Examining the impact of a strength-based program to enhance teacher-trainees' critical thinking abilities: a pilot study

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Abstract

Purpose – The purpose of this study was to examine how well a strength-based program grounded in positive psychology principles can advance the practical critical thinking skills of those pursuing the teacher training course.

Design/methodology/approach – This study used a single-group pre-test post-test design with 35 teacher-trainees from the Bachelor of Education course. The two-and-a-half-week strength-based program used the values in action survey to identify strengths. Pre- and post-test scores, measured with the Cornell Critical Thinking Test – Level Z, underwent Statistical Package for Social Sciences analysis including paired samples t-test for subcomponent and overall composite analysis.

Findings – Analysis of the pre- and post-test scores demonstrated a statistical significance in the critical thinking scores obtained by the teacher-trainees. Post-test scores were consistently significant. Out of the elements of critical thinking, induction, meaning, observation and credibility were more prominent. Deduction and assumption identification were also having a significant effect.

Originality/value – Most critical thinking programs focus on evaluating specific teaching methods for improving critical thinking skills. In education, positive psychology studies often center on students' well-being, attention spans and academic success, aligning with wellness programs. Despite the importance of strengths in positive psychology, there is a lack of research on using a strength-based approach to boost critical thinking skills. This study aims to enhance teacher-trainees' critical thinking by leveraging their individual strengths, moving away from traditional instructional strategies.

Keywords Strengths, Critical thinking, Strength-based program, Positive psychology, Teacher-trainees, Induction, Deduction, Meaning, Credibility, Assumption identification, Values in action (VIA) survey of character strengths, Cornell critical thinking test – level Z

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Introduction

Critical thinking is widely recognized as a crucial skill for individuals in the 21st century. However, choosing an effective approach to foster this skill requires a thorough understanding of its constituent elements. Recent meta-analyses have highlighted key concepts associated with critical thinking, including terms such as "analysis," "deduction," "argument," "evaluation," "inference," "conclusion," "induction," "reason," "metacognition," "comparison," "hypothesis," "synthesis," "assessment," "judgment," "problem-solving," "logic," "explanation," "self-regulation" and "bias" (Atabaki *et al.*, 2015; Geng, 2014). Within the educational domain, diverse approaches have been used to foster critical thinking across different age groups. A substantial body of research, spanning from primary education to esteemed professional courses, explores various strategies and techniques (Siller, 2001; Gunnink and Bernhardt, 2002; Timpson and Burgoyne, 2002; Hammann, 2005; Savich, 2009; Akinoglu and Baykin, 2015; Kusmaharti and Yustitia, 2022). These approaches address both domain-specific and general critical thinking skills. Strategies like problem-solving, collaborative learning, cooperative learning, flipped classroom methodologies, digital storytelling techniques and case study approaches are among the prominent methods recommended by researchers for enhancing critical thinking abilities (Zabit, 2010; Kek and Huijser, 2011; Igel and Urquhart, 2012; Yang and Wu, 2012; Asyari *et al.*, 2016; Dehghanzadeh and Jafaraghaee, 2018; Saputra *et al.*, 2019; Aufa *et al.*, 2021). Upon closer examination of these approaches, it becomes evident that the majority of efforts directed toward developing critical thinking skills are primarily centered on assessing the effectiveness of specific instructional methods.

As educators in the 21st century, we should be prepared to examine the underutilized or unexplored methodologies in addition to using the well-established methods to contribute meaningfully to this enormous field of critical thinking. The field of positive psychology, an applied branch of psychology currently in demand, is founded on various pillars, with strengths of character being a significant one. According to Linley and Harrington (2006), strength is the ability to think, feel and act in a way that facilitates excellence in achieving desired outcomes (Wood *et al.*, 2011). This positive psychology tenet emphasizes the need for critical thinking. Stress management, student wellbeing, attention measures in learning (Waters, 2011), emotional intelligence in students (Bar-On, 2010), academic achievement, mental wellness and many more are a few of the notable contributions of positive psychology in the academic area (Bianco *et al.*, 2009; Rawana *et al.*, 2011; Tschannen-Moran and Tschannen-Moran, 2011; Galassi, 2017; Soria *et al.*, 2017; Elder *et al.*, 2018; Reis *et al.*, 2022). However, despite these contributions, there is a conspicuous lack of research initiatives focusing on using a strength-based approach to enhance critical thinking abilities.

This article concentrates on implementing a strength-based program rooted in positive psychology principles to enhance critical thinking skills among teacher-trainees. The article is structured as follows: it begins with a detailed presentation of the theoretical foundations of critical thinking and the instructional design models behind the design of the strength-based program. Subsequently, the objectives and hypotheses of the study are outlined. The methods section subsequently outlines the specifics of the sample, measures and research design. A comprehensive segment on procedures is provided, delineating the activities involved in the strength-based program. Following this, the results are thoroughly discussed, leading to conclusions that address the study's limitations, uniqueness and propose future directions to continue contributing to the multidisciplinary field of education, cognition, positive psychology and innovation.

