated with vulnerability to maladjustment, including heightened risk for internalizing symptoms (Rohner et al., 2005; Segrin et al., 2013).

Similarly, emotion regulation has been shown to be a powerful correlate of psychological well-being. Literature has constantly demonstrated that adaptive strategies are related to higher resilience and life satisfaction (Garnefski & Kraaij,2006), whereas maladaptive strategies are associated with distress and psychopathology (Aldao et al., 2010). Nonetheless, beyond human caregiving, the human-animal bond provides another context in which emotional needs are experienced. Companion animals often act as attachment figures, offering comfort, security, and a sense of belonging (Kurdek, 2009; Zilcha-Mano et al., 2012).

Adequate attachment to pets has been shown to buffer stress, enhance social support, and contribute to greater life satisfaction (Beetz et al., 2012; Brooks et al., 2018). Taken together, parental practices, cognitive emotion regulation, and pet attachment represent interrelated, yet distinct correlates of psychological well-being.

Our findings indicated that recollections of parental practices, respectively warmth, rejection, and overprotection, did not significantly explain psychological well-being in adulthood when controlling for emotion regulation strategies and dimensions of pet attachment (general attachment and people substituting). These results contradict theoretical perspectives that underline the proposed relevance of parenting recollections on adult psychological well-being (Wu et al., 2023) and suggest that proximal processes such as current emotion regulation strategies could be more strongly associated. As argued by Halverson Jr (1988), adult recollections of parenting may be shaped by biases and reinterpretations, reducing their reliability and predictive value compared to current psychological processes. Adaptive and maladaptive emotion regulation strategies and general attachment to pets consistently explained psychological well-being across all models, whereas recalled parenting practices did not. This suggests that adult well-being may be more strongly related to current coping capacities and relational resources than in memories of distant caregiving.

Across all three ANCOVA models, adaptive and maladaptive cognitive emotion regulation strategies emerged as the most powerful predictors of adult psychological well-being. Empirical research supports this conclusion: adaptive strategies, such as positive reappraisal are positively associated with life satisfaction and psychological well-being, whereas maladaptive strategies, such as rumination and catastrophizing, predict higher levels of distress and psychopathology (Aldao et al. 2010; Garnefski & Kraaij, 2006). In line with these findings, the present results reinforce the idea that the way adults tend to regulate their emotions in their daily life is a central feature associated with well-being. The strength of emotion regulation predictors also reflects the temporal proximity of measurement. While parental practices were assessed retrospectively, emotion regulation strategies and psychological well-being were measured as current processes. Proximal variables tend to show stronger associations with outcome measures than distal recollections, which are prone to bias (Gibson & Kim, 2010; Hagerty, 2003). This methodological factor, combined with the theoretical centrality of regulation, may explain why emotion regulation accounted for the largest proportion of variance.

In addition to emotion regulation strategies, the general attachment dimension of pet attachment emerged as a significant correlate of psychological well-being. This finding is consistent with previous research emphasizing that the quality of the emotional bond with pets is associated with psychosocial

adjustment (Wanser et al., 2019). Importantly, the results also revealed that the people substituting dimension of pet attachment did not significantly predict psychological well-being. This finding aligns with cautionary perspectives in the literature suggesting that substituting human social bonds with animal relationships may not consistently lead to adaptive outcomes (Barklam & Felisberti, 2023; Dowsett et al., 2020). While pets can function as complementary elements for lack of adequate human attachments, relying on them as replacements may reflect underlying relational insecurities or limited access to supportive social networks, which could limit their contribution to psychological well-being.

In contrast to emotion regulation strategies and pet attachment, in our sample of female participants neither childhood desire for a pet nor current pet ownership showed significant main effects on adult psychological well-being. Consequently, childhood pet experiences may not reliably translate to adult well-being outcomes once other factors, such as emotion regulation and current pet-attachment bonds, are taken into account. Similarly, current pet ownership did not directly explain well-being. This aligns with previous findings that pet ownership alone is not uniformly beneficial and may even be associated with stressors linked to caregiving responsibilities (Northrope et al., 2025). In the present study, pet ownership became meaningful only in combination with parental rejection.

Of the three parenting dimensions, only parental rejection showed a significant interaction with the pet-related variables associate to psychological well-being. This underscores the fact that rejection, as a particularly salient aspect of parenting that may be connected with the way individuals relate to pets later in life. Findings indicated that current pet ownership interacted with rejection such that individuals with lower levels of recalled rejection reported lower well-being as pet owners compared to non-owners, while those with higher levels of rejection reported slightly higher well-being as owners compared to non-owners (even if results were statistically significant, effect sizes were small). This finding may appear counterintuitive, but a plausible explanation could be the tendency to generalize attachment experiences from parent-child relationship to other relationships (Feeney, 2004). Individuals exposed to more rejection may develop insecure attachments but can nonetheless experience pets as more reliable and less threatening sources of comfort, thus deriving compensatory benefits from pet ownership. Conversely, for those who experienced less rejection and presumably developed secure attachment patterns, the relative value of pet companionship for psychological well-being may be diminished or even complicated by the additional responsibilities of pet ownership.

A trend-level interaction further suggested that the combined effect of childhood desire for pet and current pet ownership was significantly associated with psychological well-being in adulthood. Specifically, those who wished for

and had a pet in childhood but did not currently own a pet indicated slightly higher levels of psychological well-being than current owners, perhaps because the benefits of early bonds had already been internalized, making current ownership less essential. Conversely, for those who wished for, but did not have a pet in childhood, current pet ownership was associated with somewhat higher levels of psychological well-being, suggesting that current ownership may function as a potential source of unmet connection, related to addressing unmet attachment desires. Since this effect was not significant, but marginally close, results should be interpreted with extreme caution.

Limitations and future directions

While the present study employs valuable insight, several limitations must be acknowledged when interpreting the findings. First, our chosen design was cross-sectional and relied on retrospective self-reports of parenting practices, which limits any causal conclusions. We assumed that perceived parental practices had an effect on adult psychological well-being, but it is also conceivable that individuals' current dispositions or mental states determine how they remember their parents. For example, a currently depressed young adult might recall their childhood more negatively, exaggerating memories of parental rejection. Although our focus remained on perceptions of parental practices, which are inherently subjective, the possibility of recall bias remains, as well as the issue of confounding factors such as current mental health, which has not been measured.

Additionally, we mainly focused on variables regarding pet attachment and ownership, but other factors may also play a role in how parental practices translate to adult psychological well-being. For instance, we did not measure the presence of other supportive relationships, like close friends, siblings, or romantic partners. It may be that some individuals without pets presented higher well-being scores by leaning on human sources of support instead. A person with a very warm and understanding friend or partner might show resilience to parental rejection without necessarily needing or relying on a pet. Including a measure of social support or current attachment figures in future studies would help distinguish these: do pets uniquely influence psychological well-being, or would any secure relationship do? We also did not account for individuals' baseline attachment style, which could influence how they relate to both parents and pets. In short, there may be other variables affecting these dynamics.

Another limitation involves the characteristics of our sample, which constrain generalisability. The sample size was relatively small and our participants were primarily young female university students living in Romania, not representative of all age groups or levels of education. Replicating this

research in more diverse samples, including other cultural settings, gender, age groups, is an important next step. Cross-cultural comparisons would be enlightening to determine how universally applicable the pet as protective factor model may be.

The influence of a pet may depend on numerous factors: the type of pet (dog, cat, etc.), the length of ownership, the daily interactions and caregiving activities, as well as the compatibility of both pet and owner personality. In our study, due to the small variability, we pooled all pet owners together and did not analyze differences by pet type or other nuances. Furthermore, our pet attachment scale was a self-report of the owner's feelings toward the pet; we did not have supplementary sources to verify the quality of the reported human-animal bond. People might overstate their attachment or have biases in reporting it. Behavioral indicators (e.g., time actually spent interacting with the pet), or physiological stress relief when spending time with the pet, were not measured. Future research should delve deeper into the nature of the pet-owner relationship, such as comparing different kinds of pets, assessing attachment through both surveys and observable behaviors, and possibly considering the pet's behavior towards the owner as well.

For a better understanding of the relationships investigated, future research should employ longitudinal designs that follow participants from childhood into adulthood. Such an approach would also help clarify whether having a pet before or during stressful periods can alter the impact of those stresses, rather than relying on retrospective accounts. Moreover, all data in this study were collected via self-report questionnaires at a single point in time. Future studies would benefit from experimental designs and multi-method, multi-informant assessments. Using observational or biological data alongside self-reports could provide more convergent evidence and reduce concerns that the results reflect subjective bias. We also suggest that future research on these relationships could yield more refined insights by including indicators of social and subjective well-being.

Implications

Our findings highlight the importance of effective emotion management in the way psychological well-being is contoured. Preventive mental health programs (e.g., in schools, universities, workplaces) could incorporate training in coping skills like mindfulness, emotion regulation skills, problem-solving, and seeking social support. Strengthening individuals' ability to handle stress and regulate negative emotions may enhance their immediate quality of life and help them better deal with the effects of past adversities. For those coming from difficult family backgrounds in particular, acquiring adaptive emotion regulation

strategies may foster resilience. Learning such skills may empower individuals to manage their reactions more effectively and maintain equilibrium in the face of challenges, thereby promoting well-being.

Another practical implication involves considering the human-pet bond within therapeutic or supportive contexts. Although, in the present study, the interaction effect between parental rejection and current pet ownership cannot establish causality, it suggests that for some individuals, an appropriate relationship with companion animals may be associated with higher levels of well-being. Mental health professionals might consider, where appropriate, incorporating animals into therapy as an adjunct source of emotional support.

Finally, the predictive power of emotion regulation highlights its role as a modifiable target for intervention. Whereas parental practices cannot be altered retrospectively, adaptive regulation skills can be strengthened through training and psychotherapy, leading to measurable improvements in well-being. This practical implication reinforces the importance of focusing on emotion regulation in both research and applied settings when aiming to enhance adult mental health.

CONCLUSIONS

The results of our pilot study indicated that for the assessed sample of young adult women, cognitive emotion regulation strategies were the strongest correlates of psychological well-being among the variables examined. Even if early family climate cannot be changed retrospectively, emotion regulation strategies can be continuously and actively modified during development both by the individual and by current environment (human and animal agents). Our results also indicate that pets may also be important complementary sources of emotional support and security, especially for those individuals who remember experiencing high levels of parental rejection during childhood.

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The Impact of Emotional Intelligence on Religious Leadership

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ABSTRACT. This paper examines the influence of emotional intelligence (EI) on religious leadership, with an emphasis on pastors serving in Neo-Protestant Christian contexts. Drawing on major theoretical models of EI, including those of Mayer and Salovey, Bar-On, and Goleman, the study explores how core EI competencies such as self-awareness, self-management, social awareness, and relationship management shape leadership behaviors within religious communities. A systematic review was conducted following PRISMA guidelines, using scientific databases to identify peer-reviewed studies published between 2007 and 2025. Out of 140 initial sources, eight studies met all inclusion criteria. Their findings collectively indicate that EI contributes both directly and indirectly to effective pastoral leadership. Higher EI is associated with leadership styles marked by empathy, collaboration, principled behavior, conflict-resolution ability, and servant-oriented practices. Studies consistently highlight emotional self-regulation, empathy, and communication as essential components for managing complex interpersonal dynamics within churches. Deficits in EI skills, particularly self-regulation and social skills, correlate with reduced leadership effectiveness, diminished congregational trust, and difficulty managing organizational challenges. The review underscores a recurring gap across theological education programs, which often neglect emotional development despite its demonstrated impact on ministry effectiveness. The paper concludes by recommending the integration of EI training into pastoral preparation and calls for future research to develop validated EI instruments for religious contexts and to design targeted training interventions for spiritual leaders.

Keywords: Emotional Intelligences, Religion, Leadership

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INTRODUCTION

Religious leadership is not just an administrative function or a spiritual responsibility, but also a continuous process of interaction and influence on the religious community. Pastors are not only preachers, but also counselors, mediators, community leaders - people who work with other people and bear responsibility for the souls of others. In this context, emotional intelligence plays an essential role in defining effective religious leadership.

This research explores how emotional intelligence influences religious leadership. To successfully manage complex situations, be able to resolve conflicts, and provide emotional support to parishioners, pastors need a set of interpersonal skills. Although these skills are essential in any humanistic field, pastoral training tends to focus on theology and doctrine, while aspects related to emotional intelligence are completely neglected. For a clearer understanding, it is important to clarify what the vocation of a pastor means. The vocation of pastor involves being a spiritual leader of the church, and brings with it multiple roles such as: preacher, counselor, mediator. In Romanian culture, we identify two major categories of Churches: traditional and new Churches. Traditional Churches are, in general, churches that have at least 100 years of activity/existence in Romania as an organized denomination. The Romanian Orthodox Church, the Catholic Church, the Greek Catholic Church and the Protestant Churches are the denominations that perceive themselves as traditional historical churches. Neo-Protestant Churches (Baptists, Pentecostals, Seventh-Day Adventists and Jehovah's Witnesses) are perceived by the other churches as newcomers (Muntean, 2005).

This distinction is important because the role of the pastor and the priest is different depending on the categorization. Although there are similarities in pastoral activities, such as preaching the Scriptures, officiating at baptisms, weddings, and funerals, there are also differences in pastoral practice. Pastors of Neo-Protestant Churches are directly involved in community life, having a more informal relationship with parishioners. (Muntean, 2005) For example, in the Seventh-day Adventist Church, pastoral activities include tasks such as: visiting members at home, active missionary work, premarital and marital counseling. In traditional Churches, the priest has a much more dogmatic role and the relationship with parishioners is much more formal. For example, in the Orthodox Church, there are rituals that are not present in neo-Protestant denominations, such as: Sfeștania (the consecration of houses and workplaces) or Parastas (Commemoration of the dead).

In this context, in this paper we explore religious leadership in the contexts of Neo-Protestant Churches, in which pastors have an active leadership role and we seek to answer the questions: "Does emotional intelligence influence the leadership style adopted?" and "What are the main components of emotional intelligence necessary for effective religious leadership?"

The Concept of Emotional Intelligence

Emotional intelligence is conceptualized through several theoretical models that have been developed over the years.

The first model of emotional intelligence was proposed by Mayer & Salovey in 1990 and revised in 1997 and 2004. Initially, the Mayer & Salovey model defines emotional intelligence as a subset of social intelligence, which involves the ability to monitor one's own feelings and emotions, as well as those of others, to differentiate between them, and to use this information to guide a person's thinking and actions. (Mayer & Salovey, 1990). The authors propose three dimensions of emotional intelligence: recognizing and expressing one's own and others' emotions, emotional regulation, and using emotions in flexible planning, creative thinking, redirected attention, and motivation. In 1997, Mayer & Salovey completed this model with a fourth dimension of emotional intelligence, creating the four-branch model that contains the following dimensions: the ability to perceive emotions, to use emotions to facilitate thinking, the ability to understand emotions, and to manage emotions. (Mayer & Salovey, 1997). The model was revised in 2004 and 2016, with the authors adding other subbranches. In 2016, the authors expanded the model based on new scientific discoveries in the field and the development of cognitive psychology.

Contrary to the four-branch model proposed by Mayer, Caruso and Salovey, the Bar-On model proposes a different approach and considers emotional intelligence as an intersection between emotional and social competencies, skills and facilitators, which determine how effectively we understand and express ourselves, how well we understand others and are able to empathize with them, and the extent to which we can cope with daily demands. (Bar-On, 2006). The model is mainly based on the intrapersonal ability to be aware of one's self, to understand one's strengths and point to improve and to experience one's emotions and thoughts in a desirable way. On the interpersonal side, being emotionally and socially intelligent means having the ability to be aware of other people's needs, feelings and emotions, and also to build and keep balanced and meaningful relationships. Finally, being socio-emotional intelligent means being able to successfully manage changes in the personal, social and environmental areas, through an ongoing adaptation to immediate situations, and through problem solving and decision-making skills (Bar-On, 2006).

The emotional intelligence model developed by Daniel Goleman introduces a new approach, namely emotional intelligence in the organizational environment and the context of leadership. In addition to the general conceptualization of emotional intelligence, Goleman explores its impact on performance at work, in the organization and in leadership, arguing that an effective leader has a high level of emotional intelligence. (Gayathri & Meenakshi, 2013). Goleman (1998) conceptualizes emotional intelligence as a learned ability, based on emotional intelligence, that leads to very good performance at work. Boyatzis, Goleman, & Rhee (2000) consider that a person is emotionally intelligent when he/she demonstrates competencies such as: self-awareness, self-management, social awareness and social skills when a particular situation requires and also in appropriate ways, with sufficient frequency to be effective in the given situation.

Emotional Intelligence and Effective Leadership

To understand the impact of emotional intelligence in a religious context, it is important to understand its role in leadership in general. To this end, we reviewed the literature on the relationship between emotional intelligence and effective leadership.

Emotional intelligence is very important in the field of leadership, because it has an impact on the effectiveness of leaders and on the organizational climate. Leaders with a high level of emotional intelligence manage the emotions and needs of those around them better, strengthening trusting relationships and performance in the organization. (Kour & Ansari, 2024). Empirical research has demonstrated a consistent positive correlation between emotional intelligence and leadership effectiveness. Empirical research has demonstrated a consistent positive correlation between emotional intelligence and leadership effectiveness. Based on the study conducted by Kour & Ansari in 2024, we identify the following behaviors of leaders with a high level of emotional intelligence: good communication skills, express thoughts clearly, listen carefully and actively, and are able to adapt their communication style depending on the context. They have the ability to make effective decisions based on rational analysis and integrating emotional factors into the decision-making process. Effective leaders recognize and manage their own emotional states, facilitate honest discussions, and reach solutions that are beneficial to all parties involved. At the same time, they are able to understand and address the emotional needs of staff, creating a conducive environment and providing appropriate recognition to subordinates (Kour & Ansari, 2024). Goleman and Cherniss (2024) list a series of behaviors specific to leaders with high emotional intelligence, namely: empathy, the ability

to manage one's own emotions, the ability to influence, awareness of the emotional impact on others, the correct and authentic expression of emotions, the ability to provide constructive feedback and the ability to recognize and manage one's own emotions in crisis or high-tension situations.

Another important aspect of leaders with high emotional intelligence is that they have the ability to influence the behavior of subordinates and shape the culture of the organization. They can promote a positive work environment based on trust, respect, and psychological safety, can enhance employee organizational commitment, and can contribute to improving team dynamics through communication and collaboration (Kour & Ansari, 2024). A leader with a high level of emotional intelligence can have a significant impact on employee performance, and studies show that the impact of emotional intelligence is twice as high as that of IQ (Goleman & Cherniss, 2024).

Goleman and his colleagues introduced the concept of "primal leadership" to identify the fundamental principle of leadership, namely that the primary task of leaders is to generate positive emotions in subordinates. The authors emphasize that the primary work of a leader is emotional in nature (Goleman, Boyatzis, & McKee, 2002). To describe the dynamics of leadership, the authors use the term "attunement" instead of the term "alignment". Alignment refers to the establishment of a common goal at the team or organizational level, while synchronization emphasizes the relationship between team members and its quality. In this context, leadership becomes a group function, in which the leader influences the dynamics of the team through his emotions. He becomes an emotional guide, shapes the affective climate of the team and leads it towards a state of resonance, that is, a climate in which each member has the chance to explore his potential. When the leader uses control methods based on fear or shame, he will create a climate based on dissonance, which will negatively affect the emotional dynamics of the group (Goleman, Boyatzis, & McKee, 2002). Emotional intelligence is presented as a dynamic condition that can be learned through the lens of emotional skills. The authors divide emotional competence into two general areas, classified into four categories: (1) Personal competences include self-awareness (the ability to understand one's own emotions and their impact on others), self-assessment and self-confidence, and self-management (emotional self-control, transparency, adaptability, goal orientation, initiative, and optimism). (2) Social competences include social awareness (empathy, organizational awareness, i.e., understanding organizational relationships and politics), service orientation, and the ability to manage relationships through inspirational leadership, influence, and development of others. The leader is the catalyst for change, facilitates conflict management and connection building, and has the ability to work in a team and coordinate. The authors emphasize that an effective leader should possess at least one competency from each of the

four categories of emotional intelligence. Goleman and the authors describe six leadership styles based on emotional intelligence: visionary leadership, coaching leadership, affiliative leadership, democratic leadership, pacesetting leadership, and commanding leadership. An effective leader is able to navigate these styles depending on the context and the need determined by the situation (Goleman, Boyatzis, & McKee, 2002). A common myth in the field of leadership is that true leaders are born, but the literature challenges this claim, arguing that leadership skills can be learned. Old behaviors can change and it is possible to develop emotional intelligence, but self-awareness and natural and timely feedback from others are crucial. This learning style involves training the limbic system through experience, practice, and emotional involvement. To learn to develop emotional intelligence, the individual's desire to make a change and grow is needed, an environment that supports change and provides the opportunity to practice new behaviors, and constant repetition so that new behaviors become habits (Goleman, Boyatzis, & McKee, 2002).

Caruso, Fleming, and Spector (2014) approach emotionally intelligent leadership through the lens of Mayer and Salovey's model, in which emotional intelligence is seen as a set of four interconnected cognitive skills, with the help of which the effective leader is able to perceive, understand, use, and manage his or her own and others' emotions. In this way, the leader is able to make good decisions, build healthy and stable relationships, and thus contribute to organizational performance. It is essential that these skills are used consciously and not intuitively. Emotional intelligence is essential for effective leadership. It is not a fixed trait, it is not innate, it is a skill that can be learned through awareness and practice. Navigating complex environments requires emotional stability, awareness of emotions, their management, flexibility in adopting leadership styles so that leaders can make good decisions, balance organizational success and subordinate satisfaction.

Religious Leadership

Religious leadership is a key area of study and practice within practical theology. Leadership is important at both the community or congregational level and at the institutional level of religious life. The history of religious leadership, whether exercised by clergy, laity, or a combination of both, dates back to biblical times. However, the exact role and meaning of this leadership style are subjects of ongoing debate in both academic and church circles. Biblical texts provide clear guidance on the qualities of a religious leader, but the influence of fields such as business, social science, and political studies has left its mark on contemporary perceptions of leadership in the church (Jinkins, 2012).

Religious leadership is defined as leadership exercised in religious contexts by individuals who identify with that particular context, including church leaders from various Christian traditions, and leaders from other religious communities or non-profit organizations, that have an explicit religious purpose (Storey et al., 2017).

As part of practical theology, religious leadership shares its normative, theological, and even eschatological orientation, being concerned with both enlightenment and the promotion of health in faith communities and religious organizations. Religious leadership is part of practical theology and the goal is to help religious communities develop in the life of faith. Researchers are usually influenced by the values of the denomination to which they belong, but often collaborate with people from other faiths. The field of religious leadership explores areas of study about leadership itself, organizational behavior, management, resource management, finance, conflict management, power dynamics, change processes, and professional ethics (Jinkins, 2012).

Management researcher Robert Greenleaf offers a conceptualization of religious leadership as "servant leadership." The author's goal was to change the public's perception of the relationship between leader and follower. (Jinkins, 2012; Smith 2005). The theory states that a successful leader is primarily willing to serve others. The author argues that it is possible to combine the roles of servant and leader. This fusion was authentically portrayed by Jesus Christ, whose work on earth is a perfect example of servant leadership (Giorgiov, 2016). The servant leader is characterized by a sincere desire to serve and help others. His goal is not the intention to exercise power to achieve personal goals (Smith, 2005). The conscious decision to serve others automatically leads him to lead. The servant leader's priority is to ensure that the needs of those around him are met. The success of this leadership style boils down to the questions: Do those served grow and develop as people? While being served, do they become healthier, wiser, freer, more eager to serve in turn? (Greenleaf, 2002). The servant leader's goal is to persuade people's desire to become better, and organizational success is an implicit result of servant leadership. (Smith, 2005). James MacGregor Burns defines leadership as the ability to influence followers to act towards the fulfillment of common goals. Transformational leadership involves moral and personal development of both leaders and followers (Burns, 1978). Rowan Williams, an Anglican theologian, says of religious leadership that it is a form of communicative theology, that is, it is the ability to witness the Gospel in such a way that it is relevant in multiple cultural contexts and can be understood by any population. In this approach, leadership involves an openness to other areas of knowledge, especially that of organizational behavior and managerial practices (Williams, 2000).

When we talk about religious leadership, we cannot omit the biblical vision of it. The New Testament presents a counterintuitive vision of leadership, exemplified by Jesus Christ, who refuses domination and promotes the shepherd model, focused on care, protection, and spiritual shepherding of the community. The Chronicles of the Old Testament recount the lives of great leaders such as Moses, Joshua, kings such as David or Solomon, each distinguished by skills that current specialized literature recognizes as fundamental to successful leadership. At the same time, the Old Testament portrays God as a supreme, jealous ruler with an authoritarian leadership style. In contrast, the New Testament presents a God incarnate in human flesh, who assumes the role of unconventional leader for Jewish cultural traditions. Through His pastoral leadership style, Jesus Christ refused to rule over others and presented us with a leadership style characterized by service. The New Testament approach to leadership favors the image of the pastor. The apostle, presbyter, or elder invested with authority is considered the shepherd of the community. The pastor has the responsibility to guard the community from internal and external dangers (Jinkins, 2012). The Early Christian Church was characterized by a hierarchical structure, in which leadership functions developed progressively. In this context, the central mission of spiritual leaders was to preserve the continuity of faith, to protect the spiritual integrity of the emerging Church, and to shepherd parishioners towards a pious life based on the moral principles and values of Christ's teachings.

In the first half of the 20th century, depending on the geographical and religious context, the role of the religious leader was to perpetuate traditional interpretations of religious sources and truths. These interpretations were made by religious leaders, who received theological training within their own tradition. The classical model involved maintaining religious traditions and caring for souls within a parish. In this way, they consolidated a symbolic world through which the meaning of life at that time was understood (Storey et al., 2017). In the second half of the 20th century, there was a shift in the way religious leaders understood the pastoral calling. The focus shifted from tradition and institution to the individual. The development of the field of psychology also impacted the practice of religious leaders, generating new professional standards for the practice and training of pastoral care. (Storey et al., 2017). Three leadership styles dominated Protestant congregations: the pastoral director, the pastor, and the spiritual guide (Jinkins, 2012). In the pastoral director model, the leader has the primary responsibility to build and unify the Church into the people of God. His mission is to, as a leader, urge God’s people to service and fulfill the divine mission in the local community and in the world (Jinkins, 2012; Niebuhr, 1956).

Seward Hiltner, one of the main founders of pastoral theology as a modern discipline, conceptualized ministry through the lens of "shepherding." He understood shepherding in accordance with two other perspectives, namely communication and organization. In this model, the pastor as a religious leader promotes the organization of the Church as a unitary body. Each individual member is connected and supports each other. The head of the body is Christ. In other words, the Church is made up of organs that make up one body, of which Christ is the head. The role of the pastor is to nourish the Church with spiritual food and to protect it, to protect it from external and internal threats (Jinkins, 2012; Hiltner, 1958). The leader aims for the organization to be healthy, to grow and mature, to be able to adapt to new changes in the environment. Stability, resilience and achievement of goals define the success of religious leadership. The leader has the role of motivating and maintaining the emotional balance of the religious community. To achieve these goals, the leader must have a stable, well-defined identity, not confused with the anxieties and conflicts of the community (Jinkins, 2012; Friedman, 1985).

Storey et al. (2017) address the challenges of religious leadership in the modern era, characterized by religious and community diversity. If in the past, the religious leader dictated community norms that had to be followed by the collective, today, individualism puts its mark on religiousness and leadership. Because of postmodern individualism, people feel entitled to create their own religious system. Blind obedience to a religious institution or identification with it no longer represents the standard experience of religiosity. Consequently, religious leaders must become more actively involved in the individual spiritual development of parishioners. In addition, they must understand the personal processes of attribution of meaning of each member in order to understand how to mobilize people within religious communities. In the contemporary context, religious leadership is undergoing a transition from a model centered on the institution and formal religiosity, to individualized spiritual guidance. The emphasis is placed on the personal spiritual development of parishioners with a focus on spiritual experiences. Thus, in addition to the function of representatives of the institution, religious leaders receive a new task, namely, to act as guides in spiritual development. The author presents two models of religious leadership, the modern and the postmodern. In the modern model, the leader is a central figure, with hierarchical authority and has privileged access to sources of religious teaching. The leadership style is characterized by command and control over parishioners. People are faithful members of a religious institution, and religious identity is characterized by tradition and formality. In the postmodern model, the role of the religious leader is redefined. The leader is characterized

by availability for collaboration, authenticity, and public responsibility. Believers have the freedom to personalize religious experience, preserving elements of tradition, but at the same time personalizing their spiritual identity according to their own needs and interests. The leader is no longer the representative of institutional authority, but a guide in the personal spiritual development of each believer who supports diversity within the religious community. Religious discourse also changes, becoming more oriented towards psychological and relational domains, with fewer ideological elements (Storey et al., 2017).

This reconfiguration of the role of the religious leader, from institutional authority to personalized spiritual guide, has also generated a process of hybrid professionalization. Religious leaders are no longer just representatives of the religious institution holding hierarchical power, but become professionals specialized in responding to the social, cultural and emotional demands of the community (Storey et al., 2017). Hybrid professionalization of religious leadership is the process by which religious leaders redefine their traditional collectivist roles to the demands of a postmodern, individualistic society. Spiritual competencies are complemented by organizational, psychological and managerial skills. The religious leader no longer acts exclusively as a representative of the religious institution, but becomes a professional capable of responding to the needs of the community. Thus, the religious leader assigns himself multiple roles such as: religious entrepreneur, guide of meaning, culture shaper and identity builder. He is also able to adopt traditional values to current contexts. In this context, the authority of the religious leader is no longer given by the institution, but by the relevance and impact he has in the life of the community. Given the diversity of religious, cultural, ethnic, and organizational contexts, religious leadership cannot be reduced to a universal model. Researchers propose a contextual approach, in which the tasks and roles of the religious leader vary depending on the organizational stage of the community (e.g., whether it is growing, declining, or revitalizing) and on the particularities of the community such as size, culture, and demographic composition (Storey et al., 2017).

In this sense, religious leadership is no longer just a promoter of tradition, but receives a multidisciplinary dimension. Theological skills remain fundamental, but they are no longer sufficient. To successfully fulfill his calling as a spiritual guide, the religious leader needs emotional intelligence to be able to influence, motivate and understand the needs of the community. Table 1 summarizes the theoretical approaches to religious leadership identified in the literature and included in this work.

Table 1. Theoretical approaches to religious leadership

Definition	Features of the model	Authors
The model defines religious leadership in terms of shepherding and organization.	The emphasis is on spiritual care and organizing the community into a unified body.	Hiltner (1958)
The concept of transformational leadership in a religious context is substantiated.	The pastor influences, the emphasis is on the moral and personal development of the leader and followers.	Burns (1978)
It highlights how important it is for the balance of the community that the leader has a clear identity.	The leader must have emotional stability, autonomy, adaptability, and know how to lead effectively.	Friedman (1985)
Religious leadership is defined as communicative communication.	The emphasis is on cultural contextualization, interdisciplinary leadership, and communication relevant to the present.	Williams (2000)
The author proposes the servant leadership model.	The leader prioritizes service, caring for others, and guiding those served in personal transformation.	Greenleaf (2002)
The author proposes three models of Protestant leadership: pastoral director, shepherd, and spiritual guide.	The leader has a prophetic mission; he does not lead, he shepherds, he integrates organizational and spiritual dimensions into the administration of the community.	Jinkins (2012)
The author presents the transition from institutional leadership to personalized leadership, centered on the individual and context.	Leadership becomes contextualized, and the leader has multiple roles: he is a spiritual guide and a culture shaper.	Storey et al. (2017)

METHODOLOGY

To test the hypotheses that: emotional intelligence influences the leadership style of religious leaders and that there are specific components of emotional intelligence essential for effective religious leadership, we applied a qualitative methodology, a systematic review. The literature review was conducted based on the PRISMA protocol. This method allows for structuring data and extracting relevant conclusions based on studies conducted in the field.

The databases used to identify the studies were: ResearchGate, PubMed, Google Scholar, Web of Science, Sci-Hub. These sources are scientific databases, which contain updated and scientifically validated sources. ResearchGate allows

direct access to the works of researchers. If these are not accessible on other platforms, it offers the possibility of obtaining the full versions of the articles. PubMed contains specialized literature in the field of mental and emotional health. Google Scholar provides access to many scientifically validated academic sources relevant to the subject. Web of Science is an academic database and provides access to peer-reviewed articles that guarantee the validity of the sources.

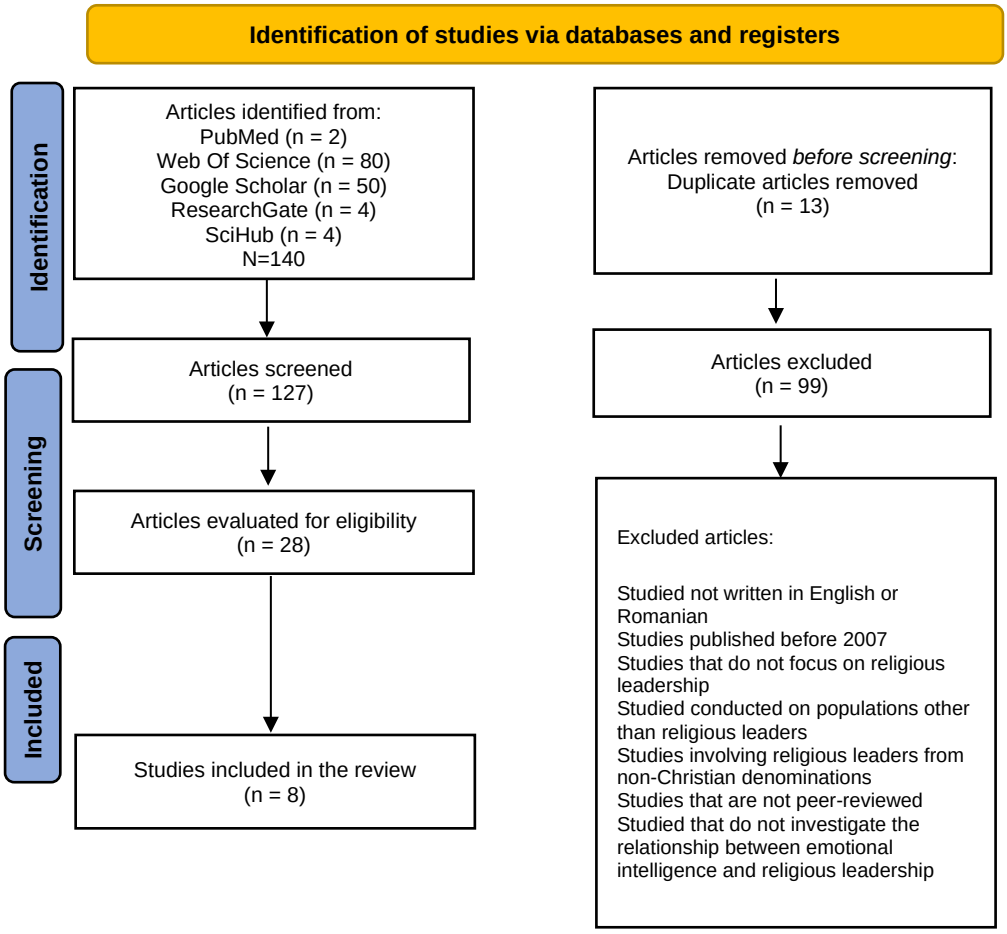
The keywords used in the search were: emotional intelligence AND pastoral leadership; emotional intelligence AND religious leadership; pastoral leadership AND Emotional Intelligence AND impact; servant leadership AND emotional intelligence AND pastoral; servant pastoral leadership AND emotional intelligence; emotional intelligence AND pastoral leadership effect.

Inclusion-exclusion criteria

The inclusion criteria for the studies on which this analysis was based were: (1) studies in English or Romanian; (2) published from 2007-2025; (3) studies conducted on religious leaders, women or men; (4) religious leaders belonging only to Christian denominations; (5) studies that used scientifically validated instruments to measure constructs, (6) studies that were peer-reviewed (7) studies investigating the connection between emotional intelligence and religious leadership. The exclusion criteria for articles and studies were: (1) studies that were not in English or Romanian (2) studies older than 2007 (3) studies that do not target religious leadership (4) studies that were conducted on a population other than that of religious leaders. (5) studies that were conducted on religious leaders belonging to denominations other than Christian ones (6) studies that are not peer reviewed (7) studies that do not investigate the connection between emotional intelligence and religious leadership.

RESULTS

Following the search process, we identified 140 studies. Before screening, 13 duplicate articles were removed, leaving 127 articles for screening. Following the second stage of selection, based on title, abstract, keywords, and discussions, 99 studies were removed, leaving 28 studies. In the third stage of selection, exclusion and inclusion criteria were applied, all studies were reviewed in detail, and 8 relevant studies remained, which were included in this paper. The entire process can be seen in detail in Figure 1.



The purpose of this research was to identify the main theoretical models, the instruments used and the conclusions relevant to the research questions, regarding the relationship between emotional intelligence and religious leadership. For each study, key aspects such as objectives, methodology used, sample, instruments used, results and final conclusions have been presented. A synthesis of all the studies analyzed can be seen in table 2.

