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# Facilitating reflection, confidence, and positive mirror effect in teacher practicum: a serial multiple mediation model

Wing W. Y. Ho <sup>1✉</sup>, Yan H. Y. Lau <sup>1</sup> & Eric K. L. Li <sup>2</sup>

This study investigates the mediating role of reflective thinking practice in the relationship between practicum and positive mirror effect in early childhood special education teacher training. The study participants comprise students enrolled in undergraduate early childhood teacher education programs specific to special education. This study entails a post-evaluation using the Experiential Learning Experiences Scale, Reflective Practice Questionnaire, and Mirror Effects Inventory to assess practicum experiences, reflective thinking practices, and mirror effects via an online survey after engaging in experiential learning, particularly a teaching practicum. The hypothetical serial multiple mediation model is analyzed using PROCESS macro. The results reveal that the relationship between practicum experiences and the positive mirror effect was at least partially explained by the desire for improvement, reflective capacity, and confidence. However, the desire for improvement is not sufficient to demonstrate a mediation effect. Moreover, the findings suggest that reflective capacity fostering student teachers' confidence may generate a positive mirror effect. These findings highlight the beneficial effects of reflective capacity in the relationship between practicum experiences and positive mirror effects in early childhood special education teacher training. This implies that practicum experiences can contribute positively to reflective capacity and foster student teachers' affective learning experiences, ultimately enhancing the overall professionalism of early childhood special education. This study provides essential insights indicating that further research should focus on extracting practical knowledge and reflective experiences in special education from pre-service and experienced in-service teachers, along with methods to cultivate positive affective experience and confidence, thereby generating a positive mirror effect in practicums across diverse disciplines.

<sup>1</sup>School of Education and Languages, Hong Kong Metropolitan University, Hong Kong SAR, China. <sup>2</sup>Department of Social Work, Hong Kong Baptist University, Hong Kong SAR, China. ✉email: [wingho11@gmail.com](mailto:wingho11@gmail.com)

## Introduction

Previous studies (e.g., Adigun et al. 2021; Reddy 2007) have predominantly investigated the impact of workplace stress and the challenges encountered when teaching children with special educational needs. These studies have compared special education teachers with other teaching professionals; however, few have examined the positive experiences in special education teacher training. Although the major studies of teacher training have focused on cognitive aspects related to special education teachers' professional knowledge in curriculum, theories, and teaching skills, affective experience (e.g., the intricate interplay of human experience) related to reflection and its mediating effects have received less attention. Positive affective experiences can assist individuals in accepting and managing their emotions, as well as in dealing with challenges in the workplace and throughout their lives.

**Experiential learning in teaching practicum.** Kolb (1984) defined experiential learning as a fundamental procedure where knowledge emerges from the transformation of experience, calling it "learning by doing." This process involves gaining knowledge, skills, and capabilities through observing, imitating, and actively engaging. Experiential learning enriches the learning process by engaging both intellect and physical involvement in tasks that encourage reflection and practical application (Rustici 1997). Consequently, individuals are able to build knowledge, skills, and values through hands-on experiences (Jacobs 1999). Various activities can generate experiential learning, such as case studies, problem-solving learning, games, role-playing, field trips, simulations, practical labs, internships, practicums, and exchange programs (Ho and Lau 2025; Sviatko 2024a; 2024b). Engaging in these diverse experiential learning experiences not only enhances practical skills and knowledge acquisition but also fosters a deeper understanding of real-world applications and scenarios, enriching holistic education and development.

Experiential learning is fundamental in teaching practicum, which is an essential component of teacher education (Thabab-Nkadamene 2017). Harrison et al. (2006) suggested that learning processes occur during teacher practice. Engaging in the teaching practicum, an experiential learning context, student teachers can step back and observe the interactions among different people (e.g., teachers and students) as they introspect in a psychological mirror. These psychological distances enable student teachers, as outsiders, to reflect on themselves and undertake more realistic appraisals of themselves and others. Student teachers have reported that they have experienced a certain degree of healing effects, known as mirror effects (Ho and Lau 2025). If individuals develop self-understanding and automatically apply their learned knowledge or skills, this is considered a positive mirror effect (Ho 2019, 2023a, 2023b). A "positive mirror effect" refers to observing a scenario in which people learn from others, gain an understanding of actions, and spontaneously apply their acquired skills or knowledge (Ho 2019, 2023a, 2023b). However, Ho (2023a) pointed out that this mirror effect may not only always be positive, but can also be negative. For instance, individuals may find themselves indulging in problematic situations or exposed to negative imagery. Therefore, it is important to implement strategies that can effectively foster reflection, enabling individuals to comprehensively evaluate positive and negative experiences. These strategies play a significant role in equipping individuals with the necessary tools to cope with past experiences and behaviors, thereby facilitating personal growth and development (Zhao et al. 2024).

**Promoting positive mirror effect through reflection.** Reflection is an important psychological concept that can be beneficial for

growth, development, and learning from mistakes. The essence of reflective practice lies in its dual nature, existing as an inner exploration within individuals and an external exchange between individuals, emphasizing the personal and relational facets of the process (Marshall et al. 2021). First, reflective learning is the process of internally examining and exploring an issue of concern, triggered by an experience that creates and elucidates personal understanding, leading to a transformed conceptual viewpoint (Boyd and Fales 1983). This is similar to self-therapy, which emphasizes reflecting on internal experiences through introspection and contemplation of inner thoughts and feelings (Reynolds and Vince 2004). Second, engaging in reflection within a small group can enhance learning and allow individuals to avail themselves of resources for learning about practice, as small group reflection involves diverse individuals with unique backgrounds, knowledge, and learning experiences. This fosters a broader network of connections among individuals, leading to increased professional and social support. Additionally, this collaborative environment can be enjoyable and provide opportunities for fun interactions (York-Barr et al. 2016).

Reflective capacity refers to student teachers' ability, desire, and tendency to actively participate in reflective thinking in academic studies and clinical practice (Rogers et al. 2019). The desire for improvement is believed to build reflective capacity, thereby fostering confidence (Gustafsson et al. 2021). However, it is questionable whether this can be achieved while simultaneously maintaining a continual desire for improvement.