Theoretical foundations of critical thinking

Philosophy and cognitive psychology stand out as the academic disciplines most deeply rooted in the foundation of critical thinking. The philosophical perspective places a strong

focus on the disposition and innate qualities of individuals engaged in critical thinking, rather than solely on the behaviors and processes associated with critical reflection. This approach draws extensively from the works of historical figures such as Socrates and Aristotle (Daniel and Auriac, 2011). In essence, the philosophical standpoint directs attention toward the qualities and traits of critical thinkers rather than their observable behaviors. Richard Paul, in his 1992 essay, explores critical thinking in the context of the clarity of ideas, emphasizing the importance of clear thought (Paul, 1992; Paul and Elder, 2019). The American Philosophical Association characterizes an ideal critical thinker as someone who aspires to be knowledgeable, possesses natural curiosity, open-mindedness, adaptability and objectivity. Such an individual understands diverse points of view, is willing to delay judgments and is open to considering new perspectives. The philosophical paradigm of critical thinking underscores the application of rationality and precise reasoning in the thought process.

The cognitive psychological approach generally follows behaviorist principles that highlight how individuals think under optimal conditions (Sternberg, 1986). According to this approach, critical thinking involves examining an issue from various perspectives, incorporating newly acquired information that challenges one's beliefs, engaging in logical reasoning, expecting claims to be substantiated by evidence, drawing conclusions based on available information and proposing solutions. Sternberg (1986) identifies three components of critical thinking: "a meta component" for addressing challenges, "a performance component" that centers on reasoning and "a knowledge acquisition component" that involves logical structuring of concepts. Ennis (1993) outlines critical thinking as a set of essential skills, including assessing the reliability of sources, understanding deductions/explanations/suppositions, evaluating the validity of an argument or evidence, forming and defending an opinion on an idea, posing appropriate questions for the given situation, developing and assessing experimental designs, articulating definitions, maintaining an open-minded perspective and making a concerted effort to stay informed. The rationale for planning strength-based program activities through the cognitive psychological approach lies in its emphasis on considering multiple perspectives. Additionally, several studies have advocated the superiority of the psychological approach over the philosophical groundwork.

Instructional design frameworks influencing the strength-based program

Instructional design models are frameworks that offer methods and activities for creating effective, efficient and engaging learning experiences (Merrill, 2009). The study's focus group consisted of adult participants aged twenty-one and above. Therefore, the concepts of Malcolm Knowles' andragogical theory were taken into account when choosing an instructional design model. This theory is rooted in the idea that adults possess a strong intrinsic motivation to be largely self-directed in their learning. Adults particularly value experiential learning, emphasizing the promotion of methods that involve practical experiences.

According to andragogical theory, adults are inclined to learn when they perceive a need to acquire knowledge for handling real-life tasks or challenges. They approach education as a means to enhance competence and fulfill their full potential. Consequently, learning experiences should be organized around categories that contribute to competency development (Knowles, 1970). Research supports the meaningful engagement of adults in the learning process when andragogy principles are applied, thereby enhancing their critical thinking abilities (Knowles *et al.*, 2014; Greene and Larsen, 2018; Abeni, 2020).

Motivation is a crucial factor for the effectiveness of a teaching-learning activity. When selecting activities for the program, careful consideration was given to the concepts,

principles and strategies presented in "Motivating students to learn" (Brophy, 2005). Key principles highlighted include the perception of learning as valuable and meaningful, the engagement and challenge of activities, the establishment of goal-oriented tasks, encouragement of self-actualization and the support of collaborative and student socialization techniques (Brophy, 2005).

When developing any program, it is essential to consider a range of factors. This involves cultivating students' interest by incorporating an optimal blend of variety and challenges to capture and sustain their attention. Clearly stating the objectives and outcomes is crucial to encourage goal-oriented behavior. Various experiential learning techniques, such as simulations, case studies, real-world situations and others, prove beneficial in achieving this. The scheduled activities should be both challenging and attainable. When organizing these activities, adopting a realistic perspective introduces an element of success, which in itself keeps students engaged and motivated. Throughout the intervention, maintaining a consistent sense of satisfaction is important. This can be achieved by linking the planned intervention to individuals' successes or personal qualities that can be used to enhance their quality of life in the real world (Keller, 2000).

All these factors are carefully accounted for in John Keller's motivational design, known as the ARCS model (Attention, Retention, Confidence and Satisfaction) (Keller, 1987). The effectiveness of the ARCS model in improving critical thinking has been validated in numerous research studies (Andinata *et al.*, 2019; Suherman *et al.*, 2021; Nugraheny *et al.*, 2022). Consequently, this model was used to design various activities and real-life scenario-based assignments for the strength-based program.

The instructional design method selected for the strength-based program is the ASSURE model, acronym for Analyze, State objectives, Select methods/media/materials, Utilize the media/materials, Require learner participation and Evaluation (Ariefiani *et al.*, 2016). This instructional design approach has proven successful in developing programs, especially in the form of modules, as demonstrated by various studies (Ramadhani and Fitri, 2020; Batir and Sadi, 2021; Affandi *et al.*, 2022). In the current study, the researcher aimed to structure the proposed strength-based program as learning modules. Hence, the ASSURE model was deemed suitable for the research's specific requirements.

Furthermore, the ASSURE model has evolved into a straightforward process for planning and implementing instructions. The initial step of this model involves analyzing students to discern their general characteristics. This aligns with the current study's focus on identifying the distinctive strengths of the students. Consequently, when formulating the program's specifics, the first step was to consider the identification of strengths. Similarly, it was imperative to assess the level of critical thinking in the teacher-trainees, as this also corresponds to the ASSURE model's directive to "analyze your learners." Thus, as part of the program's initial design phases, a pre-test measuring critical thinking was incorporated.