Brown's (2024) study investigates the connection between emotional intelligence and pastoral leadership effectiveness among religious leaders in the Richmond, Virginia, metropolitan area. The study focused on emotional intelligence traits, demographic characteristics of participants, and the quality

of the pastors' interpersonal relationships. The study addresses the lack of credibility and influence that pastors have among the American population as well as the lack of research on emotional intelligence among religious leaders and religious organizations. The study assumes that emotional intelligence is essential for effective leadership among religious leaders and that it can contribute to improving interpersonal relationships and adopting conflict resolution strategies. The study has two objectives. First, to determine whether emotional intelligence is related to emotional traits, demographic characteristics, and interpersonal relationships among pastors in the Richmond, Virginia, metropolitan area. Second, the study sought to determine whether emotional intelligence provides a set of skills necessary for effective pastoral leadership. Although the empirical results of the study conducted by Brown (2024) did not confirm significant correlations between emotional intelligence and the variables pursued by the author, and the small sample size reduces external validity, the study remains relevant through its solid theoretical contribution based on the works of Salovey, Mayer, and Goleman. These models were used as a theoretical framework in this paper, integrated together with a theological framework that links emotional intelligence to the leadership style of Jesus Christ. Due to the direct thematic relevance of the study and the solid conceptual support of the relationship between emotional intelligence and religious leadership, the study is included in this systematic review, not for its empirical value, but for its potential to substantiate future rigorous research in the field of spiritual leadership.

The study done by Carrington (2015), examines the relationship between emotional intelligence and servant leadership behaviors among leaders and pastors in the Pentecostal Church. This study is a quantitative, cross-sectional study with a sample of 81 licensed ministers from the United Pentecostal Church, International. The instrument used to measure emotional intelligence was the Trait Emotional Intelligence Questionnaire – Short Form, TEIQue-SF. Servant leadership behaviors were measured with the Servant Leadership Behavior Scale, SLBS. The study identified a moderate and significant positive correlation between the global score of emotional intelligence and leadership behaviors specific to a servant leadership style. A significant positive correlation was also identified between the dimensions of emotional intelligence (self-control, emotionality, sociability) and the dimensions of servant leadership (authentic self, voluntary subordination and transformative influence). The cross-sectional design represents a limitation because it does not allow the establishment of causality. Also, the use of self-report instruments can lead to subjective distortions and response biases. Due to the small and homogeneous sample, the results cannot be generalized to the entire population. The results show that religious leaders with higher levels of emotional intelligence tend to exhibit more behaviors typical

of servant leadership. This fact shows that emotional intelligence is associated with servant leadership style in religious context. The study identifies certain specific dimensions of emotional intelligence that are significantly associated with servant leadership characteristics. The most relevant components of emotional intelligence in servant leadership are: emotionality, well-being which includes the dimension of self-esteem, happiness and optimism, self-control and sociability. The study shows that emotional intelligence is positively correlated with servant leadership behaviors among religious leaders, as leaders with higher emotional intelligence exhibit more servant leadership behaviors (Carrington, 2015). We can thus conclude that the level of emotional intelligence influences the leadership style adopted.

Ishola-Esan's (2019) study investigates the role of emotional intelligence in pastoral leadership effectiveness in churches in Southwest, Nigeria, a region marked by recurrent conflicts between church leaders and congregation members. The study starts from the hypothesis that traditional theological training does not sufficiently include the emotional development of future pastors. As a result, they do not develop social and interpersonal skills well enough. The study aims to determine whether emotional intelligence is an important competency or not for effective pastoral leadership. The objectives of the study are: to explore what knowledge pastors have about the concept of emotional intelligence, to what extent they consider emotional intelligence to be an important competency for effective leadership and to identify which competencies are relevant for religious leaders. Another objective is to see whether these competencies are integrated into pastoral practice, namely to examine whether there is a relationship between emotional intelligence and the effectiveness of pastoral teams. The study used a descriptive design and a self-designed questionnaire, based on the literature with structural items, validated by experts and with high reliability (r=0.90). The sample consisted of 120 Baptist pastors from Southwest Nigeria. The data were statistically analyzed by percentages and Pearson correlation. The results of the study answer the question regarding the influence of emotional intelligence on leadership style. Religious leaders not only have theoretical knowledge, but also have an openness to integrate emotional intelligence into their practices. Leadership effectiveness may act as a moderator in the relationship between emotional intelligence and the leadership style adopted by pastors. Those who have a high level of emotional intelligence demonstrate several traits of an empathetic, relationship-oriented, and collaborative leadership style. In other words, the study confirms that emotional intelligence, defined by self-knowledge, self-management, social awareness, social skills and relationship management, is an important factor for the effectiveness of religious leaders and leads to the adoption of a relationship-oriented, empathetic and effective leadership style in managing human interactions and conflicts within religious

communities. The competencies that were identified as necessary for a religious leadership style are based on Goleman's theoretical conceptualization. These competencies are: self-awareness, managing one's own emotions, social awareness, social skills, and relationship management. These are the most common competencies that pastors integrate into their leadership style. This result directly answers the question of what are the necessary emotional intelligence competencies for effective leadership.

Roth, J. (2011) investigated the relationship between emotional intelligence and pastoral leadership in growing and declining Christian churches in the United States. The aim of the study is to identify whether certain emotional intelligence competencies are significantly different in the two groups compared according to church status, i.e. growing or declining. The study addresses the lack of literature on the use of emotional intelligence in the context of pastoral leadership. The author conducted a cross-sectional survey study. The sample included 41 pastors (25 from growing churches and 16 from declining churches). The instrument used was the Bar-On EQ-i (Emotional Quotient Inventory), a self-report questionnaire. The small sample size and the self-reported nature of the data are limitations that do not allow the results to be generalized to the entire population, but they provide a direction for future research. The results of the study suggest that emotional intelligence influences pastoral leadership style through its correlation with leadership effectiveness. The author's conclusion is that there are certain dimensions of emotional intelligence that are indispensable for pastors serving in declining churches. Although the study does not specifically define leadership style, the results show that pastors in growing churches (where leaders are assumed to be more effective) have higher levels of certain emotional intelligence competencies. As a result, the level of emotional intelligence directly influences the leadership style adopted by religious leaders and guides their leadership behaviors.

Heryanto et al. (2025) have investigated the relationship between spiritual leadership and emotional intelligence among religious leaders. The study explored the role of self-management as a mediating and moderating variable. The authors used a quantitative design, and the data were collected with a self-report questionnaire, based on a Likert scale with 17 indicators distributed between the three main variables: spiritual leadership, emotional intelligence and self-management, the special concept for this study. The authors tested the validity and reliability of the study to ensure that it would accurately measure the proposed concepts. To test the validity, the authors used the loading factor technical criterion, which indicates the extent to which the question targets the studied concept. All questions exceeded the minimum threshold of 0.7, as a result the questionnaire was considered valid. The results show that there is a significant relationship between spiritual leadership and emotional intelligence. They also showed that

self-management of emotions shapes effective leadership behaviors within religious organizations. Based on the results, the authors concluded that self-management can greatly impact emotional intelligence. This ability guides leaders in managing their thoughts, attitudes, allows for the control of emotions and adaptation to new situations. These skills are essential for effective religious leadership. In conclusion, the better a leader can self-manage, the more emotionally intelligent he is, which will implicitly influence the leadership style adopted. In addition to self-management, the study highlights two skills as essential for an emotionally intelligent leader: social awareness and self-awareness. These are important for the leader to effectively manage interpersonal dynamics within churches.

Francis et al. (2019) explores the level of emotional intelligence among Anglican clergy in Wales. The central aim of this study was to replicate and extend previous research into the emotional intelligence of religious leaders in the UK. In previous research, the authors observed that religious leaders in the UK have lower levels of emotional intelligence than the general population. As a result, this study targeted Anglican religious leaders in Wales to complement and add to previous research. The study is a quantitative survey, with a sample of 364 clergy from Wales. To collect data, they used the Schutte Emotional Intelligence Scale instrument, composed of 33 items. As a theoretical reference, the authors used the Goleman model of emotional intelligence. The authors do not specifically define leadership styles, but the study data suggest an implicit relationship between emotional intelligence and the adopted leadership style. Given the nature of pastoral ministry, based on empathy and relationships with parishioners, emotional intelligence skills become key tools in adopting an effective leadership style, aligned with the needs of the churches. The analysis of the responses of each participant shows us that although most religious leaders have a moderate level of self-awareness, many do not have a level of emotional intelligence high enough to be able to deal with the difficulties that arise in ministry. This indicates that the religious leader who has low emotional intelligence will have difficulty dealing with the challenges encountered in ministry, which means that the pastor has an ineffective leadership style and is not aligned with the needs of the church. The study identifies two components of emotional intelligence that are absolutely necessary for effective leadership. These are: personal skills (self-awareness, self-regulation, motivation) and social skills (empathy and other social skills). The results of the study show that most clergy in the sample have a moderate to high level of empathy and motivation. On the other hand, many of them have difficulties in self-regulation and interpreting non-verbal signals from others. Based on these results, we can conclude that the lack of these skills influences the ability of leaders to effectively exercise their leadership role. The authors highlighted the fact that although the instrument

used is scientifically validated, it is not specifically adapted for religious leaders and to measure the targeted construct as accurately as possible in a religious context.

Holford's (2020) study aims to assess the emotional intelligence competencies of pastors at the New Testament Church of God Barbados, in the context of declining church membership and attendance. The purpose of the study is to observe the extent to which pastors know how to apply emotional intelligence competencies in their practice to manage the decline. In the first stage of data collection, emotional intelligence competencies were assessed, for which the Emotional Intelligence Appraisal (EIA) questionnaire based on Goleman's theoretical model was applied. In the second stage, in order to explore in detail the competencies that pastors have in the religious context described, data were collected through semi-structured interviews, based on a semi-structured interview, with the aim of capturing the experiences lived by pastors. Although the study does not allow the generalization of the results to the entire population, it was included in this systematic review because it helps to understand the theory and provides valuable directions for future research. The results show that pastors who apply emotional intelligence skills in their religious practice have a much more effective leadership style. They are able to develop relationships with parishioners, have much more effective communication because they know how to actively listen and observe the verbal and non-verbal signals of members. An emotionally intelligent religious leader is able to be empathetic, is effective in solving problems and managing conflicts. They are perceived by parishioners to be trustworthy, respectful, friendly and are considered a good support. The integration of emotional intelligence in religious practice improves the function and effectiveness of pastors.

Higley (2007) study tracked the dynamics between a pastor leader and the pastoral team he leads. The goal was to investigate how the leader's emotional intelligence influences the effectiveness of the pastoral team he leads. The results show that a high level of emotional intelligence influences the approach to a principled leadership style. The theoretical model on which this study was based was the four-branch model proposed by Mayer and Salovey. According to this model, emotional intelligence is a mental ability (Salovey & Mayer, 1990). The author identified a fit between the dimensions of the four-branch model of emotional intelligence and the characteristics of principled leadership. These fits are: the ability to identify and talk about feelings contributes to promoting honesty and integrity, and is related to the pastor's willingness to solve problems related to the performance of members. Other skills that were strongly correlated with the traits of principled leadership are understanding, the ability to make correct assumptions about people, and the ability to know

what to say at the right time. These skills allow the leader to effectively lead the team. The leader's ability to use emotions and inspire others contributed significantly to creating a climate based on trust and collaboration within the team. In conclusion, the emotional intelligence of the pastor influences the leadership style adopted, in this case a principled style, through the way he processes and then uses emotional information to facilitate an environment based on trust and collaboration. As a result, the skills necessary for effective leadership are: identifying emotions and being willing to talk about them, the ability to inspire people, the ability to make correct assumptions about people and knowing what to say depending on the context and situation.

Table 2. Summary table of reviewed studies

Title	Author (Year)	Study Type	No. of Participants	Measurement Tool	Theoretical Basis of Leadership	Key Concepts	Conclusions
A non-experimental quantitative correlational study of emotional intelligence as an effective tool for pastoral leadership	Brown (2024)	Quantitative, correlational, non-experimental	N=30, pastors	Demographic Inventory Questionnaire (DIQ); Emotional Competence Profile Questionnaire (EPQ)	Pastoral leadership, based on the Goleman, Salovey & Mayer models	Emotional intelligence (self-awareness, self-management, empathy, social skills), effective pastoral leadership, emotional traits, demographic characteristics, interpersonal relationships	No significant correlations were identified, but the study makes a valuable contribution, as the theoretical foundation supports that emotional intelligence is relevant for effective leadership.
A correlational study of emotional intelligence and servant leadership among church leaders	Carrington (2015)	Quantitative, cross-sectional	N=81, licensed pastors	Trait Emotional Intelligence Questionnaire – Short Form, TEIQue-SF; Servant Leadership Behavior Scale, SLBS	Servant leadership, based on the TEIQue model	Emotional intelligence (self-control, emotionality, sociability, well-being), servant leadership	Emotional intelligence correlates positively with the servant leadership style

Title	Author (Year)	Study Type	No. of Participants	Measurement Tool	Theoretical Basis of Leadership	Key Concepts	Conclusions
Impact of emotional intelligence on pastors' leadership effectiveness in churches of Southwest, Nigeria	Ishola-Esan (2019)	Quantitative, descriptive	N=120, Baptist pastors	Self-reported questionnaire, validated (r=0.90)	Pastoral leadership, based on the Goleman model	Emotional intelligence (self-knowledge, self-management, social awareness, social skills, relationship management), leaders' perception of emotional intelligence, effective leadership	Emotional intelligence is associated with a leadership style based on empathy, collaboration, and effective conflict management.
The relationship between emotional intelligence and pastor leadership in turnaround churches	Roth, 2011	Quantitative, cross-sectional	N=41, pastors	Bar-On EQ-i (Emotional Quotient Inventory)	Pastoral leadership in the context of churches in decline or growth based on the Bar-On model	Emotional intelligence (independence, flexibility, optimism, self-awareness, assertiveness), leadership effectiveness in growing/ declining churches	Pastors in growing churches have higher emotional intelligence scores
The influence of spiritual leadership on emotional intelligence moderated and intervened by self-management	Heryano et al. (2025)	Quantitative	N= 85, religious leaders	Self-reported questionnaire, based on a Likert scale, validated (r>0.70)	Spiritual leadership, based on the Goleman model	Spiritual leadership, emotional intelligence, self-management as a moderating variable	Self-management positively influences emotional intelligence and implicitly leadership style

Title	Author (Year)	Study Type	No. of Participants	Measurement Tool	Theoretical Basis of Leadership	Key Concepts	Conclusions
Just how emotionally intelligent are religious leaders in Britain? A study among Anglican clergy in Wales	Francis et al. (2019)	Quantitative, cross-sectional survey	N=364, Anglican clergy	Schutte Emotional Intelligence Scale	Pastoral leadership, based on the Goleman model	Emotional intelligence (self-awareness, self-regulation, motivation, empathy, social skills), pastoral leadership effectiveness	Deficits in self-regulation and social skills negatively affect leadership effectiveness
An examination of emotional intelligence leadership practice in pastoral leaders in the New Testament Church of God Barbados	Holford (2020)	Qualitative, exploratory case study	N=5, pastors	Emotional Intelligence Appraisal (EIA) and semi-structured interview	Pastoral leadership, based on the Goleman model	Emotional intelligence (self-awareness, self-management, social awareness, relationship management), pastoral leadership	Pastors who have emotional intelligence skills adopt a relationship-oriented, empathy-based style and are able to support the church in times of crisis.
The relationship between the lead pastor's emotional intelligence and pastoral leadership team effectiveness	Higley (2007)	Mixed methods, case study	N=43, pastoral teams	Wong and Law Emotional Intelligence Scale (WLEIS); Team Effectiveness Questionnaire (TEQ); Leader Emotional Intelligence Strength Rater (LEISR)	Principled leadership, based on the Mayer & Salovey model	Emotional intelligence (identifying and expressing emotions, ability to inspire, empathy, effective communication), leadership principles	The pastor's emotional intelligence directly influences the leadership style adopted and the team's effectiveness

CONCLUSIONS

Based on our systematic review of the literature on the relationship between emotional intelligence and religious leadership, we can state that there is a direct and indirect relationship between emotional intelligence and leadership style. Also, based on the evidence from studies, we identified the dimensions of emotional intelligence necessary for effective leadership.

The studies analyzed confirmed that among the essential skills for effective religious leadership are: recognizing and managing one's own and others' emotions. These skills determine the success of religious leaders in adopting a leadership characterized by empathy, active listening and a good ability to manage conflicts. Although Brown (2024) did not identify significant correlations between emotional intelligence and his investigated variables, the author emphasizes the need to integrate the development of emotional intelligence in the training of religious leaders. He also points out how important it is for a leader to be emotionally intelligent in managing relationships and pastoral credibility crises (Brown, 2024).

The results obtained by Carrington (2015) and Ishola-Esan (2019) provide evidence in favor of the hypothesis that emotional intelligence is associated with the servant leadership style. This style is characterized by empathy, collaboration orientation and care for others. Heryanto et al. (2025) makes an important contribution. Through his study, he highlights the role of self-management ability as a mediating and moderating variable. The study reinforces the fact that emotional self-regulation is a fundamental skill for having an effective leadership style.

Roth (2011) and Francis et al. (2019) demonstrate that dimensions of emotional intelligence differentiate between effective and less effective leaders, especially in delicate contexts such as decline or where pastoral ministry requires direct interaction with the community. The two studies demonstrate that an emotionally intelligent religious leader demonstrates empathy, motivation, and good adaptive skills. In this way, the leader directly contributes to a better quality of interpersonal relationships and to the creation of an organizational climate based on trust and collaboration.

From a qualitative perspective, Holford (2020) shows that integrating emotional intelligence into pastoral practice leads to the development of better relationships and the building of trust. These are essential for maintaining cohesion in the community. In turn, Higley (2007) provides evidence that supports the association of a high level of emotional intelligence with a principled leadership style and the creation of a climate of collaboration within pastoral teams. The study identifies the following skills as important: identifying emotions, the ability to inspire others and communicating effectively.

Based on the studies analyzed, we can conclude that the most important components of emotional intelligence necessary for effective religious leadership are: self-awareness, the ability to recognize and understand one's own emotions, self-management, emotional regulation and impulse control in order to have balanced behaviors and be able to make rational decisions, social awareness, the ability to form and maintain interpersonal relationships, effective communication and the ability to manage conflicts. Also, a leader who possesses these skills and is emotionally intelligent is more likely to adopt a servant, principled or collaborative and empathetic leadership style, while leaders who have not developed these skills have difficulty adopting effective leadership behaviors. As a result, the hypothesis is confirmed according to which the level of emotional intelligence influences the religious leadership style adopted.

This systematic analysis lays the foundation for solid and necessary future directions in the development and research of this topic. A recurring idea in all studies is that theological training is often considered sufficient to prepare a religious leader, but the affective part and the development of emotional intelligence are overlooked. Religious ministry, however, is not reduced to just preaching. It involves a multidisciplinary activity, which combines skills from various areas of development, including the development of socio-emotional competencies and emotional intelligence. The reviewed studies suggest that many of the difficulties encountered in churches are due to the fact that leaders are not prepared to manage the emotional aspects of their role, which leads to ineffectiveness in ministry, professional dissatisfaction, and in terms of the community, it can lead to alienation of members, recurrent conflicts between members and general dissatisfaction of the community (Heryanto et al., 2025).

Although this paper does not aim to directly analyze specific interventions or training programs, it is important to note that all studies draw attention to the lack of formal education on the development of emotional intelligence among religious leaders. Theological training does not include special programs or modules dedicated to the development of emotional intelligence and the application of socio-emotional skills in pastoral ministry. Research has been identified that proposes training programs on emotional intelligence.

Therefore, an important direction for future research is to develop and test emotional intelligence development programs for religious leaders, and adapt validated instruments to target the general population of religious leaders. Also, special programs can be created to develop socio-emotional skills among religious leaders and extend the socio-emotional skills model to this population. Also, there is a need to expand the samples, in order to obtain valid results that can be generalized to the entire population, thus confirming the hypotheses and theories.

In conclusion, although the empirical evidence varies in terms of the strength of statistical correlations or external validity, the theoretical consensus and conceptual convergence across studies provide a landmark for an important future direction in research on the relationship between emotional intelligence and religious leadership. It is clear how important it is to integrate emotional intelligence into the training, assessment, and practice of religious leadership. The development of emotional intelligence is essential for the effectiveness of spiritual leadership in the 21st century, in which the religious context is becoming increasingly complex, multidisciplinary, and relational. The reviewed studies draw clear directions for future research. The emphasis is on adapting instruments, creating educational programs, and expanding samples to obtain valid and generalizable results.

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The Relationship Between Perceived Stress and Burnout Among University Students: The Mediating Role of Resilience

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ABSTRACT. This study explores the link between perceived stress and burnout among university students and examines whether resilience mediates this relationship. Data were collected from 157 Hungarian minority students enrolled at a Romanian university using convenience and snowball sampling, which may introduce selection bias due to non-random participant recruitment. Participants completed the Perceived Stress Scale (PSS), Maslach Burnout Inventory-Student Survey (MBI-SS), and Connor-Davidson Resilience Scale (CD-RISC), all in Hungarian. All participants provided informed consent. Results showed a positive association between perceived stress and burnout, and a negative association between resilience and both perceived stress and burnout. Mediation analysis indicated that resilience partially mediates the relationship between perceived stress and burnout. These findings highlight resilience as a protective factor that mitigates the adverse impact of stress on student burnout. Moreover, results underscore the importance of targeted interventions for minority student populations in Eastern Europe.

Keywords: perceived stress, burnout, resilience, university students, protective factor

INTRODUCTION

University students encounter multiple stressors, including academic pressure, time constraints, and performance expectations. When these demands exceed available coping resources, stress can escalate and lead to burnout—a condition characterized by emotional exhaustion, cynicism toward studies,

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and reduced academic efficacy. While stress is a well-established predictor of burnout, individual psychological resources, such as resilience—the ability to adapt and recover from adversity—may help mitigate its effects.

Research on stress, burnout, and resilience has grown substantially in recent years, but far less is known about how these processes operate within Eastern European contexts. Hungarian minority students in Romania represent a distinct group whose academic experience may be shaped by additional cultural and systemic challenges, including language barriers, minority identity stress, and navigating dual cultural expectations (e.g., Benet-Martínez & Haritatos, 2005; Verkuyten, 2018). These factors could amplify vulnerability to academic burnout. Understanding how resilience operates in this group can inform culturally sensitive interventions.

Understanding the role of resilience—a capacity to adapt positively in the face of adversity—is particularly relevant in this context. Resilience may buffer the negative effects of perceived stress and protect students from burnout; however, evidence from minority student populations in Central and Eastern Europe remains scarce. Addressing this gap is important both for theoretical advancement and for designing culturally sensitive mental health interventions.

This study investigates whether resilience mediates the relationship between perceived stress and burnout among Hungarian minority university students in Romania. By focusing on this underexplored population, the research contributes to the literature on minority student well-being and offers practical implications for higher education support services within multicultural academic settings.

Theoretical Background

Academic burnout among university students has become a critical issue due to its psychological, behavioral and academic consequences (Dyrbye et al., 2014; Isa et al., 2021), including emotional exhaustion, cynicism, and reduced academic efficacy (Maslach & Leiter, 2016). Burnout is commonly defined as a syndrome that often emerges as a consequence of chronic stress—persistent demands that exceed an individual's coping resources (Maslach & Leiter, 2016). For university students, these stressors include heavy workloads, performance pressure, and uncertainty about future careers. When stress remains unmanaged, it can lead to severe outcomes such as depression, poor academic achievement, and even dropout or suicidal ideation (Dyrbye et al., 2014; Talih et al., 2018). Understanding the antecedents of burnout is therefore essential for supporting student well-being.

Perceived stress, refers to the subjective appraisal of life situations as unpredictable, overwhelming or uncontrollable (Cohen et al., 1995). This appraisal activates physiological and psychological responses that, over time, erode coping capacity. Chronic stress depletes emotional and cognitive resources, fostering feelings of inefficacy and detachment—core components of burnout (Isa et al., 2021). Empirical studies consistently demonstrate that higher perceived stress predicts greater burnout (Cohen et al., 1995; Stauder & Konkoly Thege, 2006). Moreover, sustained stress erodes cognitive, emotional, and motivational resources necessary for effective academic functioning (Pascoe et al., 2019; Ribeiro et al., 2017).

Resilience is a multifaceted construct broadly defined as an individual's capacity to successfully adapt to stress, adversity or trauma (Masten, 2001). Contemporary models conceptualize resilience not only as a stable personal trait but also as a dynamic process shaped by interactions between individual characteristics and environmental resources (Fletcher & Sarkar, 2013; Southwick et al., 2014).

Within academic settings, resilience promotes adaptive coping strategies, effective emotion regulation, and positive appraisals of challenges, thereby helping students sustain well-being under pressure. Higher resilience is consistently linked to lower perceived stress and reduced burnout symptoms among student populations (García-Izquierdo et al., 2017; Sarrionandia et al., 2018).

A growing body of evidence suggests that resilience may buffer the impact of stress on burnout by reducing maladaptive stress responses and promoting adaptive coping mechanisms. Studies across various student populations demonstrate negative associations between resilience and both perceived stress and burnout, with resilience frequently emerging as a mediator in this relationship (Eaves & Payne, 2019; Duarte et al., 2022). These findings indicate that while stress increases vulnerability to burnout, resilience can partially counteract this effect—though typically not enough to eliminate it entirely, suggesting partial mediation.

Despite growing research on stress, burnout, and resilience, relatively little is known about these processes among minority student populations in Eastern Europe. Hungarian minority students in Romania represent a distinctive context for studying stress and burnout. These students often navigate dual cultural identities, language barriers, and systemic minority-specific challenges within higher education (Benet-Martínez & Haritatos, 2005; Paat, 2013; Verkuyten, 2018). Such factors may amplify stress and influence coping mechanisms, making resilience particularly relevant. Investigating this group provides theoretical insight into how cultural and contextual variables interact with psychological processes and offers practical guidance for culturally sensitive interventions.

The Present Study

The primary aim of the research was to investigate the relationship between perceived stress and burnout among Romanian university students. A secondary goal is to assess the association between resilience and both stress and burnout, as it is hypothesized that students with higher levels of resilience are better equipped to manage stress and are therefore less prone to burnout. Furthermore, the study seeks to determine whether resilience acts as a mediator between perceived stress and burnout—specifically, whether it can buffer or reduce the negative impact of stress on the development of burnout.

METHOD

Participants

A total of 157 university students participated in the study. The sample included individuals over the age of 18 from various academic fields and levels. All participants attended the Babes-Bolyai University, a higher education institution in Romania. Most participants were female (84.7%) and between the ages of 18 and 25 (M=21.5, SD=2.65). Most participants were students, while some both studied and worked. The participants were native Hungarian speakers living in Romania, a minority.

Procedure

The study employed a cross-sectional, quantitative design. Data were collected online via Google Forms, distributed through social media platforms to ensure accessibility. Participation was voluntary and anonymous, and informed consent was obtained in accordance with ethical guidelines.

For data analysis, correlational and mediation analyses were conducted using the PROCESS macro (Model 4) in SPSS. Resilience was specified as the mediator between perceived stress and burnout. To test the significance of the indirect effect, bootstrapping procedures with 5,000 resamples were applied, generating bias-corrected 95% confidence intervals for the mediation paths.

MEASURES

Demographics

Participants were asked to respond to several demographic questions: gender, age, year of study, higher education institution attendance.

The Perceived Stress Scale (PSS) assesses the extent to which individuals perceive situations as stressful. Participants completed the Hungarian version of the PSS (Stauder & Konkoly Thege, 2006), which contains 14 items rated on a 0-4 Likert scale, 0 means "never" and 4 means "very often". The questionnaire includes items such as: "*How often during the past month have you felt confident that you could solve your personal problems?*" or "*How often during the past month have you felt that your difficulties had piled up so high that you could no longer cope with them?*". Higher scores indicate greater perceived stress (Cronbach's $\alpha = .87$).

The Maslach Burnout Inventory - Student Survey (MBI-SS) measures burnout across emotional exhaustion, cynicism and reduced academic efficacy. The Hungarian version (Hazai et al., 2010) was completed by the participants. MBI-SS contains 15 items rated on a 0-6 Likert scale, 0 means "not at all", and 6 means "every day". Items in the questionnaire include, for example, "*I am already tired when I wake up in the morning if I have to face another day at university*" or "*I am less interested in my studies now than when I enrolled at university*". Higher scores reflect higher burnout (Cronbach's $\alpha = .67$).

The Connor-Davidson Resilience Scale (CD-RISC) is a 10-item scale measuring resilience, rated on a 0-4 Likert scale, 0 means "not true at all", while 4 means "almost always true". The Hungarian version (Járai et al., 2015) includes items such as: "*I always give my best effort, no matter what the task is*", or "*I am able to adapt to change*". Higher scores indicate greater resilience (Cronbach's $\alpha = .80$)

RESULTS

Descriptive statistics are presented in Table 1. Correlations supported all hypotheses.

Table 1. *Means, Standard Deviations, Skewness, and Kurtosis of the Variables (N=157)*

Variable	*M*	*SD*	*Skewness*	*Kurtosis*
The Perceived Stress Scale	31.00	8.57	-.48	.12
The Maslach Burnout Inventory - Student Survey	46.00	10.54	.46	-.27
The Connor-Davidson Resilience Scale	27.00	6.40	-.30	-.67

Regression analysis indicated that perceived stress positively predicted burnout ($B = 0.462$, $\beta = 0.375$, $p < .001$) (Table 2), suggesting that higher levels of perceived stress among university students were associated with increased symptoms of burnout. The standardized beta coefficient ($\beta = 0.375$) suggests a moderate effect size, confirming the strength of the relationship between stress and burnout.

Resilience negatively correlated with both stress (B = –0.317, β = –0.425, p < .001) **and burnout** (B = –0.266, β = –0.162, p = .043) (Table 2). Specifically, perceived stress showed a significant negative relationship with resilience (B = –0.317, β = –0.425, p < .001), implying that students experiencing higher stress reported lower levels of resilience. Additionally, resilience was significantly negatively associated with burnout (B = –0.266, β = –0.162, p = .043), suggesting that students with greater resilience experienced fewer symptoms of burnout.

Mediation analysis using PROCESS macro (Model 4) with 5,000 bootstrap samples revealed that resilience partially mediated the relationship between perceived stress and burnout. The unstandardized indirect effect was ab = –0.084, 95% CI [–0.162, –0.012], indicating that the indirect effect was statistically significant because the confidence interval did not include zero. The direct effect of perceived stress on burnout remained significant after accounting for resilience: B = 0.467, β = 0.379, p < .001), confirming partial mediation.

Table 2. *Mediation Analysis: The Relationship Between Perceived Stress, Burnout, and Resilience*

Relationship	B	SE	β	t	p	R^2	ΔR^2
Model 1: Perceived Stress → Burnout (Path c)	.462	.092	.375	5.042	< .001**	.141	.135
Model 2: Perceived Stress → Resilience (Path a)	-.317	.054	-.425	-5.844	< .001**	.181	.175
Model 3: Resilience → Burnout (Path b)	-.266	.130	-.162	-2.041	.043*	.141	.130
Model 3: Perceived Stress → Burnout (Path c')	.467	.101	.379	4.599	< .001**	.141	.130

N=157, *p<0.05, **p<0.01

These findings suggest that resilience acts as a **partial mediator**, mitigating but not eliminating the impact of stress on burnout.

DISCUSSION

The present study provides evidence that perceived stress significantly predicts academic burnout among university students and that resilience partially mediates this relationship. These findings align with previous research (Isa et al., 2021; García-Izquierdo et al., 2017) and extend the literature by examining a culturally distinctive population—Hungarian minority students in Romania.

Burnout develops when prolonged stress overwhelms coping resources. High perceived stress activates persistent physiological and psychological responses, such as heightened cortisol levels and negative cognitive appraisals, which gradually erode emotional energy and motivation. This depletion manifests as emotional exhaustion, cynicism toward academic tasks, and feelings of inefficacy—core dimensions of burnout (Maslach & Leiter, 2016). In academic settings, stressors such as heavy workloads, performance pressure, and uncertainty about future careers amplify this process, creating a cycle where stress perpetuates disengagement and reduced academic functioning.

Resilience operates as a protective factor by promoting adaptive coping strategies, emotional regulation, and positive reframing. Students with higher resilience are more likely to interpret challenges as manageable, maintain optimism, and mobilize social support, thereby reducing stress related harm. In this study, resilience partially mediated the stress–burnout link, indicating that while resilience buffers the negative impact of stress, it does not eliminate it entirely. This suggests that resilience alone cannot fully counteract systemic and institutional stressors, highlighting the need for multi-level interventions.

The inclusion of Hungarian minority students in Romania adds a novel dimension to the understanding of stress and burnout. These students often navigate dual cultural identities, language barriers, and potential marginalization within the educational system. Such factors may intensify stress and influence coping strategies, making resilience particularly critical for this population. By focusing on this group, the study underscores the importance of culturally sensitive approaches to student mental health and demonstrates that resilience-building interventions should consider cultural identity and minority-specific challenges.

Given the partial mediation, resilience training should be integrated into student support services but complemented by institutional reforms that reduce academic pressure. Programs such as mindfulness-based stress reduction, peer support groups, and resilience workshops can strengthen individual coping capacities. Simultaneously, universities should address structural stressors by revising workload expectations, improving access to mental health resources, and fostering inclusive environments that support minority students.

Limitations and Future Research

Several limitations should be acknowledged. First, the cross-sectional design restricts causal interpretations. Future research should employ longitudinal or experimental designs to clarify the temporal dynamics between stress, resilience, and burnout.

Second, the sample consisted exclusively of Hungarian minority students in Romania, additionally, were drawn from only one university, which limits generalizability to other cultural or educational contexts. While this focus provides valuable insight into a unique population, cultural specificity means findings may not apply to broader student groups. Future studies should include diverse samples across different regions and cultural backgrounds. Third, the gender distribution was highly unbalanced, with 84.7% female participants. Gender differences in stress perception and coping strategies may influence burnout risk, so future research should aim for more balanced samples or examine gender as a moderator.

Fourth, the internal consistency of the Maslach Burnout Inventory–Student Survey (MBI-SS) was relatively low ($\alpha = .67$), which may affect the precision of burnout measurement. Researchers should consider alternative instruments or additional reliability checks in future studies.

Fifth, all measures relied on self-reported data, which may introduce social desirability or recall bias. Finally, future research should explore additional moderators and mediators, such as social support, academic self-efficacy, and coping styles, to provide a more comprehensive understanding of the mechanisms underlying stress and burnout. Longitudinal designs and culturally sensitive interventions will be essential for advancing this field.

CONCLUSION AND IMPLICATIONS

This study provides compelling evidence that perceived stress significantly contributes to academic burnout among university students, and that resilience serves as a partial mediator in this relationship. The findings underscore the importance of resilience as a psychological buffer that can mitigate—but not entirely eliminate—the adverse effects of stress on student well-being. While students with higher resilience reported lower levels of burnout, the persistent direct effect of stress on burnout highlights the multifaceted nature of academic strain and the need for comprehensive support strategies.

For Hungarian minority students in Romania, these findings carry particular relevance. This population faces unique cultural and systemic challenges, such as language barriers, identity-related stressors, and limited access to tailored support, that may intensify academic strain.

The implications of these findings are twofold. First, they emphasize the critical role of resilience-building interventions in higher education settings. Programs aimed at enhancing students' coping mechanisms—such as resilience training, mindfulness-based stress reduction, and peer support initiatives—may serve as effective tools in reducing burnout and promoting psychological well-being. These interventions should be integrated into Eastern European university

support services and tailored to the specific needs of minority student populations, particularly Hungarian-speaking students in Romania, who may face additional cultural and systemic stressors.

Second, the results point to the necessity of addressing institutional and environmental contributors to student stress. While individual-level interventions are valuable, they must be complemented by systemic changes that reduce academic pressure, improve access to mental health resources, and foster inclusive, supportive learning environments. Universities in Eastern Europe should consider revising academic policies, workload expectations, and student support frameworks to create a more balanced and health-promoting educational experience.

Future research should build on these findings by employing longitudinal designs to explore causal pathways and by examining additional moderating variables such as social support, academic self-efficacy, and cultural identity. Expanding the sample to include diverse student populations across different cultural and educational contexts will enhance the generalizability of the results.

In conclusion, this study highlights the dual importance of strengthening individual resilience and reforming institutional practices to combat academic burnout. By adopting a holistic approach that addresses both personal and systemic factors, universities can better support student mental health and academic success, particularly for minority students navigating unique cultural challenges in Eastern Europe.

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Developing Environmental Awareness and Stewardship by Multimodal Exploration of the Natural World with the Means of Digital Technologies

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ABSTRACT. Current and acute environmental problems highlight the need to develop educational approaches that can foster both environmental awareness and stewardship. Although environmental education has advanced in recent years and is increasingly supported by policy and legislation, the literature continues to point to a gap in terms of transferring knowledge into practice. Considering this gap, the purpose of this article is to propose a conceptual model for developing environmental awareness and stewardship in lower secondary education through the multimodal exploration of the natural world supported by digital technologies. The model, constructed through a systematic synthesis of literature, is based on raising environmental awareness and stewardship through the development of scientific, environmental, and digital competences, along with strengthening the connection with the environment through multimodal and digital exploration. To illustrate the model's applicability, the article presents an example of a practical activity combining multisensory field exploration with digital tools for documenting, identifying, and interpreting environmental phenomena. This example shows how multimodal experiences, supported by technology and structured classroom reflection, can create meaningful contexts for developing competences relevant to environmental responsibility. The article argues that such competence-based, experiential, and digitally enriched approaches offer promising directions for strengthening environmental awareness and stewardship in everyday-school practice.

Keywords: environmental awareness, environmental stewardship, multimodal exploration, digital technologies, environmental education

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1. INTRODUCTION

Climate change is one of the main environmental problems currently confronting both the Earth and human populations. According to the National Centers for Environmental Information' Annual Climate Report, 2024 was declared the warmest year on record. This situation has serious ecological, social, and educational consequences, highlighting the urgent need for action. Global warming reduces available drinking water due to the fast melting of glaciers, increases extreme weather events, and disrupts animal habitats (NCEI, 2025). It also impacts plant life cycles, with many species blooming earlier because of disturbed dormancy (NASA, 2022). Organizations such as the Intergovernmental Panel on Climate Change (IPCC) highlight that the next few decades will be crucial for determining the environmental future of our planet (IPCC, 2023).