Reflection entails deep and thoughtful consideration and requires ample time to develop reflection skills. This can be particularly challenging for novice teachers, especially those still learning and gaining experience, such as student teachers (Dann and Dann 2018; van Es and Sherin 2002). Black and Wiliam (2007) highlighted that, during the initial stages of their training, student teachers tend to engage at a surface level, which is an almost mechanical form of reflection. In teaching, student teachers often perceive reflecting on action as an elusive and formidable concept, primarily due to the multitude of simultaneous responsibilities and tasks they encounter (Zhu 2011).

Based on experiential learning theory, reflection is hypothesized to mediate the association between experiential special education teacher training and the positive mirror effect (Ho and Lau 2025). Pre-service special education student teachers' educational and previous life experiences are correlated to how and what they learn during teacher training, particularly in cognitive and emotional learning contexts. These two major routes promote psychological development and professional competencies. Experiential special education teacher training provides an excellent platform to foster the learning process, thereby promoting a positive mirror effect. Therefore, this study aims to investigate the serial mediating effects of the desire for improvement, reflective capacity, and confidence between the teaching practicum and the positive mirror effect.

**Teacher practicum maximizes the positive mirror effect through reflection.** Teaching practicum encompasses the real-world application of theoretical knowledge with guidance from an experienced professional, including teaching practice and other school-based experiences (Gopinathan and Kam 2000). A practicum is a structured practical experience within a professional program overseen by a practitioner and/or faculty member who collaborates closely with the student. The purpose is to provide student teachers with supervised opportunities to apply previously learned theories, thereby developing and improving their skills, knowledge, insights, and values through practical

experience and ongoing reflection (Misra 2024). This facilitates the interactive process of experiential learning, which enables student teachers to actively construct their understanding of authentic situations.

Experiential learning in teaching practicum is not a trial-and-error process; instead, it involves a cycle of action–reflection. Reflection on each effort serves as the foundation for the subsequent attempt (Schön 1987). Within the realm of teacher education, reflective practices are significant in terms of mentoring and supervision (Proctor 1993; Urzúa and Vásquez 2008; Zeichner and Liston 1985). In some cases, reflection is considered a pivotal activity in the teacher-development process (Postholm 2008). Schön (1983) described a theory of knowledge acquisition known as reflective practice, which includes the concept of reflection-in-action and reflection-on-action (Schön 1987, 1995). Reflection-in-action refers to reflection that occurs “in the moment” during the practical act. For example, a teacher who observes a classroom problem must spontaneously determine an appropriate course of action. Reflection-on-action refers to reflection that occurs after the act has taken place, such as when a teacher reflects on their teaching at the end of the day. Van Manen (1991, 1995) supports reflection-in-action to a certain extent, and introduces the concept of “pedagogical tact.” Tact represents a practical form of knowledge that is realized within the teaching process. This implies that the teaching action inherently constitutes a unique type of knowledge that may not always be articulated through explicit statements or cognitive theories. Tacit knowledge facilitates reflection-in-action. Rogers et al. (2019) categorized reflective capacity into four dimensions of reflection: reflection-in-action, reflection-on-action, reflection with others, and self-appraisal. The concepts of reflection-in-action and reflection-on-action stem from the theories of reflective practice introduced by Schön (1983, 1987). Reflection with others refers to reflecting in conversation with someone more experienced, peers, or in a group. In a teaching practicum, reflection with others can take the form of formal supervision with a practicum supervisor or mentor, as well as peer interactions, such as discussions and peer observations. These practices serve to nurture insight and knowledge. Self-appraisal entails reflecting on and scrutinizing one’s competencies for practical application (Rogers et al. 2019). These concepts offer valuable perspectives on student teachers’ reflective practices. While engaging in reflective learning, student teachers evaluate their assumptions and beliefs, as well as those of their students, by adopting an open-minded and inquisitive approach to issues encountered in the classroom (Day et al. 2022).

Regular communication and updates with practicum supervisors facilitate a collaborative and supportive environment, leading to continuous improvement and professional development. Literature supports the idea that practicum supervisors are vital in offering timely and constructive feedback on student teachers’ practicum reports and progress (Körkkö et al. 2020). This feedback facilitates reflection and creates opportunities for reflective thinking and personal development and growth, thereby establishing productive and open discussions on observations and teaching experiences between practicum supervisors and student teachers. Therefore, student teachers should maintain regular communication with practicum supervisors and provide consistent progress updates. Participating in reflective supervision, in which student teachers engage in reflection, is associated with a desire for improvement and job satisfaction (Priddis and Rogers 2018).

Assessments in the teaching practicum include evaluations by practicum supervisors, mentor teachers, and peers, as well as teaching plans, class visits, and lesson observations. These assessments transcend mere reporting of specific facets and content. Furthermore, student teachers are required to submit

reflective papers upon completing the practicum; this serves as a way to summarize their experiences and showcase the knowledge they have gained throughout their journey.

Engaging in a teaching practicum can significantly enhance positive mirror effects, as it allows aspiring teachers to apply concepts and principles taught in the classroom (Ho and Lau 2025). To maximize the benefits of a practicum in facilitating experiential learning, the following key components can be implemented: practicum workshops, senior sharing, class–teacher mentorship, peer learning, and practicum supervision. These elements create an environment in which student teachers can not only observe and gain valuable information, insight, and understanding of practical actions, but they can also actively apply their acquired skills and knowledge during their practicum, thereby generating positive mirror effects.

**Illuminating the power of reflection in teaching practicum.** The concept of reflection has evolved over time, starting with Dewey’s ideas in 1933 and progressing to the current level of understanding. Reflection, also called reflective practice, is defined as a process that involves looking back on a situation, making informed decisions, and subsequently considering the future and evaluating the consequences of those choices (Harris et al. 2010). It is a fundamental concept utilized by educators to bridge various cognitive and procedural domains, such as problem-solving and decision-making (Adler 1991; Ng and Ye 2016; Siu et al. 2023; Tomlinson 1999).