The ASSURE framework has proven effective in various research studies aimed at improving critical thinking (Kristianti *et al.*, 2017; Mohammed, 2020; Sumiarto *et al.*, 2020; Utama, 2022). The choice to adopt this model as the basis for instructional design in the current study is substantiated by the success demonstrated in these previous studies.

The strength-based program is fundamentally rooted in the principles of positive psychology. Consequently, it is essential to address the instructional design within this paradigm. In this regard, the study incorporates PERMA, an instructional design model proposed by Martin Seligman, which encompasses positive emotion, engagement, relationships, meaning and accomplishments (Seligman, 2018).

This instructional design model encompasses the five crucial elements mentioned above. In this research, the relationship between the 24 character strengths and critical thinking is established with the aid of the PERMA instructional design model:

(1) Positive emotion is fostered through the initial phase of the program, where the values in action inventory of strengths (VIA) is implemented. Identifying their unique core or character strengths instills optimism and constructive attributes within the teacher-trainees.

(2) Engagement is addressed by incorporating a set of challenging yet interesting activities during the strength-based program. The teacher-trainees apply their skills and strengths to complete these tasks, involving them in processes of critical thinking.

(3) Relationship element involves establishing connections between the teacher-trainees' strengths and their performance in the activity/task. This initiates a logical linking and connection process, which is a crucial aspect of critical thinking.

(4) Meaning is achieved when the tasks become meaningful to the teacher-trainees, prompting them to view activities from a broader perspective. This also encompasses critical thinking.

(5) Accomplishment is realized through the successful completion of tasks/activities using core or signature strengths. This can range from the ability to justify a stance to more challenging achievements, such as generating diverse novel ideas. Once again, critical thinking skills are harnessed through the utilization of strengths.

Therefore, in this study, the PERMA instructional design approach is used to establish a connection between strengths and critical thinking. This instructional design model has demonstrated effectiveness in diverse academic settings, as evidenced by studies conducted by Lambert D'raven and Pasha-Zaidi (2016), Kun *et al.* (2017), Lai *et al.* (2018), Nebrida and Dullas (2018), Sahin *et al.* (2019) and Cheng and Chen (2021).

Objectives of the study

The following are the objectives of the study:

- to identify the signature strengths of the teacher-trainees;
- to investigate the impact of the strength-based program on various subcomponents of critical thinking, as measured by Cornell Critical Thinking Test - Level Z; and
- to check the effectiveness of the strength-based program in enhancing critical thinking abilities of teacher trainees.

Hypothesis

H1. There is a significant difference in the critical thinking pre- and post-test scores of teacher trainees after the implementation of the strength-based program.

Methods

Sample

This pilot study included 35 second-year teacher-trainees who were part of the Bachelor of Education program at MIT Art, Design and Technology University in Pune, India. The

research objectives were communicated to the students, and those who agreed to participate were ultimately included in the study. The research used purposive sampling as the chosen sampling design.

Measures

Value in action inventory

One fundamental principle in positive psychology focuses on character strengths (Littman-Ovadia *et al.*, 2021). The most widely used tool for evaluating these strengths is the Value in Action Inventory, as noted by McGrath in 2019. The classification of these strengths stems from the collaborative efforts of fifty-five researchers who meticulously examined a range of "psychological, philosophical, and theological" literature to identify, define and assess these strengths (Dahlsgaard *et al.*, 2005). During the development of the VIA assessment, a comprehensive exploration of the cultural traditions of "China (Confucianism and Taoism), South Asia (Buddhism and Hinduism) and the West (Athenian philosophy, Judaism, Christianity and Islam)" was also undertaken (Dahlsgaard *et al.*, 2005). Each of the six primary virtue categories, which transcend cultural and national boundaries, aligns with a specific character strength, as proposed by Seligman in 2000. The VIA Survey of Character Strengths is a self-report questionnaire tailored for adults, comprising 240 face-valid items. Using a five-point Likert-style scale, this survey measures respondents' agreement with statements representing the 24 character strengths identified in the VIA Classification. The VIA Survey-240 exhibits satisfactory internal consistency and test-retest reliability. It also demonstrates moderate and increasing levels of psychometric validity, indicating reasonable correlations with expected constructs and negligible correlations with unrelated constructs like social desirability. Moreover, the reported studies indicate moderate and acceptable levels of predictive validity. While the VIA survey used in this research is freely accessible online, participation requires a straightforward registration process. It is important to note that the inventory containing the survey questions is protected by copyright, preventing the direct inclusion of specific questions in this research paper. The inventory includes numerous similar straightforward statements, covering areas like maintaining concentration at work, incorporating humor into activities, speaking up against mean comments and showcasing competence in leading group activities, among others.