In response to these urgent challenges, many countries have introduced environmental education and sustainability courses, alongside legislative measures (Hazel Mae, 2024). The European Union, for example, has implemented initiatives such as *GreenComp: The European Sustainability Competence Framework* (Bianchi et al., 2022) and the *Green Claims Directive* to promote sustainable practices and protect consumers from greenwashing (European Commission, 2023). However, while these measures are important and necessary, they are not enough. A stronger connection with the environment and a deeper understanding of both theoretical and practical aspects underlying climate change and its mitigation remain essential.

Environmental education (EE) plays a key role in addressing this gap. Scholars and policymakers believe that in addition to regulations, raising awareness, building knowledge, and encouraging pro-environmental behaviors are also crucial for mitigating environmental problems (Fos & Ko, 2019). Beyond knowledge acquisition, environmental education aims to develop the skills and attitudes necessary for learners to engage responsibly with the natural world (Hazel Mae, 2024; UNESCO, 1976). UNESCO's Education for Sustainable Development for 2030 framework aligns with the United Nations Sustainable Development Goals 4 (Quality Education) and 13 (Climate Action). It focuses on equipping learners with the knowledge, skills, and attitudes necessary to effectively respond to environmental challenges (UNESCO, 2020; United Nations, 2015).

Building on these perspectives, this article argues that without the development of *scientific and digital competences* – prerequisites and means for cultivating *environmental competences* – awareness remains at the level of mere knowledge and does not translate into concrete and informed action. Learners, especially adolescents, are a key group because their values, attitudes, and identities

regarding nature and sustainability are formed during early adolescence. Therefore, bridging the gap between theoretical understanding and practical action is essential.

Environmental education provides a way to foster this kind of learning. According to UNESCO (1976, 1978), EE is a process where three elements – the cognitive, emotional, and behavioral – participate equally. Furthermore, it also aims to develop theoretical knowledge and introduce key concepts about environmental issues, such as:

- ***carbon footprint:*** the total amount of greenhouse gases emitted directly or indirectly by human activities, measured in CO_2 equivalents per year;
- ***ecological footprint***: the amount of land area needed to support human consumption and to absorb waste, providing a measure of lifestyle sustainability;
- ***handprint***: positive actions taken by individuals or organizations that help reduce negative environmental impact (Hazel Mae, 2024).

When learners internalize these concepts, it helps them move from awareness to responsibility and eventually to action through environmental stewardship. Environmental stewardship includes diverse sustainable practices such as: community engagement, protecting biodiversity, and using resources responsibly (Worrell & Appleby, 2000; UNESCO, 2020).

There is empirical evidence supporting the idea that environmental knowledge is likely to promote pro-environmental attitudes and behaviors. Previous research has identified several factors that affect students' environmental awareness and their willingness to engage in pro-environmental actions. For instance, McNeal et al. (2014) and Akrofi et al. (2019) observed that students who participate in interactive activities, such as debates or climate-focused clubs, show greater engagement and measurable learning outcomes. Specifically, participation in climate-related clubs and witnessing local effects of climate change increased students' knowledge and awareness. Similarly, Freije et al. (2017) showed that taking part in environmental education programs improves students' understanding of concepts like carbon and ecological footprints, leading to more sustainable behaviors. In addition, Barreda (2018) highlighted the fact that climate change and carbon footprint are better understood as grade level increases. Students' perceptions and beliefs, therefore, are essential components in promoting effective pro-environmental action.

Despite the increase in research, several gaps still remain. Most studies focus on knowledge construction, paying less attention to how different learning methods and digital tools can be combined to raise awareness and promote scientific and environmental competences in lower secondary environmental education. As students engage more with digital cultures, the use of new

technologies, such as simulations, augmented reality, virtual reality, gamified environments, and collaborative digital platforms, could help bridge this gap and create more immersive, relevant, and impactful experiences.

Given the current environmental challenges, the goals of environmental education, and the gaps identified in existing research, this paper proposes a model designed to promote environmental awareness and foster environmental stewardship in lower secondary education. The model focuses on developing scientific, environmental and digital competences and strengthening students' connection with nature through both multimodal and digital exploration (Figure 1). The ultimate aim is to turn awareness into informed, responsible action.

2. CONCEPTUAL AND APPLIED FRAMEWORK

Figure 1 presents the proposed conceptual model, which illustrates the dynamic interplay among scientific, digital and environmental competences, connectedness with nature, multimodal and digital exploration, environmental awareness, and environmental stewardship. The model emphasizes how these aspects are linked and support each other.

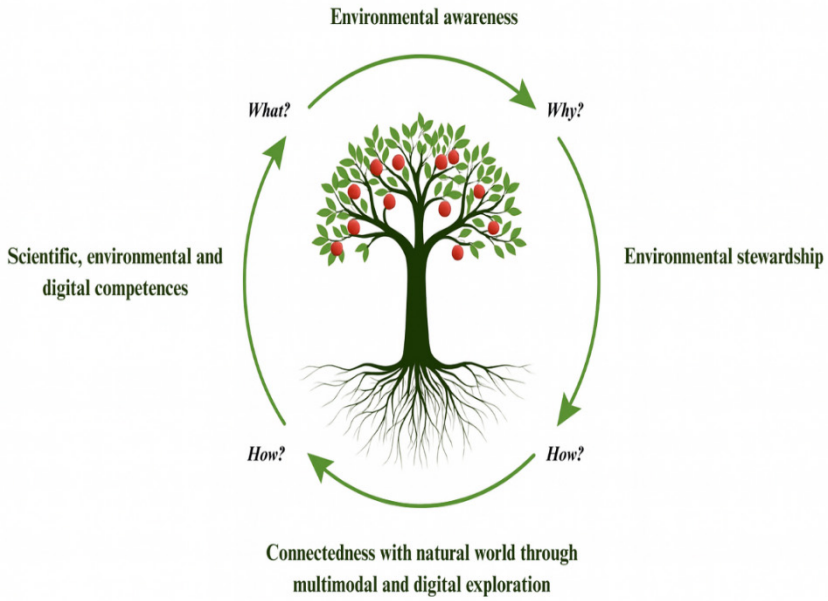

Figure 1. A conceptual model for developing environmental awareness and stewardship through multimodal and digital exploration

They shape students' understanding and involvement with the natural world. The following section elaborates on the conceptual foundations of the study, clarifying the definitions, dimensions, and pedagogical relevance of each construct within lower secondary education. Collectively, these concepts provide a framework for fostering scientifically grounded, digitally enhanced, and ethically responsible connections with the environment.

2.1. Environmental awareness – from knowledge to sensitivity

What is environmental awareness?

One meaning of the term *awareness* refers to the capacity "to be aware," that is, to recognize and engage with the surrounding reality. UNESCO (2017) defines environmental awareness as being conscious of the total environment and the impact of one's actions, combined with a desire to improve environmental conditions. Given the global phenomenon of climate change, environmental awareness means having clearly formed ideas about the origin and nature of environmental problems, including personal contributions to problems, such as carbon emissions (Hazel, 2024).

Scholars often regard environmental awareness as a multidimensional concept that includes three related dimensions (Roczen et al., 2014):

1. *Cognitive dimension* – refers to knowledge of ecological systems, environmental issues, and scientific processes. This would entail understanding cause and effect, for instance, linking the use of fossil fuels to the release of greenhouse gases.

2. *Affective dimension* – implies emotional involvement, sensitivity, and values in relation to environmental preservation. It highlights the internalization of environmental issues as personally significant and morally relevant.

3. *Behavioral-intentional dimension* – describes the willingness or intention to engage in environmentally friendly actions, which may not have yet materialized in concrete behavior, but serves as a significant predictor of such behavior.

Within this framework, two central questions arise: *Why is it important to address environmental awareness, and how can it be effectively cultivated?*

Why develop environmental awareness?

For a long time, environmental education has focused on knowledge acquisition about ecological processes, biodiversity, pollution, and climate change. However, research shows that knowledge alone does not encourage pro-environmental behavior (Jensen, 2002; Bamberg & Möser, 2007). Students may understand the causes of global warming or how the greenhouse effect works, but this understanding does not always lead to action or commitment.

What helps bridge this gap is *sensitivity*, understood as an emotional connection to environmental issues that fosters empathy, care, and personal relevance. Practical examples illustrate how knowledge can evolve into sensitivity. For instance, when students read about deforestation in a textbook, they acquire information at an intellectual level. However, when they explore local forests, observe signs of biodiversity loss, or engage with multimedia stories about communities affected by deforestation, their awareness deepens into sensitivity. This emotional connection creates the conditions for shifts in attitudes and behaviors.

How can environmental awareness be cultivated?

First, according to Roczen et al. (2014), environmental competences are multidimensional and include knowledge, skills, and attitudes related with the environment. Fostering environmental awareness requires the development of both scientific and environmental competences. Scientific competences enable students to investigate ecological systems, analyze data, and understand complex causal processes. Environmental competences guide this scientific knowledge towards making ethical decisions and adopting sustainable practices.

Second, an auspicious approach for cultivating awareness is strengthening *connectedness to nature*, defined as the perceived closeness of the human–nature relationship (Brügger et al., 2011). Studies suggest that a strong connection to nature can predict pro-environmental behaviors and contribute to psychological well-being (Capaldi et al., 2014; Pensini et al., 2016; Barbaro & Pickett, 2016). Direct experiences with nature, outdoor learning, and involvement in environmental projects often lead to higher levels of connectedness and greater commitment to ecological issues (Pensini et al., 2016). Additionally, Otto and Pensini (2017) argue that viewing oneself as part of the natural world predicts pro-environmental behavior more effectively than general environmental knowledge.

Therefore, cultivating awareness represents only the first step. For awareness to result in meaningful change, it must become a responsibility, which manifests through community involvement, sustainable actions, and a long-term commitment to environmental protection. This *responsibility*, expressed by the concept of environmental stewardship, will be discussed in the following section.

2.2. Environmental stewardship – from sensitivity to responsibility

Why environmental stewardship?

If environmental awareness provides the basis for *understanding* and *sensitivity,* environmental stewardship is where those feelings, attitudes, and forms of empathy translate into real *responsibility*. Environmental stewardship involves sustained care for ecosystems and natural resources, informed by sound decision-making, ethical behavior, and active participation (Bennett et al., 2018; Enqvist et al., 2018). It goes beyond one-time eco-friendly actions. It requires a continuous effort to keep ecological balance and sustainable livelihoods, both individually and collectively (Schlosberg et al., 2019).

The shift from sensitivity to responsibility can be seen as a developmental journey. Sensitivity fosters care and concern, while stewardship turns that care into action. In this sense, stewardship expresses itself through the use of three complementary dimensions:

1. *Individual responsibility* – performing actions to minimize environmental harm in everyday life, such as consuming less, using less energy, or protecting nature.
2. *Collective responsibility* – participating in community efforts, whether a school recycling program or a local habitat restoration project.
3. *Civic engagement* – supporting broader sustainability initiatives, from policy advocacy to youth engagement in climate action (Bennett et al., 2018).

Without this active layer, awareness risks remaining symbolic or superficial. This gap, frequently referred to as the *value–action gap*, has been identified in both early and recent research (Kollmuss & Agyeman, 2002; Gifford & Nilsson, 2014). Bridging it requires educational experiences in which students not only empathize with the natural world but also recognize their own agency and capacity to act. Several studies have highlighted that the perceptions of affective response, interdependence, and contributory value will positively impact learners' engagement in pro-environmental behaviors (Otto & Pensini, 2017; Stevenson et al., 2021).

For young people, stewardship closely relates to development of their identity. Early adolescence is a time when values, attitudes, and social identities are still forming, making it a crucial time to integrate sustainability into their self-concept (Stevenson et al., 2013). Engaging in real-world projects, such as citizen science, community conservation, or school-community partnerships, allows adolescents to move from passive learners to active participants. These experiences also build moral reasoning and an ethos of shared responsibility while reinforcing the idea that environmental stewardship is both an individual and a social effort.

Digital technologies add another layer to this process. Online collaboration platforms, simulations, gamified sustainability apps, or participatory mapping tools create exciting opportunities for students to act as stewards in both physical and digital environments (Kuo et al., 2019; Haji-Hassan et al., 2024). By measuring their ecological footprint using mobile phone applications, writing digital stories about their activities, or taking part in global online campaigns, for example, adolescents learn how environmental responsibility can be linked to their daily lives. In this sense, multimodal and digital approaches can make stewardship more relevant, accessible, and resonant with youth cultures.

In summary, environmental stewardship can be considered the responsibilization of sensitivity – a progression from empathic awareness to sustained action and civic engagement. By incorporating opportunities for personal responsibility, collective effort, and digital innovation, education can help shape students who are not only aware of environmental issues but also ready to serve as active stewards of the planet.

2.3. Connectedness with nature – multimodal and digital exploration

A key question in encouraging environmental awareness and responsibility is not just *what* learners should know or *why* these ideas are important, but *how to* cultivate them effectively. As mentioned before, recent educational research emphasizes that strengthening students' *connectedness with nature* – their sense of closeness and relationship with the natural world – is one of the most promising pathways toward lasting pro-environmental behavior (Whitburn et al., 2020; Martin et al., 2020). This connection goes beyond mere knowledge; it involves a relationship and an emotional bond that can inspire responsibility, empathy, and sustainable action. Because it reflects how close individuals feel to the natural environment, connectedness can be nurtured through direct contact with nature and through meaningful experiential activities (Pensini et al., 2016) mediated by digital technologies.

Multimodal exploration as a gateway to connection

Traditional classroom instruction often struggles to foster connectedness because it relies primarily on verbal and cognitive methods. In contrast, multimodal learning – which combines sensory, emotional, and physical experiences – provides a more complete approach. Louv (2008) introduced the idea of "nature deficit disorder," highlighting the impact of modern lifestyles that keep young people away from direct contact with nature. To combat this, multimodal methods integrate visual, auditory, kinesthetic, and emotional experiences to enhance learner engagement and strengthen their relationship with nature.

Exploration of the natural world typically occurs through the senses and the integration of multiple natural stimuli (i.e., visual, audio, tactile, olfactory). The combination of the information derived from multiple sensory sources is called *multisensory integration*, a process that underpins the concept of "presence". In everyday experiences, the brain is constantly engaged in selecting relevant sensory stimuli over irrelevant ones. As a result, a stronger sense of presence emerges from a richer combination of sensory input (Marruci et al., 2021). In addition, from a psychological perspective, multimodal experiencing of the world stimulates the storage of sensory memory traces in long-term memory as episodic knowledge, although these traces tend to degrade quickly. Only when attention is directed to specific aspects of these sensory memories are they transferred into working memory. Within working memory, individuals can *consciously* retain the information and reflect on the experience in context (Fadel & Lemke, 2008).

Therefore, a multimodal exploration of the environment can be a way to increase connection with nature and, implicitly, eco-awareness and environmental stewardship. Studies show that combining various sensory inputs in education improves cognitive performance, sense of presence, and engagement in learning (Marucci et al., 2021, Luo, 2023). Additionally, this multimodal approach offers multiple access points for learners, particularly for those with different learning styles (Bezemer & Kress, 2016).

In the context of environmental education, a 2008 study conducted by Auer emphasizes the importance of using the senses to explore the environment as a complement to rational understanding. While helping to clarify the cause-and-effect relationships between humans and the environment, it also increases students' awareness of their own biological connections to nature. Through conscious involvement with what they see, hear, smell, taste, and touch, students begin to dissolve the boundaries between the observer and the observed, thereby creating an authentic relationship with the environment. Similarly, Beery and Jørgensen (2018) outline a learning progression that emphasizes children's sensory experiences as integral to developing environmental consciousness, blending imagination and knowledge.

A related pedagogical concept worth mentioning in connection with multimodal exploration is experiential learning. Experiential learning is defined as "the process whereby knowledge is created through the transformation of experience" (Kolb, 2014). Kolb describes this as a cyclical model with four phases: 1. concrete experience (experiencing), 2. reflective observation (reflecting), 3. abstract conceptualization (thinking), and 4. active experimentation (acting). The cycle begins with a concrete experience, followed by reflection. Learners then connect this experience with their prior and new knowledge, solidifying their understanding, which then leads to new behaviors.

Hence, multimodal exploration through concrete experiences enhances connection with the environment and implicitly strengthens eco-awareness, ultimately encouraging environmental stewardship. Outdoor explorations, eco-art projects, and reflective storytelling illustrate how sensory experience combined with emotional expression can foster a conscious attachment to nature (Beery, 2013). Activities such as noticing local ecosystems, conducting field-based investigations, visualizing and interpreting ecological data, and communicating findings through visual art, narrative, or digital media stimulate both the cognitive and affective dimensions of awareness (Somerville & Green, 2012).

Multimodal involvement allows learners not only to "learn about" the environment but also to experience it in layered, meaningful ways. Embodied and multisensory methods have been shown to deepen learners' relationships with nature and cultivate ecological sensitivity (Beames et al., 2012). For example, combining field observations with reflective writing and digital photography enables students to merge scientific inquiry with personal insight, fostering environmental responsibility through rich multimodal experiences supported by digital tools.

Digital exploration as a complement to direct experience

Deepening environmental education concepts and exploring the environment through the senses can be supported by integrating digital technologies into learning activities. Learners can use immersive tools such as augmented reality (AR) and virtual reality (VR) to witness ecosystems, engage with species, and model ecological processes that would otherwise be unavailable (Markowitz et al., 2018). Similarly, gamified platforms can engage learners in tasks such as monitoring biodiversity or reducing virtual ecological footprints, reinforcing both knowledge and affective engagement. Mobile applications for biodiversity monitoring, ecological footprint calculation, or citizen science projects also encourage active involvement and a sense of responsibility (Boncu et al., 2022).

Digital technologies also enhance the teaching and learning process. In a recent study, Greenwood and Hougham (2015) reported that digital tools – such as plant identification apps, simulators, and virtual hiking experiences – have become increasingly integrated into environmental education. According to the authors, these digital technologies provide essential means for gathering, tracking, and sharing relevant ecological information, and for involving students and the wider public in citizen science initiatives. Applications that facilitate the recognition of plants and animals, the measurement of noise pollution, or the documentation of natural elements also support the exploration and highlight the human-environment relationship. Several concrete examples of integrating digital technologies in environmental education are detailed in the practical suggestions subchapter.

The integration of multimodal and digital approaches is not intended to replace direct contact with the natural world but to complement and amplify it. When learners alternate between outdoor inquiry and digital enhancement their engagement deepens and becomes more personal. Research suggests that this hybrid model strengthens both the affective dimension (empathy and appreciation for nature) and the cognitive-behavioral dimension (knowledge application and action orientation) of connectedness (Markowitz et al., 2018).

In conclusion, multimodal exploration is an effective way to promote connectedness with nature and contributes to both the cognitive and affective dimensions of environmental awareness. However, its influence on sustainable behavior depends on the development of scientific and digital competences alongside environmental competences, which enable individuals to engage with, interpret, and act upon the natural world in meaningful ways. Multimodal exploration therefore reaches its full educational potential when embedded within a broader competence-based framework for action, as discussed in the next section.

2.4. Competences for action – scientific, environmental, and digital competences

Translating environmental awareness and stewardship into sustained behavior requires the development of competences for action. According to the Council of the European Union's recommendations, competences are understood as a combination of different types of knowledge, skills, values, and attitudes that a person acquires in various learning situations. Competences provide learners not only with knowledge but also with the cognitive, affective, and practical resources necessary to make informed decisions and engage in responsible practices (Council of the European Union, 2018). In environmental education, three types of competences are especially important: scientific, environmental, and digital. Together, they form the foundation that enables learners to move beyond awareness and toward meaningful environmental stewardship.

Scientific competences

The Romanian national education system, through the National Education Law no. 198/2023, has adopted the eight key competences recommended by the European Commission as overarching objectives for both compulsory and post-compulsory education (Parliament of Romania, 2023). However, because scientific subjects (Biology, Chemistry, and Physics) are taught separately in Romania, the present article frames scientific competences through the lens of Biology competences and the middle-school Biology syllabus.

The middle-school Biology syllabus focuses on developing four general competences – learning outcomes with a high level of generality, achieved at the end of a learning cycle (Şăitan, 2017; Kenyeres et al., 2022):

1. *Exploring biological systems, processes, and phenomena using scientific tools and methods;*
2. *Communicating appropriately in different scientific and social contexts;*
3. *Solving problem situations in the living world based on logical thinking and creativity;*
4. *Manifesting a healthy lifestyle within a natural environment conducive to life* (Ministry of National Education, 2017).

But why is it necessary to discuss scientific competences – specifically those developed through the study of Biology – in the context of environmental education and environmental competences?

First, in the proposed model, scientific competences are essential prerequisites for developing environmental awareness and environmental stewardship, which later converge toward the formation of environmental competences. Multiple researchers support this premise. For example, Popov (2006) argues that environmental competence manifests: "as a synthesis of intellectual and scientific components (cognitive and activity-based, including general knowledge and skills), personal characteristics (values, abilities, traits, willingness to engage in various activities), and experience that allows a person to use their potential to carry out complex tasks, and to adapt promptly and successfully to a constantly changing society and professional environment." Furthermore, according to Berenyi (2016), developing scientific competences is essential for explaining the natural and mechanical processes underlying environmental issues.

A detailed analysis of general competences 1 and 3 shows that they support the development of exploratory knowledge and skills, critical and creative thinking, problem-solving abilities, as well as reflective attitudes – awareness of one's place within the ecosystem – and decision-making skills aimed at protecting both the individual and the surrounding environment (Kenyeres et al., 2022). These objectives are closely connected to the meaning of environmental competences.

Environmental competences

The ultimate goal of environmental education is to foster a more ecological way of living. This can be attained by acquisition of environmental competences (EC). Specialists in this area define EC as abilities to make decisions that minimize environmental harm, to follow the principles of sustainable development, to apply environmental knowledge in real-life situations, and to

take responsibility for addressing environmental issues arising from one's personal activities (Romaniuk et al., 2021). Other authors argue that EC are strongly related to environmental awareness, culture, ethics, behavior and values and consist of developing: "*cognitive skills* (understanding environmental processes and impacts), *practical skills* (ability to apply sustainable practices), *affective skills* (values, attitudes, and motivation to act), and *metacognitive skills* (reflection and critical thinking)" (Doychinova, 2024). Khrolenko (2021) defines EC as comprising several core components: "cognitive (knowledge-based), informational–experimental, motivational–value-oriented (axiological), and operational (practical–applied)". Considering the competence-based approach, EC can be understood as the application of this educational paradigm within the domains of ecology and sustainable development. Thus, environmental competence encompasses knowledge, skills, and attitudes that are applied in the background of environmental education.

Aligned with this paradigm, previous studies have proposed various models that describe what EC entail and how they can be developed, considering the interdependencies among factors that support its acquisition. Grasel (2001) described EC as a result of three interrelated aptitudes: application of knowledge, evaluation of behavioral alternatives (in terms of feasibility and consequences) and self-reflection. Corral-Verdugo (2002), however, described EC as a latent disposition that feed into different skills (knowing how to practice ecological behaviors) and aptitudes such as: personal motives, cultural beliefs, and awareness of environmental situations (environmental perception).

Kaiser and Fuhrer (2003) conceptually separated the types of knowledge associated with EC in:

a) ***environmental system knowledge*** (knowledge about how the natural environment functions),

b) ***action-related knowledge*** (knowledge about actions that reduce negative impact on the environment), and

c) ***effectiveness knowledge*** (knowledge about how effective are various behaviors in terms of reducing for example CO_2 emissions).

Subsequently, Frick et al. (2004) examined the relationship between environmental system knowledge and pro-environmental behavior. Their findings showed that although system knowledge did not directly trigger ecological behavior, it facilitated the acquisition of action-related and effectiveness knowledge. These latter two forms of knowledge, when combined, promoted pro-environmental behavior.

While environmental competences provide the cognitive, practical, and ethical grounding for responsible interaction with the natural world, they cannot be fully developed in isolation from today's digital landscape. As learners increasingly

engage with information, communication, and problem-solving through digital tools, digital competences become essential for understanding, monitoring, and acting upon environmental issues.

Digital competences

A distinctive aspect of contemporary education is the increasing importance of digital competences in supporting environmental awareness and stewardship. Defined by the European Commission (2019) as the confident, critical, and responsible use of digital technologies for learning, work, and participation in society, digital competences extend environmental learning into interactive, multimodal contexts. Tools such as simulations, augmented and virtual reality, gamified environments, and collaborative online platforms allow students to explore complex ecological processes that are otherwise inaccessible. As previously mentioned, research indicates that integrating digital approaches enhances motivation, engagement, and long-term retention of pro-environmental attitudes (Markowitz et al., 2018).

Moreover, digital competences are central to fostering a sense of agency. When students monitor their ecological footprint through apps, share findings in collaborative digital platforms, or engage in online citizen science, they see their actions as part of a larger community of practice. Thus, digital competences complement scientific and environmental competences by situating knowledge and responsibility within the realities of learners' digital culture.

Together, these three types of competences provide the foundation for transforming awareness into action, a process illustrated in the following practical section through an applied example of fostering environmental awareness and stewardship.

3. PRACTICAL SUGGESTIONS

The next section presents an activity aligned with the proposed model outlined above. The activity is inspired by 4DX cinema experiences, where the design principle is to "use your senses" to engage actively and become fully immersed in the experience. In this way, a sensory and emotional connection with the surrounding environment is created. The activity is based on a multimodal exploration of the world, using four senses – visual, auditory, olfactory, and tactile – with the support of digital tools, and can be completed within a single school day. This method of exploring the environment through the senses, involves visiting locations that are impacted by human activity, such as industrial areas, and natural settings like forests. The purpose of the visit is to

bring students into direct contact with nature, to observe the biophysical features, and to identify signs of human influence on habitats. Engaging the senses during the exploration helps strengthen students' connection to the natural world while fostering environmental awareness and stewardship.

4. METHODOLOGY

Participants and duration

- **Target group:** Lower secondary students
- **Group size:** 15–30 students
- **Duration:** One school day (3–6 hours depending on transport and site accessibility)

Targeted competences

a) Scientific competences (derived from the Biology syllabus)

a. Exploring biological systems, processes, and phenomena using scientific tools and methods.

b. Solving problem situations in the living world based on logical thinking and creativity.

b) Environmental competences

a. Developing awareness by perceiving, comparing, and reflecting on environmental conditions across contexts.

b. Assuming responsibility by identifying and proposing sustainable individual and collective actions.

c) Digital competences

a. Using digital tools to document, classify, and analyze environmental observations.

b. Monitoring environmental changes over time by using digital tools to track, compare, and interpret the effects of human activities.

Learning objectives

- Students will describe the concept of ecological and carbon footprint, based on their experience in the natural environment.
- Students will reason about the human impact on the environment based on the information gathered during the outdoor activity.

Students will propose solutions to reduce their carbon footprint based on the reflection exercise.

Materials

- Mobile devices, tablets or laptops;
- Flipchart sheets;
- Markers

Locations

1. Industrial area
2. Natural habitat (e.g. a forest)
3. Classroom

Procedure

Part I: Exploring an industrial area

The purpose of visiting an industrial area is to highlight the effect of human activities on the environment. This component of the activity guides students to explore cause–effect relationships between people and the environment through multimodal observation and digital tools.

The first exercise establishes an initial connection through the auditory sense. Students are invited to remain silent for one minute and attend closely to the surrounding soundscape. *What types of sounds do they identify?* In industrial zones, these may include traffic noise, mechanical tools, or industrial machinery. Afterward, students briefly reflect on their emotional and physical responses: *did the environment feel comfortable or safe?* Using a *decibel-meter application*, students then measure sound intensity to identify potential sources and levels of noise pollution.

Figure 2. Industrial area illustrating visible sources of emissions
Source: Public domain image

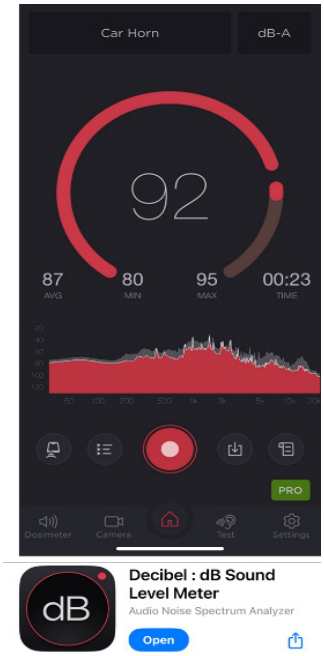

Figure 3. Example of sound level measurement
using the Decibel: dB Sound Level Meter app
Source: Screenshot from the Decibel: dB Sound Level Meter app

A second activity focuses on visual exploration and environmental recognition. Students observe natural and artificial elements in the area: *how many plant or animal species are visible? What built structures dominate the landscape, and what impacts might they have? How many vehicles circulate in the area?* By observing, students are also able to see the smoke rising from heavily producing factories, as well as the smoke from automobiles burning fuel. These are indicators of carbon footprint. Students record what they notice and reflect on how these features shape their feelings about the environment.

The final exercise in this section activates the sense of smell. Students focus on their breathing for one minute, inhaling and exhaling deliberately. *What scents do they perceive? What does the air feel like?* Industrial areas often contain odors associated with emissions, fuel combustion, or chemical processes, and students note their sensory impressions. This reflection supports awareness of air quality and its relationship to human activities.

Part II: Exploring a forest

Visiting a forest on the periphery of a city aims to provide students with a genuine connection to nature. Compared with industrial zones, this environment is minimally affected by human intervention, allowing students to engage with it in a more authentic way. As in the previous activity, at least four senses will be activated during the exploration.

Following the same methodology, students are invited to remain silent for one minute and attend closely to the sounds they can hear. *Which sounds will the students be able to identify*? Students may identify bird calls, insect vibrations, the rustling of leaves, or the cracking of dry twigs. This sensory investigation may stimulate curiosity about the sources of these sounds. Using apps such as *BirdNet Sound ID*, students can record and identify bird species based on audio input.

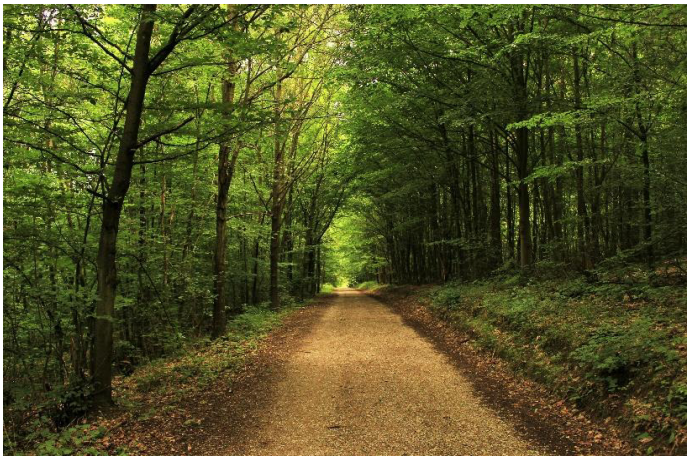

Figure 4. Forest environment used for multimodal exploration activities
Source: Public domain image

Figure 5. BirdNET Sound ID – digital tool for identifying bird species based on audio input
Source: BirdNET Project, Cornell Lab of Ornithology and Chemnitz University of Technology (https://birdnet.cornell.edu/)

Students will again measure sound intensity with the decibel app and compare the results with those collected in the industrial area, noting the significant differences between the two sites. Afterward, students reflect on their emotional responses to the soundscape.

The second activity focuses on visual and tactile exploration. Students observe natural and man-made elements present in the forest. Here, they may encounter the full biocenosis of the ecosystem: animals (birds, insects), plants, fungi, lichens, and other organisms. Some students may be drawn to particular trees, others to lichens growing on the bark, and others to the diversity of plants or fungi they notice. Applications such as *PictureThis* or *iNaturalist* can support this investigation by identifying species and providing information about their characteristics, habitat, and ecological requirements.

Figure 6. PictureThis application logo
Source: PictureThis – Plant Identifier App (https://www.picturethisai.com/)

Figure 7. iNaturalist application logo
Source: iNaturalist Platform, California Academy of Sciences & National Geographic Society (https://www.inaturalist.org/)

Direct contact with nature through touch deepens the sense of connection and, implicitly, nature awareness. Alongside the diversity and beauty of the biocenosis, students may also encounter traces of human intervention – improperly disposed plastics, waste, or areas affected by deforestation. These observations encourage students to reflect on human impact even in environments perceived as natural.

Finally, students activate the sense of smell to investigate the forest environment. *What scents can they identify?* Depending on the type of forest, they may perceive woody or resinous aromas, the scent of moss, lichens, insects, fungi, or soil. In some areas, they may also detect unpleasant odors resulting from improperly discarded waste. This multisensory engagement supports a deeper, embodied understanding of the ecosystem.

Part III: Classroom activity

Back in the classroom, students reflect on their field experiences by following Kolb's experiential learning cycle. They deepen their awareness by drawing inferences from what they saw, heard, smelled, and felt, and they further internalize the relationship between humans and the natural environment. To strengthen their environmental knowledge, students also engage in conceptual learning related to climate change, ecological and carbon footprints, and environmental stewardship. Discussions include the idea of a *handprint* and how individual and collective actions can mitigate environmental degradation.

Using a fishbone graphic organizer, students work in a whole-class activity to identify the causal factors observed during the field trip – such as deforestation, plastic waste, and carbon emissions from cars and factories – that contribute to accelerating global warming. This exercise provides an opportunity to explore and consolidate key concepts including *carbon footprint*, *ecological footprint*, *climate change*, and *global warming*.

Considering the fact that carbon emissions are the main factor contributing to the acceleration of global warming students can use the ecological footprint calculator to estimate their own environmental impact and better understand how carbon footprint metrics are determined.

Figure 8. Ecological Footprint Calculator interface
Source: Global Footprint Network – Ecological Footprint Calculator (https://www.footprintcalculator.org/home/en)

To help students visualize the consequences of climate change, two digital simulations can be integrated into the activity. *See how your city's climate might change* (National Geographic simulator) uses scientific data to approximate changes in average regional temperatures by 2070. For example, projections for Cluj, Romania, indicate increases in both summer and winter averages by approximately 5-6°C.

Figure 9. Climate change projection interface
from the National Geographic climate simulator
Source: National Geographic – "See how your city's climate might change by 2070" (https://www.nationalgeographic.com/magazine/graphics/see-how-your-citys-climate-might-change-by-2070-feature)

How concerning are these issues? They may seem abstract or distant to students, who often perceive climate change impacts as unlikely to occur in the near future. By using the following simulator, however, they can gain a more concrete understanding of these changes and their ecological implications. The *Climate Change Impact Filter* (Google Experiments) simulator illustrates, for example, how an ecosystem's fauna would respond to an average temperature increase of approximately five degrees, as projected for Cluj. Under such conditions, the model shows that many species would no longer survive. In contrast, what happens to improperly discarded waste – such as bottles or juice cans – under the same temperature increase? Unfortunately, the answer is very little: these materials remain largely unchanged, as they decompose only at much higher temperatures and over extremely long periods of time.

Figure 10. Interface of the Climate Change Impact Filter showing species survival projections under rising temperatures
Source: Google Arts & Culture – Climate Change Impact Filter (https://experiments.withgoogle.com/climate-impact-filter)

In the final classroom activity, using the Three-Step Interview technique, students reflect on their experience and on the possibility of changing certain behaviors. This activity requires working in groups of four, with each student taking on a different role in each interview round. They respond to several guiding questions: *what sensations or feelings did the two locations evoke for you? Which aspects of your daily behavior contribute to an increased carbon footprint? How can you contribute to reducing the carbon footprint?* The activity concludes with the creation of products such as posters, diagrams, or oral presentations through which students reflect on and propose solutions to various environmental problems.

Together, the set of activities presented above demonstrates how multimodal exploration, combined with digital tools and structured classroom reflection, can effectively transform environmental awareness into meaningful engagement. By activating multiple senses, field observations, and collaborative classroom work, students begin to develop the scientific, environmental, and digital competences needed to understand and respond to ecological challenges. These practical examples illustrate how environmental awareness and stewardship can be meaningfully initiated within everyday school practice.

5. CONCLUSIONS

Climate change and its negative consequences represent the most acute environmental problems requiring educational approaches to mitigate these challenges (IPCC, 2023; NCEI, 2025), therefore, raising awareness of these issues, along with enhancing active engagement, are important measures for combating these problems. The purpose of this article is to propose a model for developing eco-awareness and environmental stewardship based on the development of scientific, environmental, and digital competences and increasing connectedness to the environment through multimodal exploration supported by digital technologies.

The analysis presented in this article shows that environmental awareness and environmental stewardship are not isolated constructs but interconnected dimensions that evolve through cognitive understanding, emotional sensitivity, and action-oriented responsibility (Roczen et al., 2014). The conceptual model proposed here illustrates how environmental awareness requires establishing a connection with the environment, achieved through the development of scientific, environmental, and digital competences and mediated by the senses and technology (multimodal and digital exploration) and how this ultimately leads to the internalization of stewardship behaviors (Pensini et al., 2016). Multimodal exploration through the senses is the basis for establishing a connection with the environment, because daily interaction with the environment is achieved through the senses, which determine the feeling of awareness and presence (Marruci et al., 2021). Digital technologies such as AR/VR, 3D applications, observation tools, digital maps, etc. contribute to this connection by expanding access to and analysis of natural phenomena, processes, and elements (Markowitz et al., 2018).