Reflective practice entails not only reflecting on individual actions but also the ability to work across different perspectives without promoting oppressive practices. Additionally, it enables individuals to gain insights into their professional experiences and explore possibilities to create alternative ways of perceiving reality (Adamowich et al. 2014; Zambo 2014). This process enables participants to reinterpret their values, interests, and knowledge in relation to others (Elliott 1991; Norton et al. 2011), thereby providing them with valuable skills and perspectives. Reflective thinking leads to “intelligent action” as it encompasses the individual’s prior experience with all aspects of the subject matter while contemplating a potential solution to the immediate problem (Dewey 1933; Ng et al. 2013). The reflection process transcends analyzing past actions, resulting in a heightened level of knowledge and comprehension (Khedher 2015), and subsequently generating positive mirror effects.

Moreover, reflecting on a negative experience is more likely to generate learning than reflecting on a positive one (Field et al. 2000). The expression “learned from our experience,” has a negative connotation rather than a positive one. Nevertheless, this does not imply that we learn only from our unsuccessful actions. Kolb (1985) suggests that learning can and does occur when our reflections are informed by the introduction of an abstract idea or “theory” that enables us to step back from our normal reality and gain a new perspective, allowing us the opportunity to adjust or make new choices. Experiential learning occurs through both positive and negative experiences. Experiential learning theory proposes that reflection can facilitate positive experiences and help individuals unlearn negative experiences. Ho and Lau (2025) found that student teachers experience a certain degree of positive mirror effect. Despite the use of various tasks and experiences in practicum to enhance student teachers’ reflection and teaching, the exact impact of reflection in facilitating the positive mirror effect experienced by student teachers in these tasks and experiences remains limited. Rogers et al. (2019) called for additional research and suggested exploring how to sustain reflection as a positive influence, encompassing the cultivation of confidence and resilience while concurrently maintaining a

Table 1 Participants' characteristics (N = 324).			
		n	%
Sex	Male	21	6.5
	Female	303	93.5
Age (years)	16–20	43	13.3
	21–25	234	72.2
	26–30	18	5.6
	31–35	9	2.8
	36–40	12	3.7
	41–45	8	2.4
Group <sup>a</sup>	Year 2 (full-time, pre-service teacher)	57	17.7
	Year 4 (full-time, pre-service teacher)	233	71.9
	Year 4 (part-time, in-service teacher)	34	10.4
Educational attainment	Secondary school	9	2.8
	Tertiary education (e.g., Higher diplomas, diplomas)	34	10.5
	University (e.g., Bachelor's, Postgraduate diplomas)	278	85.8
	Master's	2	0.6
	Other	1	0.3
Teaching experiences	Yes	88	27.2
	No	236	72.8
Years of teaching experience	No teaching experience	122	37.7
	Less than 1 year	133	41.0
	1–2 years	38	11.7
	3–5 years	22	6.8
	6–10 years	5	1.6
	10 years or above	4	1.2
Registered teacher	Yes	173	53.4
	No	151	46.6

<sup>a</sup>full-time = full-time program; part-time = part-time program.

continual desire for improvement, as an avenue for future research.

**Serial mediators: desire for improvement, reflective capacity, and confidence.** Extended discussions have considered how to maximize the level of reflection. Gustafsson et al. (2021) stated that the desire for improvement is believed to build reflective capacity, which fosters confidence. Individuals who possess a strong desire for improvement and actively engage in self-reflection and retrospection experience a great sense of accomplishment, particularly within the teaching profession (Fan et al. 2015). A reflective practitioner is conceived as a way of articulating and restoring confidence in the importance of knowledge in practice, which is the knowledge that is not simply applied but arises through each individual's reflections on their own unique actions in practice settings (Hunt 2021).

Throughout the teaching practicum, student teachers are fueled by strong aspirations for continuous improvement, an elevated capacity for reflection, and a heightened sense of confidence in their abilities. They exhibit a deep yearning for ongoing growth as they actively embrace reflective thinking in various learning situations. In such instances, individuals conscientiously evaluate their existing knowledge, identify areas for development, and proactively bridge the gap between their current understanding and desired learning outcomes. In Dewey's (1933) view, reflective thinking is characterized by an ongoing and attentive evaluation of a belief or a supposed body of knowledge. This process involves a thorough examination of the supporting grounds for that

knowledge and an exploration of the possible outcomes and inferences that arise from it. Student teachers actively participate in the transformative process of self-directed growth and development by maintaining a keen awareness of their learning journey.

This study aims to highlight the advantages of reflective practices, which contribute to increased confidence and positive experiences for student teachers, as well as the provision of high-quality services for children with special education needs. Notably, being reflective does not imply that student teachers remain passive and contemplative without taking action.

Present study

Reducing the gap between research and practice via practitioner–researcher collaboration that benefits both parties through sharing knowledge, skills, and ideas and incorporating the best evidence-based professional practice enhances teaching quality in special education. While special education student teachers complete their academic preparation and clinical training, they are immersed in special childcare settings to teach and provide appropriate training for children with special educational needs. It is crucial to apply the acquired knowledge and sophisticated skills to cognitive and affective aspects during the teaching practicum (Sviatko 2024a; 2024b). This study sheds light on the outcomes of combining the specific features of experiential special education teacher training, psychological changes caused by mirror effects, and the development of reflective thinking practice to enhance the quality of special education. Further research is needed to determine whether reflection practices (i.e., desire for improvement, reflective capacity, and confidence) mediate the positive mirror effect associated with practicums. This cross-sectional study aims to examine empirical evidence of the links between practicum experiences, reflective thinking practice, and positive mirror effects that may have a positive influence on future professional practice. Therefore, this study explores the following hypotheses:

*Hypothesis 1:* Practicum experiences positively predict positive mirror effect (H<sub>1</sub>).

*Hypothesis 2:* Desire for improvement mediates the relationship between practicum experiences and the positive mirror effect (H<sub>2</sub>).

*Hypothesis 3:* Reflective capacity mediates the relationship between practicum experiences and the positive mirror effect (H<sub>3</sub>).

*Hypothesis 4:* Confidence mediates the relationship between practicum experiences and the positive mirror effect (H<sub>4</sub>).

*Hypothesis 5:* Desire for improvement and reflective capacity act as serial mediators between practicum experiences and positive mirror effect (H<sub>5</sub>).

*Hypothesis 6:* Desire for improvement and confidence act as serial mediators between practicum experiences and positive mirror effect (H<sub>6</sub>).