Cornell Critical Thinking Test – Level Z

The Cornell Critical Thinking Test – Level Z is a proprietary test that requires purchase from The Critical Thinking Co. All components of this test are protected by copyright, restricting public access and precluding the direct inclusion of specific questions in this research paper. The Cornell Critical Thinking Tests – Level Z evaluates skills such as "induction, deduction, credibility, observation, meaning, and identification of assumptions" (Ennis *et al.*, 2005). This assessment is used to gauge the critical thinking proficiency of advanced and gifted high school students, college students, graduate students and adults. The CCTT-Z is a multiple-choice test comprising 52 questions, with the latest version formulated in 2005. Completing the test typically takes around 50 min, and the grading is quantitative in nature (Ennis *et al.*, 2005). The CCTT-Z demonstrates considerable reliability and validity when compared to other standardized tests (Bataineh and Zghoul, 2006). The scenarios presented in the test are broad and applicable globally, transcending cultural or geographic boundaries (Iwaoka *et al.*, 2010). For instance, one case examines whether 18 year olds should be permitted to vote, while others explore discussions on topics such as water chlorination. This illustrates the test's universally relevant nature. The overall test focuses on similar, practical, everyday examples and is tailored to an adult audience.

Moreover, being a straightforward multiple choice test, it is easy to quantify. It has proven effective in various academic settings worldwide. The components of this assessment encompass diverse aspects and support a broad range of activities, making it valuable for enhancing critical thinking skills within strength-based programs.

Research design

A single-group pre-test post-test design was used in a study involving 35 teacher-trainees enrolled in the Bachelor of Education program at MIT Art, Design and Technology University, Pune. The VIA Survey of Character Strengths was administered to identify the distinct strengths within the sample. Subsequently, a strength-based program was devised and executed, spanning a two and a half weeks duration within a pilot study framework. The program was validated by the experts. The pre-test and post-test scores for critical thinking were measured using the standardized Cornell Critical Thinking Test – Level Z. The Shapiro–Wilk test was used to assess the normality of the distribution. Paired samples *t*-test and Cohen's d were calculated using Statistical Package for Social Sciences (SPSS) version 25.

Procedures

Ideally, an intervention aimed at enhancing recessive strengths should be strategically planned subsequent to the identification of core or dominant strengths. However, in this study, the researcher chose to concentrate specifically on dominant core strengths for several reasons. The primary rationale stems from the fundamental principle of positive psychology, which advocates for the enhancement or emphasis on positive aspects rather than rectifying unfavorable ones, as asserted by Seligman *et al.* (2005), Alex Linley *et al.* (2006), Anchor (2011) and Peterson and Park (2014). Additionally, a body of research, including studies by Lounsbury *et al.* (2009), Park and Peterson (2009), Kern and Bowling (2015), Yin and Majid (2018) and Tang *et al.* (2019), consistently demonstrates that focusing on dominant qualities, as opposed to less developed capabilities, leads to favorable outcomes. Therefore, the strength-based program centered on dominant character strengths due to these aforementioned considerations.

The teacher-trainees engaged in the strength-based program for a period of two and a half weeks. The first week emphasized fortifying the groundwork of strengths, while the subsequent duration was dedicated specifically to exercises aimed at enhancing critical thinking skills using the teacher-trainees' unique signature character strengths. These activities encompassed both individual tasks and collaborative group assignments.

The breakdown of activities implemented in the two-and-a-half-week strength-based program is outlined below:

- Situational analysis: Teacher-trainees engaged in a task where they were presented with various challenging hypothetical situations. They were then prompted to articulate the emotions or feelings they would associate with each situation. Notably, the responses predominantly comprised negative words or phrases. This activity aimed to convey the importance of cultivating a positive mindset rather than constantly dwelling on the negatives.
- Introductory lecture on positive psychology: In this session, a lecture combined with a discussion introduced teacher-trainees to the principles of positive psychology, with a specific emphasis on strengths.
- The unique me activity: This activity involved teacher-trainees reflecting on their individual characteristics. They were provided with a worksheet to guide them

through this process. After completing the worksheet, the facilitator provided a debriefing session, using the insights gained to introduce the concepts of 24 character strengths and 6 virtues based on positive psychology principles.

- Identification of signature character strengths: The teacher trainees took the VIA Survey of Character Strengths by logging into the official researcher's site created at www.viacharacter.org/. Participants reviewed their individual results from the VIA survey and reflected on their strengths by aligning them with the information provided by the researcher. Following this, a group discussion ensued, addressing any questions or concerns related to the 24 character strengths.
- Wearing the reviewer's hat activity: The primary goal of this task was to explore the correlation between strengths and achievement. Conducted as a group exercise, each group was provided with a 3–4 min video clip. The teacher-trainees were tasked with analyzing the videos, focusing on the strengths of the central characters. The researcher posed a set of guiding questions to facilitate the analysis process. Subsequently, the groups presented their findings, leading to a comprehensive class discussion.
- Spotting my strengths: Here, teacher-trainees were prompted to recall instances from their recent experiences where they applied their signature character strengths to effectively navigate different practical situations.
- Autograph please: This exercise was aimed to help teacher-trainees recognize that strengths can be deliberately used in real-life situations to achieve success.
- Startup Pitches: The teacher trainees were required to collaborate and apply their individual character strengths collectively to address a hypothetical challenge. At the conclusion, the researcher sought reflections from the teacher-trainees on the entire process they used to intentionally leverage their character strengths to arrive at a successful solution for the posed hypothetical challenge.
- Why should we hire you? Personal interviews are crucial in the employment process with the commonly posed question being "Why should we hire you?" The teacher-trainees were provided with a task requiring them to respond to this question. The focus was on highlighting their unique signature strengths that set them apart as the most suitable candidate for the job. This task served as a continuation of the previous activity, aiming to apply strengths strategically in a more practical setting.
- Session on critical thinking: The researcher conducted a session to introduce the concept of critical thinking and discuss the essential elements explored in the study. These elements encompassed "induction, deduction, credibility, observation, meaning, and identification of assumptions."
- Spot the error: The purpose of introducing this activity was to integrate critical thinking elements into everyday situations. In this task, the researcher provided teacher-trainees with links to various clone research journals. Working in groups, the teacher-trainees were required to examine the websites of these clone journals, applying the critical thinking elements introduced to them and ultimately drawing conclusions from their analysis.
- Worst case scenario: In this instance, the teacher-trainees were presented with diverse worst-case scenarios. To effectively navigate these situations, the teacher-trainees were required to leverage their unique individual strengths collectively as a team, in conjunction with various critical thinking elements. The aim of this activity was to provide teacher-trainees with the first hand realization that integrating