The practical example provided – based on the multimodal and digital exploration of contrasting environments – demonstrates how the theoretical constructs discussed can be meaningfully operationalized in everyday school

practice. Through sensory interaction, comparative analysis, experiential reflection, and the use of digital tools, students begin to develop the scientific, environmental, and digital competences needed to interpret environmental changes and propose sustainable solutions (Şăitan, 2017; Kenyeres et al., 2022). This approach effectively addresses the value–action gap identified in environmental education research (Kollmuss & Agyeman, 2002; Gifford & Nilsson, 2014) by enabling learners to translate awareness into responsibility and responsibility into informed action.

From this perspective, the article offers several contributions. From a conceptual standpoint, it describes and combines ideas from competence-based education, environmental awareness, stewardship, and connectedness to nature into a single model specifically designed for lower secondary education. From a pedagogical perspective, it transforms this model into a concrete activity sequence that integrates digital tools, multimodal, and outdoor exploration in order to support environmental awareness and stewardship. From an educational standpoint, it aligns with current national and European policy orientations that prioritize sustainability competences and the responsible use of digital technologies in education (Bianchi et al., 2022; Council of the European Union, 2018; Parliament of Romania, 2023). Together, these contributions position the article at the intersection of environmental education, science education, and digital education, making it relevant for curriculum designers, teacher educators, and practitioners interested in competence-based approaches to sustainability.

The article also presents a series of limitations that open up future directions for research. Firstly, the proposed model is predominantly conceptual and exemplified by a single activity applicable in lower secondary education. The article does not report empirical data on learning outcomes, changes in attitudes, or sustained behavioral effects. Second, the pedagogical design presupposes access to natural and anthropized sites, adequate time for fieldwork, and sufficient digital infrastructure and competences at the school level – conditions that may not be uniformly available across educational contexts.

In relation to future research directions, a first step would be the empirical validation of the proposed conceptual model. Studies should be conducted to investigate the impact of multimodal exploration and digital technologies on ecological behaviors. Other interventions or digital resources can also be developed to support the development of ecological awareness and stewardship. Last but not least, the professional development of teachers must be considered, preparing them for the design, implementation, and adaptation of activities aimed at developing ecological awareness and stewardship.

In conclusion, environmental stewardship is developed through a combination of awareness, knowledge, experience, and emotional involvement. This can be achieved by increasing connection with the environment through

multimodal and digital exploration, based on the simultaneous development of scientific, digital, and environmental competences. Increasing environmental stewardship is a continuous process, that equips learners not only to understand the challenges of our time but also to participate actively in shaping a more sustainable future.

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ELearning Platforms Adoption and Use in Universities: A SEM Approach

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ABSTRACT. ELearning platforms adoption and use by university students has become prevalent worldwide, developing nations still lag behind. This study aims to establish critical paths amongst determinants of "behavioural Intention" and "use behaviour" in eLearning platforms adoption and use by university students. The PLS-SEM method was used to evaluate the modified unified theory of acceptance and use of technology path model. A sample of 520 university students from Zimbabwe was used to collect data using an online survey created on Google Forms. The findings show that "Habit" had the most influence (0.804) on "Behavioural Intention," followed by "Performance Expectancy" (0.319) and "Effort Expectancy" (0.270). Behavioural Intention had a significant influence (0.831) on "Use Behaviour." The path model explains 88.8% of "Behavioural Intention," and 76.1% of "Use Behaviour" variances. This study, though limited, is significant to students in higher education, policy makers and researchers given the importance of technology in the education sector.

Keywords: ELearning technologies; ELearning Platforms; eLearning; Online Learning; ODeL; UTAUT; UTAUT2; Higher Education; Zimbabwe

1. INTRODUCTION

The integration of eLearning platforms in the education sector has become a crucial focus point, with universities positioned as significant ground globally in the aftermath of COVID-19. COVID-19 revolutionized the education sector through technology though historical traces of technological use in education date back to the 1960s (Weizenbaum, 1966). Technology adoption

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and use in the education sector dates back to chat-bots development (Weizenbaum, 1966). However, eLearning became prevalent during and after COVID-19 especially in developed countries with developing countries still lagging behind due to financial and infrastructural challenges. The adoption and use of technology in education has seriously improved human capital development and higher education learning (Maune, 2023). Maune (2016) argues that technology has become a crucial element in human capital development due to significant increase in demand for novel skills. Higher education today has become a conduit through which technologies are developed and unveiled. Universities are obligated to adapt and exploit these new technologies thereby impacting human capital development that meets the demands of the 21st century. Artificial intelligence applications such as ChatGPT have significantly transformed the educational landscapes (OpenAI, 2024) with educators and learners leveraging their capabilities to augment their learning experiences through dynamic feedback (Cukurova, Miao & Brooker, 2023).

ELearning technologies adoption and use in universities is not without challenges (Strzelecki, 2023). Such challenges particularly in Africa have been influenced by socioeconomic classes which date back to the colonial era (Maune, 2023). The colonial era left a divide that is prevalent up to today. Irrespective of these challenges the following eLearning platforms are being used in universities in Zimbabwe and these are Microsoft Teams, Wiseup, Moodle, and ChatGPT. Although eLearning platforms adoption and use have gained popularity in the recent past in Zimbabwe, research into factors influencing behaviour intention and use behaviour among university students remain scant. This gap is particularly significant as it aids to informed policy development and implementation. Moreso, such an understanding of the factors influencing student behaviour in adoption and use of eLearning platforms in universities is crucial and needed. In closing this research gap, a clear perspective of the factors influencing the adoption and use of eLearning platforms helps the educational system through tailor made approaches that address students concerns.

Since the construction of the UTAUT and its modification into UTAUT2, literature has shown an increasing interest in the adoption and use of technology in higher education (Venkatesh, Morris, Davis & Davis, 2003 and Venkatesh, Thong & Xu, 2012). The impact of COVID-19 has also seen an increase in the use of eLearning technologies by university students the world over. However, developing countries are still lagging behind due to a number of constraints such as financial and infrastructure. Despite all these challenges, studies have shown a spike in the uptake of eLearning platforms by university students (Akbari et al. 2022, Shams et al. 2022).Cojocariu, Lazar, Nedeff, & Lazar, 2014).Wang, Ran, Liao, Yang, 2010). Maune, 2023, Ahmad et al. 2023). The coming in of AI

applications has also seen more research being carried out on their impact on academic integrity (Cotton & Cotton, 2023, Tlili et al. 2023, and Williamson, Macgilchrist & Potter, 2023).

Maune (2023) argues that there are a number of factors influencing university students/learners' behaviour intention and use behaviour in adopting and use of eLearning platforms. Kempson and Whyley (1999); Ellis, Lemma, & Rud, (2010*)* and Beck, Demirgüç-Kunt, & Honohan, (2009) argue that factors such as literacy, information, involuntary or voluntary, cost, trust, socioeconomic, eligibility, and documentation are among the top most influencers of eLearning technologies adoption and use in universities by students. These factors must, however, precede behaviour intentions and use behaviour (Shneor and Munim, 2019).

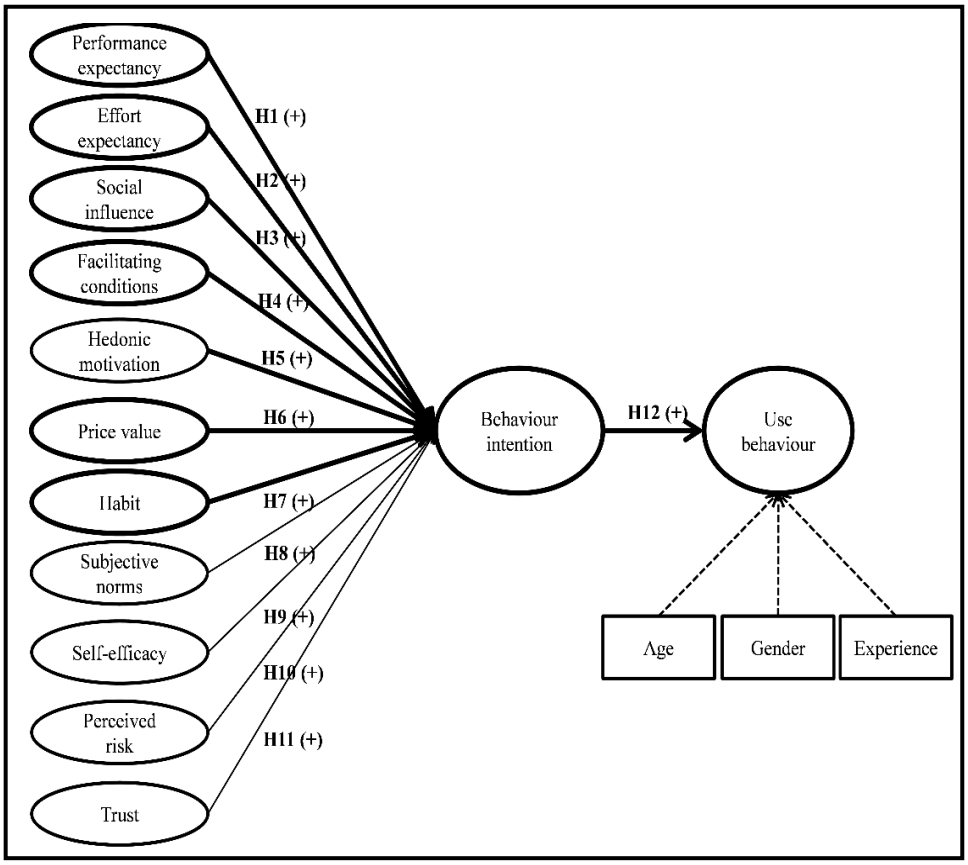

Figure 1. Path Analysis Research model
Source: Adapted from Maune (2021) and Maune and Themalil (2022).

Various theories Fishbein & Ajzen (1975) (Theory of Reasoned Action - TRA), Ajzen (1991) (Theory of Planned Behaviour - TPB), Venkatesh et al. (2003) (UTAUT), and Venkatesh et al. (2012) (UTAUT2) and later modifications by various researchers and authors, forms the basis for this study. An extended model (Maune, 2021; Maune and Themalil, 2022) developed in prior studies was examined using SEM to distinguish factors that impact eLearning technologies adoption and use by students in universities in Zimbabwe. Figure 1 denotes the research model adopted for this study.

1.1. Hypothesis development

The following hypotheses were formulated from a prior research model (Maune, 2021) developed by the same author as shown in Figure 1. These hypotheses validated and tested the proposed path analysis model above. Table 1 shows the proposed research hypothesis

Table 1. *Proposed Research Hypothesis*

Proposed Hypothesis
H_1 "Performance expectancy will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_2 "Effort expectancy will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_3 "Social influence will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_4 "Facilitating conditions will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_5 "Hedonic motivation will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_6 "Price value will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_7 "Habit will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_8 "Subjective norms will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_9 "Self-efficacy will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_{10} "Perceived risk will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_{11} "Trust will have a direct positive influence on the behavioural intention to use eLearning platforms in universities by students."
H_{12} "Behavioural intention to use will have a direct positive influence on the eLearning platform Use behaviour in universities by students."

This article seeks to close this research gap through examining the factors influencing eLearning technologies in higher education using SmartPLS-SEM approach in Zimbabwe. An extended Unified Theory of Acceptance and Use of Technology (UTAUT2) by Venkatesh et al. (2012), Maune (2021) and Maune and Themalil (2022) informed the study through examining the factors influencing behaviour intention and use behaviour of eLearning technologies by university students in Zimbabwe.

The article, first explain the EUTAUT2 model for adoption and use of eLearning platforms by students in universities in Zimbabwe. A measurement scale tailor made to suit this framework is also presented. Thereafter, the results of the analysis using Smart PLS-SEM are shared. This is followed by a deep engagement of discussion of the research findings showcasing significant contributions of the study. The study will conclude with theoretical and practical implications as well as limitations and future research direction.

2. MATERIAL AND METHODS

This study examined the factors influencing eLearning platforms adoption and use by students in universities in Zimbabwe. The role of behavioural intention was also examined. To have an in-depth appreciation of the relationships of the variables, the study used a quantitative method. Data was collected from students in their second year (2.2) and fourth year (4.2) from two universities (one state owned and one private owned) using Google Forms online survey. Complete autonomy was guaranteed for the students with a consent statement being part of the questionnaire. A total number of 1680 commercial students were invited to participate in the survey. These students were invited to participate in the survey from June to November 2023. To avoid biases, students were promised confidentiality, anonymity of responses and voluntary participation. The survey was sent through a link generated from Google Forms platform. At least ten minutes were needed to complete the survey. A pilot survey was distributed to 10 university students and lecturers to identify conspicuous characteristics, confusing, difficult, and poorly worded questions. These adjustments were then incorporated into the main survey that was distributed.

2.1. Respondents and procedure

Completed surveys were automatically returned to the author by 525 respondents (31.25%). After cleaning the data, which included deleting observations with missing data and suspected unengaged respondents, there were 520 respondents with complete data to utilize (30.95% response rate). The sample

size utilized in this article was guided by Marcoulides and Saunders' (2006) investigation. The minimum sample size necessary must be determined by the maximum number of arrows pointing to the latent variable in the model (Marcoulides & Saunders, 2006). Prior scholars (Hoyle, 1995) also influenced the work, arguing that a modest sample size is usually a good place to start when performing path modeling. In this study, unengaged respondents were those who reported the same response for all successive items (for example, a 5 across all observable variables). Descriptive demographic statistics are shown in Table 2.

Table 2. *Demographic statistics*

Variable	Classification	Frequency	Percentage
Gender	Male	322	62%
	Female	198	38%
Age	<20	15	3%
	21 – 30	385	74%
	31 – 40	120	23%
Marital Status	Single	463	89%
	Married	52	10%
	Divorced	5	1%
Education	Level Two (2)	182	35%
	Level Four (4)	338	65%

Source: Author's compilation

2.2. Measurement

The students were invited to complete an online survey built in Google Forms aimed to measure the latent variables presented in the modified UTAUT model (Maune, 2021). These latent variables are, self-efficacy, habit, hedonic motivation, performance expectancy, price value, effort expectancy, perceived risk, social influence, trust, facilitating conditions, subjective norms, behaviour intention, and use behaviour. The latent constructs scales in the model were adapted and modified from prior studies (Venkatesh et al., 2003; Venkatesh et al., 2012; Groß, 2015; Abrahão et al., 2016; Shneor & Munimb, 2019; Maune and Themalil, 2022). Wong (2013) explains that SEM has two sorts of measurement scales: reflective and formative. The indicators are strongly connected and interchangeable, implying that reliability and validity tests were conducted in agreement with previous research (Shneor & Munimb, 2019; Petter, Straub, & Rai, 2007; Hair, Hult, Ringle, & Sarstedt, 2013). A 5-point Likert scale was utilized, with 1 indicating complete disagreement and 5 indicating complete agreement. Table 3 displays measurement items, factor loadings, and sources.

Table 3. *Latent Variables, Measurement Items, Factor Loadings, and Sources*

Latent variable	Measurement items	Factor loadings	Source
PE (*performance expectancy)*	1. "I find eLearning platforms useful in my daily learning." 2. "Using eLearning platforms increases my chances of achieving my learning goals." 3. "Using eLearning platforms helps me accomplish my studies/learning more quickly." 4. "Using eLearning platforms increases my productivity."	**0.933** *Removed* **0.942** *Removed*	PE1-4 adapted and modified from "performance expectancy" in Venkatesh et al., 2003 and Venkatesh et al., 2012.
EE (*effort expectancy)*	1. "Learning how to use eLearning platforms is easy for me." 2. "My interaction with eLearning platforms is clear and understandable." 3. "I find eLearning platforms easy to use." 4. "It is easy for me to become skillful at using eLearning platforms."	**1.000** *Removed* *Removed* *Removed*	EE1-4 adapted and modified from "effort expectancy" in Venkatesh et al., 2003 and Venkatesh et al., 2012.
SI (*social influence)*	1. "People who are important to me think that I should use eLearning platforms." 2. "People who influence my behaviour think that I should use eLearning platforms." 3. "People whose opinions I value prefer that I use eLearning platforms."	**0.894** **0.877** *Removed*	SI1-3 adapted and modified from "social influence" in Venkatesh et al., 2012 and Venkatesh et al., 2003 for SI1-2.
FC (*facilitating conditions)*	1. "I have the resources necessary to use eLearning platforms." 2. "I have the knowledge necessary to use eLearning platforms." 3. "ELearning platforms are compatible with other technologies I use." 4. "I can get help from others when I have difficulties using eLearning platforms."	**1.000** *Removed* *Removed* *Removed*	FC1-4 adapted and modified from "facilitating conditions" in Venkatesh et al., 2003 and Venkatesh et al., 2012.
HM (*hedonic motivation)*	1. "Using eLearning platforms is fun." 2. "Using eLearning platforms is enjoyable." 3. "Using eLearning platforms is very entertaining."	**0.815** **0.943** **0.920**	HM1-3 adapted and modified from "hedonic motivation" in Venkatesh et al., 2012.
PV (*price value)*	1. "ELearning platforms are reasonably priced." 2. "ELearning platforms are a good value for the money."	**0.676** **0.859** **0.898**	PV1-3 adapted and modified from "price value"

Latent variable	Measurement items	Factor loadings	Source
	3. "At the current price, eLearning platforms provide good value."		in Venkatesh et al., 2012.
HT (*habit)*	1. "The use of eLearning platforms has become a habit for me." 2. "I am addicted to using eLearning platforms." 3. "I must use eLearning platforms." 4. "Using eLearning platforms has become natural to me."	**0.910** **0.656** **0.841** **0.888**	HT1-4 adapted and modified from "habit" in Venkatesh et al. (2012).
PR (*perceived risk)*	1. "I would not feel completely safe to provide personal information through eLearning platforms." 2. "I am worried about the future use of eLearning platforms because other people might be able to access my data." 3. "I do not feel protected when sending confidential information via eLearning platforms." 4. "The likelihood that something wrong will happen with the use of eLearning platforms is high."	**0.588** *Removed* **0.943** **0.710**	PR1-4 adapted and modified from "risk" in Abrahão et al. (2016).
TT *(trust)*	1. "I think they are honest." 2. "I think they are trustworthy." 3. "I think they provide good services to users." 4. "I think they care about their users and take their concerns seriously." 5. "I think they keep users' security and privacy in mind."	*Removed* *Removed* **0.956** *Removed* **0.663**	TT1-5 adapted and modified from "trust" in Groß (2015).
SN *(subjective norms)*	1. "People who are important to me think that I should use eLearning platforms in learning." 2. "People who influence my behavior encourage me to use eLearning platforms in learning." 3. "My colleagues think that I should use eLearning platforms in learning." 4. "My friends think that I should use eLearning platforms in learning."	**0.876** **0.637** **0.867** *Removed*	SN1-4 adapted and modified from "subjective norms" in Shneor & Munimb (2019).
SE (self-efficacy)	1. "I have confidence in my ability to use eLearning platforms in learning." 2. "I have the expertise needed to use eLearning platforms." 3. "I am confident in my ability to navigate and use eLearning platforms in learning."	**0.836** *Removed* *Removed* **0.999**	SE1-4 adapted and modified from "subjective norms" in Shneor & Munimb (2019).

Latent variable	Measurement items	Factor loadings	Source
	4. "I am confident in my ability to use eLearning platforms in learning."		
BI (*behavioural intention)*	1. "I intend to continue using eLearning platforms in learning in the future." 2. "I will always try to use eLearning platforms in learning." 3. "I plan to continue to use eLearning platforms in learning frequently."	**0.924** *Removed* **0.919**	BI1-3 adapted and modified from "behavioural intention" in Venkatesh et al., 2003 and Venkatesh et al., 2012.
UB (use *behaviour)*	1. "I frequently use eLearning platforms in learning." 2. "I spend much effort in using eLearning platforms in learning."	**0.925** **0.811**	UB1-2 adapted and modified from "subjective norms" in Shneor & Munimb (2019).

Source: Authors' compilation

2.3. Structural Equation Modeling Approach

This study utilized SmartPLS3 for data analysis, following previous methods in SEM (Maune, Matanda & Mundonde, 2021; Maune and Themalil, 2022). This approach was preferred due to predictive accuracy and its applicability in dealing with small sample sizes. Despite the limitations associated with the approach (Wong, 2013), it has become more popular in applied research projects. Moreover, the approach has been applied in management information systems, marketing, organization, business strategy, and behavioural sciences among other fields (Maune et al., 2021; Maune and Themalil, 2022). Data was first cleaned before uploaded into SmartPLS 3 software for analysis (Maune and Themalil, 2022).

2.4. Analysis

Figure 3 shows the partial least square path model estimations for this study. The results of the path analysis model were as follows:

2.4.1. Reflective Measurement Scale

There are two types of measurement scale in SEM that have two measurement scales; formative and reflective. A reflective measurement scale was adopted in this study because the indicators were highly correlated and

interchangeable (Haenlein & Kaplan, 2004; Petter et al., 2007; Hair et al. 2013; Maune and Themalil, 2022). Therefore, the study thoroughly examined the reliability and validity of the indicators. Maune et al. (2021) and Maune and Themalil (2022) argue that each reflective indicator is related to a specific latent variable or construct using a simple regression analysis.

During the evaluation of the measurement model, 17 items were removed because of low factor loadings (<0.600) and high cross-loading (Gefen & Straub, 2005; Maune and Themalil (2022). Cronbach's alpha and composite reliability (CR) tests were used to test the reliability of the constructs (Table 4). All the constructs in the study met the required CRs threshold of 0.700 (Hair, Hult, Ringle & Sarstedt, 2017; Maune & Themalil (2022). Cronbach's alpha of each construct was above the threshold of 0.700. Convergent validity was acceptable since the AVE were higher 0.500 (Bagozzi & Yi, 1988; Maune & Themalil (2022). Table 4 shows the reliability, validity and factor loadings output. The Fornell-Larcker criterion was used to assess discriminant validity and the output is as shown in Table 5. The results in Table 5 align with Fornell & Larcker (1981) and Maune and Themalil (2022) showing a greater square root of AVE than the inter-construct correlation for all the constructs. The Heterotrait-Monotrait ratio was also used to assess discriminant validity of correlations (Henseler, Ringle & Sarstedt, 2015). The output shows all values below 0.900 threshold thereby establishing discriminant validity (Maune and Themalil, 2022) (Table 6).

Table 4. *Factor Loadings, VIF, Composite Reliability, and Convergent Validity*

Indicators	Loadings	VIF	Cronbach's Alpha	Composite Reliability	AVE
PE1	0.933	*4.384*	0.935	0.935	0.879
PE3	0.942	*4.384*			
EE1	1.000	1.000	1.000	1.000	1.000
SI1	0.894	2.596	0.879	0.879	0.784
SI2	0.877	2.596			
FC1	1.000	1.000	1.000	1.000	1.000
HM1	0.815	*3.354*	0.923	0.923	0.801
HM2	0.943	*3.308*			
HM3	0.920	*3.763*			
PV1	0.676	1.946	0.854	0.855	0.667
PV2	0.859	2.404			
PV3	0.898	2.122			
HT1	0.910	2.910	0.896	0.897	0.689
HT2	0.656	2.044			

Indicators	Loadings	VIF	Cronbach's Alpha	Composite Reliability	AVE
HT3	0.841	2.566			
HT4	0.888	*3.070*			
PR1	0.588	1.741	0.794	0.799	0.580
PR3	0.943	1.872			
PR4	0.710	1.544			
TT3	0.956	1.673	0.776	0.802	0.677
TT5	0.663	1.673			
SN1	0.876	1.634	0.844	0.841	0.642
SN2	0.637	2.510			
SN3	0.867	2.668			
SE1	0.836	*3.297*	0.910	0.917	0.848
SE4	0.999	*3.297*			
BI1	0.924	*3.576*	0.918	0.918	0.849
BI3	0.919	*3.576*			
UB1	0.925	2.292	0.858	0.861	0.757
UB2	0.811	2.292			

Table 5. *Fornell-Larcker Criterion*

	BI	EE	FC	HM	HT	PE	PR	PV	SE	SI	SN	TT	UB
BI	*0.921*												
EE	0.832	*1.000*											
FC	0.788	0.811	*1.000*										
HM	0.859	0.829	0.772	*0.895*									
HT	0.897	0.781	0.741	0.889	*0.830*								
PE	0.872	0.847	0.837	0.898	0.862	*0.937*							
PR	-0.102	-0.043	-0.108	-0.107	-0.098	-0.068	*0.761*						
PV	0.699	0.718	0.649	0.731	0.835	0.781	-0.066	*0.817*					
SE	0.072	0.161	0.098	0.078	0.052	0.077	-0.230	0.146	*0.921*				
SI	0.847	0.810	0.803	0.858	0.887	0.871	0.102	0.714	0.012	*0.886*			
SN	0.020	0.120	0.071	0.061	-0.028	0.042	-0.417	0.051	0.691	-0.060	*0.801*		
TT	0.123	0.052	0.023	0.072	0.081	0.044	-0.387	0.013	0.154	0.041	0.444	*0.823*	
UB	0.869	0.715	0.716	0.796	0.846	0.833	-0.101	0.725	0.078	0.773	0.069	-0.029	*0.870*

Note: Values in Italic Represent Square-roots of AVE.

Table 6. *Heterotrait-Monotrait Ratio (HTMT)*

	BI	**EE**	**FC**	**HM**	**HT**	**PE**	**PR**	**PV**	**SE**	**SI**	**SN**	**TT**	**UB**
BI	-												
EE	0.832												
FC	0.788	0.811											
HM	0.857	0.828	0.771										
HT	0.892	0.777	0.737	0.887									
PE	0.872	0.847	0.837	0.896	0.861								
PR	0.160	0.110	0.146	0.163	0.148	0.119							
PV	0.695	0.715	0.642	0.730	0.835	0.775	0.089						
SE	0.082	0.159	0.094	0.098	0.088	0.086	0.305	0.148					
SI	0.846	0.810	0.803	0.857	0.889	0.871	0.138	0.711	0.048				
SN	0.055	0.114	0.070	0.079	0.057	0.071	0.433	0.054	0.680	0.073			
TT	0.130	0.082	0.080	0.086	0.103	0.089	0.384	0.089	0.155	0.092	0.504		
UB	0.868	0.717	0.716	0.797	0.855	0.836	0.141	0.734	0.078	0.775	0.084	0.064	-

2.4.2. Structural Model

The path analysis model was evaluated once reliability and validity of variables was established. Tenenhaus et al. (2005), Avkiran (2018) and Maune and Themalil (2022) state that, the theoretical model below is evaluated to provide empirical evidence of the path model using SmartPLS:

$$\xi_j = \beta_{jo} + \sum_i \beta_{ji}\xi_i + v_j$$

"Where: ξ_j is the endogenous construct and ξ_i represents the exogenous constructs, while β_{jo} is the constant term in this (multiple) regression model, β_{ij} are the regression coefficients, and v_j is the error term; the predictor specification condition applies" (Maune & Themalil, 2022).

The PLS-SEM path analysis model output in Figure 2 shows the hypothesized results of the path analysis model in Figure 1. The path analysis model was evaluated using the significance of paths, Q^2, and R^2. The strength of each structural path (R^2 value for the dependent variable) determined the goodness fit of the model. Falk and Miller (1992) and Maune and Themalil (2022) argue that the value for R^2 should be equal to or over 0.1. The output in

Table 7 shows all R^2 values for the study and they were above 0.1. The study, therefore, established the predictive capability of the model. Wong (2013) argues that predictive relevance of endogenous variables is established by Q^2. Therefore, the study established a Q^2 above zero (0) denoting predictive relevance. The study output in Table 7 denotes significance of the prediction by the constructs.

Collinearity of constructs was assessed through examining the outer VIF values of the model (Maune & Themalil, 2022). Table 4 shows the output of VIF values for all groupings of exogenous variables and related endogenous variables. The VIF output values were below the threshold of 5 denoting non-existence of collinearity among indicators in the model (Maune & Themalil, 2022). Hence, collinearity was not an issue in the model. Further examination of the output was carried out and the results are as shown in Table 7. The outputs verify the hypotheses and the significance testing for the path coefficients within the path analysis model.

Table 7. *Coefficients, STDEV, T-Statistics, P-Values, Confidence Intervals, R^2, and Q^2*

Hypothesis	Relationship	β	STDEV	T Statistics	P Values	2.50%	97.50%
H_1	PE - > BI	0.319	0.172	1.074	0.283	-0.173	0.499
H_2	EE - > BI	0.270	0.141	1.652	0.099	-0.025	0.528
H_3	SI - > BI	-0.157	0.100	0.577	0.564	-0.116	0.288
H_4	FC - > BI	0.099	0.094	1.005	0.315	-0.092	0.286
H_5	HM - > BI	-0.086	0.114	0.537	0.592	-0.155	0.290
H_6	PV - > BI	-0.306	0.070	1.299	0.194	-0.244	0.037
H_7	HT - > BI	0.804	0.109	3.650	0.000	0.197	0.623
H_8	SN - > BI	0.025	0.084	0.511	0.610	-0.064	0.278
H_9	SE - > BI	-0.034	0.075	0.632	0.528	-0.253	0.066
H_{10}	PR - > BI	0.024	0.071	0.647	0.517	-0.217	0.071
H_{11}	TT - > BI	0.065	0.070	0.665	0.506	-0.111	0.175
H_{12}	BI - > UB	0.831	0.074	9.604	0.000	0.546	0.838
		R^2	R^2 Adjusted	Q^2			
	BI	0.888	0.874	0.657			
	UB	0.761	0.751	0.515			

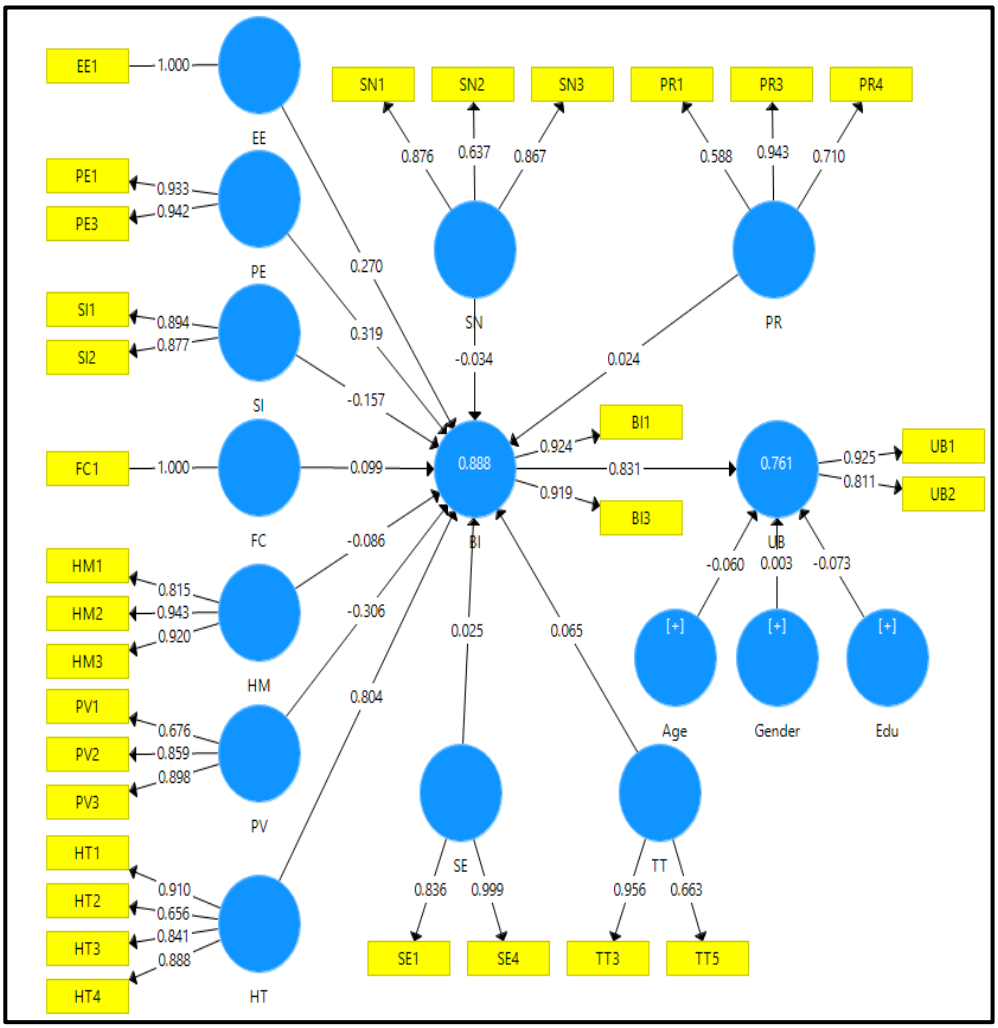

Figure 2. PLS-SEM path model output
Goodness of fit: SRM, Saturated Model – 0.064 & Estimated Model – 0.066.

2.4.3. Importance-Performance Map Analysis (IPMA)

IPMA was extracted to establish the importance and performance of constructs in the model. Performance reflects the size of the latent variable scores while importance shows the total effect on the targeted construct in the PLS-SEM path model (Maune & Themalil, 2022). The output of the IPMA is critical in prioritizing management action. Maune and Themalil (2022) argue

that management should as a matter of priority place more focus on addressing the performance of indicators that shows huge importance in explaining certain targeted constructs, nonetheless having low performance.

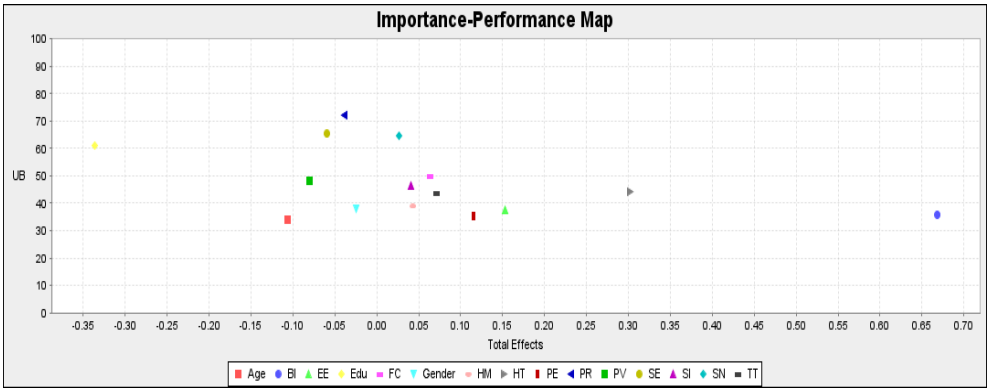

Figure 3. Importance-Performance Map Analysis

The study considered an indicator important when its total effect on "Use Behaviour" (UB) was absolutely high (Y-axis). Therefore, in this study "Habit" (HT) (0.302) has greater absolute importance on UB outside BI (0.668) (Figure 3 and Table 8). Moreover, an indicator has a greater performance when it has a higher score. This score reflects strong measurement of paths as shown by the X-axis. In this study "Perceived Risk" (PR) (72.155) shows greater performance than any other indicators (Table 8 and Figure 3).

3. DISCUSSION

This study examines eLearning platforms adoption and use in universities in developing countries using Zimbabwe as a case study. A PLS-SEM approach was used to analyse data collected through an online survey that targeted students at two universities in Zimbabwe. A modified UTAUT2 model (Figure 1) was examined. The study placed more emphasis on BI and UB's psychological reasoning. Behaviour intention and use behaviour of eLearning platforms in higher education by students is considered a planned behaviour. A path analysis framework modified from UTAUT2 in Figure 1 was examined using the PLS-SEM algorithm to establish significant paths and relationships. The extracts of output are shown in Table 2 to Table 7.

Of importance, however, was the relationship between "Habit" and "Behaviour Intention" (HT -> BI) that is significant at 95% confidence level with a p-value of < 0.05 (0.000) and a T-Statistic of 3.650. Another noteworthy

relationship was BI -> UB that was significant at 95% confidence level with a p-value of <0.05 (0.000) and a T-Statistic of 9.604. The observation reveals that HT has the most noticeable influence (0.804) on BI, followed by PE (0.319), then EE (0.270) and FC (0.099). BI has a significant influence (0.831) on UB and it accounts for 76.1% of the UD variance. All the latent variables account for 88.8% of the BI variance as indicated by R^2. The explained variances were higher than those by previous researchers (Strzelecki, 2023; Maican, Cazan, Lixandroiu, & Dovleac, 2019; Hoi, 2020). The (HT -> BI) findings are consistent with previous studies (Strzelecki, 2023; Sitar-Taut & Mican, 2021; Alotumi, 2022; Jakkaew & Hemrungrote, 2017; Kumar & Bervell, 2019). However, some of findings were inconsistent with other prior studies (Twum, Ofori, Keney, Korang-Yeboah, 2022; Ain, Kaur & Waheed, 2016) who found no direct effect of HT on BI.

During the evaluation of the paths, 17 items (indicators) were omitted because of low factor loadings or high-cross loadings as supported by Gefen & Straub (2005) and Maune & Themalil (2022). Data did not support these paths. Most of these omitted indicators were from EE and FC despite previous findings that showed their significant influence on the latent variables (Venkatesh et al., 2003; Venkatesh et al., 2012; Limayem, Hirt & Cheung, 2007). These findings were inconsistent with findings from other previous studies (Arain, Hussain, Rizvi & Vighio, 2019; Azizi, Roozbahani & Khatony, 2020; Nikolopoulou, Gialamas & Lavidas, 2020; Raman & Don, 2013; Raffaghelli, Rodriguez, Guerrero-Roldan & Baneres, 2022; Mehta, Morris, Swinnerton & Homer, 2019) who found a strong correlation between the variables.