*Hypothesis 7:* Reflective capacity and confidence act as serial mediators between practicum experiences and the positive mirror effect (H<sub>7</sub>).

*Hypothesis 8:* Desire for improvement, reflective capacity, and confidence act as serial mediators between practicum experiences and positive mirror effect (H<sub>8</sub>).

Methods and material

**Participants.** The participants eligible for inclusion were pre- and in-service teachers (N = 324, 93.5% F) who enrolled in an undergraduate early childhood education program, specializing in leadership and special educational needs and participating in a



**Fig. 1** The experiential learning model of the teaching practicum.

practicum. The participants' characteristics are summarized in Table 1.

**Intervention.** The teaching practicum consisted of a semester-long course with three main components separated into four stages. The first component was a practicum workshop that involved an introductory briefing, supervision with practicum supervisors, group sharing with seniors and peers, and discussions. The second component involved fieldwork in an assigned internship school, which included classroom observations, peer observations, managing classroom routines with mentors, independent teaching, peer sharing, and on-site supervision with mentors and practicum supervisors. The third component involved on-site supervision, peer evaluation, and reflective reports.

Year 2 students had to fulfill two requirements: attend two three-hour practicum workshops and complete a total of 400 h of teaching practicum, with 56 of those hours dedicated to compulsory independent teaching. All Year 4 students had to attend a three-hour practicum workshop and complete 160 h of teaching practicum.

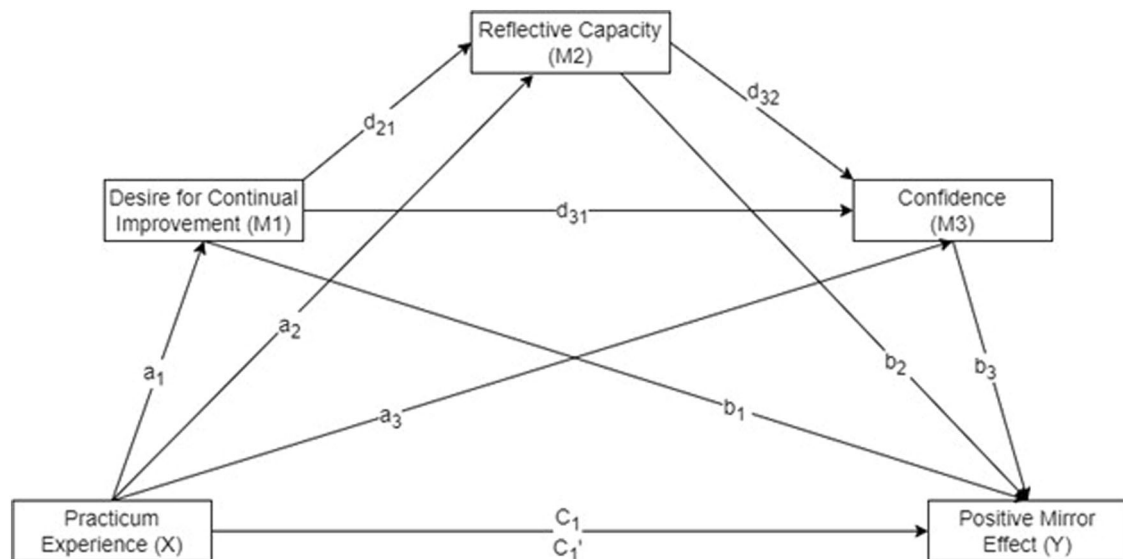
Throughout the semester, all students were expected to teach small and large groups of children separately. This approach allowed them sufficient time to reflect on and provide feedback on their teaching practices. During fieldwork, students attended practicum workshops in which they could share their teaching experiences, learning insights, and classroom management strategies with their peers and practicum supervisors (O'Rourke

and Houghton 2009). The research team operated independently, and no practicum supervisors were involved in the research team. Figure 1 illustrates the experiential learning model of the teaching practicum.

### Measures

**Experiential Learning Approach Questionnaire.** Participants' learning and teaching experiences were measured using a self-constructed inventory, the Experiential Learning Approach Questionnaire (ELAQ) (Ho, 2023a). The questions were divided into two subscales: learning (e.g., I believe that what I am being asked to learn in this course is important) and teaching (e.g., The teacher challenges me to think). The scale comprises 28 items rated on a five-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*, 1 = *not satisfied*, and 5 = *extremely satisfied*). It has 7 and 21 items related to *learning* and *teaching*, respectively. Higher scores indicated greater agreement with education and greater satisfaction with students' practicum experiences. The subscales were reliable for Cronbach's alpha coefficients of practicum experiences related to learning and teaching, which were 0.89 and 0.97, respectively. The total scale achieved high internal consistency reliability, with a Cronbach's alpha coefficient of 0.97.

**Reflective Practice Questionnaire.** The participants' reflective practice and related practicum experiences were measured using the Reflective Practice Questionnaire (RPQ) (Rogers et al. 2019). The scale has 40 items rated on a six-point Likert scale (1 = *not at*



**Fig. 2** The hypothesized serial multiple mediation model with three mediators ( $M_1$  = desire for improvement,  $M_2$  = reflective capacity,  $M_3$  = confidence) representing eight distinct effects of practicum experiences (X) on positive mirror effect (Y), one direct and seven indirect. Direct effect  $H_1$ :  $X \rightarrow Y = C_1$ ; three indirect effects of X on Y through one mediator ( $H_2$ :  $X \rightarrow M_1 \rightarrow Y = a_1b_1$ ;  $H_3$ :  $X \rightarrow M_2 \rightarrow Y = a_2b_2$ ;  $H_4$ :  $X \rightarrow M_3 \rightarrow Y = a_3b_3$ ); three indirect effects of X on Y through two mediators in serial ( $H_5$ :  $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y = a_1d_{21}b_2$ ;  $H_6$ :  $X \rightarrow M_1 \rightarrow M_3 \rightarrow Y = a_1d_{31}b_3$ ;  $H_7$ :  $X \rightarrow M_2 \rightarrow M_3 \rightarrow Y = a_2d_{32}b_3$ ), and one through all three mediators in serial ( $H_8$ :  $X \rightarrow M_1 \rightarrow M_2 \rightarrow M_3 \rightarrow Y = a_1d_{21}d_{32}b_3$ ).