signature character strengths with critical thinking elements could lead to enhancements in critical thinking skills through practice.

- Turn a new leaf: The teacher-trainees received an advertisement poster for analysis. The researcher explained that each poster used in this exercise had been involved in some controversy, leading to its removal from circulation. The teacher-trainees were tasked with examining the assigned advertisement and were allowed to use the internet to gather information about the controversy it had faced. After gaining a clear understanding, the teacher-trainees were required to use their unique character strengths and all the critical thinking elements to redesign the given advertisement in a non-controversial way.
- Crafting solutions: The teacher-trainees were assigned to various groups, with each team receiving a classroom scenario depicted in an open educational resource image. The researcher instructed the participants to identify the specific issue within the educational challenge depicted and devise a feasible and practical solution. The teams were encouraged to leverage the individual character strengths of their members, combined with relevant critical thinking elements, to address the problem effectively.
- Educational project: The objective of this activity was to incorporate all essential components of critical thinking alongside the distinctive character strengths in a practical educational scenario. Teacher-trainees were divided into different groups, each assigned an educational project. Participants were instructed by the researcher to devise a solution for the challenges presented in their respective educational projects. In the process of creating an effective framework, they were required to integrate all aspects of critical thinking and use the signature character strengths within their teams. The final responsibility of each team was to generate a prototype, a tangible outcome representing their comprehensive design for the assigned project. The prototype could take the form of a model or sketch, illustrating the team's well-thought-out approach to addressing the challenges posed by the project.

Pre-testing was done using the Cornell Critical Thinking Test – Level Z before the implementation of the program. The same test was used for post testing after the implementation of the program.

Results

The results of the Shapiro–Wilk normality test indicated that the data adhered to a normal distribution. This was evident from the fact that the p-value (S-W = 0.947; df = 35; p = 0.092) was greater than 0.05 (Table 1). The diagrammatic representation of the data for normality was done using the histogram (Figure 1) and the PP plot (Figure 2). All indications pointed toward the normal distribution of the data.

The results of the VIA Survey of Character Strengths were generated automatically by the researcher's website. This helped the researcher understand the overall class profile of the sample in terms of their signature character strengths (Figure 3).

Paired t-test was used to investigate the impact of the strength-based program on various subcomponents of critical thinking, as measured by Cornell Critical Thinking Test – Level Z. There was a uniform rise in all the elements of critical thinking: deduction ($t = -13.886$, $p = <0.001$), meaning ($t = -14.733$, $p = <0.001$), observation and credibility ($t = -17.198$,

Descriptives	Statistic	Std. error
VAR00001		
Mean	16.7429	0.60854
95% confidence interval for mean		
Lower bound	15.5061	
Upper bound	17.9796	
5% trimmed mean	16.6587	
Median	17.0000	
Variance	12.961	
Std. deviation	3.60019	
Minimum	11.00	
Maximum	24.00	
Range	13.00	
Interquartile range	6.00	
Skewness	0.398	0.398
Kurtosis	−0.729	0.778
Test of normality		
	Shapiro–Wilk	
Statistic	df	Sig.
0.947	35	0.092