All latent variables except HT were insignificant towards BI at 95% confidence level as shown by their p-values and t-statistics. This was so despite prior findings (Venkatesh et al., 2003; Venkatesh et al., 2012; Groß, 2015; Abrahão et al., 2016; Shneor & Munimb, 2019; Roy, 2017). The study results, however, confirm previous research findings (Liu & Tai, 2016; Barua, Alam & Hu, 2018; Chao, 2019; Tarhini, Alalwan, Shammout, Al-Badi, 2019; Khurana, & Jain, 2019; Gharaibeh, Gharaibeh, Gharaibeh & Bdour, 2020). The following significant paths were established, HT -> BI and BI -> UB with significant p-values and t-statistics.

Our findings found that HM has an insignificant negative impact on BI. The finding is inconsistent with prior studies (Azizi, Roozbahani & Khatony, 2020; Hu, Laxman, & Lee, 2020; Faqih & Jaradat, 2021) while consistent with findings by Ain et al. (2016) and Raza et al. (2022). The findings on SI are in line with those by Alotumi (2022) and Kumar & Bervell (2019) who found insignificant influence of SI on BI. PV has insignificant negative influence on BI consistent with prior findings (Strzelecki, 2023; Nikolopoulou et al., 2020; Osei, Kwateng & Boateng, 2022). However, this was inconsistent with findings by Farooq, Salam, Jaafar, Fayolle, Ayupp, Radovic-Markovic & Sajid (2017) and Azizi et al. (2020).

Furthermore, our findings regarding FC were in line with those of prior studies (Strzelecki, 2023; Alotumi, 2022; Kumar & Bervell, 2019; Dajani & Abu Hegleh, 2019). This was contrary to findings by Faqih & Jaradat (2021) and Yu et al. (2021).

Significance of paths, Q^2, and R^2 were used to assess the path analysis model's goodness of fit as denoted in Table 7. Predictive relevance was established for constructs in line with prior studies (Falk & Miller, 1992; Briones-Penalver, Bernal-Conesa & Nieves-Nieto, 2018; Maune & Themalil, 2022).

Perhaps the most important finding for eLearning adoption and use in higher education by students relates to the IPMA that identifies significant areas of focus (Maune & Themalil, 2022). These are the areas of focus that generate targeted constructs within the PLS-SEM path analysis diagram. In this study "Habit" (HT) (0.302) had the greatest absolute importance on UB outside BI (0.668) (Figure 3 and Table 8). The same was "Perceived Risk" (PR) (72.155) that showed the greatest performance than any other indicators in the study (Table 8 and Figure 3). Ceteris paribus, a unit rise in HT performance will result in a 0.302 rise in UB (Table 8 and Figure 3).

Table 8. *Importance-Performance Analysis*

Construct	Performance	Total effect
BI	35.763	0.668
EE	37.750	0.153
FC	49.750	0.064
HM	38.961	0.043
HT	44.244	0.302
PE	35.349	0.115
PR	72.155	-0.039
PV	48.170	-0.080
SE	65.341	-0.060
SI	46.613	0.041
SN	64.692	0.026
TT	43.345	0.071
UB	40.614	-

4. CONCLUSION AND IMPLICATIONS

4.1. Conclusion

This study examines eLearning platforms adoption and use by students in Zimbabwe universities using a PLS-SEM algorithm to analyse the data. A path model in Figure 1 was evaluated to establish significant relationships between indicators. This path model was a modification of the UTAUT2 that incorporated other latent variables selected from other theories of technology adoption and use (Maune, 2023). This study confirmed the significant influence of "Habit" on BI on the adoption and use of eLearning platforms by university students in Zimbabwe. The adoption and use of eLearning platforms is still in its infancy stages in Zimbabwe with different universities at different levels of adoption and use. Therefore, there is a need for more research studies to be carried out in the field. This study can be useful in providing the basis or foundation for further future studies.

4.2. Implications for research

The application and replication of the path analysis model is critical for ODeL experts and other practitioners in higher education given how technological developments are impacting higher education. The role of technology has become more important than ever before, especially with the impact of AI. The findings of this study are critical to the development of higher education in developing countries in general and Zimbabwe in particular. Further future research will be guided by the findings of this study.

Although the UTAUT2 is an important theory in evaluating relationships between constructs in the use of technology, modifications and expansion of the theory has proved important in different fields with different results realized. This is critical in research since there is no straight solution to a given problem. Researchers should therefore forge ahead with what works since truth is a normative concept – truth is what works.

The proposed path analysis model was evaluated empirically using PLS-SEM to establish critical relationships in eLearning platforms adoption and use in higher education. Using this approach, a cognitive psychological viewpoint to human behaviour in decision making was adopted. The findings of this study show an insignificant relationship among all the constructs except for HT and BI that had significant paths as shown by their p-values and t-statistics. Habit came out as a key determinant in the adoption and use of eLearning platforms by students in universities in Zimbabwe confirming the findings by Strzelecki (2023).

Overally, results showed that behavioural intention has significant influence on use behaviour in the adoption and use of eLearning platforms by students in universities in Zimbabwe. To further authenticate these findings, there is a need to analyse this data using different analytical softwares such as AMOS, R and Stata. A bigger sample might be considered in this endeavor. Further modifications maybe required to this framework. This study was critical in addressing the research gap exposed by prior research (Maune, 2023). The study (Maune, 2023) reviewed relevant literature in developing the extended path model that was evaluated by this study. This study provides the starting point in further future research in the field. Critical dimensions have been identified that will help in future research. The path model was informed by literature (Maune, 2023).

More so, by expanding the path model, the study hypothesized that social influence, habit, performance expectancy, facilitating conditions, effort expectancy, subjective norm, self-efficacy, hedonic motivation, price value, trust, and perceived risk were key determinants in adopting and using of online learning applications by university students in Zimbabwe. However, more indicators for facilitating conditions and effort expectancy were not supported by data; hence they were omitted in the path analysis model. However, the findings in this study confirm prior research results (Shneor & Munimb, 2019; Chao, 2019; Tarhini, Alalwan, Shammout, Al-Badi, 2019; Khurana, & Jain, 2019; Gharaibeh, Gharaibeh, Gharaibeh & Bdour, 2020).

4.3. Implications for practice

Technology has proven to be key in higher education especially during and after COVID-19 pandemic. Globally, technology has become prevalent in higher education especially AI related applications such as ChatGPT. Gill et al. (2024) argue that, “AI applications are becoming crucial for colleges and universities, whether it be for personalized learning, computerised assessment, smart educational systems, or supporting teaching staff. They offer support that results in reduced expenses and enhanced learning results.” However, although use of technology in higher education has become popular, it comes with its own risks and difficulties. To this end, Gill et al. (2024) state that, “there are concerns regarding the potential misuse of [technology], as it could be employed to generate academic tests and assignments for students and provide tailored responses to coursework questions and assessments. As a result, a number of institutions have forbidden students from using [certain technologies] including a ban within an entire country.”

The path analysis model was able to explain and predict various relationships as shown in Figures and Tables above. This has practical implications

in recommending factors driving 'Behavioural Intention' and 'Use Behaviour' in the use of online learning applications by university students. The path analysis model has essential inferences critical for higher education. Maybe, the most essential discovery was that Habit (HT) plays a critical role in the adoption and use of eLearning platforms by students in universities in Zimbabwe.

Furthermore, the IPMA has also proven to be critical in decision-making and in this case, "Habit" (HT) (0.302) had the greatest absolute importance on UB outside BI (0.668) (Figure 3 and Table 8). The same was "Perceived Risk" (PR) (72.155) that showed the greatest performance than any other indicators in the study (Table 8 and Figure 3). IPMA clearly shows critical areas for managerial focus and prioritization. For example, management's focus should be on the constructs of higher importance and low performance. These constructs have higher chances for improvement. This is critical for management since it is illogical to focus on constructs of low importance as this will have no impact in improving the targeted construct.

4.4. Limitations

This study examines eLearning platforms adoption and use by students in Zimbabwe universities using a PLS-SEM algorithm to analyse the data. A path model in Figure 1 was evaluated to establish significant relationships between indicators. Sample size limited this study as a bigger sample could have improved the findings. More universities could have been used in this study but only two were targeted. The study was also limited to students in the Faculty of Commerce and level 2.2 and 4.2. Financial resources also limited the study as this study was self-funded. Given funding, the researcher could have improved on the sample size by targeting students in different faculties and programs. The study was also limited to a single methodology.

Mixed methods will improve the research findings as studies have shown that mixed methods are better than mono-methods. Mixing qualitative and quantitative research methods is critical in dealing with biases associated with using one method. By using mixed methods, the researcher will be able to answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach. The researcher will be able to use the strengths of an additional method to overcome the weaknesses in another method by using both in a research study. Despite all this, the researcher forged ahead with the approach that worked for this study since truth is a 'normative concept.'

Disclosure statement

There is no potential or existing conflict of interest in this study.

Data availability statement

The study used data obtained from a survey which can be provided on request from the author, A.M.

Declaration of funding

No funding was received for this study.

Author contribution statement

The author contributed everything in this article, that is, conceptualisation – A.M; Methodology – A.M; Data collection – A.M.; Writing – A.M, Investigation – A.M, Reviewing – A.M.

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Persuasive Arguments and Career Decisions Among Grade 12 Learners in Selected Secondary Schools in South Africa

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ABSTRACT. The study examined persuasive arguments and adjustment in career decisions among grade 12 learners in selected secondary schools in South Africa. Persuasive Arguments theory guided the research. The design adopted in this research was a multiple case study. The participants comprised 14 learners in grade 12 in two selected secondary schools in South Africa. Data was collected using Focus Group Discussions. Thematic analysis framework was used in data analysis. The findings indicated that persuasive arguments in the form of new information, knowledge from other learners and original information influenced career adjustment among learners. The implication of this finding is that universities reconsider training teacher counsellors on career paths and subject requirements to equip them with the best knowledge on varied careers.

Key words: Persuasive Arguments, Career Decisions, Secondary Schools, South Africa

INTRODUCTION

In psychology, social groups have features namely purpose, interactions, small size, purpose, interdependence, relationships among others, and motivation. In this regard, a group is defined as a collection of more than two people who are interacting face to face, are aware of their membership of the group, strive to attain the common goal of the team, and strive towards positive interdependence

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(Bettenhausen, 1991). From the standpoint of group dynamics individuals in a group gain confidence in collective decisions, there is increased motivation to make decisions, members gain social support from each other, and the members benefit from enhanced interaction with other competent others. Many benefits of making decisions as a group rather than as an individual can be found in previous research in group dynamics. According to Lombard (2020), there are many benefits of group collective decision making including pooled information that an individual does not have. One person's knowledge deficiencies can be covered by another member of the group (Lombard, 2020). According to Kivlighan et al (2012), groups have a wider number of approaches to problem solving than individuals working alone. As a result, there may be as many perspectives and approaches of problem solving as there are group members. During group decision making, there are more possibilities or approaches. As members learn new information from one another about issues being discussed in the group, they become more knowledgeable and understanding of the issues. They can participate together in making decisions on the issue and are thus satisfied with the decision making because it is much more likely to be accurate than by an individual and more likely to address problems more effectively than by individuals working alone (Kivlighan, 2012).

Furthermore, in group decision making, members make use of advantages including access to more alternatives among other members, varied information presented by others, many patterns in decision making and finally best decisions as compared to an individual making decisions alone (Hirschi & Dauwalder, 2015). Group members may integrate information by listening to each other's views to produce varied and best decisions by collecting information from other members and reaching a consensus as compared to what an individual can do (Lombard, 2020). In this regard, in group decision making, individuals learn from each other, there is available new knowledge that members from each other, and the decision arrived at is regarded as best. According to Lee et al (2019), the growing complexity of many judgements necessitates specialized expertise in a variety of fields, which is typically contained by different members in a group as compared to an individual on their own. In addition, individuals in a group support collective decisions because risks of the decision are spread among all members (Lombard, 2020). The more people who approve and commit to a decision, the more probable it is that the choice will be implemented successfully (Lombard, 2020). As a result, groups have much better and more accurate judgement of ideas because the different members bring in expertise and this leads to increased efficacy in the group consensus decision. Members involved in group decision making consider various alternatives and reach best decisions that have compromise stands on the issue being discussed at hand (Hirschi & Dauwalder, 2015).

Group dynamics are regarded as processes and behaviours that occur among members in a small social group. Group decision making is important because it brings together different ideas, knowledge, information and other alternatives that all contribute to discussions leading to a single decision which has benefited from increased alternatives from different members of a group (Lombard, 2020). In groups, individuals' behaviours are influenced by other members in a group from social comparisons and persuasive arguments which result from dynamic interactions among members. Previous research indicates that when others are present, people work more and quicker, and that when an individual is alone, there is likelihood of reduced performance because of lack of social support (Kivlighan, London, & Miles, 2012; Hirschi & Dauwalder, 2015). Individuals are constantly interacting with others elsewhere, as well as within the group and with the group itself. A group is a collection of at least two people who gather for a specific purpose, communicate with each other, influence each other, and rely on each other. A gathering should have common goals and conventions, but they should also recognize themselves as a group (Hirschi & Dauwalder, 2015).

Persuasive Arguments

Persuasive arguments are about the type, convincing and credibility of information that is presented by other members of the group and is available for consideration by others (White, Charles & Nelson, 2008). The perspectives on a subject being discussed may change or remain unchanged in group decision making, depending on the type and nature of information that was available for the members for consideration. Information presented during group decision making and is regarded as novel, credible, valid, original and persuasive affect group members' opinions, causing them to change from their previously held position about an issue prior to group meeting to a new position (Zhang, et al., 2020). Furthermore, these elements are related to the communicator or presenter of information, in addition to the material conveyed during the group meeting. If the information presenter in a group is perceived to be an expert or experienced in the issue being discussed, members may be persuaded to abandon their pre-group meeting decisions in favour of new ones because the persuasive member is communicating true or credible information. Making a career choice might be challenging because there are so many possibilities available in the world. It may be difficult to choose the finest career because no one wants to engage in work in a career that they dislike or that does not fit their personal standards. There are several components and strategies that can help people choose the ideal career that they want and like. Because those

settled in their chosen profession put more effort, concentrate more and make more money, which can lead to a happier living and a stress-free existence. When this occurs, they will be able to live a healthy lifestyle (White et al, 2008). Individuals' ability to persuade others is a vital tool in any decision-making process. The capacity to persuade others, provide persuasive arguments, and persuade people to act is a valued quality that can be useful in a variety of workplaces. If you want to learn how to enhance your persuasive skills, you must first understand what the phrase involves.

Persuasion is the process of convincing someone else to do something or agree to something. Persuasion is used in the workplace to sell items, recruit team members, and boost efficiency. A good persuasion skill can persuade people to do well and succeed (Zang, et al., 2020). A convincing employee can also help to speed up and simplify group decision-making. Persuasion is a key soft skill that, when utilized correctly, may have a considerable impact on professional decisions. Good communication skills serve as the foundation for developing other persuasive abilities. Effective communication skills include being able to convey yourself properly, leveraging nonverbal cues, and using vocabulary that the other person understands (Zang, et al, 2020). If you can present your ideas and thoughts in an entertaining manner that appeals to your listener, they will shift their original decisions to support the group agreed one. When listening to alternative arguments from others on job choices, this can cause learners to change their ideas. Another crucial persuasive talent is the ability to detect and comprehend your listener's emotions. Emotional intelligence is an acquired skill that allows you to recognize and respond to the emotions of others. The best method to accomplish this is to speak with them. When utilized for persuasion, it also assists you in tailoring your persuasive approaches to a specific situation or person. For example, while discussing with a group of classmates at school about changing careers because their peers believe it is not right for them. You see that their arms are crossed and that they are avoiding eye contact as you speak to them. When they speak, their phrases are brief and to the point. You should be able to discern if they are upset or intimidated by using your emotional intelligence. With this information, you can change your persuasion strategies to try to calm them down or alleviate their anxieties (Young, 2016).

Persuasive Arguments Theory

Persuasive Arguments Theory (PAT) argues that shifts from individual pre group decisions to post group decisions is attributed to information that is available during group deliberations (Sieber & Ziegler, 2019). This theory argues

that in group decision making, there is a determined pool of relevant arguments from different members involved in the group task. The pre-discussion position held by an individual is assumed to reflect the pro and con arguments that he or she can retrieve from memory. In addition, it is presumed that the pool of arguments is only partially shared among group members. During group discussion, arguments are being stated, some of which are persuasive to individual group members. According to Sieber and Ziegler (2019), the persuasiveness of arguments is determined by the degree to which they are perceived to be original and contain more evidence. During group decision making, individuals have pre-group preferred decisions which are likely to shift after post group decisions because of a more available pool of arguments presented by other members (Sieber & Ziegler, 2019). Therefore, as group deliberations continue, members gain access to more alternatives that are presented, leading to shifts in decisions. On the other hand, persuasive arguments enhance shifts in decisions by members because of the pool of information that is available for the group (Sieber & Ziegler, 2019). Therefore, there is increased demand to listen, process and weigh the options in the persuasive arguments that are presented by other members of the group. Sieber and Ziegler (2019) further argue that the pool of arguments available from other members of the group presents relevant information leading to shifts in original pre group decisions that are possessed by members. Thus, group polarization results from persuasive arguments that are presented by members of the group.

Literature Review

Literature exists on persuasive arguments on group decisions in different contexts such as business fields, psychology and economics, but there is dearth of literature in educational contexts. Joyal-Desmarais, et al., (2022) indicated that persuasion is enhanced by varied motivations, presence of concrete evidence in the group and the nature of arguments that are presented during the group decision making process. In earlier research in Kenya, Aloka and Bojuwoye (2014) reiterate that persuasion is a critical in the group disciplinary decisions for students. To confirm the above evidence, White, et al., (2008) argues that positive beliefs among members in a group resulted from persuasive arguments that were presented by other persons regarded as senior and older. Reporting on factors that lead to persuasive arguments in a group, Aloka (2021) argued that credible, new, original information that is presented by teachers with long years of teaching experience causes shifts among young teachers leading to polarization in decisions. In another research which also concurs

with the above literature, Weidong and Gwanhoo (2000) reiterate that initial decisions of people shift after persuasive arguments are presented to members of a group.

In another related research, Ta, et al., (2022) indicated persuasive messages are easy to read, shorter, content loaded and relevant, leading to shifts in individual decisions of members of a group. Thus, persuasiveness of messages is understood from psychological and social aspects as critical sources to understand this phenomenon. In another research that investigated organizations decision making processes, Lantz, (2020) indicated that appeals that are persuasive are more likely to influence members of a group to shift decisions. In addition, Hadoux, et al., (2023) argues that a goal argument may, among other things, incorporate an intention to change behaviour, though we accept that there is a difference between have an intention to do something, and doing it. Nonetheless, having an intention to change behaviour is a valuable step towards changing behaviour. Moreover, Aloka, and Mathebula (2022) indicated that the persuasive arguments were regarded depending on whether they were original, from older and more senior persons, and whether the content was strong with more evidence.

To support the above argument, Penczynski (2016) reiterates that shifts in decisions during group deliberations results from factors such as original information, informative arguments and the ability of people to provide more concrete evidence. To reiterate, Vicente, et al., (2025) study indicated that individual decisions are affected by the pool of persuasive arguments that are presented during intervention. In addition, Obermaier and Koch (2024) argues that weak arguments do not lead to shifts in individual decisions because members lack motivation to change their preferred opinions. Similarly, Dawson, et al., (2024) reiterate that a strong social authority in a group deliberation brings more credibility to the information being presented and this is a key driver to shift in decision. Most recently, Hubbart (2025) argues that strong persuasive argumentation boosts leadership capacity, enhances best decisions and promotes effectiveness in communication during group deliberations. From the literature review above, very scanty information is available regarding the educational context in South Africa. Moreover, most reviewed studies have focused on career decisions in general but very little information was available on grade 12 learners.

GOAL OF RESEARCH

The goal of the research was to examine persuasive arguments and career decisions among grade 12 learners in selected secondary schools in South Africa.

METHODS

Research Design

A multiple case study research design was adopted to guide this research. The research explored group dynamics on persuasive arguments and career decisions among learners. This research design is about understanding similarities and differences among cases that are studied in almost similar contexts (Hunziker & Blankenagel, 2021). This research design was relevant to this study because it ascertained assessing and exploring different contexts of two schools.

Study Participants

The study participants comprised 14 Grade 12 learners from two selected township secondary schools in South Africa. Thus, 7 participants were obtained in two school contexts with similar characteristics. The participants were selected using simple random sampling techniques. The sample size of 14 learners for qualitative data collection was appropriate because Mason, (2010) study argues that between 10 and 50 research participants are adequate for data saturation in qualitative aspects. The demographic profile of participants is presented in Table 1:

Table 1. *Demographic profile of participants*

Demographics	**Categories**		**Proportion %**
Gender	Males	7	50%
	Females	7	50%
Ages	17 years	1	7.14%
	18 years	8	57.14%
	19 years	4	28.57%
	20 years	1	7.14%
School type	Public	14	100%
	Private	0	0%
Socio-economic status (SES)	Low SES	10	71.42%
	Moderate SES	2	14.28%
	High SES	2	14.28%

The demographic profile of participants is presented in Table 1 above. Regarding the gender of learners, there was equal representation since 50% were males and another 50% were females. Regarding the ages of learners, 8 (57.14%) were 18 years old, 4(28.57%) were 19 years old and those 17 years

and 20 years had 1(7.14%) each. This indicates that most learners were within the expected age of grade 12 learners with the majority at 18 years. Based on school type, 14 (100%) were in public schools. Finally, based on socio-economic status, most learners 10(71.42%) were in the low socio-economic status, and 2(14.28%) were from moderate and high socio-economic status.

Research Tools

The study adopted a focus group discussion guide for data collection. According to Guest et al., (2016), focus groups discussions of two groups and above are recommended for saturation of qualitative data. The validity and reliability of focus group discussion guide and the data obtained was ascertained by using a peer to provide an overview of the transcribed data, member checking to ensure that accurate data was collected, and finally peer debriefing after data collection where participants had access to the data to confirm their authenticity (Nowell, et al., 2017).

Procedure

Upon receiving ethical clearance from the university, permission was obtained from the Gauteng Department of Education. The researcher made appointments with the principals of the two selected secondary schools, and the participants were identified. Each of them completed and signed the consent form. Thereafter, the 7 learners were assembled in an office for the focus discussion which took approximately one hour 30 minutes. The data was audio recorded. Thereafter, the learners were debriefed after the session of data collection.

Analysis of Data

The data obtained was analyzed by using thematic framework. According to Nowell, et al., (2017), thematic analysis process involves six phases. First, the researcher familiarized himself with the data obtained to get an overall sense of what the content was about. Secondly, the researcher generated initial codes from the transcribed data by analyzing the words that feature prominently all through. Thirdly, the researcher searched for themes that emerged from the data, and codes were also merged to assist in creating the themes and confirming them. Fourth, the researcher reviewed the themes, confirming their accuracy. Finally, the researcher defined, named the themes and wrote the report which also included interpretation of the presented data (Nowell, et al., 2017).

RESULTS

The study examined persuasive arguments and adjustment to adjustment in career decisions among learners in secondary schools. Group members' perceptions on a subject being discussed may alter or remain intact depending on the nature of the discussion (Feinstein et al., 2013). The discussion below presents the themes on the influence of group discussion on Grade 12 learners' career decision making.

Sub-theme 1: *Influence of group discussion*

The influence of group conversation is defined as the impact that a debate among peers and friends can have on one's career decision-making process. For example, if one individual in a group has a different opinion, it is quite probable that the individual's opinion will trump that of other members of the group to the point that a member may desire to change an already made decision to adhere to that of the group. Group discussion is a technique for learners to express their thoughts on a particular subject. Most participants indicate that group discussions have little influence on their career selection. Participant 3 stated that having a friend who values the same things as you can be a helpful effect on the career decision-making process. This usually provides learners with directions and the ability to discuss career-related difficulties with people who share the same values:

"When it comes to peers for instance, I have two friends and we are in a debating club together. Debate has to do with speaking and we also work together. I do debate because I want to do Law, my other friend is doing debate and he is also good in physical science, and that has to do with science he's quite good at it. He wants to be a doctor. The second friend is also debating but he has a different perspective because he is interested in another thing. If you have a positive company that you are able to influence each other positively. If you are able to get what you want to do and do it, you don't have to copy the second person and that will be a positive influence but you must follow your passion and one should not allow negative influence." (Participant 3)

Participant 5 echoed what some of the participants said and mentioned that *"I think it has a very huge positive influence."* (Participant 5). Participant 3 also supported other participants' assertion that group discussion indeed influenced their career decision.

"It has influenced me in a positive way because my friend who knows better than me has been able to influence me positively." (Participant 3).

Participant 4 expresses an opinion that differs from most of the participants. Participant 4 believed that group discussions had a negative impact on career decisions because the participant believed that having such an argument with friends or peers can cause confusion, derail one's initial plan, and reduce a learner's

focus, especially for those who struggle to decide on their career of choice, as indicated by the participant: *"I have a slightly different opinion because I will say it has a negative influence on me..."* (Participant 4).

Participants 2 and 4 noted a lack of information in making professional decisions at a specific point in their academic experience. Most participants stated that professional information usually came late after they had made their career decisions, usually when they were in Grade 12, rather than being a progressive thing that should lead their journey towards making their career decisions. The participants observed the priority placed on their pass rate while ignoring discussions that could help their life. However, participant 4 emphasized family influence, explaining that having the group discussion would make no difference to some of them because their career paths would be determined for them by their family. In certain cases, learners must follow family traditions when it comes to career choices, with families failing to examine their children's talents and shortcomings. The following excerpts reflect participants' views on the influence of group discussions on career decisions:

"Such discussions mostly happen after grade 12. It is quite unfortunate that we are usually focus on our results pass rate and not necessarily on what a group is saying. Instead of having a quality conversation like this we usually compete with ourselves." (Participant 1).

"Unfortunately, we don't share information among ourselves. We are always thinking about what people are going to say about us and instead of us standing our ground firmly. Sometimes it's a family decision for some of us. The family decides this is the career path you must follow." (Participant 2).

"I think lack of information is what influences our careers decision making. For instance, I want to study supply chain management and I really wish I knew all that I know now since last year." (Participant 4).

Participating in career discussions can occasionally help learners who are struggling with career decisions by giving them ideas on what to choose while listening to some of their friends' perspectives on career. Three of the participants claimed that the group conversation had no influence on them since their career decisions are based on their strengths and experiences and are not influenced by peer discussions. One of the participants believed that most of their career discussion should focus on inspiring one another to grow themselves rather than being a competition, as expressed by the participants in the following extracts:

"I feel like, fine my strengths, but I mostly do experience myself but I also gain something from my friends too, like so each and every friend is a different breed. So, once we come together like the discussion becomes good, we learn from ourselves in the process it's your progress and not mine if you are able to gain something good from the discussion. But that doesn't mean that when I express

myself and my abilities it counts to what I do, so I feel like it's all about empowerment and how we're going about it to achieve our goals, but at the same time, career decisions are all about individuality. If I can do this, you can do it and we never want to see someone else behind us." (Participant 12).

"I made my career decisions based on my strengths and abilities on what I'm interested in. Because I am me and I stand alone." (Participant 9).

"... if I decide to do something then it is what it is. Something that I would do regardless of anyone else's opinions or anything." (Participant 13).

"Interesting. So, I can make a decision based on what I can do but then I feel like she is better than me, and then I want to put myself in her position knowing well that I don't have the potential she possesses. We are all going to get something. So, like, it's not a competition where you make yourself do what others are doing and that's where it gets twisted cause a lot of people especially teenagers, like I can feel jealous cause she's making a better decision, and then I'm looking at her life. Yeah. But then she's got that potential, when I look at my grades and I feel like maybe I'm dumb, like, we shouldn't do that. Like, you should, like, build yourself to get where you want to get and stop feeling like we are in competition with ourselves." (Participant 6).

"I feel like empowerment is like one of the best tools we can use, like empower me as a friend and I empower you back. Let's not make it feel personal and we're not competing. We all want to get somewhere in life, but it's mainly in your mind what you tell yourself. Wake up every day and tell yourself you are great. You are not competing with anyone and you are enough, once you feel like enough, like you get to the goals you set for yourself. And with that comes like a high self-esteem as well as self. Awareness of knowing. That you are capable of doing whatever you want. So, like I might be competing with them, you can change the low self-esteem and however, I feel like I have power over others, but then it's not like that. She knows what she wants. She knows where her strength and interest lie, and I know mine that is, so it's just a matter of fixing yourself to get where you want to, and then the rest is sorted." (Participant 9).

While it is crucial for Grade 12 learners to participate in career discussions, participants 12 and 13 said that social community and experience are components that demand specific attention in career decision making:

"I feel like it's a broad open discussion, but then we have to keep in mind the social community, experience in communities. I mean, if I have an ambition and a fair dream, it's just based on like everyone's dream. But some of us, like our backgrounds, are not the same. Especially teenage pregnancy, like a lot of things contribute so badly, so I feel like your career could be based on what you want to see yourself actually, how you look in the shoes of another person. You have to put yourself in your own shoes. You can look back sometimes and not be limited to your environment." (Participant 12).

"That in order for you to achieve your dreams or get out of the situation that you're in, you have to depend on yourself instead of relying on others because those people aren't going to be there forever. And you, relying on them, now puts you at a disadvantage because you are going to always be dependent on them and when they leave, you might fall and you want to be independent rather than being dependent on somebody." (Participant 13).

Participant 10 presented a different perspective on the impact of group discussions as something that is so perplexing because most of the time the discussions are on the type of career that can be pursued based on individual strengths and abilities combined with the marks obtained in learners' subject choices that match the individual learners' preferences. However, the participant described the situation as confusing in most instances rather than helping towards making an informed career decision. Participant 14 believes that consistency is essential in all of these discussions and that every individual should be consistent with their career choice and not alter their career every time they have career discussions with their peers.

"These discussions are confusing because today you want to be a doctor tomorrow you want to be another thing and now you want to be a Nurse. You don't even know what to do. So, it tells me that you don't even know the route to take because now you are confused. Once you put something in your mind that I want to be this. Now you don't know the specific route to take and you force yourself to do a subject that you are not good at like Physics, when you get to matric you can't even like to mix anything, not even A&B." (Participant 10).

"You get to a point where you might think, oh, I want to be a firefighter, but I want to be a soccer player because I can play soccer. So that means such arguments do not apply to me at all, it doesn't affect my career decision. I want to be a soccer player. I have nothing more than that." (Participant 1).

"I also feel like I'm going to go back to her point that consistency is key. If you're consistent, this argument won't be confusing to me, since you know what you want to be, and that's where you stand." (Participant 14).

From the findings presented above, it is apparent that some learners were influenced to make their career decisions through group discussion with their peers. The grade 12 learners perceived these discussions as helpful towards shaping their respective career decisions. The next sub-theme interrogates the career decision adjustment of learners based on the arguments or discussions with their friends or peers.

Sub-theme 2: *Career decision adjustment*

The transition from school to work is a critical stage in most people's professional lives. This transition begins with a career decision process and concludes with a process of adjustment towards making the final career decision. Career choices are mostly influenced by self-efficacy expectations and are

anchored in social situations (White et al., 2008). Work adjustment research focuses on the process by which young people become socialised and involved in persuasive arguments that lead to a change in their career choices. Engaging in career conversations can sometimes be influential in both positive and negative ways. Most participants are of the view that, considering the present economic condition in the country, it is inevitable to implement changes to their career choices often until they reach their desired destination. The fact that changes that are happening around the country have an effect on the career choices made is a concern for most of the participants, as they mentioned that it is necessary for them to adjust their decisions based on these changes as they affect their choice, which could not allow them to be consistent with their decision because it is important to always weigh one's options when deciding on a career. This is evident in the following discussions with the Grade 12 learners.

If we knew all these before now, one might have acted differently. There are times some of us are academically strong, but we are not exposed to the realities of career decisions. We are simply not equipped. (Participant 1).

The conversation I had with my friend made me start something on the side just in case my choice of career doesn't favor me in the long run. So, I'll say it has a high influence on us. (Participant 3).

"Personally, I feel like consistency is key regardless of what you do but when you have the patience you can build up, like in terms of regenerating income, you can invest, you can buy shares. There are always good things to do and grow. I just feel like once you have an income, a stable income, it just generates from there. So, some people might see a career path that you just want to make money instantly, like, right now, some of us see it as progress. We have to start from somewhere. So, like every obstacle you have to face and then you have to celebrate opportunities in any little way that it comes. Because even if you just start a business now, you might not have hopes that it would develop. But if you like putting the hard work and the effort and your heart into it, you will get where you want to get. That, and yet we are here and we still feel like it's not enough. So, I just felt the little we have you can expand so like you just feel like you need to trust the process, but then you have to have faith in yourself and you have to put yourself 1st and you have to think even how hard it gets you have to like to stay consistent." (Participant 12).

"...but we should also look at our circumstances. Like the economy that we're in, the inflation rates, it's such things that influence what you want to be. I mean, who wants to work, maybe let's say 8 to 9:00 every day and then not be able to make ends meet. No one wants to be in that situation, so hence the careers that will pay you more is what you might possibly choose, even if it's not what you wanted to do, you just have to choose." (Participant 14).

"You cannot be consistent when the economic rate and the situation is not consistent or stable. So, you change as the economic changes." (Participant 11).

"...change is..., it's mostly coming from the heart, something we haven't thought about if, like, actually teach your person if you want to be a doctor. For instance, if you want to be a teacher, then explaining something to others is easy. But you must think like when you are making the career decision, like, can you really believe and trust your ability. It's not really basically about changing your career based on arguments that were made in class. If the picture is clear to you on what you want to do, then go ahead." (Participant 10).

"Like if you're in a job that relates to your interest. Then you will produce a great quality of work. If you are there for the money, then nothing will happen." (Participant 13).

Participant 9 recalls how the group conversation influenced her career choice. The participant described how one of the arguments in class caused her to question a career choice she had made before the conversation. The debate has prompted the participant to revise the initial career decision that was reached as a result of knowledge presented during the discussion with the peer as against the prior decision.

"We once had an argument in class. We were talking about teachers and doctors, people were saying teachers don't get a lot of money and people were saying doctors get a lot of money. And by that I was like, ohh okay, it's like this. I had to make up my mind, because once when growing up, I wanted to be a teacher, but then when I got to matric and hearing the arguments between the learners, I was like ohh so, teachers don't earn a lot of money and I don't want to be in those shoes. I want to make a lot of money. Yes. So, I was like, no these arguments are changing my decision, so I have to make a list of changes. I have to make small changes or see if I do want to continue being a teacher or maybe make another decision or maybe be a doctor or a lawyer or something else, that has happened in the past." (Participant 9).

According to the preceding extracts, career adjustment is clearly important, as participants in this study stated. The participants expressed their discontent with the country's economic position, which they claim has a negative impact on their career decisions as young adults, forcing them to make changes as frequently as feasible. In fact, it can be deduced that some participants consider their abilities while contemplating a career change, while others consider the financial benefits associated with their choices.

DISCUSSION

The findings indicate that if one individual in a group has a different opinion, it is quite probable that the individual's opinion will trump that of other members of the group to the point that a member may desire to change an already made decision to adhere to that of the group. This finding agrees with Joyal-Desmarais, et al., (2022) which indicated that persuasion is enhanced by varied motivations, presence of concrete evidence in the group and the nature of arguments that are presented during group decision making process. In agreement with the findings, Aloka (2021) reiterates that persuasion is critical in the group disciplinary decisions for students. Moreover, Weidong and Gwanhoo (2000) agree that persuasion significantly affects the formation of users' initial perceptions, attitude toward, and intention to adopt information technology. Ta, et al., (2022) provides a more parsimonious understanding of the social psychological pathways to persuasion as it operates in the real world through verbal behavior. Lantz, (2020) indicated that appeals that are persuasive are more likely to influence members of a group to shift decisions. In addition, Hadoux, et al., (2023) argues that a goal argument may, among other things, incorporate an intention to change behaviour, though we accept that there is a difference between having an intention to do something, and doing it. Nonetheless, having an intention to change behaviour is a valuable step towards changing behaviour.

In agreement with the findings, Aloka and Mathebula (2022) indicated that the persuasive arguments were regarded depending on whether they were original, from older and more senior persons, and whether the content was strong with more evidence. Finally, this finding agrees with Sieber and Ziegler (2019) theoretical assertion that the persuasiveness of arguments is determined by the degree to which they are perceived to be original and contain more evidence. During group decision making, individuals have pre-group preferred decisions which are likely to shift after post group decisions because of a more available pool of arguments presented by other members. In addition, the findings concur with Penczynski (2016) which reiterate that shifts in decisions during group deliberations results from factors such as original information, informative arguments and the ability of people to provide more concrete evidence. Moreover, Vicente, et al., (2025) study indicated that individual decisions are affected by the pool of persuasive arguments that are presented during intervention. In agreement to the findings, Hubbart (2025) argues that strong persuasive argumentation boosts leadership capacity, enhances best decisions and promotes effectiveness in communication during group deliberations.

CONCLUSIONS & RECOMMENDATIONS

The study concludes that if one individual in a group has a different opinion, it is quite probable that the individual's opinion will trump that of other members of the group to the point that a member may desire to change an already made decision to adhere to that of the group. The study further concludes that students should adjust their decisions based on changes as they affect their choice, which could not allow them to be consistent with their decision because it is important to always weigh one's options when deciding on a career. The findings of the study have implications for teacher counsellors and grade 12 learners in secondary schools. The teacher counsellors should provide adequate career training to grade 12 learners in secondary schools. Moreover, the Department of Education should train teacher counsellors on career paths and subject requirements to equip them with the best knowledge on varied careers.

Limitations of the Study

The study had one limitation in that only 14 participants were involved. However, the study still achieved its goal being a qualitative one, in which it did not intend to generalize findings but to achieve in depth findings during interviews.