all, 6 = extremely), and each subscale contains four items. The four subscales for assessing *reflective capacity* include reflection-in-action, reflection-on-action, reflection with others, and self-appraisal. Following Gustafsson et al. (2021), the subscales include one subscale for the *desire for improvement*, three subscales for *confidence* (general confidence, communication confidence, and job satisfaction), and two subscales for *potential negative outcomes associated with reflective supervision* (uncertainty and stress upon interacting with students and their parents). Prior to averaging, an item in the job satisfaction subscale (i.e., There are times when I find myself wishing that I did not have to go to work) was reverse-scored. Priddis and Rogers (2018) stated that RPQ subscales may be used selectively depending on practical restrictions and purposes. This study focuses on the positive aspects of practicum experiences that contribute to their effectiveness, so the subscale about potential negative outcomes associated with reflective supervision was excluded from the data analysis. Therefore, three subscales related to positive aspects (desire for improvement, reflective capacity, and confidence) were chosen to serve as mediators of the relationship. The subscales were reliable for Cronbach's alpha coefficients of desire for improvement, reflective capacity, and confidence, which were 0.84, 0.93, and 0.86, respectively. The total of these three scales achieved high internal consistency reliability, with a Cronbach's alpha coefficient of 0.95.

**Mirror effects inventory.** Participants' affective experiences of mirror effects were examined using the Mirror Effects Inventory (MEI) (Ho 2023a, 2023b), which consists of 37 items rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The scale has 5, 18, and 14 items related to *general*, *positive*, and *negative* mirror effects, respectively. Higher scores indicated a stronger experience of mirror effects. Ho (2023a) stated that the three types of mirror effects exist independently. Focusing on positive affective experiences, a positive mirror effect was selected for this study. Therefore, general and negative effects were excluded from the data analysis. The subscale of the positive mirror effect was reliable for a Cronbach's alpha coefficient of 0.87.

## Procedures

**Ethical considerations.** This study strictly followed the Ethical Principles of Psychologists and the Code of Conduct of the American Psychological Association (2024) and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards (World Medical Association, 2025). This study was approved by the University's Research Ethics Committee. The primary data were kept strictly confidential to maximize benefits to the students. Individual participant identities were not disclosed in the analysis because only consolidated results were presented.

**Data collection.** Participants were recruited by a university practicum coordinator. Email invitations with a consent statement and a link to the questionnaire were sent to potential participants. Participants were provided with an introductory page emphasizing anonymity and confidentiality. Their involvement was clearly articulated to avoid any physical or psychological harm. Additionally, participants were informed that they could opt out of the study at any time without incurring any consequences. Anonymity was ensured through the online questionnaire. This self-administered questionnaire was designed to be completed within 25 min by most participants and within two weeks of the practicum.

**Data analysis.** Quantitative analyses were performed using IBM SPSS 29 to test the descriptive statistics. Bivariate correlations were calculated to examine the relationships between the variables included in the serial multiple mediation analysis. Common method bias was analyzed using Harman's one-factor test. Exploratory factor analysis was performed with all variables, and the unrotated factor solution was examined (McFarlin and Sweeney 1992). There was no indication of common method bias in 27.09% of the variance (Podsakoff et al. 2003).

Sequential mediation analysis was employed to investigate Hypotheses 1–8. The hypothesized research model depicted in Fig. 2 posits that desire for improvement ( $M_1$ ), reflective capacity ( $M_2$ ), and confidence ( $M_3$ ) serve as serial mediators in the relationship between practicum experiences and positive mirror

**Table 2 Means, standard deviations, and correlations among the variables (N = 324).**

Variable	M	SD	1	2	3	4	
1. Practicum experiences	110.96	16.95	0.97				
2. Desire for improvement	19.29	3.20	0.36***	0.84			
3. Reflective capacity	72.50	10.08	0.52***	0.72***	0.93		
4. Confidence	51.31	7.53	0.55***	0.47***	0.73***	0.86	
5. Positive mirror effect	66.39	8.49	0.54***	0.44***	0.65***	0.61***	0.87

Values on the diagonal are Cronbach's  $\alpha$  coefficients.  
\*\*\* $p < 0.001$ .

effect. The PROCESS macro, Model 6 (Version 4.1; Hayes 2022), and bootstrapping method (Bollen and Stine 1990), were employed on 10,000 bootstrap samples to determine the indirect effects, generating 95% bias-corrected bootstrap confidence intervals. Statistical significance was determined at the 5% level with 95% confidence intervals (Cohen et al. 2016).

Results

**Descriptive statistics.** Descriptive statistics for the study variables are presented in Table 2. All the variables were significantly correlated (Cohen 1988). Practicum experiences had a moderate, positive, and statistically significant correlation with desire for improvement ( $r = 0.36, p < 0.001$ ), reflective capacity ( $r = 0.52, p < 0.001$ ), confidence ( $r = 0.55, p < 0.001$ ), and positive mirror effect ( $r = 0.54, p < 0.001$ ). Desire for improvement had a strong, positive, and statistically significant correlation with reflective capacity ( $r = 0.72, p < 0.001$ ), and a moderate, positive, and statistically significant correlation with confidence ( $r = 0.47, p < 0.001$ ) and positive mirror effect ( $r = 0.44, p < 0.001$ ). Reflective capacity had a strong, positive, and statistically significant correlation with confidence ( $r = 0.73, p < 0.001$ ) and positive mirror effect ( $r = 0.65, p < 0.001$ ). Confidence had a strong, positive, and statistically significant correlation with a positive mirror effect ( $r = 0.61, p < 0.001$ ).

**Serial multiple mediation analysis.** The results of the PROCESS analysis are presented in Table 3. Hayes (2022) stated that one direct and seven indirect effects include: three passing through only a single mediator, desire for improvement ( $H_2$ ), reflective capacity ( $H_3$ ), and confidence ( $H_4$ ); three indirect effects passing through two serial mediators, desire for improvement and reflective capacity ( $H_5$ ), desire for improvement and confidence ( $H_6$ ), and reflective capacity and confidence ( $H_7$ ); and one through all three, desire for improvement, reflective capacity, and confidence, which act as serial mediators between practicum experiences and positive mirror effect ( $H_8$ ). Figure 3 shows the results of the serial multiple mediation analysis.