Table 1.
Normality testing

Source: Authors' own creation

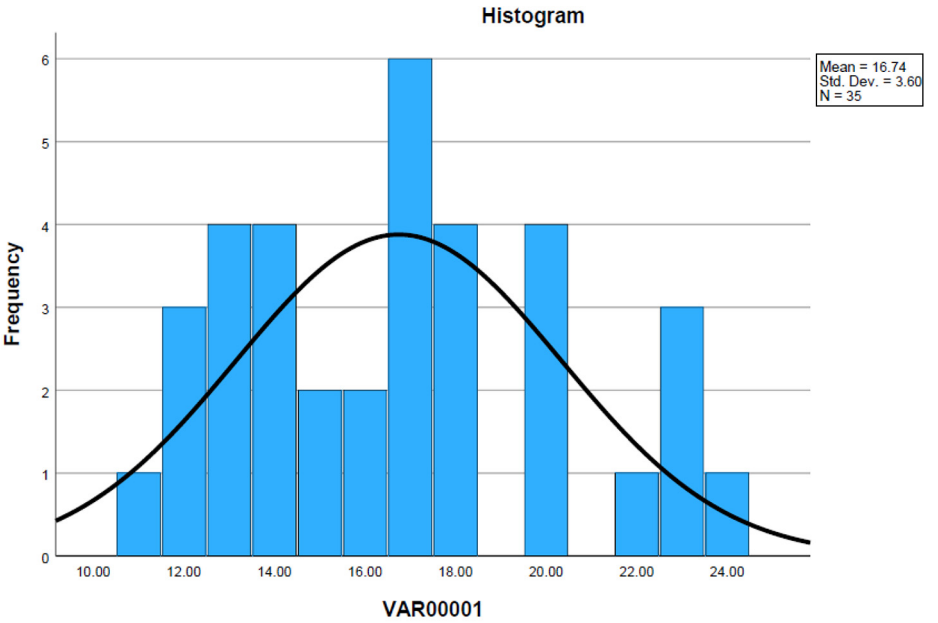
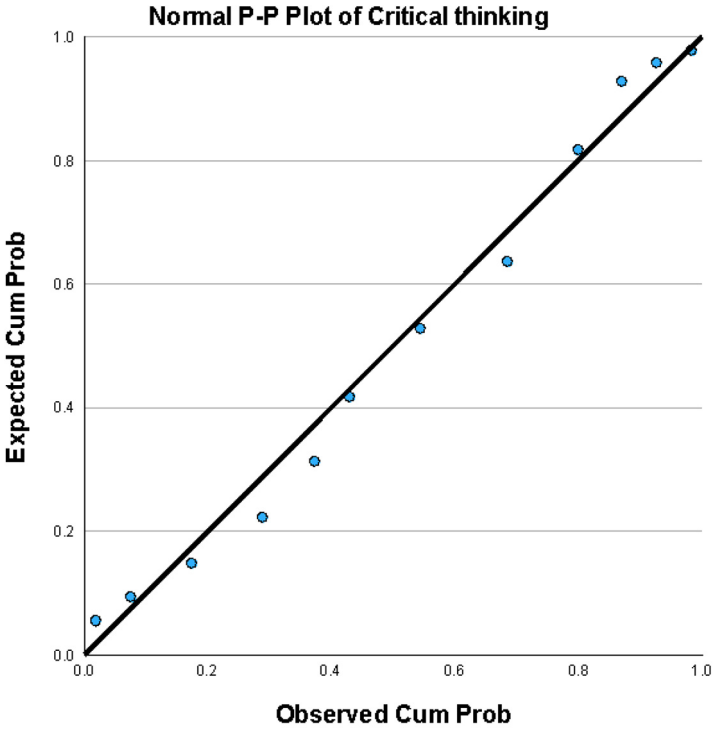


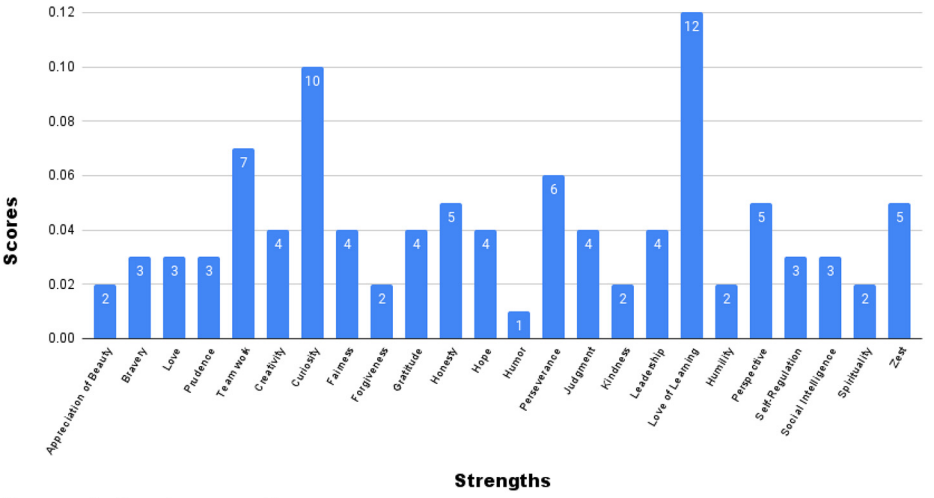
Figure 1.
Histogram showing a normal distribution

Source: Authors' own creation



Source: Authors' own creation

Figure 2.
PP plot depicting a normal distribution



Source: Authors' own creation

Figure 3.
Class profile of strengths

$p = <0.001$), induction (t = −14.714, $p = <0.001$) and assumption ($t = -12.550$, $p = <0.001$) (Table 2).

However, substantial rise was predominantly seen in the elements of induction, meaning, observation and credibility (Table 2).

Analysis of the composite data using the paired t- test, emphasized the effectiveness of the strength-based program in enhancing critical thinking among teacher-trainees. This was evident in the observed rise in critical thinking scores from pre-test to post-post measurements ($t = -27.513$; $p = <0.001$) (Table 3).

Cohen's d was used to compute the effect size (point estimate = −4.651). The pre-test scores were initially entered into SPSS, followed by the post-test scores. The negative sign signifies that the post-test scores' mean exceeds that of the pre-test scores. The resulting value of 4.351 denotes a substantial effect size, indicating a practically meaningful difference between the pre-test and post-test scores (Table 4).