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Practicum Training of Students in Special Education. A Theoretical Review of Reflective Strategies and Instruments

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Abstract. This theoretical review examines the central role of reflective strategies and instruments in practicum training for undergraduate students in Special Education. Practicum experiences serve as a critical bridge between theoretical concepts or models and the complex realities of working with children with diverse learning, behavioral, and communication needs. Across literature, reflective practice emerges as a multidimensional process that supports professional growth by deepening students' understanding of educational decisions, fostering self-awareness, and strengthening developing professional identities. Foundational forms of reflection - including reflective thinking, reflective writing, guided dialogue, and the use of reflective logs - enable student teachers to critically interpret classroom experiences, confront challenges, and integrate theoretical knowledge with situated practice. Research consistently highlights reflective thinking as a catalyst for analyzing educational events, questioning assumptions, and linking experience to broader educational principles. Mentoring and collaborative dialogue further enhance reflective engagement by providing intellectual, emotional, and contextual support. Among reflective instruments, structured reflective logs hold value as diagnostic and developmental tools, helping students articulate their learning, examine their beliefs, and set goals for improvement. The review also notes that reflective writing requires explicit scaffolding, including modelling, guided practice, and clear criteria, to cultivate depth and consistency. Overall, the findings emphasize that practicum training is most effective when reflective strategies are intentionally inserted, systematically supported, and collaboratively enacted. Such practices contribute to the development of independent, critically minded practitioners capable of engaging in the complexities of Special Education and sustaining ongoing professional growth.

Keywords: reflective practice, practicum training, Special Education, reflective logs, teacher education.

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INTRODUCTION. STRUCTURE OF PRACTICUM TRAINING

Undergraduate practicum training for students enrolled in Special Education programs provides opportunities to develop the competencies needed for a range of specialized professions they may pursue after graduation or through postgraduate and in-service preparation, including special education teacher, speech and language therapist, special educator, support teacher, and educational counsellor. As students enter their practicum experience, they are guided by specific strategies, techniques, and approaches that blend theoretical learning with practical, hands-on engagement. Among these, reflection-based strategies hold particular importance because they deepen students' understanding of what to observe, how to focus their professional growth, and how to interpret their emerging sense of professional identity and responsibility. The reflective practices integrated into the practicum include reflective writing - linked to self-awareness and personal development as students articulate their thoughts and emotions while exploring personal limits (Wright, 2018); reflective thinking - centered on relating, experimenting, exploring, and connecting theoretical knowledge with practical experience (Hathazi & Serban, 2022; Helyer, 2015); reflective logs - used to document the reflection process; and active listening, complemented by individual or group mentoring sessions. Throughout their practicum and mentoring activities, students are encouraged to develop the skills necessary for assessing and supporting children with disabilities. In doing so, they learn to address questions such as: How do I begin? What should I focus on first? What is happening in this context? Is this approach appropriate? Is behavior a form of communication? How does the child learn? How can I better understand and respond to the child's needs and interests?

The practicum aims to cultivate students' professional responsibilities through targeted assignments and objectives, including building strong mentor relationships, reflecting on teaching, producing documents and resources, observing communication with families, participating in the professional community, and engaging in ongoing professional development (Machost & Stains, 2023). Through the implementation of reflective strategies, all parties involved contribute to the development of reflective practitioners - individuals who critically examine, reorganize, and reconsider their planning, observations, and interpretations. As students strengthen their reflective abilities, they learn to integrate others' perspectives into their own practice and experience (Tyler, Boldi, & Cherubini, 2022). For teachers and mentors, this process involves drawing on their expertise to understand how students learn and communicate, fostering the trust and openness needed to build a supportive mentoring relationship.

Reflective thinking in practicum training

Reflective thinking represents a foundational approach within teacher education programs, functioning as a key mechanism for supporting professional development during practicum training. Early conceptualizations of reflective practice, particularly those advanced by John Dewey (1933), established the groundwork for understanding the qualities and dispositions of reflective professionals. Within educational contexts, the primary goal of reflective practice is to foster teachers' capacity to reason about their instructional decisions - why particular strategies are chosen and how teaching can be refined to positively influence student learning outcomes (Lee, 2005). In parallel, the practicum serves as a structured bridge between theory and practice, offering student teachers regular, supervised opportunities to apply and evaluate their knowledge, skills, and attitudes within authentic school environments (Ryan, Toohey, & Hughes, 1996). Building on this perspective, Damon (1992) contends that the practicum's central purpose is to surface problems and issues that prompt the exploration of relevant theories and professional knowledge, positioning practice itself as the organizing core of the curriculum.

Reflective thinking enables student teachers to critically examine experiences through the lens of their evolving understandings, thereby maximizing learning in real-world contexts. Practicum training thus encourages them to apply theoretical principles and pedagogical skills, progressively developing competencies through diverse classroom experiences and gaining insight into the realities of professional practice. This process allows student teachers to assess their readiness for a teaching career, evaluate their improvement, and identify topics requiring further personal or professional development (Ryan, Toohey, & Hughes, 1996).

A recurring theme in the literature concerns the shifting perceptions of preparedness that student teachers experience as they progress through practicum and internship placements. While many preservice teachers initially feel confident due to prior coursework or general exposure to educational theories, the feedback they provide at the conclusion of their training often reveals a more nuanced and self-critical perspective. This shift highlights a growing awareness of the complexities inherent in teaching environments, including the dynamics of teacher–student relationships, the diverse needs of children, and the challenges of managing difficult behaviors. Such developments suggest that the practical realities encountered during fieldwork often expose gaps that are not evident in theoretical preparation alone. The emotionally charged nature of unfamiliar experiences further contributes to a decrease in perceived readiness. Whereas theoretical study may instill a sense of readiness, the practical application

of this knowledge frequently reveals educational challenges and situational nuances that theory alone cannot fully address. The heightened expectations associated with meeting diverse learners' needs during the internship may also contribute to reduced confidence. If this is the case, it should not be interpreted as regression. Instead, it reflects the emergence of deeper critical self-awareness. Li et al. (2025) argue that teacher education programs must support more effectively the transition from theory to practice by providing structured mentorship and sustained opportunities for self-growth as preservice teachers move from academic understanding to professional application. Practicum programs are therefore encouraged to cultivate reflective and critical thinking, enabling student teachers to evaluate their performance and actively pursue continuous improvement. In this sense, Tripp and Rich (2012) conceptualize reflection as a critical, analytical process through which teachers assess the effects of their instructional resolutions within specific contexts to enhance practice. Similarly, Ryan (2013) views reflection as an effort to understand experience concerning oneself, others, and environmental conditions, while reimagining and shaping expectations for personal and collective purposes.

Research consistently stresses the significance of reflection, self-worth, and training in classroom organization as integral components of teacher education (Harlin, 2014; Kong, 2010; Yuksel, 2014). For instance, Kong (2010) examined the effects of a video system on student teachers' capacity for self-reflection and found that video browsing yielded more extensive and deeper reflective notes, particularly in areas such as classroom management and professional teaching knowledge. These enhanced reflections also provided a strong foundation for meaningful professional dialogue with mentors. Complementary studies further demonstrate a positive connection among teachers' self-reflection, coursework in organizational teaching issues, and their sense of self-value (Bullock, Coplan, & Bosacki, 2015; Patterson & Seabrookes-Blackmore, 2017).

More recent research further advances understanding of how reflective practice can be deliberately fostered within teacher education. Minott (2025) proposes the Reflective Approach to Teaching Practicum Debriefing (RATPD), a structured and cognitively informed framework intended to scaffold student teachers' reflective processes and strengthen the connection between educational theory and the lived complexities of classroom teaching. Reflective teaching usually employs the following cognitive dimensions: the capacity to identify, explain, and critically evaluate teaching episodes as a basis for future improvement; the use of self-directed inquiry and critical thinking to build context-sensitive professional knowledge; and the ability to challenge assumptions, explore multiple courses of action, engage in higher-order thinking, and reflect consciously

on self-learning. Equally important in this process is how teachers draw on personal experience, ethical considerations, and professional judgment to make sense of their practice.

Reflective teaching is also understood as a social and collaborative endeavor. It requires openness to sharing ideas, exchanging feedback, and engaging in collective dialogue, as well as the capacity to navigate uncertainties related to personal teaching beliefs and perceptions of competence. These perspectives position reflective thinking not merely as an individual cognitive exercise but as a socially situated, dialogic, and structured process that plays a central role in shaping teachers' emerging professional identities.

A critical dimension of practicum training involves supporting student teachers to translate theoretical knowledge of reflection into practical, actionable processes (Resch & Schrittesser, 2021). Wong (2016) emphasizes that reflection enhances learning by shaping how students perceive and make meaning from practicum experiences. He observes that challenges - such as self-doubt, questions about identity, or daily struggles - often generate insights and deeper reflection, allowing student teachers to articulate and interpret their experiences for professional and personal growth. By critically examining these emotional and pedagogical challenges, student teachers deepen their self-knowledge and develop resilience toward the inherent complexities of teaching. Mentors play a vital role in helping student teachers process these challenges. By situating reflective discussions within the broader school community, mentors offer support in contextualizing experiences and alignment with professional norms and expectations.

Finally, the effectiveness of practicum training is strengthened when teachers and mentors share responsibility with student teachers and collaborate to build trusting relationships (Corrigan & Chapman, 2008). Teachers must strive to be trustworthy professionals (Trelstad, 2008), creating safe and supportive learning environments in which student teachers feel encouraged to engage in reflective dialogue and openly explore their developing practices. A trusting, collaborative environment thus forms the foundation for meaningful reflection, enabling student teachers to explore, express, and refine their emerging professional identities.

Reflective learning strategies used in practicum training

Reflective practice is conceptualized as a continuous, participatory process that enhances the quality of teacher education experiences (Machost & Stains, 2023; Mohamed et al., 2022). It typically involves an iterative cycle comprising

reflection, planning for future action, acting, and evaluating outcomes, thus embedding elements of problem solving, action orientation, and critical inquiry (Mohamed et al., 2022). A substantial body of research demonstrates that reflective practice has the potential to strengthen critical thinking and decision-making processes (Baporikar, 2021; Wilson et al., 2022), particularly when grounded in real professional experiences. Its significance also lies in its capacity to foster learning, growth, and ongoing professional development (Friedland, 2015; Harvey & Vlachopoulos, 2020; Zwozdiak-Myers, 2018).

Within teacher professional development, reflective practice is regarded as an essential component of effective training programs. It enables teachers to critically evaluate their instructional strategies and align their educational choices with students' needs (Borko, 2004). Studies on comprehensive professional development initiatives further suggest that the integration of reflective practice enhances teachers' subject knowledge and reinforces their ability to manage diverse classroom contexts (Garet et al., 2001). Recent trends highlight an increasing emphasis on technology-enhanced learning and collaborative professional communities, both of which complement reflective practice by encouraging teachers to initiate thoughtful dialogue about education and scrutinize their approaches to classroom management.

From the perspective of student teacher education, reflective practice is critical for training aspiring educators with the knowledge, skills, and dispositions required for effective teaching. The transition from student teacher status to beginner teacher status is frequently marked by challenges related to behavior management, building relations with the learners, planning the activities and the transition between them, and support learner diversity. Given the complexities of early career teaching, it is argued that reflective practices during this transition must be intentional and targeted (Nuraeni & Heryatun, 2021). Reflective practice for student teachers typically includes recollection of experiences, exercising reflection while conducting an activity, making a reflection in retrospect of the teaching activity, and participating in mentoring or peer discussion processes that facilitate the construction of personal theories of teaching (Nuraeni & Heryatun, 2021).

However, research indicates that student teachers often encounter difficulties in relating their reflections to theoretical frameworks. Many tend to focus on identifying problems or describing instructional processes without recognizing the theoretical underpinnings of their actions or the implications for curriculum development. As a result, they may not demonstrate sustained critical reflection (Matengu et al., 2021; Jones & Ryan, 2014). Structured reflective activities, including journaling, feedback sessions, and coursework-linked reflection tasks, have been shown to nurture self-awareness and professional development

(Harford & MacRuairc, 2008; Malicay, 2023). These practices support pre-service teachers in scrutinizing the values, beliefs, and attitudes they bring to teaching (Anand & Gangmei, 2023), thereby contributing to the integration of theory and practice.

To promote deeper reflection, practicum training should incorporate strategies that expose student teachers to new ideas and encourage them to translate theory into innovative pedagogical approaches (White, 2009). Enhancing instructional competencies - such as classroom management, teaching strategies, and student engagement - allows teachers to put theoretical concepts in educational environments, thereby strengthening their understanding of teaching in authentic contexts (Anand & Gangmei, 2023; Malicay, 2023). Given that teaching and learning processes are interdependent, mentorship and tutoring sessions should be designed to support reflective engagement. Effective mentoring practices include asking purposeful questions, prompting student teachers to articulate experiences in relation to theory, modelling complex reflective thinking, guiding decision making about classroom practices, creating meaningful assessments, and emphasizing individual contributions (Szabo & Schwartz, 2011; Hibbard et al., 2010; Means et al., 2010).

Li (2025) identifies tutorial sessions and reflective journals as strategies for examining the impact of reflective practice on pedagogical skill development, professional competence, and readiness to navigate diverse educational settings. The findings suggest that tutoring experiences contribute to greater teaching competence, increased responsibility, and the development of teacher identities. These results align with studies demonstrating that reflective practice and mentoring support a deeper understanding of educational practices (Winchester & Winchester, 2014; Massey & Lewis, 2011) and foster professional identity formation (Pillen et al., 2013; Trent, 2010; Findlay, 2006).

Reflective strategies have a central role in practicum training programs aimed at cultivating autonomous, reflective practitioners. Its development is reinforced through structured activities such as reflective teaching journals and the gathering of peer or student feedback, which help pre-service teachers acquire critical teaching competencies. Mentors must therefore provide explicit guidance to highlight that reflective activities are focused and aligned with professional development goals. One influential framework in this regard is the three-part reflective framework (Loughran, 2002; Freese, 1999), which involves anticipatory reflection (planning and reasoning before teaching), contemporaneous reflection (decision making while teaching), and retrospective reflection (post-lesson analysis). This framework structures mentor–student teacher interactions by promoting open discussion, encouraging questioning, fostering observation of real-time decision making, and engaging in shared post-lesson reflection.

Collaborative work is also underscored as essential within practicum contexts, as it contributes significantly to the development of professional competence (Lozano Cabezas et al., 2022; Raduan & Na, 2020). Collaborative reflection enables student teachers to embed reflective attitudes into their ongoing academic and professional growth (Bas, 2022) and to sustain such practices even in the absence of explicit role models. Collaborative reflection sessions additionally cultivate a shared learning culture and strengthen professional development communities (Li, 2025).

Reflective logs as purposeful instruments in practicum training

Reflective logs are generally understood as written tasks that require learners to articulate and analyze their experiences through reflective thinking (Moon, 2004). Their use is well established across practice-based learning environments, including teacher education (Korthagen, 2011). The primary function of reflective logs is to cultivate students' critical and reflective thinking by encouraging systematic attention to how they analyze their own actions, recognize their development, and formulate future goals (Lee & Gyogi, 2016). According to Moon (2004), the reflective process that structures these logs typically unfolds in a series of stages: description and timeline establishment, integration of additional ideas, reflective analysis through observations or questions, deeper processing such as generating or testing new interpretations, and the eventual production of the written account.

Within teacher education practicum settings, reflective logs serve as a mechanism for student teachers to assess their learning, identify difficulties, and consider strategies for improvement. They also provide space for examining and potentially reshaping pre-existing beliefs and assumptions. Although reflective logs have limitations - such as variable depth of reflection and reliance on students' willingness to be candid - Lee and Gyogi (2016) emphasize that they nonetheless offer access to learners' perspectives that might otherwise remain inaccessible to instructors. For mentors and practicum coordinators, these logs function as diagnostic tools that reveal students' understanding, progress, and challenges, thereby enabling personalized and timely feedback.

Research further demonstrates that reflective logs contribute to the development of complex, often interdisciplinary competencies, such as deep information processing (Temple, 2001). They support awareness of professional dispositions, values, and knowledge, which are foundational in teacher preparation. Moreover, reflective writing helps student teachers interpret emotional and behavioral responses and to recognize the personal significance of their practicum

experiences. Effective integration of reflective logs into practicum programs therefore requires deliberate instructional design, including explicit planning of reflective activities, structured opportunities for reflection before, during, and after practicum events, and the creation of an institutional culture that values reflective practice (Eyler, Giles, & Schmiede, 1996).

Reflective logs may be implemented in diverse formats, from printed templates to digital platforms such as online blogs. Their content can include standard or context-specific questions, commentary on selected behaviors or incidents, descriptions from the perspective of an external observer, or open-ended reflections blending accounts of observed activities with personal insights (Trif & Popescu, 2013). Online platforms additionally allow instructors to regulate submission timelines by controlling the opening and closing of entries, thereby ensuring continuous engagement - a key element in developing reflective capacity (Dyment & O'Connell, 2010). Although Lucas and Fleming (2012) didn't find differences in the quality or depth of reflection among online and paper journals, students often expressed a preference for hard-copy formats.

Given that reflective writing is not an intuitive skill for most novice teachers (Epp, 2008; Spalding & Wilson, 2002), explicit instruction is essential for meaningful engagement in reflective learning (Munchy, 2014). Studies show that targeted training can substantially enhance students' perceived ability to reflect (McInnis-Bowers, Chew, & Bowers, 2010). Such training may include familiarizing students with the format of logs, clarifying the purpose of reflective writing so that both the "how" and the "why" are understood (Sharma, 2010), modelling reflective thinking through examples and structured assignments with gradually reduced scaffolding (Dyment & O'Connell, 2010), and articulating clear assessment criteria, as students often express uncertainty about evaluative expectations (McGarr & Moody, 2010).

DISCUSSION AND CONCLUSION

Practicum training in Special Education represents a critical formative space in which theoretical knowledge, practical experience, and professional identity intersect. This review highlights the central role of reflective strategies and instruments in mediating this intersection, demonstrating that reflective practice - whether expressed through reflective thinking, guided dialogue, or structured writing - serves as the conceptual and pedagogical core of practicum learning. Across literature, reflective engagement emerges as both a cognitive and relational process: it enables student teachers to interpret their instructional decisions, confront the complexities of real educational environments, and

cultivate the dispositions of autonomous, ethically grounded practitioners. Through structured cycles of observation, analysis, and action, students develop deeper awareness of their strengths, limitations, and evolving professional responsibilities.

The reviewed studies consistently affirm that reflection is indispensable for supporting the transition from theoretical preparation to situated professional practice. Practicum experiences frequently disrupt initial confidence, revealing gaps between academic knowledge and the nuanced realities of working with children with diverse communication, behavioral, and learning needs. Rather than signaling inadequacy, these shifts indicate the emergence of critical self-awareness and the internalization of professional standards. Reflective strategies - particularly those embedded in mentoring, feedback discussions, and collaborative learning communities - help student teachers make sense of challenges, contextualize them within broader educational principles, and generate informed pathways for improvement.

Equally, instruments such as reflective logs provide essential scaffolding for translating experiential learning into purposeful professional growth. When integrated intentionally into practicum programs, logs function as diagnostic, developmental, and metacognitive tools that deepen students' analytical capacities and support mentors in tailoring guidance. The literature stresses that reflective writing is not innate; thus, explicit instruction, modelled examples, and clear evaluative criteria are necessary to cultivate meaningful engagement and sustained reflective habits.

Taken together, the evidence suggests that practicum training is most effective when reflective strategies are deliberately embedded, systematically supported, and collaboratively enacted. By fostering environments characterized by trust, dialogue, and critical inquiry, teacher education programs can strengthen the development of reflective practitioners - professionals capable of navigating complexity, responding thoughtfully to learners' needs, and continually refining their educational expertise.

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Integrating the *ASSURE* Instructional Design Model in the Medical Education System: Applications in the Anatomy Discipline

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ABSTRACT. The ASSURE model is a methodical framework that incorporates the study of learner characteristics, educational objectives, technology integration, resource selection and use, active student engagement, and ongoing evaluation. The article's primary goal is to analyse the ASSURE model's suitability for medical education, with particular emphasis on anatomy instruction. This method highlights the benefits of individualised, interactive, and student-centered learning while offering a comprehensive viewpoint on the ASSURE model's potential in medical education. The initiative enhances the teaching process by investigating these facets. The concept establishes a standard for integrating cutting-edge technology into medical education, transforming anatomy instruction into a dynamic, engaging, and student-centered process. This method facilitates the production of skilled workers who can adapt to the demands of the contemporary healthcare system.

Keywords: The ASSURE model, instructional design, innovative learning, anatomy.

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INTRODUCTION

Undergraduate practicum training for students enrolled in Special Education programs provides opportunities to develop the competencies needed for a range of specialized professions they may pursue after graduation or through postgraduate and in-service preparation, including special education teacher, speech and language therapist, special educator, support teacher, and educational counsellor. As students enter their practicum experience, they are guided by specific strategies, techniques, and approaches that blend theoretical learning with practical, hands-on engagement. Among these, reflection-based strategies hold particular importance because they deepen students' understanding of what to observe, how to focus their professional growth, and how to interpret their emerging sense of professional identity and responsibility. The reflective practices integrated into the practicum include reflective writing - linked to self-awareness and personal development as students articulate their thoughts and emotions while exploring personal limits (Wright, 2018); reflective thinking - centered on relating, experimenting, exploring, and connecting theoretical knowledge with practical experience (Hathazi & Serban, 2022; Helyer, 2015); reflective logs - used to document the reflection process; and active listening, complemented by individual or group mentoring sessions. Throughout their practicum and mentoring activities, students are encouraged to develop the skills necessary for assessing and supporting children with disabilities. In doing so, they learn to address questions such as: How do I begin? What should I focus on first? What is happening in this context? Is this approach appropriate? Is behavior a form of communication? How does the child learn? How can I better understand and respond to the child's needs and interests?

The practicum aims to cultivate students' professional responsibilities through targeted assignments and objectives, including building strong mentor relationships, reflecting on teaching, producing documents and resources, observing communication with families, participating in the professional community, and engaging in ongoing professional development (Machost & Stains, 2023). Through the implementation of reflective strategies, all parties involved contribute to the development of reflective practitioners - individuals who critically examine, reorganize, and reconsider their planning, observations, and interpretations. As students strengthen their reflective abilities, they learn to integrate others' perspectives into their own practice and experience (Tyler, Boldi, & Cherubini, 2022). For teachers and mentors, this process involves drawing on their expertise to understand how students learn and communicate, fostering the trust and openness needed to build a supportive mentoring relationship.

Reflective thinking in practicum training

Reflective thinking represents a foundational approach within teacher education programs, functioning as a key mechanism for supporting professional development during practicum training. Early conceptualizations of reflective practice, particularly those advanced by John Dewey (1933), established the groundwork for understanding the qualities and dispositions of reflective professionals. Within educational contexts, the primary goal of reflective practice is to foster teachers' capacity to reason about their instructional decisions - why particular strategies are chosen and how teaching can be refined to positively influence student learning outcomes (Lee, 2005). In parallel, the practicum serves as a structured bridge between theory and practice, offering student teachers regular, supervised opportunities to apply and evaluate their knowledge, skills, and attitudes within authentic school environments (Ryan, Toohey, & Hughes, 1996). Building on this perspective, Damon (1992) contends that the practicum's central purpose is to surface problems and issues that prompt the exploration of relevant theories and professional knowledge, positioning practice itself as the organizing core of the curriculum.

Reflective thinking enables student teachers to critically examine experiences through the lens of their evolving understandings, thereby maximizing learning in real-world contexts. Practicum training thus encourages them to apply theoretical principles and pedagogical skills, progressively developing competencies through diverse classroom experiences and gaining insight into the realities of professional practice. This process allows student teachers to assess their readiness for a teaching career, evaluate their improvement, and identify topics requiring further personal or professional development (Ryan, Toohey, & Hughes, 1996).

A recurring theme in the literature concerns the shifting perceptions of preparedness that student teachers experience as they progress through practicum and internship placements. While many preservice teachers initially feel confident due to prior coursework or general exposure to educational theories, the feedback they provide at the conclusion of their training often reveals a more nuanced and self-critical perspective. This shift highlights a growing awareness of the complexities inherent in teaching environments, including the dynamics of teacher–student relationships, the diverse needs of children, and the challenges of managing difficult behaviors. Such developments suggest that the practical realities encountered during fieldwork often expose gaps that are not evident in theoretical preparation alone. The emotionally charged nature of unfamiliar experiences further contributes to a decrease in perceived readiness. Whereas theoretical study may instill a sense of readiness, the practical application

of this knowledge frequently reveals educational challenges and situational nuances that theory alone cannot fully address. The heightened expectations associated with meeting diverse learners' needs during the internship may also contribute to reduced confidence. If this is the case, it should not be interpreted as regression. Instead, it reflects the emergence of deeper critical self-awareness. Li et al. (2025) argue that teacher education programs must support more effectively the transition from theory to practice by providing structured mentorship and sustained opportunities for self-growth as preservice teachers move from academic understanding to professional application. Practicum programs are therefore encouraged to cultivate reflective and critical thinking, enabling student teachers to evaluate their performance and actively pursue continuous improvement. In this sense, Tripp and Rich (2012) conceptualize reflection as a critical, analytical process through which teachers assess the effects of their instructional resolutions within specific contexts to enhance practice. Similarly, Ryan (2013) views reflection as an effort to understand experience concerning oneself, others, and environmental conditions, while reimagining and shaping expectations for personal and collective purposes.

Research consistently stresses the significance of reflection, self-worth, and training in classroom organization as integral components of teacher education (Harlin, 2014; Kong, 2010; Yuksel, 2014). For instance, Kong (2010) examined the effects of a video system on student teachers' capacity for self-reflection and found that video browsing yielded more extensive and deeper reflective notes, particularly in areas such as classroom management and professional teaching knowledge. These enhanced reflections also provided a strong foundation for meaningful professional dialogue with mentors. Complementary studies further demonstrate a positive connection among teachers' self-reflection, coursework in organizational teaching issues, and their sense of self-value (Bullock, Coplan, & Bosacki, 2015; Patterson & Seabrookes-Blackmore, 2017).

More recent research further advances understanding of how reflective practice can be deliberately fostered within teacher education. Minott (2025) proposes the Reflective Approach to Teaching Practicum Debriefing (RATPD), a structured and cognitively informed framework intended to scaffold student teachers' reflective processes and strengthen the connection between educational theory and the lived complexities of classroom teaching. Reflective teaching usually employs the following cognitive dimensions: the capacity to identify, explain, and critically evaluate teaching episodes as a basis for future improvement; the use of self-directed inquiry and critical thinking to build context-sensitive professional knowledge; and the ability to challenge assumptions, explore multiple courses of action, engage in higher-order thinking, and reflect consciously on self-learning. Equally important in this process is how teachers draw on

personal experience, ethical considerations, and professional judgment to make sense of their practice.

Reflective teaching is also understood as a social and collaborative endeavor. It requires openness to sharing ideas, exchanging feedback, and engaging in collective dialogue, as well as the capacity to navigate uncertainties related to personal teaching beliefs and perceptions of competence. These perspectives position reflective thinking not merely as an individual cognitive exercise but as a socially situated, dialogic, and structured process that plays a central role in shaping teachers' emerging professional identities.

A critical dimension of practicum training involves supporting student teachers to translate theoretical knowledge of reflection into practical, actionable processes (Resch & Schrittesser, 2021). Wong (2016) emphasizes that reflection enhances learning by shaping how students perceive and make meaning from practicum experiences. He observes that challenges - such as self-doubt, questions about identity, or daily struggles - often generate insights and deeper reflection, allowing student teachers to articulate and interpret their experiences for professional and personal growth. By critically examining these emotional and pedagogical challenges, student teachers deepen their self-knowledge and develop resilience toward the inherent complexities of teaching. Mentors play a vital role in helping student teachers process these challenges. By situating reflective discussions within the broader school community, mentors offer support in contextualizing experiences and alignment with professional norms and expectations.

Finally, the effectiveness of practicum training is strengthened when teachers and mentors share responsibility with student teachers and collaborate to build trusting relationships (Corrigan & Chapman, 2008). Teachers must strive to be trustworthy professionals (Trelstad, 2008), creating safe and supportive learning environments in which student teachers feel encouraged to engage in reflective dialogue and openly explore their developing practices. A trusting, collaborative environment thus forms the foundation for meaningful reflection, enabling student teachers to explore, express, and refine their emerging professional identities.

Reflective learning strategies used in practicum training

Reflective practice is conceptualized as a continuous, participatory process that enhances the quality of teacher education experiences (Machost & Stains, 2023; Mohamed et al., 2022). It typically involves an iterative cycle comprising reflection, planning for future action, acting, and evaluating outcomes, thus

embedding elements of problem solving, action orientation, and critical inquiry (Mohamed et al., 2022). A substantial body of research demonstrates that reflective practice has the potential to strengthen critical thinking and decision-making processes (Baporikar, 2021; Wilson et al., 2022), particularly when grounded in real professional experiences. Its significance also lies in its capacity to foster learning, growth, and ongoing professional development (Friedland, 2015; Harvey & Vlachopoulos, 2020; Zwozdiak-Myers, 2018).

Within teacher professional development, reflective practice is regarded as an essential component of effective training programs. It enables teachers to critically evaluate their instructional strategies and align their educational choices with students' needs (Borko, 2004). Studies on comprehensive professional development initiatives further suggest that the integration of reflective practice enhances teachers' subject knowledge and reinforces their ability to manage diverse classroom contexts (Garet et al., 2001). Recent trends highlight an increasing emphasis on technology-enhanced learning and collaborative professional communities, both of which complement reflective practice by encouraging teachers to initiate thoughtful dialogue about education and scrutinize their approaches to classroom management.

From the perspective of student teacher education, reflective practice is critical for training aspiring educators with the knowledge, skills, and dispositions required for effective teaching. The transition from student teacher status to beginner teacher status is frequently marked by challenges related to behavior management, building relations with the learners, planning the activities and the transition between them, and support learner diversity. Given the complexities of early career teaching, it is argued that reflective practices during this transition must be intentional and targeted (Nuraeni & Heryatun, 2021). Reflective practice for student teachers typically includes recollection of experiences, exercising reflection while conducting an activity, making a reflection in retrospect of the teaching activity, and participating in mentoring or peer discussion processes that facilitate the construction of personal theories of teaching (Nuraeni & Heryatun, 2021).

However, research indicates that student teachers often encounter difficulties in relating their reflections to theoretical frameworks. Many tend to focus on identifying problems or describing instructional processes without recognizing the theoretical underpinnings of their actions or the implications for curriculum development. As a result, they may not demonstrate sustained critical reflection (Matengu et al., 2021; Jones & Ryan, 2014). Structured reflective activities, including journaling, feedback sessions, and coursework-linked reflection tasks, have been shown to nurture self-awareness and professional development (Harford & MacRuairc, 2008; Malicay, 2023). These practices support pre-service

teachers in scrutinizing the values, beliefs, and attitudes they bring to teaching (Anand & Gangmei, 2023), thereby contributing to the integration of theory and practice.

To promote deeper reflection, practicum training should incorporate strategies that expose student teachers to new ideas and encourage them to translate theory into innovative pedagogical approaches (White, 2009). Enhancing instructional competencies - such as classroom management, teaching strategies, and student engagement - allows teachers to put theoretical concepts in educational environments, thereby strengthening their understanding of teaching in authentic contexts (Anand & Gangmei, 2023; Malicay, 2023). Given that teaching and learning processes are interdependent, mentorship and tutoring sessions should be designed to support reflective engagement. Effective mentoring practices include asking purposeful questions, prompting student teachers to articulate experiences in relation to theory, modelling complex reflective thinking, guiding decision making about classroom practices, creating meaningful assessments, and emphasizing individual contributions (Szabo & Schwartz, 2011; Hibbard et al., 2010; Means et al., 2010).

Li (2025) identifies tutorial sessions and reflective journals as strategies for examining the impact of reflective practice on pedagogical skill development, professional competence, and readiness to navigate diverse educational settings. The findings suggest that tutoring experiences contribute to greater teaching competence, increased responsibility, and the development of teacher identities. These results align with studies demonstrating that reflective practice and mentoring support a deeper understanding of educational practices (Winchester & Winchester, 2014; Massey & Lewis, 2011) and foster professional identity formation (Pillen et al., 2013; Trent, 2010; Findlay, 2006).

Reflective strategies have a central role in practicum training programs aimed at cultivating autonomous, reflective practitioners. Its development is reinforced through structured activities such as reflective teaching journals and the gathering of peer or student feedback, which help pre-service teachers acquire critical teaching competencies. Mentors must therefore provide explicit guidance to highlight that reflective activities are focused and aligned with professional development goals. One influential framework in this regard is the three-part reflective framework (Loughran, 2002; Freese, 1999), which involves anticipatory reflection (planning and reasoning before teaching), contemporaneous reflection (decision making while teaching), and retrospective reflection (post-lesson analysis). This framework structures mentor–student teacher interactions by promoting open discussion, encouraging questioning, fostering observation of real-time decision making, and engaging in shared post-lesson reflection.

Collaborative work is also underscored as essential within practicum contexts, as it contributes significantly to the development of professional competence (Lozano Cabezas et al., 2022; Raduan & Na, 2020). Collaborative reflection enables student teachers to embed reflective attitudes into their ongoing academic and professional growth (Bas, 2022) and to sustain such practices even in the absence of explicit role models. Collaborative reflection sessions additionally cultivate a shared learning culture and strengthen professional development communities (Li, 2025).

Reflective logs as purposeful instruments in practicum training

Reflective logs are generally understood as written tasks that require learners to articulate and analyze their experiences through reflective thinking (Moon, 2004). Their use is well established across practice-based learning environments, including teacher education (Korthagen, 2011). The primary function of reflective logs is to cultivate students' critical and reflective thinking by encouraging systematic attention to how they analyze their own actions, recognize their development, and formulate future goals (Lee & Gyogi, 2016). According to Moon (2004), the reflective process that structures these logs typically unfolds in a series of stages: description and timeline establishment, integration of additional ideas, reflective analysis through observations or questions, deeper processing such as generating or testing new interpretations, and the eventual production of the written account.

Within teacher education practicum settings, reflective logs serve as a mechanism for student teachers to assess their learning, identify difficulties, and consider strategies for improvement. They also provide space for examining and potentially reshaping pre-existing beliefs and assumptions. Although reflective logs have limitations - such as variable depth of reflection and reliance on students' willingness to be candid - Lee and Gyogi (2016) emphasize that they nonetheless offer access to learners' perspectives that might otherwise remain inaccessible to instructors. For mentors and practicum coordinators, these logs function as diagnostic tools that reveal students' understanding, progress, and challenges, thereby enabling personalized and timely feedback.

Research further demonstrates that reflective logs contribute to the development of complex, often interdisciplinary competencies, such as deep information processing (Temple, 2001). They support awareness of professional dispositions, values, and knowledge, which are foundational in teacher preparation. Moreover, reflective writing helps student teachers interpret emotional and behavioral responses and to recognize the personal significance of their practicum experiences. Effective integration of reflective logs into practicum programs

therefore requires deliberate instructional design, including explicit planning of reflective activities, structured opportunities for reflection before, during, and after practicum events, and the creation of an institutional culture that values reflective practice (Eyler, Giles, & Schmiede, 1996).

Reflective logs may be implemented in diverse formats, from printed templates to digital platforms such as online blogs. Their content can include standard or context-specific questions, commentary on selected behaviors or incidents, descriptions from the perspective of an external observer, or open-ended reflections blending accounts of observed activities with personal insights (Trif & Popescu, 2013). Online platforms additionally allow instructors to regulate submission timelines by controlling the opening and closing of entries, thereby ensuring continuous engagement - a key element in developing reflective capacity (Dyment & O'Connell, 2010). Although Lucas and Fleming (2012) didn't find differences in the quality or depth of reflection among online and paper journals, students often expressed a preference for hard-copy formats.

Given that reflective writing is not an intuitive skill for most novice teachers (Epp, 2008; Spalding & Wilson, 2002), explicit instruction is essential for meaningful engagement in reflective learning (Munchy, 2014). Studies show that targeted training can substantially enhance students' perceived ability to reflect (McInnis-Bowers, Chew, & Bowers, 2010). Such training may include familiarizing students with the format of logs, clarifying the purpose of reflective writing so that both the "how" and the "why" are understood (Sharma, 2010), modelling reflective thinking through examples and structured assignments with gradually reduced scaffolding (Dyment & O'Connell, 2010), and articulating clear assessment criteria, as students often express uncertainty about evaluative expectations (McGarr & Moody, 2010).

DISCUSSION AND CONCLUSION

Practicum training in Special Education represents a critical formative space in which theoretical knowledge, practical experience, and professional identity intersect. This review highlights the central role of reflective strategies and instruments in mediating this intersection, demonstrating that reflective practice - whether expressed through reflective thinking, guided dialogue, or structured writing - serves as the conceptual and pedagogical core of practicum learning. Across literature, reflective engagement emerges as both a cognitive and relational process: it enables student teachers to interpret their instructional decisions, confront the complexities of real educational environments, and cultivate the dispositions of autonomous, ethically

grounded practitioners. Through structured cycles of observation, analysis, and action, students develop deeper awareness of their strengths, limitations, and evolving professional responsibilities.

The reviewed studies consistently affirm that reflection is indispensable for supporting the transition from theoretical preparation to situated professional practice. Practicum experiences frequently disrupt initial confidence, revealing gaps between academic knowledge and the nuanced realities of working with children with diverse communication, behavioral, and learning needs. Rather than signaling inadequacy, these shifts indicate the emergence of critical self-awareness and the internalization of professional standards. Reflective strategies - particularly those embedded in mentoring, feedback discussions, and collaborative learning communities - help student teachers make sense of challenges, contextualize them within broader educational principles, and generate informed pathways for improvement.