Confirming  $H_1$ , the results showed a total effect of practicum experiences on the positive mirror effect through mediators,  $B = 0.27, p < 0.001$ . The results indicated that increased practicum experiences and mediators generated a greater degree of positive mirror effects. When the mediators were excluded in the analysis, this coefficient was reduced but was still statistically significant (direct effect,  $c'$ ),  $B = 0.12, p < 0.001$ . Practicum experiences still generated positive mirror effects. Practicum experiences were also found to be a positive predictor of the desire for improvement ( $a_1$ ) ( $B = 0.07, p < 0.001$ ), ( $a_2$ ) reflective capacity ( $B = 0.18, p < 0.001$ ), and ( $a_3$ ) confidence ( $B = 0.10, p < 0.001$ ).

As shown in Table 4, the analysis of indirect mediation by bootstrapping found that the resulting data supported the significance of Path 2 (Practicum experiences  $\rightarrow$  Reflective capacity  $\rightarrow$  Positive mirror effect;  $B = 0.0623, SE = 0.0142, 95\% CI [0.0363, 0.0924]$ ), confirming  $H_3$ ; Path 3 (Practicum

experiences  $\rightarrow$  Confidence  $\rightarrow$  Positive mirror effect;  $B = 0.0221, SE = 0.0081, 95\% CI [0.0077, 0.0390]$ ), confirming  $H_4$ ; Path 4 (Practicum experiences  $\rightarrow$  Desire for improvement  $\rightarrow$  Reflective capacity  $\rightarrow$  Positive mirror effect;  $B = 0.0451, SE = 0.0119, 95\% CI [0.0251, 0.0711]$ ), confirming  $H_5$ ; Path 6 (Practicum experiences  $\rightarrow$  Reflective capacity  $\rightarrow$  Confidence  $\rightarrow$  Positive mirror effect;  $B = 0.0203, SE = 0.0071, 95\% CI [0.0076, 0.0357]$ ), confirming  $H_7$ ; and Path 7 (Practicum experiences  $\rightarrow$  Desire for improvement  $\rightarrow$  Reflective capacity  $\rightarrow$  Confidence  $\rightarrow$  Positive mirror effect;  $B = 0.0147, SE = 0.0056, 95\% CI [0.0052, 0.0271]$ ), confirming  $H_8$ . However, Path 1 (Practicum experiences  $\rightarrow$  Desire for improvement  $\rightarrow$  Positive Mirror Effect;  $B = -0.0065, SE = 0.0129, 95\% CI [-0.0335, 0.0179]$ ) and Path 5 (Practicum experiences  $\rightarrow$  Desire for improvement  $\rightarrow$  Confidence  $\rightarrow$  Positive mirror effect;  $B = -0.0036, SE = 0.0024, 95\% CI [-0.0091, 0.0002]$ ) were not significant, rejecting  $H_2$  and  $H_6$ .

The results revealed a significant indirect effect of practicum experiences on the positive mirror effect through desire for improvement, reflective capacity, and confidence ( $b = 0.0147, t = 2.625$ ), supporting  $H_8$ . Furthermore, the total direct effect of practicum experiences on the positive mirror effect in the presence of mediators was significant ( $b = 0.1179, p < 0.001$ ). Hence, the desire for improvement, reflective capacity, and confidence partially mediated the relationship between practicum experiences and positive mirror effects. Table 4 summarizes the mediation results. This is consistent with previous research (Ho, 2023a, 2023b), in which practicum experiences were related to a positive mirror effect; however, as predicted, this relationship was mediated only by reflective capacity and confidence and not the desire for improvement. These findings reaffirm and broaden existing research on the variables of reflective thinking practice and the positive mirror effect. Practicum experiences appeared to be positively related to positive mirror effects by enhancing the desire for improvement, reflective capacity, and confidence.

Discussion

Empirical studies (e.g., Gao 2015; Korucu-Kış 2021) have consistently shown significant associations between experiential learning and reflection; however, knowledge about mirror effects is limited. Focusing on student teachers' practicum experiences, this study examines the mediating roles of desire for improvement, reflective capacity, and confidence in the relationship between experiential learning and positive mirror effects. A serial multiple mediation model was used to examine how practicum experiences, as a form of experiential learning, influence reflective thinking practice through the effects of the desire for improvement, reflective capacity, and confidence. Statistically significant relationships were observed between the variables.

This study hypothesized that some or all of the total effects of practicum experiences on the positive mirror effect operate through mediators. Hence, the total effect can be divided into direct and indirect effects. The direct effect is the effect of practicum experiences on the positive mirror effect in the absence of

Table 3 Summary of multiple regression analyses for the serial multiple mediation model.																				
Model 1				Model 2				Model 3				Model 4								
Outcome variable		Desire for improvement				Reflective capacity				Confidence				Positive mirror effect						
Model	B	95% CI	SE	$\beta$	t	B	95% CI	SE	$\beta$	t	B	95% CI	SE	$\beta$	t					
Constant	11.71	[9.55, 13.88]	1.10		10.64***	15.31	[9.91, 20.71]	2.74		5.58***	7.75	[3.39, 12.11]	2.22		3.50***					
Practicum experiences	0.07	[0.05, 0.09]	0.01	0.36	6.97***	0.18	[0.14, 0.23]	0.02	0.30	8.04***	0.10	[0.06, 0.14]	0.02	0.23	5.28***					
Desire for improvement						1.92	[1.69, 2.16]	0.12	0.61	16.09***	-0.24	[-0.48, 0.00]	0.12	-0.10	-1.93					
Reflective capacity											0.51	[0.43, 0.60]	0.04	0.68	11.86***					
Confidence																				
Model summary	$R^2 = 0.13$ , $F_{(1, 322)} = 48.52$ , $p < 0.001$					$R^2 = 0.60$ , $F_{(2, 321)} = 240.00$ , $p < 0.001$					$R^2 = 0.57$ , $F_{(3, 320)} = 143.92$ , $p < 0.001$					$R^2 = 0.49$ , $F_{(4, 314)} = 78.04$ , $p < 0.001$				
N = 324.																				
SE standard error.																				
** $p < 0.01$ , *** $p < 0.001$ .																				

mediators. The indirect pathway is the effect of practicum experiences on the positive mirror effect that works through mediator(s). With two exceptions, the paths in the model were significant.