Discussion and conclusion

This study presents a unique approach that capitalizes on individual strengths to improve critical thinking abilities, especially among teacher-trainees. The results of the Value in Action survey provide clarity on the predominant strengths within the class, emphasizing virtues such as wisdom, humanity and justice (Figure 4). In alignment with the primary research objective, detailed reports of each teacher-trainee's individual character strengths were obtained. Notably, love for learning and curiosity emerged as prominently featured strengths among the top five strengths for a majority of teacher-trainees on average.

One significant aim of this study was to assess the influence of the strength-based program on different subcomponents of critical thinking, as evaluated by the Cornell Critical Thinking Test – Level Z (CCTC-Z). Consequently, each subcomponent of the CCTC-Z was scrutinized in relation to the pre- and post-test scores. Notably, there was a consistent increase observed across all facets of critical thinking. However, particularly noteworthy enhancements were observed in the domains of induction, meaning, observation and credibility. These findings indicate a consistent and positive impact of the strength-based program on enhancing critical thinking skills. This collective improvement raises the likelihood of an overall composite effect stemming from the strength-based program.

The effectiveness of the strength-based program activities in enhancing the critical thinking abilities of participating teacher-trainees has been successfully demonstrated. The verification of this assertion, corresponding to the main hypothesis of the research, was achieved through the statistical analysis of paired *t*-test. These tests confirmed an increase in critical thinking scores among the teacher-trainees between the measurements conducted before and after the implementation of the strength-based program.

The effectiveness of the strength-based program in augmenting critical thinking skills among teacher-trainees is intricately linked to the program's comprehensive design and the thoughtful incorporation of positive psychology principles. The decision to concentrate specifically on dominant core strengths, influenced by foundational tenets from positive psychology scholars like Seligman, Peterson and Park, underscores the program's strategic approach. By prioritizing the enhancement of positive attributes rather than addressing perceived weaknesses, the program aligns with a well-established paradigm that underscores the power of emphasizing strengths for positive outcomes.

The carefully structured two-and-a-half-week program unfolded in a deliberate sequence, commencing with a foundational week dedicated to fortifying inherent strengths and progressing to targeted exercises aimed at amplifying critical thinking skills using each teacher-trainee's unique signature character strengths. The diverse array of activities,

Elements of critical thinking	Paired samples test									
	Paired differences								Significance	
				95% confidence interval of the difference						
	Mean	SD	Std. error mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Induction										
Pretest – Post-test	−4.91429	1.97591	0.33399	−5.59303	−4.23554	−14.714	34	<0.001	<0.001
Deduction										
Pre-test – Post-test	−3.71429	1.58247	0.26749	−4.25788	−3.17069	−13.886	34	<0.001	<0.001
Meaning										
Pre-test – Post-test	−4.02857	1.61765	0.27343	−4.58426	−3.47289	−14.733	34	<0.001	<0.001
Assumption										
Pre-test – Post-test	−3.00000	1.41421	0.23905	−3.48580	−2.51420	−12.550	34	<0.001	<0.001
Observation and Credibility										
Pre-test – Post-test	−1.08571	0.37349	0.06313	−1.21401	−0.95742	−17.198	34	<0.001	<0.001

Source: Authors' own creation

Table 2.
Paired sample t-test for sub-components of critical thinking

Table 3.
Paired sample t-test for overall critical thinking

Paired samples test									
	Paired differences							Significance	
				95% confidence interval of the difference					
Critical thinking score	Mean	SD	Std. error mean	Lower	Upper	*t*	df	One-Sided *p*	Two-Sided *p*
Overall critical thinking									
Pre-test – Post-test	−16.74286	3.60019	0.60854	−17.97956	−15.50615	−27.513	34	<0.001	<0.001

Source: Authors' own creation

ranging from situational analysis to collaborative group assignments and real-world applications like "Why should we hire you?" and "Turn a new leaf," provided a dynamic and engaging platform for participants to apply their strengths in varied contexts.

The program's success can be traced to its emphasis on practical application and reflection. Activities such as "Spotting my strengths" and "Worst case scenario" prompted teacher-trainees to reflect on real-life instances where they applied their signature character strengths to navigate practical challenges. This reflective element deepened their understanding of the integration of strengths in everyday situations and contributed to the internalization of these concepts.

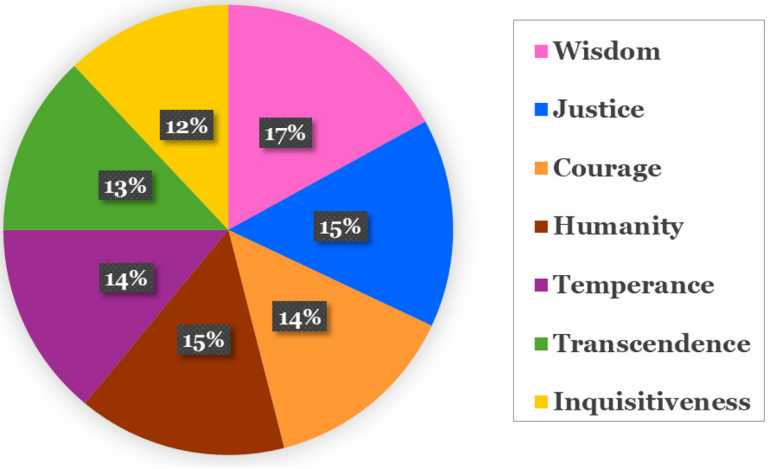
Furthermore, the incorporation of critical thinking elements in activities such as "Session on critical thinking," "Spot the error," and "Crafting solutions" ensured a holistic development approach. These activities encouraged participants to systematically apply critical thinking skills in conjunction with their unique character strengths, fostering a synergistic relationship between the two cognitive processes.