Equally, instruments such as reflective logs provide essential scaffolding for translating experiential learning into purposeful professional growth. When integrated intentionally into practicum programs, logs function as diagnostic, developmental, and metacognitive tools that deepen students' analytical capacities and support mentors in tailoring guidance. The literature stresses that reflective writing is not innate; thus, explicit instruction, modelled examples, and clear evaluative criteria are necessary to cultivate meaningful engagement and sustained reflective habits.

Taken together, the evidence suggests that practicum training is most effective when reflective strategies are deliberately embedded, systematically supported, and collaboratively enacted. By fostering environments characterized by trust, dialogue, and critical inquiry, teacher education programs can strengthen the development of reflective practitioners - professionals capable of navigating complexity, responding thoughtfully to learners' needs, and continually refining their educational expertise.

Introduction

Contemporary medical education is undergoing a complete transformation, driven by rapidly advancing technology and the demands of an increasingly diverse academic environment. Adapting to these changes is imperative, as it presents an opportunity to reconfigure traditional teaching methods and transform them into a dynamic, student-centred process. Instructional design models, such as ASSURE, are essential for organising a structured, interactive, practical educational process (Abuhassna & Alnawajha, 2023).

The ASSURE model is a systematic framework that integrates learner-characteristics analysis, setting instructional objectives, selecting and using instructional materials and technologies, active student participation, and continuous assessment. The model presented supports the development of a personalised learning environment in which diverse learning styles and individual needs are recognised and valued. By utilising emerging technologies, such as augmented reality (AR), virtual reality (VR), and 3D simulations, medical education can provide students with immersive experiences that facilitate deep learning and application of theoretical knowledge (Bernard, 2023; Abuhassna & Alnawajha, 2023).

These technologies are intended to increase student motivation and engagement and improve academic performance by promoting active learning (Parvu et al., 2023a; Parvu et al., 2023b). For example, exploring anatomical structures through AR and VR simulations provides students with a three-dimensional perspective on the human body, facilitating understanding of spatial relationships and their functions (Pottle, 2019). At the same time, tailoring teaching to individual learning styles helps create a more effective and adaptive educational process (Luchs, 2023).

This paper explores the relevance of the ASSURE model in medical education, with a particular focus on anatomy, highlighting how each stage of this model can contribute to a more structured, engaging, and relevant learning process for future healthcare professionals.

Aim of the paper

The paper's main aim is *to analyse the applicability of the ASSURE model in medical education, with a focus on anatomy teaching.* By examining each stage of the model, the paper aims to highlight the following aspects:

· Personalisation of the educational process: How can analysing learner characteristics support the development of teaching methods tailored to individual needs and learning styles?

· Integration of modern technologies: The added value of tools such as AR, VR, and 3D simulations in anatomy learning, encouraging applied and collaborative learning.

· Continuous assessment and feedback: Constant assessment of student progress can help optimise the educational process and improve academic performance.

· Bridging theory and practice: facilitating the transition from theoretical knowledge to its application in clinical situations through simulations and interactive scenarios.

This approach provides an integrated perspective on the potential of the ASSURE model in medical education, highlighting the advantages of tailored, interactive, and student-centered instruction. By exploring these aspects, the project contributes to improving the educational process.

1. Instructional Design Models: Background and Current Trends

The general principles of instructional design are:

· Learner-centredness: tailoring materials to individual needs and learning styles (Abuhassna & Alnawajha, 2023).

· Clarity of objectives: formulating specific, measurable outcomes. Defining learning objectives is central to any instructional design. In medical education, objectives need to be precise, e.g., 'Identify the anatomical structures of the central nervous system (North et al. 2021).

· Logical structuring of content: progressive and coherent organisation. Materials should be organised to support the gradual accumulation of knowledge, moving from simple to complex concepts (Luchs, 2023).

· Interactive activities: active involvement of learners to reinforce learning. Active learning (e.g., by solving clinical cases or practical activities) stimulates critical thinking and application of knowledge (Luchs, 2023).

· Constant feedback: providing information about progress for adjustment and motivation. Models should accommodate adjustments to students' needs and feedback to improve subsequent lessons (Abuhassna & Alnawajha, 2023).

· Continuous evaluation: measuring the effectiveness of materials and methods. Assessment should be integrated into the learning process to provide helpful feedback and adapt teaching strategies (Luchs C. 2023).

1.1. The context of instructional design

Instructional design has evolved in response to the need to structure the educational process systematically. Its role has become more critical in the current context, characterised by digitisation and rapid access to information. This field's main premises are (Abuhassna & Alnawajha, 2023).

1.1.1. Learner-orientation (Abuhassna, H., & Alnawajha, S. 2023)

1.1.2. Personalisation of learning and active student involvement: Modern education emphasises the personalisation of learning and active participation of learners and students. Instructional design models help to create materials that respond to individual needs and different learning styles. (Abuhassna, H., & Alnawajha, S. 2023)

1.1.3. Educational Technology Integrating digital tools such as e-learning platforms and multimedia resources is a dominant trend. Medical education facilitates the use of virtual simulations and interactive resources, providing students with more authentic learning experiences (Abuhassna & Alnawajha, 2023).

1.1.4. Need for evidence-based design: Instructional design models are founded on learning theories such as behaviourism, constructivism, and cognitive theory. They provide a scientific framework for designing lessons, materials, and activities. (Abuhassna & Alnawajha, 2023)

Some instructional design models are:

1.2. The ADDIE instructional model is a framework used for developing instructional materials and instruction that is qualitative and effective. The model's name is an acronym and stands for (Patel, S. R. et al. 2018)

· *Analysis*: This stage focuses on identifying learning needs, objectives, instructional problems, content, and context of instruction (Jabaay, 2020).

· *Design:* A detailed plan of the instruction is made, taking into account the learning objectives, teaching strategies, materials needed, and assessment methods (Jabaay et al. 2020).

· *Development:* In this stage, the necessary materials and resources are produced for further use. These materials may include manuals, photo- and video-based presentations, or interactive applications (Li & Cheong, 2023).

· *Implementation:* is the stage where the instructional methods are put into practice (Aydin SO. et al. 2023).

· *Evaluation:* It is the last stage of the model and focuses on analysing the effectiveness of the instructional model through evaluations during and at the end of the sessions (Patel et al. 2018).

1.3. The ASSURE instructional model is put into practice using the following steps:

· Analyse learners: identify participant characteristics, such as age, gender, knowledge level, learning style, and access to resources (Weller et al. 2015).

· State objectives: Set learning objectives that establish what participants should know as a result of the lesson (Weller et al. 2015).

· Select methods, media, and materials: Choosing the most appropriate educational tools and supporting materials (Weller et al. 2015).

· Use methods, media, and materials: Planning how these resources will be integrated (Khene et al. 2021).

· Require learners' participation: Actively involve learners through interactive and applied activities (Khene et al. 2021).

· Evaluate and revise: Evaluate the effectiveness of the educational process through constant feedback for future improvement (Khene et al. 2021).

1.4. Gagne's instructional model is based on nine steps, based on psychological and pedagogical principles. These steps are as follows: capturing attention, informing about objectives, stimulating recall of prior knowledge, presenting material, guiding learning, eliciting performance, providing feedback, evaluating performance, and creating retention and transfer. (Miner et al. 2015)

1.5. Current Trends in Instructional Design

In recent years, instructional design has been influenced by several major trends:

1.5.1. Technology-based learning

a.Medical simulators and virtual reality (VR) are used to recreate complex clinical scenarios.

b.Online platforms allow access to asynchronous courses, facilitating distance learning. (Miner, A. et al. 2015)

1.5.2. Gamification

Game elements are integrated into the educational process to increase student motivation and facilitate hands-on learning. (Espada-Chavarria et al. 2023)

1.5.3. Microlearning

This trend involves fragmenting content into small, accessible, and easily digestible modules, which is well-suited to intensive medical education.

1.5.4. Personalised learning (Luchs, 2023)

Using artificial intelligence, courses can be tailored to each student's specific needs. (Luchs C. 2023)

1.5.5. Interdisciplinary approach

Instructional design in medical education integrates content from multiple disciplines (biology, technology, and ethics) to provide a holistic perspective. (Espada-Chavarria et al. 2023)

In conclusion, modern education's instructional design models provide a well-defined framework for organising and delivering educational content. In medical education, current trends, such as the use of technology and active learning methods, contribute to the training of better-trained specialists.

The following chapter will explore the specific applicability of the ASSURE model, demonstrating how it can be utilised in anatomy teaching.

2. Overview of the ASSURE model

Teachers use the ASSURE model to design and implement practical lessons, tailoring learning materials and methods to students' needs. The model's steps are designed to maximise learner engagement and ensure active, practical learning. It is structured into six stages; each stage is essential for providing effective instruction tailored to learners' needs (Byrne et al., 2022).

The ASSURE model provides a flexible framework applicable across various educational contexts, contributing to the continuous improvement of teaching and learning. Using this model, teachers can create a compelling and innovative information system (Shah, 2020).

Detailed description of each stage in the ASSURE model:

2.1. Analyse learners' characteristics

In this stage, the characteristics of the target group of learners are analysed to understand their educational needs, learning styles, and level of preparedness. This analysis is necessary for lesson personalisation and when choosing the most appropriate learning methods (Figure 1) (Byrne et al., 2022).

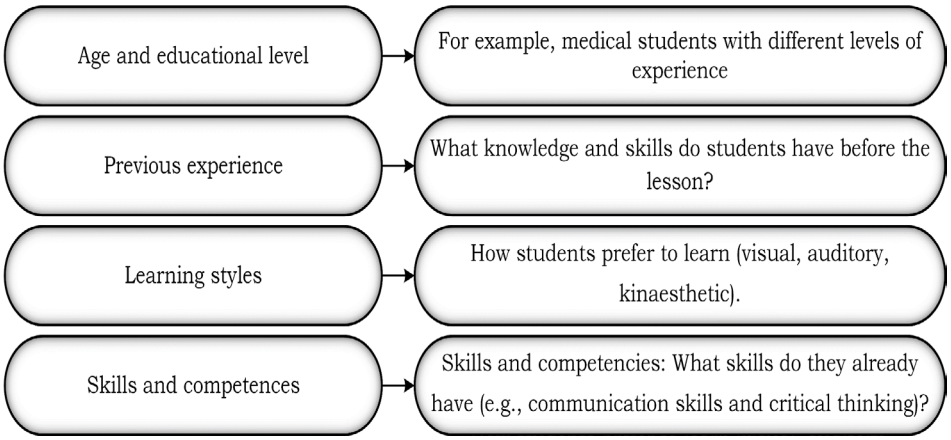

Figure 1. - Important aspects to analyse when applying the ASSURE model (Byrne M et al., 2022)

2.2. State objectives

At this stage, clear and measurable lesson objectives should be set. These should be specific and reflect what students need to know and be able to do by the end of the lesson (Figure 2). The objectives should be SMART (Specific, Measurable, Attainable, Relevant, Achievable, and Time-bound) (Chavez et al., 2023).

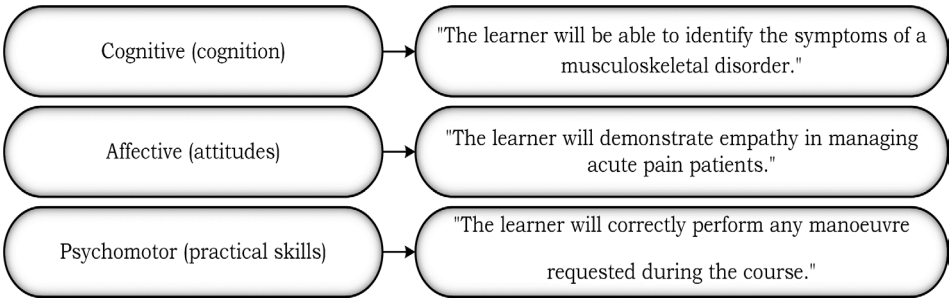

Figure 2. Examples of objectives used during lesson delivery (Shah, 2020)

Objective setting should ensure that the lesson is as clear as possible and that the objectives are aligned with student needs and educational standards (Chavez et al., 2023).

2.3. Resource selection (Select methods, media, and materials)

Here, all resources and materials required to achieve the educational objectives will be selected. Choosing instructional strategies that will match the student's learning styles, e.g., direct teaching, project-based learning, and collaborative learning (Figure 3).

These may include teaching methods, technologies, learning materials, and domain-specific equipment (Shah et al., 2020).

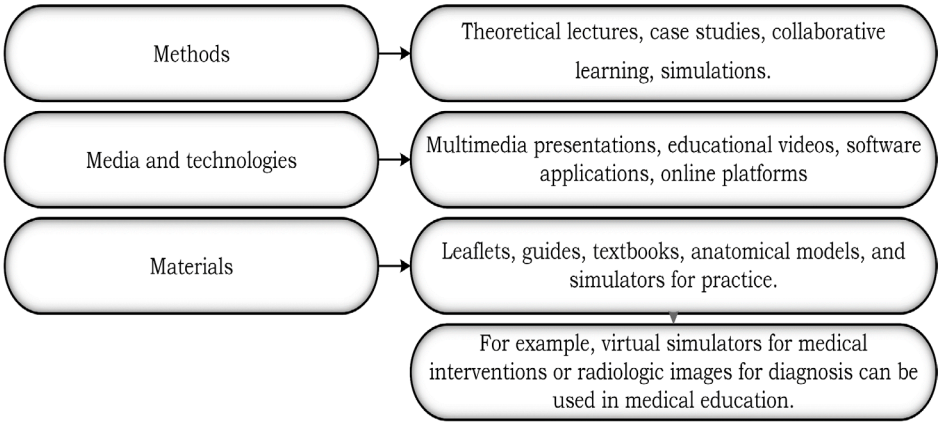

Figure 3. Examples of resources and materials that can be used by the teacher (Bhise N et al, 2024)

2.4. Utilise media and materials

After selecting materials and resources, this stage will focus on their effective integration into the lesson. Technologies and materials should be used to facilitate active learning and learner participation. An essential aspect at this stage is the lesson delivery using the chosen technologies and learning materials (Figure 4) (Bhise et al., 2024).

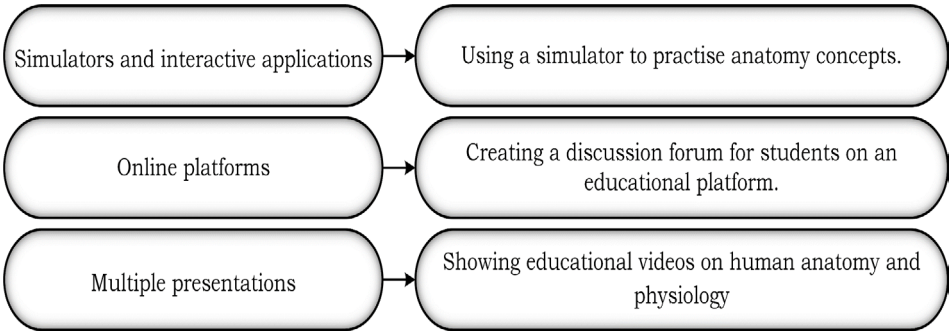

Figure 4. Examples of the use of technologies (Beadle D, 2021)

2.5. Require learner participation

Active learner participation is essential for effective learning. At this stage, learners must actively participate in the learning process through interactive activities, practical exercises, and feedback sessions (Byrne et al., 2022).

Active learner participation is essential for the most effective learning. At this stage, learners should be actively involved in the learning process through interactive activities, practical exercises, and feedback sessions. This stage aims to actively involve learners in the learning process, thereby significantly deepening the lessons taught (Shah, 2020).

Examples of activities used for constructive learning:

· Clinical simulations: Learners actively participate in solving clinical cases, discussing treatment options, and making decisions.

· Group exercises: Working in groups to solve diagnostic problems or analyse a case study.

· Role-playing: Learners role-play as, for example, doctors and patients, to learn how to communicate effectively in medical situations (Notarianni, 2021).

2.6. Evaluation (Evaluate and revise)

At the end of the lesson or educational activity, it is necessary to evaluate learners' progress and determine the extent to which objectives have been achieved. Evaluation can also serve as a tool for the continuous improvement of the educational process.

The ASSURE model steps can be evaluated by collecting qualitative and quantitative data (participant feedback, performance tests, and observations) and identifying strengths and areas for improvement. This continuous process helps to optimise the educational process and adapt it to the needs of the students (Figure 5) (Chavez et al., 2023).

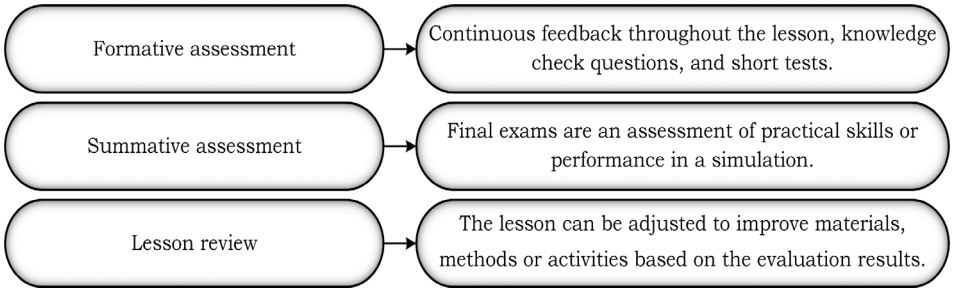

Figure 5. Types of assessment: (Chavez et al., 2023)

Assessment should not be limited to a final test but should be an ongoing process of monitoring progress and adjusting instruction to better meet learners' needs.

In addition to these types of assessment, there are other ways in which the most accurate assessment of learners can be achieved (Figure 6) (Byrne et al., 2022)

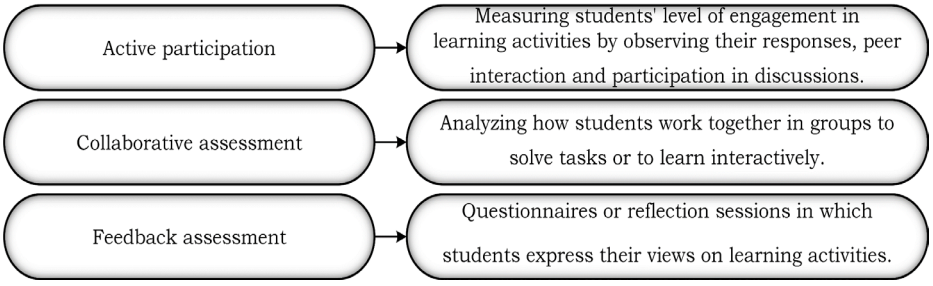

Figure 6. Student assessment methods (Notarianni, 2021)

3. Applicability of the ASSURE model in the medical field

The ASSURE model is a didactic methodology used in education for lesson planning and implementation, aiming to integrate modern technologies and educational materials effectively. In the healthcare field, the ASSURE model has significant applications, contributing to the preparation of future healthcare professionals (Garrison & Vaughan, 2015).

The ASSURE model offers numerous benefits to medical education by enabling the integration of modern teaching and learning methods. This methodology facilitates the tailoring of educational content to the specific needs of students and health professionals, ensuring adequate preparation for the challenges of medical practice.

3.1. Lesson planning and resources:

Effective lesson planning in medical education is essential for imparting complex knowledge and ensuring students' understanding. The ASSURE model emphasises identifying the audience, setting learning objectives, selecting appropriate materials, and integrating modern technologies.

A.Identifying the Audience: In medical education, students may have varying knowledge, skills, and learning styles. Applying this step involves analysing students' educational needs, such as using diagnostic tests to identify knowledge gaps (Garrison & Vaughan, 2015).

B.Establish Clear Objectives: An example of an objective in medical education might be, "Students will be able to identify the major anatomical structures of the heart using interactive 3D models." SMART (Specific, Measurable, Attainable, Relevant, Time-bound) objectives are fundamental to this process (Garrison &Vaughan, 2015; McDonald, 2019).

C.Use of interactive materials: Modern technologies, such as mobile apps, interactive simulations, or video lessons, offer learning opportunities tailored for the digital generation. For example, platforms such as Visible Body provide detailed anatomical models that facilitate understanding complex structures (Kumar & Sharma, 2020).

A key aspect of lesson planning is to identify the most effective strategies for different categories of learners. For example:

· Visual learners benefit from using diagrams, anatomical illustrations and interactive 3D models. These resources help understand the relationships between anatomical structures, especially in neuroanatomy or surgery.

· Kinesthetic learners need hands-on activities like participating in medical simulations, working with advanced manikins, or performing exercises in anatomy labs.

· Auditory learners can benefit from interactive lectures in which concepts are explained in detail, as well as group discussions and case studies (Garrison &Vaughan, 2015; McDonald, 2019).

The ASSURE model allows teachers to adapt materials and teaching methods to these factors. The use of digital platforms such as Nearpod or Kahoot! Stimulate active student engagement through interactive quizzes and real-time feedback sessions. (Kumar & Sharma, 2020)

A concrete example of the application of this model in medical education is cardiopulmonary resuscitation (CPR) training. Teachers can plan the lesson as follows:

A. Show a video explaining the correct CPR techniques.

B. Using manikins for practical simulation.

C. Testing skills in simulated scenarios, providing personalised feedback.

3.2. Use of modern technologies in medical education:

Modern technologies play a crucial role in medical education, helping to create engaging and compelling learning experiences. The ASSURE model encourages the strategic integration of these technologies (Zhu & Liu, 2023).

A. Augmented (AR) and Virtual Reality (VR):

Augmented and virtual reality are increasingly used in medical education to simulate complex procedures or explore human anatomy. Apps such as AnatomyAR+ allow students to visualise and interact with organs and systems in three-dimensional space, enhancing understanding. VR simulations also provide a safe environment for practising surgery.

B. 3D Models:

3D printing and modelling software are valuable tools for medical education. They allow the creation of accurate organ models, allowing students to learn through hands-on experimentation. For example, 3D printers can generate replicas of bones or blood vessels in preparation for surgery (Zhu & Liu, 2023).

C. E-learning platforms:

Digital platforms such as Coursera, Lecturio or Khan Academy include interactive modules for medical training. They offer courses that combine videos, quizzes, and tests, allowing students to manage their learning pace.

D. Artificial intelligence (AI)-based technologies:

Artificial intelligence is beginning to play an important role in medical education. E-learning platforms like Medscape Education or Lecturio use algorithms to personalise the learning experience. For example, AI can analyse a student's test performance and recommend supplementary materials tailored to their knowledge gaps (Khan & Olawale, 2018).

E. Mixed Reality (MR):

Mixed reality combines elements of VR and AR, allowing students to interact with a virtual environment while remaining connected to the real world. One example is Microsoft HoloLens, which allows students to explore the human body layer by layer, simulating the dissection experience without cadavers. This technology is beneficial in countries with limited resources for anatomy education (Khan & Olawale, 2018).

F. Gamification in medical education:

Gamification methods are used to transform learning into an engaging experience. Educational games, such as Level Ex (which simulates complex clinical scenarios), allow students to develop practical skills in a safe environment. For example, a student can learn how to treat a fracture or manage a medical emergency by making quick decisions within the game (Khan & Olawale, 2018).

3.3 Assessment and feedback in medical education

Monitoring student progress and providing appropriate feedback are essential to the learning process, and the ASSURE model incorporates these elements to improve teaching methods.

A. Formative and summative assessment:

Using digital technologies, assessments can become more dynamic and personalised. Online quizzes, such as those through Moodle or Canvas, allow continuous progress monitoring. Summative assessments, such as exams, can be combined with immediate feedback methods to increase the effectiveness of the educational process.

B. Use of simulators for assessment:

Medical simulators, such as the Laerdal SimMan, assess students' clinical skills and rapid decision-making in realistic scenarios. These simulators provide opportunities for real-time feedback and enable course adjustments based on identified needs (Selzer et al., 2021).

C. Personalised Feedback:

Personalised feedback is an important component of the ASSURE model. Teachers can use digital tools to analyse student performance and offer suggestions for improvement. For example, analysing clinical procedure videos can be combined with constructive feedback to correct errors. (Selzer et al., 2021).

D. The importance of real-time feedback:

In medical education, immediate feedback is critical in correcting errors and reinforcing knowledge. For example, in a simulation lab, students may receive feedback on the accuracy of hand positioning during cardiac massage or intubation. Advanced devices, such as sensor simulators that measure

applied pressure or the speed of manoeuvres, provide students with a clear picture of their progress (WHO. Digital Health in Medical Training. Geneva: World Health).

E. Assessment through digital portfolios:

In modern medical education, digital portfolios are used to document student progress. These include video recordings of practised procedures, test results, research projects, and other materials that reflect the competencies developed. Platforms such as ePortfolio and Mahara enable students and teachers to collaborate to improve performance.

F. Complex scenario-based assessments:

Another innovative assessment method is the use of complex clinical scenarios. These assessments involve students in realistic simulations, such as managing a patient with multiple comorbidities. Teachers can assess theoretical knowledge, practical skills, communication skills, and the ability to make pressure-based decisions (Arandjelovic & Callaway, 2022).

G. Future perspectives:

The ASSURE model can be extended to integrate new trends in medical education.

For example, work can be done on integrating Big Data and predictive analytics to track individual student performance and customise curricula according to their needs.

Creating cross-disciplinary experiences: collaboration between different specialisations (medicine, engineering, computer science) to develop innovative solutions, such as robotic surgery simulations.

The ASSURE model not only ensures a structured educational process but also contributes to the development of well-trained physicians capable of meeting the challenges of modern healthcare (Arandjelovic & Callaway, 2022).

Case study: Teaching anatomy using the ASSURE model

In medical education, traditional teaching methods are often limited in their ability to illustrate the complexity of human anatomy. The integration of advanced technologies such as virtual reality (VR) and augmented reality (AR) through the ASSURE (Analyse Learners, State Objectives, Select Methods, Utilise Media and Materials, Require Learner Participation, and Evaluate and Revise) model can radically transform the learning experience, providing students with a deep and applied understanding of the structure of the human body (Pottle, 2019).

Students can more easily explore the human body through virtual or augmented reality. Students can explore and manipulate 3D models of organs and systems, observing structures from all angles. AR can overlay additional information on physical or simulated models, providing essential details about

the functions and interactions among various systems (Moro et al., 2017). Using VR provides students with a fully immersive experience, allowing them to explore the human body in a safe, controlled virtual environment. AR simulations can create realistic clinical scenarios in which students apply their acquired knowledge to diagnose and treat medical conditions. In addition to the other aspects presented, we can affirm that new technology-integrated methods are more engaging and enjoyable for students, thereby increasing motivation and attention to the subject of anatomy.

4. Context and Target Audience

Medical school students are preparing for careers in medicine and already possess a solid foundation of theoretical knowledge. They need interactive and visual methods to deepen their detailed understanding of anatomy and to link theory to practice. In medical education, traditional teaching methods are often limited in their ability to illustrate the complexity of human anatomy (Pottle, 2019).

The integration of advanced technologies such as virtual reality (VR) and augmented reality (AR) through the ASSURE model (Analyse Learners, State Objectives, Select Methods, Utilise Media and Materials, Require Learner Participation, and Evaluate and Revise) can radically transform the learning experience by providing students with a deep and applied understanding of the structure of the human body (Abdullah et al., 2023). Students can more easily explore the human body through virtual or augmented reality, thereby gaining access to interactive, visual methods that deepen their understanding of anatomy and link theory to practice (Layona et al., 2018).

4.1. Educational Objectives

Students will explore and analyse complex anatomical structures using VR glasses and 3D models. Using VR glasses and 3D models, students can visualise and interact with anatomical structures in a detailed and realistic manner. This allows them to better understand the complexity and interdependence of human body systems. These new methods can capture details that anatomy atlases or cadaver-based studies cannot. Students will describe the functions and interactions between different anatomical systems. By utilising VR and AR technology, students will learn to describe in detail the functions of each anatomical system and how they interact to maintain body homeostasis (Kolla et al. 2020).

Students will apply the knowledge acquired through interactive VR clinical simulations to solve medical cases. Students will be placed in virtual environments that simulate real clinical situations. For example, they may be exposed to a head trauma case, where they have to identify the affected structures and make appropriate medical decisions quickly. (Sun et al., 2023).

4.2. Teaching Methods

Using VR glasses for a detailed and interactive exploration of anatomical structures. Each tissue that builds an organ can be visualised, observing a system with each element included, but also the human body as a whole; the student can also interact interactively, for example, through the Virtual Anatomy Dissection Table, where both the human body and the medical situations it may be subjected to can be studied (Kadri et al. 2024).

Integrating AR applications to overlay information and images on real or simulated structures. AR applications allow the superimposition of detailed information on real or simulated anatomical models. For example, students can use tablets or smartphones to directly see labels and detailed descriptions of different body parts on an anatomical mannequin. Students can rotate and zoom 3D models using AR to view anatomical structures from different angles. This provides a more precise and more detailed perspective than traditional static models. AR apps allow students to interact with anatomical models. For example, they can select specific body parts to receive additional information, observe how a particular organ functions, or understand interactions among body systems (Uribe et al., 2023). AR apps can be tailored to meet individual student needs, providing a personalised learning experience. Students can explore various anatomy modules and sections at their own pace, depending on their level of knowledge and specific interests (Wu et al., 2022).

For example, using AR, students can visualise the cardiovascular system in detail, following the path of blood through the heart and blood vessels and understanding the function of each component in maintaining blood circulation.

Collaborative learning activities and group discussions to facilitate in-depth understanding. Students are divided into small groups and given specific tasks related to specific anatomical systems or medical conditions. Each group must create an interactive presentation using VR glasses and AR apps to illustrate anatomical structures and functions. It is much easier and more efficient for students to be divided into small groups, rotating groups and discussing anatomical parts with different classmates (Kolla et al. 2020).

4.3. Materials Required

4.3.1. VR Goggles

· Compatible with anatomy educational apps. Several VR glasses options are compatible with anatomy educational apps. Here are some of the most popular ones:

· ***Anatomyou VR:***

· It provides an immersive 3D VR experience for learning human anatomy. It is compatible with mobile devices and tablets, offering detailed navigation and dynamic cues for key anatomical structures (Kolla et al., 2020).

· ***Human Anatomy VR:***

· Considered one of the most advanced VR platforms for anatomy, this app enables 3D DICOM image visualisation and multi-user collaboration for a deep understanding of anatomy (Seung Woo Baek et al., 2024).

· ***BookWidgets VR Apps:***

· Offers a wide range of classroom VR apps, including language learning and science apps. These can be used to explore human anatomy interactively and engagingly (Dunn et al., 2019).

· ***Alter Learning VR:***

· This platform transforms complex concepts into interactive 3D models, enhancing visual understanding and student engagement with anatomy (Dunn et al., 2019).

4.3.2. Mobile/tablet devices to integrate augmented reality applications:

· ***Smartphones AR-Ready:***

· Google Pixel 6/6a/6 Pro: They are compatible with ARCore, Google's AR technology, delivering an immersive AR experience. (Telefon Google Pixel 6, 128GB, 8 GB RAM, 5G, Dual SIM, Stormy Black - eMAG.ro)

· iPhone 12 and newer versions: They use ARKit, Apple's AR technology, to create immersive AR apps. (https://www.emag.ro/telefoane-mobile/brand/apple/filter/model-f9396,iphone-12-v-9297249/c?msockid=21fb6079a6cf6d2f05667207a7166c1d%C3%A2%C3%AE)

· Samsung Galaxy S21/S22: Samsung devices are also compatible with ARCore, delivering a high-quality AR experience. (Telefon mobil Samsung Galaxy S21, Dual SIM, 128GB, 8GB RAM, 5G, Phantom White - eMAG.ro***)***

· ***AR tablets:***

· Lenovo Phab 2 Pro: One of the first AR tablets compatible with Google's Project Tango.

· Asus ZenFone ARLenovo Phab 2 Pro offers an advanced AR experience and is compatible with Project Tango.

· Android tablets and smartphones: Android devices that support ARCore can be used for AR applications. Ensure that the device has at least 1 GB of free storage and an unlimited mobile data plan to use AR apps (Moro et al., 2017).

4.3.3. Additional resources such as anatomical atlases and digital textbooks:

· **BIOMAP:** An interactive platform that lets you explore human anatomy in 3D. It includes over 800 3D models and is helpful for both students and professionals. (BIOMAP)

· **- Netter Atlas of Human Anatomy, 7th Edition:** One of the most popular anatomy atlases, also available in digital format. Includes detailed and up-to-date images. (Netter Atlas de Anatomie a Omului Editia 7 - Callisto.Ro)

· **Anatomy 3D Atlas:** An Android app that provides detailed 3D models of different anatomical systems. Useful for students, doctors and other medical professionals. (Home | Anatomy.app | Learn anatomy | 3D models, articles, and quizzes)

· ***Digital Textbooks***

· ***Netter Atlas of the Anatomy of Man plus eBook*** includes additional online floor plans, dissection movies and interactive 3D models.

· ***Livingstone Atlas of Human Anatomy:*** 2020 Edition offers additional digital resources and over 300 multiple-choice questions.

4.4. Practical Implementation

Technology Introduction: the teacher presents and demonstrates using VR goggles and AR applications, illustrating a 3D cardiovascular system model (Kolla et al. 2020).

The teacher will present and demonstrate the use of VR goggles and AR applications to illustrate a 3D cardiovascular system model. This demonstration will include navigating the 3D model and highlighting the system's main components and functions (Sun et al., 2023).

4.5. Activities

Live demonstration: the teacher will use VR glasses to navigate through the 3D model of the cardiovascular system, showing how students can interact with the model and access detailed information (Lee & Park, 2023). Using AR Apps: The teacher will demonstrate using AR apps to overlay information on real or simulated structures. For example, the teacher will use a tablet to demonstrate how blood flow and cardiac function data can be displayed directly on an anatomical manikin (Lee et al., 2023).

Group Projects: students collaborate to create interactive presentations about different anatomical systems, using 3D and AR models to illustrate key points. Each group will research their assigned anatomical system, collect relevant information, and plan the structure of the presentation (Carolyn et al., 2015).

Using 3D Models and AR: Groups will use VR goggles and AR applications to create interactive models and overlay visual information on anatomical structures. These will include informative labels, functional descriptions, and

animations to illustrate biological processes. (Venkatesan et al., 2021) Interactive Presentation: Each group will present their research results and models to peers and teachers. The presentations will be interactive, allowing the audience to interact with the 3D and AR models.

4.6. Require Learner Participation

A. Student Involvement

Experiential Learning: Students manipulate 3D models and explore augmented reality, facilitating a practical understanding of anatomy. Experiential learning employs advanced technologies to explore and understand anatomical structures. By manipulating 3D models and using augmented reality (AR) applications, students can see in detail the complex structures of the human body and understand how they work together (Radu et al., 2023)

B. Experiential Learning Activities

- *Detailed Exploration of 3D Models:*

Activity: Students use VR goggles to explore a 3D model of an anatomical system, such as the cardiovascular system. They can rotate, zoom, and manipulate the model to view the structures from all angles. (Kolla et al., 2020)

Benefit: This activity provides a detailed, interactive visualisation that facilitates a deeper understanding of anatomy.

- *Using Augmented Reality:*

Activity: Students can overlay detailed information on real or simulated models using AR apps on mobile devices. For example, they can visualise blood flow through arteries and veins on an anatomical mannequin (Akçayır et al., 2017).

Benefit: AR provides a hands-on learning method, allowing students to see biological processes in real time and context.

- *Interactive Clinical Simulations:*

Activity: Students participate in VR clinical simulations to identify and treat virtual patients' medical conditions. This may include exploring the respiratory system to diagnose breathing problems. (De Mattei et al., 2024)

- *Intro to Clinical Simulation:*

Description: The teacher will introduce the students to the clinical scenario and simulation objectives. For example, in the respiratory system, students must diagnose and treat breathing problems.

Duration: 10 minutes

- *Exploring the Respiratory System with VR:*

Activity: Students will use VR goggles to explore the respiratory system of virtual patients. They can visualise the anatomy of the lungs, trachea, and bronchi in detail and identify any abnormalities.

Duration: 20 minutes

- *Diagnosis of Respiratory Conditions:*

Activity: Students will diagnose respiratory conditions in virtual patients using information and observations from the VR simulation. This may include problems such as asthma, pneumonia, or bronchitis.

Duration: 20 minutes

- *Treatment Planning and Implementation:*

Activity: Based on diagnosis, students will plan and apply appropriate treatment for virtual patients. This may include medication administration, oxygen therapy, or other medical interventions.

Duration: 30 minutes

- *Feedback and Reflection:*

Activity: Upon completion of the simulation, the teacher will provide detailed feedback to the students, highlighting strengths and areas for improvement. Students will have the opportunity to reflect on the experience and discuss lessons learned.

Duration: 20 minutes

Benefits

Simulated Clinical Scenarios: Students apply their acquired knowledge in simulated clinical scenarios, discussing medical cases and identifying affected anatomical structures.

Interactive Assessments: Interactive tests and quizzes that use VR and AR technologies to assess student knowledge engagingly (El Hussein et al., 2022).

Evaluate and Revise.

Evaluating Effectiveness

Continuous Feedback: Students provide feedback on the use of VR goggles and AR apps, enabling rapid adjustments to the teaching method.

Performance Monitoring: Formative and summative assessments track student progress and identify areas needing improvement.

Adaptation of Methodology: Based on feedback and assessment results, the teacher revises and adapts the methodology to maximise student effectiveness and engagement.

Integrating the ASSURE model into anatomy teaching creates an interactive, applied-learning environment that utilises VR and AR technologies. This approach enhances students' understanding of human anatomy and promotes active participation and collaboration, thereby better preparing them for future careers in medicine (Azer et al., 2018).