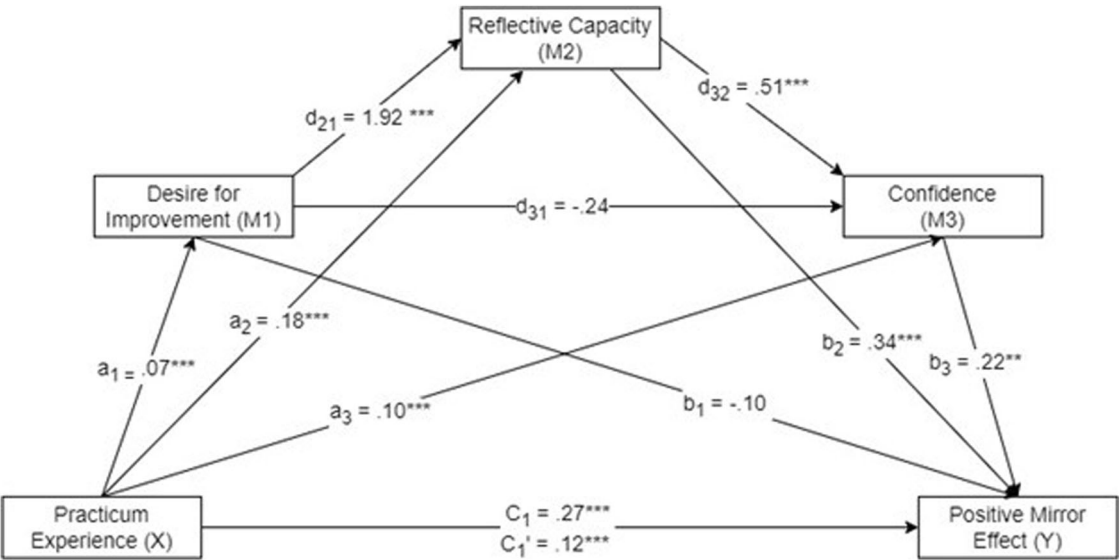
In the serial multiple mediation analysis, practicum experiences had both direct (supporting H<sub>1</sub>) and indirect effects on the positive mirror effect. The total effect of the practicum experiences on the positive mirror effect was also significant. This direct effect is consistent with prior studies showing that practicum experiences are a significant predictor of positive mirror effect (Ho 2023a; 2023b). Practicum experiences offer an environment in which individuals can observe others' actions, learn new skills and knowledge, develop action understanding, and gain insights, subsequently generating a positive mirror effect.

Practicum experiences and positive mirror effects were mediated by reflective capacity (supporting H<sub>3</sub>). This finding is also consistent with a previous study indicating that student teachers drew on various experiences during a practicum for reflection, primarily on actions (Zhu 2011). Reflection has a vertical dimension ranging from descriptive surface levels to deeper levels of analysis and synthesis, as well as an iterative dimension, which is triggered by experience, producing a new understanding and the potential or intention to act differently in response to future experiences (Mann et al. 2009). This study also found that the practicum experiences and positive mirror effects were mediated by confidence (supporting H<sub>4</sub>). Nolan and Rouse (2013) supported the idea that diverse practicum experiences can build confidence, put theory into practice, and confirm career choices.

Additionally, practicum experiences and positive mirror effects were serially mediated by a desire for improvement and reflective capacity (supporting H<sub>5</sub>). The desire for improvement is believed to build the reflective capacity (Gustafsson et al. 2021). Reflective capacity helps student teachers boost their confidence. This study also presented a statistically significant serial multiple mediation model, indicating the role of reflective capacity and confidence in the positive mirror effect (supporting H<sub>7</sub>). Reflective capacity has been postulated to boost confidence (Lestander et al. 2016; Maggiori et al. 2016). Studies have demonstrated a positive relationship between increased confidence in one's work, action, understanding, and insight, which, in turn, generates a positive mirror effect (McMahon and Hevey 2017; Sweet 2023).

Importantly, desire for improvement, reflective capacity, and confidence were found to indirectly contribute to the likelihood of generating a more positive mirror effect (supporting H<sub>8</sub>). As predicted, these results showed that the relationship between practicum experiences and the positive mirror effect was mediated by the desire for improvement and, therefore, reflective capacity and confidence. These results support our hypothesis that teaching practicums are beneficial for reflective practice. Cavanagh and Prescott (2010) found that student teachers' ability to reflect on their teaching improved during practicums. In a practicum context, students have the opportunity to practice and refine their teaching skills under the guidance of mentors. This experience allows them to develop self-confidence and autonomy and prepares them for future careers in the teaching profession (Widodo and Ferdiansyah 2018). Dierking and Fox (2013) supported the idea that confident teachers are more likely to positively impact their students and instill confidence in them. Confidence enhances the positive mirror effect as it allows individuals to observe and learn from others, gain action understanding, and spontaneously apply their learned knowledge and skills in a similar context.

However, the mediation effect of the desire for improvement between practicum experiences and the positive mirror effect was not significant, as per our study (therefore, H<sub>2</sub> was not supported). Experiential learning may contribute to a desire for improvement,



**Fig. 3** The serial multiple mediation analysis depicts the process of the relationship between practicum experiences and the positive mirror effect through desire for improvement, reflective capacity, and confidence. *c*, total effect of practicum experiences; *c'*, direct effect of practicum experiences with mediators controlled. Unstandardized regression coefficients are reported in this figure.  $^{**}p < 0.01$ ,  $^{***}p < 0.001$ .

