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Online training module to reduce stigma and improve knowledge about autism in pre-service teachers: Cross-cultural comparison of Hong Kong and Canada

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ABSTRACT

Stigma and attitudes toward the inclusion of autistic students have primarily been investigated in Western countries. Little remains known about factors that shape these perspectives about autistic students cross-culturally. Using a cross-cultural sample of pre-service teachers from Hong Kong and Alberta, Canada, we aimed to evaluate if participation in an online autism training is associated with improved autism knowledge, stigma, and attitudes toward inclusion. We also explore cultural factors associated with autism stigma. A total of 55 and 57 pre-service teachers from Canada and Hong Kong, respectively, completed an online training module that included research-based information about autism and neurodiversity. Participants completed measures assessing autism knowledge, stigma, and attitudes toward inclusion before and after the training and answered open-ended questions about their perceptions of autistic people and their families. Results showed that, across countries, participation in training was associated with increased autism knowledge, more positive attitudes toward inclusion, and reduced stigma. In both countries, lower autism stigma was associated with higher autism knowledge, more confidence educating autistic people, heightened appreciation of biodiversity, and lower social dominance orientation. Despite having more prior experience educating autistic people, participants in Hong Kong reported higher autism stigma and exhibited lower autism knowledge than their counterparts in Canada. Compared to Canada, participants in Hong Kong exhibited more misconceptions and stereotypes about autism and described community members as treating autistic people and their families with less respect. Understanding educators' knowledge and attitudes toward autism cross-culturally can inform training needs and approaches that work for specific cultures.

1. Introduction

Inclusive education provides the foundation for an inclusive society and is therefore, essential for democracy. When educated in inclusive settings, disabled and nondisabled students also tend to be more engaged and to experience better academic, employment, and social outcomes (Kefallinou et al., 2020; Wehmeyer et al., 2016). For example, autistic students often experience academic and

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social benefits in inclusive educational settings (e.g., Boutot & Bryant, 2005; Dyer, 2022; Eldar et al., 2010; Kurth & Mastergeorge, 2010). However, inclusive education can result in mixed or negative outcomes for autistic students, including social isolation and bullying (e.g., Dalgaard et al., 2022; Humphrey & Lewis, 2008; Mesibov & Shea, 1996). Some autistic students describe harrowing experiences in mainstream settings due to stigma from teachers and peers (Billington et al., 2024; Goodall, 2018). Challenges to authentically including autistic students have led some to call for autism-specific educational placements (Merry, 2020; Ravet, 2011). Instead, autistic students and their parents often advocate for training to help educators better support them in inclusive settings (Billington et al., 2024; Carrera et al., 2023; Goodall, 2018).

This call for educator training aligns with evidence that the effectiveness of inclusive education varies based on many factors, including how inclusive education is conceptualized, school and surrounding culture, and available resources, such as educator training and expertise (Eldar et al., 2010; Roberts & Simpson, 2016; Russell et al., 2023; Saloviita, 2020; Sharma et al., 2008; Yang et al., 2024). Although training for current and aspiring educators is consistently identified as a key factor impacting successful inclusion, general education teachers often receive little to no training about autism or strategies to teach autistic students in inclusive settings (Brock et al., 2014; Dillenburger et al., 2016; Lindsay et al., 2013; Wittwer et al., 2024). To foster authentically inclusive learning environments for autistic students, there is a need to improve teachers' knowledge of autism, reduce their autism stigma, and enhance their attitudes toward implementing inclusion in their classrooms (Gómez-Marí et al., 2021, 2022; Lewis & Stojanovik, 2024; Roberts & Simpson, 2016; Sanz-Cervera et al., 2017; Segall & Campbell, 2012). Educators who express more positive attitudes toward inclusion are more likely to use inclusive practices (Ewing et al., 2018; Yang et al., 2024).

In the current study, we evaluated an autism training designed to help educators in training understand and support autistic students in two cultural contexts: Canada (where there is a relatively large amount of research focused on inclusive education but teachers report insufficient training to support inclusive education for autistic people; Lindsay et al., 2013) and Hong Kong (where there is less research focused on inclusive education and support for inclusive education has developed more slowly; Poon-McBrayer, 2014). We investigated potential changes with training in three interrelated factors believed to impact how effectively educators provide inclusive education to autistic students, namely attitudes toward the inclusion of autistic students, autism stigma, and autism knowledge. We also examined predictors of stigma and participants' open-ended reflections about how they and their community members treat autistic people in each cultural context to better understand interrelationships among the above-mentioned factors and guide the development of culturally sensitive trainings.

2. What is inclusive education?

Inclusive education is recognized as a human right for all students by international organizations (United Nations, 2006; UNESCO, 2020). However, "inclusive education" means different things to different people, from simply placing students with disabilities in mainstream classrooms to providing specialized support in mainstream settings and creating welcoming communities for all (Finkelstein et al., 2021). Growing consciousness about diversity and intersectionality over time has influenced some of these definitions of inclusive education. Indeed, the UN Committee on the Rights of Persons with Disabilities (2016, p. 4) described inclusion as an inherently dynamic "process of continuing and pro-active commitment to eliminate barriers impeding the right to education, together with changes to culture, policy, and practice of regular schools to accommodate and effectively include all students." Recognizing the importance of inclusive education for combatting discriminatory attitudes and providing high-quality education for all, representatives of 92 governments and 25 international organizations met over three decades ago in Salamanca, Spain to call upon countries around the world to develop policies and/or laws to promote inclusive education. The resultant Salamanca Statement affirmed that, "The fundamental principle of the inclusive school is that all children should learn together, wherever possible, regardless of any difficulties or differences they may have" (United Nations Educational, Scientific and Cultural Organization, 1994, IX, p. 11).