The significant rise observed in critical thinking elements, particularly in induction, meaning, observation and credibility, as indicated by the paired *t*-test results, underscores the program's success in enhancing critical thinking skills. The collective improvement

Effect size	Standardizer[a]	Point estimate	95% confidence interval of the difference Lower	Upper
Overall critical thinking				
Pre-test – Post-test	Cohen's d	3.60019	−5.796	−3.498
	Hedges' correction	3.68211	−5.667	−3.420

Source: Authors' own creation

Table 4.
Paired samples effect sizes



Source: Authors' own creation

Figure 4.
Class profile of six virtues

across all facets of critical thinking demonstrates the program's ability to holistically impact the multifaceted nature of higher-order thinking skills.

In summary, the success of the strength-based program in enhancing critical thinking abilities can be attributed to a combination of intentional design choices, positive psychology principles, practical application of strengths and a reflective approach. These factors collectively created an immersive and transformative learning experience for teacher-trainees, showcasing the potential of strength-based interventions in nurturing complex cognitive skills.

Many studies have demonstrated the potential of strength-based program in the context of gifted students with Asperger syndrome, well-being and participation in academic work, bullying prevention, life satisfaction and academic achievement (Bianco *et al.*, 2009; Duan *et al.*, 2014; Elder *et al.*, 2018; Galassi, 2017; Madden *et al.*, 2020; Rawana *et al.*, 2011; Reis *et al.*, 2022; Soria *et al.*, 2017; Tschannen-Moran and Tschannen-Moran, 2011). Each of these contexts involves intricate and challenging variables. Similarly, critical thinking, being a complex higher-order thinking skill, shares this complexity. In alignment with the findings of our current pilot study and the noteworthy findings from previous research on strength-based programs, it can be affirmed that a strength-based intervention stands out as an innovative solution for enhancing complex and challenging skills.

The study's limitations were associated with the chosen research design, as a single-group pre-test post-test design presents significant challenges in terms of internal validity. The decision to avoid a two-group design was driven by the belief that simply subjecting a control group to a series of lectures on critical thinking would not yield accurate results. Additionally, based on the researcher's knowledge and an extensive literature review, there was no other strength-based program specifically designed to enhance critical thinking skills that could have been administered to the control group for a meaningful comparison.

Furthermore, the pilot study had a modest final sample size of 35. While a larger sample size would have facilitated broader generalization of results, two justifications can be made. First, this study was a pilot, and second, the central limit theorem asserts that as the sample size increases, the distribution of sample means approximates a normal distribution, irrespective of the population's distribution. According to this theorem, sample sizes equal to or greater than 30 are generally deemed sufficient, making the chosen sample size of 35 appropriate in this context.

Uniqueness of the research

Numerous global studies have been conducted to enhance critical thinking skills among students across different age groups. However, there is a notable scarcity of research focusing on instilling these skills in teacher-trainees. This study specifically targeted aspiring teachers currently undergoing training. By implementing a strength-based program to enhance critical thinking abilities in these teacher-trainees, there is a significant potential for these individuals to impart their acquired knowledge to students when they become professionals in the teaching field. Furthermore, it is apparent that the strategies used to improve critical thinking, such as problem-solving and cooperative methodologies, are well-established approaches that have been used for many years. Similarly, while strength-based programs have been successfully integrated into academic settings, they have often been placed within the wellness framework. In this study, a unique approach was taken by using a strength-based program to enhance the critical thinking skills of teacher-trainees. To the best of the researcher's knowledge, there has been no prior attempt to use

strength-based programs for this purpose. This represents a novel step in the multidisciplinary intersection of positive psychology, cognitive psychology and education. The findings of this research can provide a solid groundwork for future studies aiming to explore the benefits of strength-based programs in relation to various variables. The distinctive aspect of the study also lies in the design of the strength-based program's activities, which emphasize the integration of multiple strategies.

Future research

As this study served as a preliminary investigation, we intend to expand our research by using a larger sample size and incorporating an interrupted time series design to address the limitations associated with a single-group pre-test post-test setup. Additionally, we are in the final stages of developing a strength-based program dedicated to enhancing creativity in teacher-trainees. Simultaneously, we are working on a comprehensive strength-based program that aims to address both creative and critical thinking aspects concurrently.

Additionally, concerning future research directions stemming from this study, efforts can persist in developing a strength-based program tailored for various age groups and exploring different skill sets that have not been extensively examined. These skill sets are not limited to cognitive dimensions and can extend to encompass the affective and psychomotor domains. Unlike previous studies that often integrated strength-based programs within the framework of wellness programs, our research aimed to evaluate the effectiveness of strength-based program from a different perspective. Similar endeavors should be undertaken to gain a thorough understanding of the genuine potential of strength interventions in less-explored areas on a global scale.

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