Table 4 Bootstrapping indirect effects and 95% CI for the sequential mediating model.				
Model Pathway	Effect	Boot SE	95% CI	
			Lower	Upper
Path 1 Practicum experiences → Desire for improvement → Positive Mirror Effect	−0.0065	0.0129	−0.0335	0.0179
Path 2 Practicum experiences → Reflective capacity → Positive mirror effect	0.0623	0.0142	0.0363	0.0924
Path 3 Practicum experiences → Confidence → Positive mirror effect	0.0221	0.0081	0.0077	0.0390
Path 4 Practicum experiences → Desire for improvement → Reflective capacity → Positive mirror effect	0.0451	0.0119	0.0251	0.0711
Path 5 Practicum experiences → Desire for improvement → Confidence → Positive mirror effect	−0.0036	0.0024	−0.0091	0.0002
Path 6 Practicum experiences → Reflective capacity → Confidence → Positive mirror effect	0.0203	0.0071	0.0076	0.0357
Path 7 Practicum experiences → Desire for improvement → Reflective capacity → Confidence → Positive mirror effect	0.0147	0.0056	0.0052	0.0271
<b>Total</b>	0.1545	0.0202	0.1168	0.1960

*CI* Confidence interval.  
10,000 bootstrap samples with 95% CI.

but this may not generate a positive mirror effect. It is plausible that the desire for improvement is not sufficient to generate a positive mirror effect; it requires passing through a comprehensive process of reflection and integrating evidence gained from outsiders' knowledge into individual practice (Howes 2023).

This study also showed that the effect of practicum experiences on the positive mirror effect was not mediated by a desire for improvement or confidence (therefore,  $H_6$  was not supported). The relationship became insignificant after removing reflective capacity, suggesting that reflective capacity is a more important predictor for generating a positive mirror effect. In summary, it is plausible that reflective capacity and confidence are more important mediators. However, further studies are required to substantiate this claim. The findings not only support our hypothesis but also contribute to the expanding body of literature that highlights the significance of reflective capacity and the role of confidence in teaching practicums. The findings could shed light on the mechanisms through which practicum experiences influence positive mirror effects.

**Limitations and recommendations**

*Limitations of this study.* This study has three potential limitations. First, the differences between pre- and in-service teachers

involve the ability to learn from experience, as it does from some perspectives (Dewey 1933). The current study was limited by its sample size and geographic location. This study involved 34 and 290 in- and pre-service teachers, respectively, from a university in Hong Kong. Owing to the small sample size of in-service teachers, it was not possible to compare significant relationships among the groups. Thus, the influence of teaching experience and other demographic variations on the desire for improvement, reflective capacity, and confidence may be further explored to maximize the effectiveness of the teaching practicum.

Second, our sample was limited to Chinese students. Given the significance of reflective practice in teacher education, especially in enhancing the overall professionalism of early childhood special education, it is important to investigate the effect of reflective capacity across cultures (that is, student teachers' ability, desire, and tendency to engage in reflective thinking practice) (Rogers et al. 2019). To enhance the cross-cultural generalizability of the current findings, future research should consider enlisting larger and more diverse samples from various cultural backgrounds.

Third, this study relied solely on quantitative data. Franco (2017) suggested that diverse experiences in which students work in collaborative groups can prove valuable in helping them feel

empowered in their future careers. Therefore, students' learning stories and the progress of reflection are interesting and can add value to refine the experiential learning model of teaching practicum. To further enrich the understanding of design for improvement, reflective practice, and confidence, future research could adopt a mixed methods design that incorporates qualitative data with quantitative measures. This approach provides a comprehensive and multifaceted perspective.

**Recommendation for further research.** Special education student teachers encounter various challenges while working with children who may have diverse emotional and behavioral difficulties. Therefore, they should develop tactics to manage and defuse negative behaviors while ensuring an inclusive learning atmosphere. Student teachers have insufficient knowledge to develop intervention strategies and best practices to deal with individual differences. Therefore, continuous psychological and professional development helps student teachers to adapt to new environments, refine their skills to effectively meet their students' needs, and provide them with education.

Ongoing psychological and professional development is crucial to continually equip teachers with professional competencies, which will enable them to effectively fulfill their work roles. Furthermore, teachers must be equipped with effective pedagogies, solid professional knowledge, and competencies to deal with shifting contextual conditions (Gao 2015). The findings of this study cannot offer an explicit answer; rather, they yield implicit insights for researchers and educators to consider while promoting reflective thinking practices to enhance special education knowledge and skills.

This study examines the mediating effects of reflection from an affective perspective. Future studies should explore the effects of reflection on both emotional and pedagogical experiences. Seligman (2011) suggested that there are five categories of building blocks for optimum flourishing: positive emotion, engagement, relationships, meaning, and accomplishment (PERMA). These five categories provide a framework for evaluating positive learning experiences when designing experiential learning programs. Future research should consider these five experiences when designing learning activities, assessments, and evaluations.

## Conclusions

Practicum experiences enable students to develop a desire for improvement, reflective capacity, confidence, and positive mirror effects. This study highlights the importance of reflective capacity in enhancing practicum experiences, fostering confidence, and positive mirror effect in early childhood special education teacher training. Future research should focus on extracting practical knowledge and reflective experiences from both pre-service and experienced in-service special education teachers.

## Data availability

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession numbers (s) can be found at: [https://osf.io/6mx8r/?view\\_only=b23ab4b86ff74b27a21d6edb38348c61](https://osf.io/6mx8r/?view_only=b23ab4b86ff74b27a21d6edb38348c61).

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## Author contributions

Wing W. Y. Ho – Funding acquisition, Conceptualization, Methodology, Formal analysis, Investigation, Writing- Original draft preparation, Reviewing, and Final Editing, Yan H. Y. Lau – Project administration, Investigation, Resources, Writing- reviewing, Eric K. L. Li – Writing- reviewing.

## Competing interests

The authors declare no competing interests.

## Ethical approval

All procedures involving human participants performed in this study were in accordance with the Ethical Principles of Psychologists and the Code of Conduct of the American Psychological Association (2017) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards (World Medical Association, 2025). The study underwent a full review and was approved by Hong Kong Metropolitan University's Research Ethics Committee [REC Reference No.: HE-RD/2022/1.1] on August 17, 2022. The scope of approval covered all aspects of the study, including participant recruitment, data collection, and data analysis. Participant anonymity and confidentiality were strictly maintained.

## Informed consent

Informed consent was obtained from all participants for participation in the study. Participants were fully informed about the objectives of this study, the use of their data, their right to withdraw at any time, and the compensation provided for their participation. No vulnerable individuals were involved in the study.

## Additional information

**Correspondence** and requests for materials should be addressed to Wing W. Y. Ho.

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