CONCLUSIONS

Adopting the ASSURE model in medical education provides an innovative and practical framework to transform traditional teaching methods into interactive, engaging, and personalised experiences. Following the analysis, the following were identified:

By analysing learner characteristics (age, educational level, learning styles, and existing competencies), the model enables the tailoring of lessons to students' specific needs. This is essential in medical education, where students have high academic demands and diverse learning approaches. Adapting materials helps to reduce frustration and increase motivation.

Augmented and Virtual Reality:

· AR and VR allow exploring complex structures in a three-dimensional, immersive way, increasing the understanding of spatial relationships between anatomical structures.

· 3D Simulations: allow practising medical procedures in a safe environment where errors have no real consequences, preparing students for clinical practice.

· Gamification: Students can develop clinical skills engagingly and effectively through interactive games. For example, cardiopulmonary resuscitation (CPR) simulations or medical emergency management.

The model promotes direct student involvement through clinical simulations, group projects, and interactive sessions. In medical education, these methods enhance theoretical understanding and practical skills, such as decision-making under pressure and effective team communication.

The model includes formative and summative assessment methods, such as interactive tests, digital portfolios, and assessments based on complex clinical scenarios. Real-time feedback helps students correct errors immediately, improving their skills.

Artificial intelligence integration:

· AI can analyse student performance and personalise learning with suggestions tailored to individual needs.

· Big Data and predictive analytics can help identify educational gaps and adjust the curriculum in real-time.

· Cross-disciplinary collaborations: Using the ASSURE model in partnership with other domains (engineering, IT) opens up new opportunities, such as developing advanced robotic simulations.

The ASSURE model not only supports theoretical learning but also contributes to students' practical preparation, equipping them with essential skills to manage complex healthcare situations.

The model sets a benchmark for integrating advanced technologies in medical education, making the teaching of anatomy a dynamic, engaging, and student-oriented process. This approach facilitates the development of well-trained professionals who can adapt to the challenges of the modern medical system.

Conflict of interests

Nothing to declare.

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Leadership Competences of Early Childhood Educators: The Mediating Role of Their Motivation

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ABSTRACT. Strong leadership competences among early childhood educators are essential to securing a formative learning environment in kindergarten. Such competences are developed by motivated teachers to continuously improve their didactic performance. The study aimed to investigate the relationship between leadership competences, specifically focusing on how these competences relate to preschool teachers' motivation along their careers. 188 Romanian early childhood educators filled in two standardized instruments: the Teacher Leadership Scale (TLS) and the Teacher Motivation Questionnaire (TMQ). Data analysis using Spearman correlations, Kruskal-Wallis and Mann-Whitney U tests revealed a significant positive correlation between intrinsic motivation and leadership competences. We found significant differences by age groups, with younger teachers displaying lower leadership competence scores. Qualitative responses complemented the quantitative findings, highlighting professional development, communication improvement, and leadership support as key areas for enhancing leadership competences. The results suggest the need for differentiated training programs, tailored to teachers' age and experience levels. Fostering intrinsic motivation, which emerged as a key driver for professional engagement and educational leadership development, should receive particular emphasis. The research provides insights for improving teacher development strategies in early childhood education and emphasizes the role of motivation to be fostered for promoting leadership growth.

Key-words: leadership competences; pedagogical leadership; early childhood education; teacher motivation; preschool teachers

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ZUSAMMENFASSUNG. Starke Führungskompetenzen bei Erzieherinnen und Erziehern sind unerlässlich, um ein förderliches Lernumfeld im Kindergarten zu gewährleisten. Solche Kompetenzen werden von motivierten Lehrkräften entwickelt, um ihre didaktische Leistung kontinuierlich zu verbessern. Ziel der Studie war es, den Zusammenhang zwischen Führungskompetenzen zu untersuchen, wobei der Schwerpunkt auf der Frage lag, wie sich diese Kompetenzen auf die Motivation von Erzieherinnen und Erziehern im Laufe ihrer Karriere auswirken. 188 rumänische Erzieherinnen und Erzieher füllten zwei standardisierte Fragebögen aus: die Teacher Leadership Scale (TLS) und den Teacher Motivation Questionnaire (TMQ). Die Datenanalyse unter Verwendung von Spearman-Korrelationen, Kruskal-Wallis- und Mann-Whitney-U-Tests ergab eine signifikante positive Korrelation zwischen intrinsischer Motivation und Führungskompetenzen. Wir stellten signifikante Unterschiede zwischen den Altersgruppen fest, wobei jüngere Lehrkräfte niedrigere Werte bei den Führungskompetenzen aufwiesen. Qualitative Antworten ergänzten die quantitativen Ergebnisse und hoben die berufliche Weiterentwicklung, die Verbesserung der Kommunikation und die Unterstützung der Führungskräfte als Schlüsselbereiche für die Verbesserung der Führungskompetenzen hervor. Die Ergebnisse deuten auf die Notwendigkeit differenzierter Schulungsprogramme hin, die auf das Alter und den Erfahrungsstand der Lehrer zugeschnitten sind. Die Förderung der intrinsischen Motivation, die sich als wichtiger Motor für das berufliche Engagement und die Entwicklung von Führungskompetenzen im Bildungsbereich herausstellte, sollte besonders betont warden. Die Forschung liefert Erkenntnisse zur Verbesserung von Strategien zur Lehrerfortbildung in der frühkindlichen Bildung und betont die Bedeutung der Motivation, die zur Förderung der Führungskompetenz gefördert werden muss.

Schlüsselwörter: Führungskompetenzen; pädagogische Führung; frühkindliche Bildung; Motivation von Lehrkräften; Vorschullehrerinnen und -lehrer

1. INTRODUCTION

In early childhood education (ECE), leadership competences are essential for creating an organised and effective learning environment. Leadership competence includes planning, organisational, communication, and evaluation skills, all of which contribute to the success of the educational process (Fonsén & Ukkonen-Mikkola, 2019). Early childhood educators (ECEs) with strong leadership competences and pedagogical leadership are able to respond effectively to children's needs and work with parents and colleagues to ensure an educational climate favourable to the harmonious development of preschool children (Bodin, 2025; Boyd, 2001). Their pedagogical leadership allows them to handle the

diversity of roles and pedagogical actions they are responsible for as preschool teachers, combining their theoretical knowledge, wisdom (Bodin, 2025), and motivation for improved teaching practices.

While the leadership competences refer to organizational coordination, decision-making, and management responsibilities, pedagogical leadership is more closely related to educational practice. It involves guiding teaching processes, making decisions in activities with children, and reflecting both individually and collectively on professional practices (Bodin, 2025; Bøe et al., 2022). Nguyen et al. (2020) define teacher leadership as teachers' capacity to lead both inside and outside the classroom, contributing to a community of teachers and leaders, influencing others toward improved instructional practice, and taking responsibility for outcomes. The definition emphasizes the integration of teaching and leadership. While pedagogical aspects are embedded within teacher leadership, in fact, regarding ECEs, the terms pedagogical/ instructional leadership and teacher leadership largely overlap, and we will use them as quasi-similar, as ECE educators are mainly concerned with managing the group of children on their daily basis.

Despite studies emphasing the importance of motivation in teacher education, the relationship between motivation and leadership competences remains underexplored. In spite of the leadership competence covering the motivating of children, little is known about teachers' motivation and its relation with teacher leadership competence (Bøe et al., 2022). It is believed that strong intrinsic motivation can stimulate the continuous development of leadership competences, as findings on investigations done on teachers as higher level of schooling emphasized such correlations (Setyawati, 2023; Thoonen et al., 2011). Furthermore, appropriate extrinsic motivation can support teachers' ability to overcome challenges in the school environment and maintain high levels of performance in managing their group of children and educational relationships. There is a dearth of research on how ECE teachers' motivation evolves over their careers and influences their leadership competence. While the connections between teacher leadership and motivation, covering as well the role of school leadership and organizational environment in influencing them, are more intensively researched for the upper levels of schooling, their relation for ECEs in kindergarten is less explored (Muijs et al., 2004; Nguyen et al., 2020). The educators in ECE often enjoy a lower professional status which might lead to demotivation over time, in spite of their initial commitment to fostering children's development.

The research aims to further investigate these connections and how they evolve over time, providing a better understanding of the relationship between leadership competences and motivation among ECEs, with the aim of

providing a useful theoretical and practical basis for optimising training programs and supporting educational leadership in kindergartens, as we try to capture also the educators proposals on how such leadership competences can be improved.

2. THEORETICAL BACKGROUND

2.1 Leadership competences in early childhood education

A teacher with strong leadership skills can create an educational climate favourable to children's learning and development (Wenner & Campbell, 2016). Effective classroom management directly influences children's behaviour and performance, and a well-organised educational setting contributes to the development of a trusting relationship between teachers and children (Fonsén & Ukkonen-Mikkola, 2019).

The leadership competences of ECEs as modelled by Boyd (2001), include dimensions such as collegial influence, involvement in decision-making, and commitment to professional development. Teachers' instructional leadership can stimulate pedagogical innovation and contribute to improving children's academic achievement through increased collaboration between teachers and the use of child-friendly instructional strategies (Bodin, 2025).

Recent studies emphasize additional influences on the development of teacher leadership competences. Bodin (2025) highlights the role of individual and collective reflection in strengthening pedagogical leadership, showing how teachers reinterpret their practices and roles over time. Similarly, Bøe et al. (2022), through a shadowing study of early childhood teachers, demonstrate that pedagogical leadership is exercised in everyday classroom situations, through negotiation, practical decisions, and modelling of relationships with children. According to Nguyen et al. (2020), five key factors shape the nature, quality, and effectiveness of teacher leadership: school culture, school structure, principal leadership, peer relationships, and person-specific factors. A collaborative and supportive school culture fosters authentic teacher leadership, whereas cultures of blame and coercion act as barriers. Flexible and transparent school structures enable innovation, while rigid, top-down systems restrict teacher leadership. Principals play a crucial role by providing time, space, and opportunities for teacher involvement, as well as by supporting and recognizing teacher leaders. Strong peer relationships based on trust and mutual support enhance teachers' influence, whereas weak relationships diminish their impact. Finally, personal factors such as knowledge, motivation, and, in some cases, teaching experience can positively affect teachers' leadership capacity (Nguyen

et al., 2020). At the same time, Thoonen et al. (2011) underline that teachers' motivation and their involvement in leadership are shaped by the leadership style of principals and by the organizational conditions of the school, which create or limit opportunities for professional and pedagogical growth. While teacher leadership can be influenced by the kindergarten organization, and its supportive, friendly and stimulating ecosystem, the pedagogical leadership of educators in ECE is largely influenced by the personal factors, as Nguyen et al. (2020) and Setyawati (2023) suggest.

Conceptions of teacher leadership are grounded in pedagogical leadership. From an pedagogical perspective, teacher leadership can be categorised into three broad models: *(1) the teacher leadership model*, which formalises instructional leadership roles and responsibilities through recognition and compensation, such as titles and release time; *(2) the multiple leadership roles model*, which informally distributes instructional leadership roles and responsibilities among multiple teachers, although the title and formal position of each teacher leader remain classroom teacher and *(3) the 'every teacher a leader' model*, which informally involves all teachers in collaborative efforts for instructional improvement and school reform without assigning specific roles and responsibilities (Muijs & Harris, 2003).

Researchers have not agreed on a consensus of the definition and use of the term "*teacher leader*", partly due to the diverse roles educators can play in kindergarten management (Wenner & Campbell, 2016). Leadership competence is correlated with developing productive relationships among teachers, children, and parents, which leads to better communication and improved educational outcomes (Fonsén & Ukkonen-Mikkola, 2019). Whether we are talking about activities like planning, effective space organisation, or effective communication with parents as applied aspects of classroom management (Bodin, 2025), all these activities are refined through experience, reflection, and continuous improvement. To what extent educators are open and motivated to such improvement is to be explored.

Beyond mere administrative management, pedagogical leadership requires teachers to engage in both individual and collective reflection to guide their educational actions. This reflective practice, combined with what Bodin (2025) describes as phronesis or practical wisdom, enables teachers to make contextually informed decisions rather than merely applying theoretical frameworks. Furthermore, leadership in early childhood settings is not always formally recognized; much of it occurs "invisibly" through daily interactions, decision-making, and the ways teachers negotiate and model relationships with children and colleagues (Bøe et al., 2022). This perspective highlights that pedagogical leadership is enacted in both formal and informal contexts, embedded in the everyday dynamics of teaching practice.

Such dynamics are influenced by educational organizational conditions and leadership practices of head teachers as they impact the motivation of teachers for learning, improved teaching practices, and contribution to improved organizational conditions (Thoonen et al., 2011; Chen, Fan, 2025) and learning environment.

Summing up, both kindergarten's organizational ecosystem and personal treats of educators shape their (pedagogical/) leadership. Let's further explore how motivation of educators, as main personal treat gearing theirs commitment, acts in ECE.

2.2. Motivation in early childhood education

The motivation of ECEs has a direct impact on the quality of teaching and continuing professional development. Motivated teachers are more engaged, adopt innovative practices, and actively participate in educational leadership activities (Eyal & Roth, 2011; Chen, Fan, 2025). The ability of the kindergarten leadership to foster teacher autonomous or controlled motivation for improved teaching practices and involvement in organization is strongly influenced by the transformational and integrative leadership style of the principal, by stimulating working conditions, and by support (Eyal & Roth, 2011).

Teachers' motivation plays a central role in shaping educational practices and mediates the effects of leadership and organizational conditions. While individual factors such as intrinsic interest and professional goals are important, research indicates that teachers' motivation is also significantly influenced by transformational leadership and supportive organizational environments (Thoonen et al., 2011).

As explanatory support, the Self-Determination Theory (Deci & Ryan, 2000) states that human motivation is underpinned by the satisfaction of three fundamental psychological needs: autonomy, competence, and relatedness. In an educational context, when teachers feel autonomous in decision-making, competent in their professional work, and well-integrated into the school community, their intrinsic motivation increases, leading to more profound engagement in teaching and professional development.

Similarly, the two-factor theory of Hertzberg (Alshmemri et al., 2017) differentiates between motivational factors (intrinsic to the job) and hygiene (organisational and contextual) factors (extrinsic). Motivational factors, such as a sense of achievement, professional recognition, responsibility, and opportunities for advancement, contribute to job satisfaction. Hygiene factors, on the other hand, such as institutional policy, relationships with colleagues, and working conditions, do not generate satisfaction, but their absence leads to demotivation and dissatisfaction (Alshmemri et al., 2017). Although initially applied in

organisational settings, the bifactor theory is highly applicable in educational contexts. For ECEs, job satisfaction can be increased by recognising merit, giving positive feedback, and engaging in meaningful activities, while aspects such as working conditions and managerial support need to be kept at a satisfactory level to prevent demotivation (Muijs et al., 2004).

Çetinkaya & Arastaman (2023) and Wenner & Campbell (2016) suggest that teachers' transition to leadership roles is often underpinned by a strong motivation for involvement, a desire to positively influence the school community, and a need for professional development. Therefore, ECEs' motivation, whether intrinsic or extrinsic, is a fundamental component that influences engagement, personal initiative, the quality of professional relationships, and the development of leadership competences. Based on these premises, we will investigate how professional motivation affects the development of leadership competences in ECEs, aiming to answer the following *research questions*: Is there a correlation between leadership competences and teacher motivation (intrinsic and extrinsic) in early childhood education? If yes, what demographic and professional variables (such as age, educational level, teaching environment, work experience, and kindergarten program) influence such correlation and how?

Also, as we try to deepen the understanding of such correlation, we capture as well the suggestions early childhood educators offer for improving leadership competences, their motivational drives.

3. METHODOLOGY

The study followed a quantitative cross-sectional design with complementary qualitative elements to analyse the relationship between teachers' motivation and their leadership competences in ECE. A correlational and comparative design was used to explore both the relationships between variables and possible differences due to demographic factors (age, experience, education, etc.). Furthermore, through open-ended questions, the perspectives of ECEs on how their leadership competences can be improved were collected.

Participants

188 participants, out of which 170 kindergarten teachers in different regions of Romania, reunited by the convenience method, and 18 students from pre-service BA program in Pedagogy of Primary and Preschool Education of our university, some of them already working in kindergartens, participated in the research. Of this sample, 184 (97.9%) were female, 3 (1.6%) were male, and 1 (0.5%) did not specify the gender. The age distribution ranged from 18

to over 60 years old, with the majority falling in the 18-30 age group (41.5%), followed by the 31-45 age group (36.7%). In terms of education, almost half of the respondents had a bachelor's degree (48.9%), one-third had a master's degree (34.6%), and (13.8%) had a pedagogical high school. The majority live in urban areas (62.8%), and (29.8%) in rural areas. Most of the respondents come from public institutions (83.5%). As regards seniority in the field, a significant percentage have between 1 and 5 years of experience (42.6%). (60.1%) of the respondents work in extended day nurseries. In addition to these data, Table 1 summarizes the sample distribution and characteristics of the respondents.

Table 1. *Sample distribution based on collected socio-demographic data*

Socio-demographic categorical data		*Frequency (N)*	*Percentage (%)*
Age	18-30	78	41,5
	31-45	69	36,7
	46-60	36	19,1
	60+	2	1,1
	Do not mention	3	1,6
Gender	Male	3	1,6
	Female	184	97,9
	Do not mention	1	0,5
Studies	Pedagogical high school	26	13,8
	University studies (bachelor)	92	48,9
	University studies (Master)	65	34,6
	University studies (PhD)	1	0,5
	Another	4	2,1
Teaching environment	Urban	118	62,8
	Rural	56	29,8
	Student	14	7,4
Type of institution	Public	157	83,5
	Private	13	6,9
	Student	18	9,6
Work experience	1-5	80	42,6
	6-10	32	17
	11-20	30	16
	20+	28	14,9
	Student	18	9,6
Kindergarten programme	Normal	57	30,3
	Extended	113	60,1
	Student	18	9,6

Instruments

Data were collected using two instruments: *the Teacher Leadership Scale (TLS)*, developed by Wang & Xia (2020), and the *Teachers' Motivation Questionnaire (TMQ)*, developed by Ramzan & Khurram (2023).

The TLS was designed to measure ECE teacher leadership in China. The instrument consists of 19 items and measures leadership competences on four dimensions: *Leading teaching and professional development* (8 items); *Characteristics of teacher leaders* (4 items); *Participation in school-wide decision-making* (4 items); *Diversity and continuous improvement* (3 items). In the original version, responses are measured on a Likert scale from *1=strongly disagree* to *6=strongly agree*. In this study, the scale was changed to a 1 to 5 format, keeping the meanings of the lowest and highest points the same, to match another tool used in the research (TMQ) and to include a neutral middle option. To verify that this adaptation did not affect the psychometric quality of the instrument, internal consistency coefficients (Cronbach's α) were recalculated for each of the four dimensions. The values obtained confirmed an adequate to very satisfactory internal consistency. The Cronbach's Alpha coefficient of the instrument is 0.895, indicating a very satisfactory internal consistency of the scale. Satisfactory values were obtained for most of the dimensions: for *Leading teaching and professional development*, the alpha-Cronbach was 0.828; for *Characteristics of teacher leaders*, the coefficient was 0.874; and for *Participation in school-wide decision-making*, it was 0.828, indicating good reliability of these scales. *The diversity and continuous improvement* dimension had a lower Alpha-Cronbach score of 0.513, which means it is less reliable and may need more items or changes in future studies. Sample items for each dimension of the instrument include: (1) "*I apply theoretical knowledge in practice*"; (2) "*I would consider an experienced colleague to be a teacher leader*"; (3) "*I am involved in discussions about personnel decisions*"; (4) "*I respect the views of every colleague when facing differing opinions*".

The second instrument, the TMQ, was used to assess teacher motivation and was constructed and validated based on Herzberg's Bifactorial Theory. The instrument includes 8 items for *intrinsic motivation* (items 20-27) and 10 items for *extrinsic motivation* (items 28-37). The Cronbach's Alpha coefficient for the 18 items is 0.923, which reflects excellent internal consistency. The Alpha-Cronbach coefficient for each dimension indicates a high level of reliability: 0.846 for *intrinsic motivation* and 0.898 for *extrinsic motivation*. The instrument uses a Likert scale from 1 to 5, where *1 indicates strong disagreement* and *5 indicates strong agreement*. Sample items for each dimension of the instrument: (1) "*Teaching gives me purposeful life.*"; (2) "*I am pleased with the working environment in my kindergarten.*"

Given that the TLS and TMQ instruments were originally developed and validated in English, it was necessary to adapt them to Romanian in the specific context of this research. Both instruments were back-translated and culturally adapted. The process included translation into Romanian by a specialist, followed by back-translation into English by a fluent speaker. All versions were compared to resolve discrepancies and ensure clarity, cultural relevance, and conceptual equivalence with the original.

Procedure

In March 2025, the questionnaire consisting of the two instruments was administered online, through the QuestionPro platform, to ensure quick completion and to reach as many participants as possible. The completion time is approximately 10-15 minutes. A total of 188 valid and fully completed responses were collected via social media (groups for preschool/beginner teachers) and faculty courses. Participants were informed that responses were anonymous, data confidential, and used solely for educational and scientific purposes within this research. The questionnaire included clear instructions, emphasizing the voluntary nature of participation, and noted that participants could withdraw from the research at any time. An institutional email address was provided for any questions or clarifications. Approval from the university research council for conducting the study was obtained (no. 51201/2025).

4. RESULTS

Analysis of the raw results was performed using the SPSS (Statistical Package for the Social Sciences) program, a tool developed by IBM (International Business Machines Corporation) that is commonly used in research. Although the sample size (N = 188) is sufficient, tests of normality indicated significant deviations from the normal distribution, which is why non-parametric statistical methods were used. The Spearman correlation coefficient was used to look at how the variables are related, and the Mann-Whitney U (for two groups) and Kruskal-Wallis (for three or more groups) tests were used to compare differences between groups, the results being presented in detail in *Tables 2-12*.

To test the relationship between leadership competences and intrinsic motivation of ECEs we used Spearman's correlation coefficient. The results indicate a positive and statistically significant correlation between the two variables, $r_s(188) = 0.706$, $p < .001$ (Table 2). Thus, a strong positive correlation between leadership competences and intrinsic motivation was identified. The intensity of the correlation is strong, suggesting that those teachers who are intrinsically motivated also tend to exhibit more developed leadership competences.

Table 2. *Spearman correlation analysis between leadership competences and intrinsic motivation of ECEs*

Variabile	*M*	*AS*	*r*	*P*
Intrinsic motivation	34.5798	4.07667	r = 0.706	p < 0.001
Leadership competences	75.6383	8.61146	r = 0.706	p < 0.001

Note: ** p < .05, ** p < .01, *** p < .001*

In order to test the relationship between leadership competences and extrinsic motivation of ECEs, we used the Spearman correlation coefficient. The results indicate a positive and statistically significant correlation between the two variables, r_s(188) = 0.626, p < .01 (Table 3). Thus, statistical data supports the identified moderately positive correlation between leadership competences and extrinsic motivation. The moderate intensity of the correlation indicates that, in general, a higher level of extrinsic motivation is associated with a higher level of leadership competences.

Table 3. *Spearman correlation analysis between leadership competences and extrinsic motivation of ECEs*

Variable	*M*	*AS*	*r*	*P*
Extrinsic motivation	40.4149	6.48472	r = 0.626	p < 0.01
Leadership competences	75.6383	8.61146	r = 0.626	p < 0.01

Note: ** p < .05, ** p < .01, *** p < .001*

The Kruskal-Wallis test was used to test whether there were significant differences in the scores of leadership competences according to the age group of the respondents. The results indicated a statistically significant difference between groups, $\chi^2(2) = 7.602$, p = .022 (Table 4). Thus, the research question is supported by the statistical data: are there significant differences in leadership competences according to the age of teachers.

Table 4. *Results of the Kruskal-Wallis test on differences in leadership competences by age group of respondents*

Age group	*N*	*M*	χ^2 *(H)*	*df*	*p*
18-30	78	89.93			
31-45	69	83.40			
46-60	36	112.97			
			7.602	2	.022

Note: ** p < .05, ** p < .01, *** p < .001*

To find out which groups were different, we did additional Mann-Whitney U tests between pairs of groups, adjusting for multiple comparisons; so, we compared ages 18-30 with 31-45, 18-30 with 46-60, and 31-45 with 46-60.

To test the differences in leadership competences between teachers aged 18-30 and 31-45, the Mann-Whitney U test was applied. The results indicated that there was no statistically significant difference between these two groups, U = 2494.5, Z = -0.764, p = 0.445 (Table 5). Thus, leadership competences are comparable between these age groups. This finding suggests that the level of leadership competences is relatively comparable between early career and mid-career teachers. It is possible that, during this period, the accumulated experience may not be sufficiently divergent to generate significant differences, or that both categories benefit from similar contexts of managerial training and involvement. Therefore, age per se does not seem to be a determining factor for the differentiation in leadership competences in the 18-45 age range.

Table 5. *Comparison between 18-30 and 31-45 age groups*

Age groups	*N*	*M*	*U*	*Z*	*p*
18-30	78	76.52			
31-45	69	71.15			
			2494.5	-0.764	0.445

Note: *U = Mann-Whitney U, Z = Z score for Mann-Whitney test, p = significance value (p < 0.05 indicates statistically significant difference).*

The differences in leadership competence between teachers aged 18-30 and 46-60 were analysed with the Mann-Whitney U test. The results indicated a statistically significant difference, U = 1046, Z = -2.186, p = 0.029 (Table 6), showing that the 46-60 age group showed significantly higher scores in leadership competences compared to the 18-30 age group, suggesting that age and, therefore, professional experience and exposure to managerial roles play an important role in the development of these competences. Younger teachers (18-30 years) in the early years of their careers may not yet have had the opportunity to train or practise managerial skills at the same level, as these skills usually develop over time through practical involvement and participation in institutional decision-making processes. This finding is consistent with the idea that experience gained over an extended professional career contributes to the development and strengthening of these competences.

This significant difference between the youngest and oldest groups in the sample shows that there are no major differences between adjacent groups (e.g., 18-30 and 31-45 years), and they self-evaluate comparable leadership competences.

Table 6. *Comparison between 18-30 and 46-60 age groups*

Age groups	*N*	*M*	*U*	*Z*	*p*
18-30	78	52.91			
46-60	36	67.44			
			1046	-2.186	0.029

Note: *U = Mann-Whitney U, Z = Z score for Mann-Whitney test, p = significance value (p < 0.05 indicates statistically significant difference).*

The Mann-Whitney U-test revealed leadership competences between teachers aged 31-45 and those of 46-60 years, indicating a significant difference, with U = 845, Z = -2.684, p = 0.007 (Table 7). This suggests that the 46-60 age group has higher scores on leadership competences than the 31-45 age group. Therefore, leadership competences do not seem to show a statistically significant increase in the early career stages (between 18-30 and 31-45 years), but a significant jump in their development becomes evident in later stages as teachers accumulate substantial experience, reaching the 46-60 years age range. This suggests that professional maturity and long experience contribute directly to a marked improvement in these competences.

Table 7. *Comparison between 31-45 and 46-60 age groups*

Age groups	*N*	*M*	*U*	*Z*	*p*
31-45	69	47.25			
46-60	36	64.03			
			845	-2.684	0.007

Note: *U = Mann-Whitney U, Z = Z score for Mann-Whitney test, p = significance value (p < 0.05 indicates statistically significant difference).*

To test if there are significant differences in the total scores on leadership competences according to the level of education completed, we used the Kruskal-Wallis test, given that the variable level of education has

three categories (pedagogical high school, bachelor, and master) and the distribution of the data is not parametric. The results indicate that there are no significant differences between the analysed groups; $\chi^2(2) = 0.117$, $p = 0.943$ (Table 8). Thus, it can be concluded that the level of completed education does not significantly influence the leadership competences of ECEs. No significant differences between groups were identified for this variable; thus, it was not necessary to perform post-hoc tests.

Table 8. *Kruskal-Wallis test results on differences in leadership competences scores according to the respondents' level of education completed*

Educational level	*N*	*M*	χ^2 *(H)*	*df*	*p*
Pedagogical high school	26	92.77			
University studies (bachelor)	92	90.69			
University studies (Master)	65	93.55			
			0.117	2	0.943

Note: ** p < .05, ** p < .01, *** p < .001*

To test whether there are significant differences in leadership competences according to the teaching environment (urban or rural), we used the Mann-Whitney test, considering two independent groups and non-parametric data. The results indicate that there are no significant differences between teachers teaching in urban and rural settings, U = 3,053.00, Z = -0.810, p = 0.418 (Table 9). Therefore, the teaching environment does not significantly influence leadership competences. No significant differences were found between groups for this variable; thus, post-hoc tests were not necessary.

Table 9. *Results of the Mann-Whitney U test on the differences in leadership competences scores according to the level of respondents' teaching environment*

Teaching environment	*N*	*M*	*U*	*Z*	*p*
Urban	118	85.37			
Rural	56	91.98			
			3053.000	-0.810	0.418

Note: ** p < .05, ** p < .01, *** p < .001*

The results of the Kruskal-Wallis test indicate that there are no statistically significant differences in the leadership competences of early childhood teachers according to the number of years of experience, $\chi^2(3) = 7.240$, $p = 0.065$ (Table 10). Thus, professional experience does not seem to significantly influence leadership competences in this study. No significant differences between groups were identified for this variable; thus, post-hoc tests were not necessary.

Table 10. *Results of the Kruskal-Wallis test on differences in leadership competences scores according to respondents' work experience*

Experience	*N*	*M*	*χ^2 (H)*	*df*	*p*
1-5	80	79.10			
6-10	32	84.33			
11-20	30	82.97			
20+	28	107.84			
			7.240	3	0.065

Note: ** p < .05, ** p < .01, *** p < .001*

The results of the Mann-Whitney test indicate that there are no statistically significant differences in teachers' leadership competences according to the kindergarten program in which they teach, $U = 3099.000$, $Z = -0.402$, $p = 0.688$ (Table 11). Thus, the kindergarten program (normal or extended) does not significantly influence leadership competences in this study. No significant differences were found between groups for this variable; thus, post-hoc tests were not necessary.

Table 11. *Results of the Mann-Whitney U test for differences in leadership competences scores by respondents' kindergarten program*

Kindergarten program	*N*	*M*	*U*	*Z*	*p*
Normal	57	87.63			
Extended	113	84.42			
			3099.000	-0.402	0.688

Note: ** p < .05, ** p < .01, *** p < .001*

To assess the respondents' perceptions and suggestions on how to improve leadership competences in ECE, a qualitative analysis of the answers given to the open-ended question '*What proposals/suggestions do you have for improving leadership competences in early childhood education?*' was carried out. The 69 responses were subject to thematic coding (Table 12). Coding was done manually, and categories were introduced into SPSS for frequency analysis. Responses were browsed and coded based on recurring themes identified in the text. For each established thematic category, the responses were transformed into binary variables, where a value of 1 indicates the presence of the proposition in the response and 0 its absence. The categories analysed were established using an inductive approach, based on recurrent themes identified directly from the participants' responses, and included: training, communication and collaboration, support for the head teacher, teaching materials, reducing bureaucracy, working conditions, conflict management, staff involvement, and responses with no proposal. This coding allowed the frequency of each theme to be quantified, providing a structured perspective on the priorities and needs expressed by respondents. The qualitative analysis thus carried out adds to the understanding of the factors perceived as essential in the development of leadership competences in ECE, complementing the quantitative data obtained through the other research instruments.

Analysis of the open-ended responses indicates that *training* is the most frequently mentioned category, with (23.2%) of the valid responses, which emphasises a major concern for continuous development and improvement of managerial skills in ECE. A significant percentage (27.5%) of the respondents did not offer *any suggestions*, which may reflect either satisfaction with the current situation or a lack of ideas or motivation to propose changes. *Communication and collaboration* is the third most frequent category (13%), suggesting the importance of interpersonal relationships and transparency in educational management. At the same time, *the support of the principal* is emphasised by (11.8%) of the participants, indicating that the support of institutional leaders is perceived as essential for managerial effectiveness. *Teaching materials* and *staff involvement* have a similar influence (8.7%), emphasising the need for adequate resources and the active participation of all teachers in decision-making. Categories such as *reducing bureaucracy*, *working conditions* and *conflict management* were mentioned less frequently, suggesting that, in the perception of the respondents, these are not the most pressing issues in the context of leadership competences.

Table 12. *Frequency and percentage of proposals to improve leadership competences in ECE*

Categories	*N valid*	*Appears (n)*	*Appears (%) of N valid (69)*	*Appears (%) of total sample (188)*
Professional training	69	16	23.2%	8.5%
No suggestions	69	19	27.5%	10.1%
Communication and collaboration	69	9	13.0%	4.8%
The support of the principal	69	8	11.8%	4.3%
Teaching materials	69	6	8.7%	3.2%
Staff involvement	69	6	8.7%	3.2%
Working conditions	69	3	4.3%	1.6%
Conflict management	69	3	4.3%	1.6%
Reducing bureaucracy	69	2	2.9%	1.1%
Patience	69	2	2.9%	1.1%

Note: *Of the total of 188 respondents, 69 provided at least one response. The values represent the number and percentage of valid responses for each suggestion category. Responses were coded as 1 (presence of suggestion) and 0 (absence of suggestion).*

5. DISCUSSION

The aim of the study was to investigate the relationships between leadership competences and motivation of educators in ECE, as well as the factors that determine differences in leadership competence. The results revealed positive and significant correlations between intrinsic and extrinsic motivation and leadership competences. Significant differences in leadership competences were also found by age group, while differences by educational level, teaching background, work experience, or kindergarten program were not significant. These data underscore the crucial role of motivation, particularly intrinsic motivation, in the development of leadership competences.

In line with the Self-Determination Theory (Ryan & Deci, 2000), the study found a strong positive relationship between leadership competences and intrinsic motivation, and between kindergarten leadership and teacher motivation (Eyal & Roth, 2011). The positive and significant correlation confirms the self-determination and intrinsic motivation theories.

Analyses of differences in leadership competences by demographic variables revealed a significant influence of age group, with clear differences between the 18-30 and 46-60 age segments. This finding is in line with the

idea that accumulated experience contributes to the development of leadership competences (Fonsén & Ukkonen-Mikkola, 2019; Muijs & Harris, 2003). Understanding how leadership competences evolve in the teaching profession is essential for improving educational practice. Such competences develop gradually over teachers' careers, becoming stronger through professional experience, continuous reflection, and the use of practical wisdom in educational situations (Bodin, 2025). Nguyen et al. (2020) further stress that involvement in teacher leadership activities positively influences teachers' leadership knowledge and skills. However, stronger leadership competences might be less valuable if demotivated educators, once boredom, low professional image or self-esteem, or other contextual factors might negatively influence teachers 'motivation.

Contrary to other studies, we observed no significant differences by educational level, teaching background, work experience or kindergarten program. Extrinsic motivation had a weaker correlation with leadership competences, aligning with the findings of Herzberg (Alshmemri et al., 2017). The result suggests that for ECEs, intrinsic motivation is more relevant to the assumption of developing leadership competencies and managerial roles. It is important to note that, although intrinsic motivation is a key factor, the development of leadership competence is also influenced by the organisational context, including the quality of leadership provided by the institution's managers. They have the ability to establish a conducive atmosphere that fosters teacher motivation and facilitates the growth and implementation of leadership skills (Setyawati, 2023; Thoonen et al., 2011). Furthermore, sustainable improvement in teaching depends on the support of principals, whose leadership plays a central role in fostering teachers' professional learning and leadership capacities (Thoonen et al., 2011).

Besides the role of principals on supporting the leadership competences, teachers more frequently suggest that for improving leadership competences principals should foster communication and collaboration, as well as professional training, as the qualitative analysis of the open-ended responses revealed, indicating the need for courses and training. Issues like reducing bureaucracy, improving working conditions or conflict management were mentioned less frequently. These qualitative results complement quantitative data, providing a nuanced perspective on needs and concerns. These qualitative results complement quantitative data, providing a nuanced perspective on needs and concerns.

From a practical point of view, the evidence suggests that professional development programs need to be geared towards boosting intrinsic motivation and strengthening leadership competences, especially for young teachers, who

have been shown to have less developed managerial skills. This suggests the need for differentiated interventions, taking into account age and level of experience.

As a limit, although we obtained a reasonable 188 responses, a larger sample could yield more robust and representative results. The study's other limitation was the alteration of the TLS scale, which could potentially impact the distribution of responses. However, the high reliability and confirmed factor structure support the use of the adapted format.

Future research could look more into how managerial skills affect staff motivation, consider other important factors like the work environment or organisational culture, and use bigger groups and different methods to make the findings more relevant and useful for educational practice. It is also recommended to explore in more detail the concrete directions for interventions highlighted in the qualitative analysis, such as training, improving communication, and strengthening managerial support.

6. CONCLUSIONS

The study contributes to understanding the relationship between leadership competence and motivation among ECEs. The results of this study provide an important starting point in understanding how motivation influences the development of ECEs' leadership competences. The research revealed that intrinsic motivation is closely related to the enhancement of these leadership competences that are essential for the smooth functioning of educational institutions.

Based on the data obtained, the positive correlation between intrinsic motivation and leadership competences is confirmed, as well as a moderate but significant link with extrinsic motivation. These aspects emphasise the need for professional development strategies to focus not only on supporting the intrinsic motivation of educators but also on strengthening effective leadership in preschool institutions.

Furthermore, the analysis of the open-ended responses revealed important practical issues, such as the need to prioritise professional training, improve communication and collaboration among teachers, and increase managerial support. These elements can provide concrete directions for future interventions, contributing to a more complex and applicable understanding of the factors influencing leadership competences in ECE. But such factors need to be further explored, giving the professional status and working conditions of ECE educators that might influence their motivation and leadership competence over the years.

Summing up, to foster the leadership competences of ECEs, it is essential to implement programs and policies that both harness personal motivation and promote a supportive organisational environment, led by leaders who continuously inspire and support professional development.

Disclosure statement

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