The Salamanca Statement sparked ongoing growth in policies and laws supporting inclusive education, as well as research focused on inclusive education, around the world (UNESCO, 2024). However, inclusive education research continues to be dominated by Western countries like the United States (U.S.) and Canada, with limited representation from Asia (Hernández-Torrano et al., 2022; Khamzina et al., 2024). Indeed, a recent review of studies focused on pre-service teacher training in inclusive education revealed that the vast majority of the 36 interventions reviewed were conducted in Australia, Canada, Europe, and the U.S. (Khamzina et al., 2024). Only three studies, two from Turkey and one from Hong Kong, took place in non-Western countries. The latter study was published in 2007 when the authors noted that Hong Kong was still in the early stages of adopting inclusive educational practices. It revealed quasi-experimental evidence that participation in a compulsory 20-hour long course on inclusive education was associated with improvements in attitudes toward inclusive education among pre-service teachers (Stella et al., 2007). The current study builds on this work, and a recent call for training to support inclusive education in Hong Kong (Yang et al., 2024), by examining potential benefits of a much briefer training conducted in Hong Kong almost two decades after its predecessor. The sparse research focused on inclusive education in Asia is problematic because authentic inclusive education can promote acceptance and appreciation of people with disabilities and disability-related stigma, including negative attitudes toward inclusion (Molina Roldán et al., 2021), which tend to be heightened in Asian relative to Western countries (Kim et al., 2023; Sharma et al., 2006).

3. What is stigma?

Stigma, or labeling of differences, stereotyping, distinguishing between "us" and "them," and discrimination, negatively impacts the social, educational, and employment opportunities of stigmatized people and contributes to heightened mental health challenges

among autistic people (Goffman, 1963; Link & Phelan, 2001; Turnock et al., 2022). In the current study, we used a commonly used measure of stigma, social distance, or the degree to which people prefer to stay distant from stigmatized people across varied contexts (Bogardus, 1933). We also assessed attitudes toward the inclusion of autistic students. Given that educational exclusion is a form of discrimination, stigma can be conceptualized as a broader construct of which negative attitudes toward the educational inclusion of autistic students is one example (Crowson & Brandes, 2010; D'Addio et al., 2020).

Stigma toward autistic people may be higher in Asian countries such as China, Japan, Lebanon, Malaysia, and South Korea relative to Western countries such as the U.S. and the United Kingdom (U.K.) (de Vries et al., 2020; Feinstein, 2011; Obeid et al., 2015; Someki et al., 2018; Yu et al., 2020). Variations in predictors of stigma across cultural contexts suggest that different strategies may be needed to teach about autism in diverse contexts. For example, in-group favoritism, or the tendency to view groups one is part of as superior to others, was associated with heightened autism stigma in the U.S. but not South Korea. In contrast, cultural tightness, or allegiance to social norms, was associated with heightened stigma in South Korea but not the U.S. (Kim et al., 2022). These findings suggest that norm-based training may be more effective in South Korea than in the U.S.

Conversely, predictors of stigma that are commonly (though not always) observed across cultural contexts highlight aspects of training that may be beneficial across cultures. For example, frequently observed associations between heightened autism knowledge, greater quantity and quality of contact with autistic people, and lower autism stigma (e.g., Shand et al., 2020; Kim et al., 2023) suggest that trainings should impart knowledge about autism and should include some form of contact with autistic people. Consistent with this recommendation, a participatory autism training, which was developed in collaboration with autistic students and included videos of their experiences, was more effective at reducing stigma and increasing knowledge and support for inclusion than a non-participatory training, which was developed without substantive autistic input (Gillespie-Lynch et al., 2022).

The above study is one of very few autism trainings that included a randomized design (for another example, conducted recently following a quasi-experimental pilot study in South Korea, see Kim et al., 2024a; b). Most autism training studies rely on quasi-experimental designs, which is also a limitation of the current study. Another common limitation in existing autism research is that cross-cultural investigations of attitudes and knowledge about autism among educators remain very limited (Kim et al., 2023, 2024c; Saade et al., 2021). To promote autism acceptance and inclusion in different cultural contexts, it is important to understand how people from particular cultures think, act, and feel. However, a paper reviewing trainings to reduce autism stigma revealed that only 4 out of 26 training studies included cross-cultural data, and only two of them included participants from countries in Asia (i.e., Japan and Singapore; Kim et al., 2023). This observation, in conjunction with the aforementioned pattern of limited research focused on educational inclusion in Asia, highlights the need for cross-cultural training studies focused on autism and inclusion that include Asian regions. Although disability policies and legislation are often less well-established in Asian than Western countries, there are pronounced regional variations in disability supports (United Nations Economic and Social Commission for Asia and the Pacific, 2012), highlighting the need for autism and inclusive education research comparing specific regions in Asia, like Hong Kong, to specific regions within Western countries where variations in supports are also apparent, like Alberta, Canada.

4. Education for autistic students in Hong Kong

Similar to many Southeast Asian nations, Hong Kong has separate systems of mainstream and special education (Low et al., 2018). Although the enactment of the Disability Discrimination Ordinance in 1995 and the ratification of the UN Convention on the Rights of Persons with Disabilities (UN CRPD) in 2008 stipulate that students with disabilities have the right to be included in education, there is currently no statutory law that protects the rights of students with disabilities in Hong Kong by ensuring access to high-quality inclusive education. Students who have higher support needs, such as autistic students with co-occurring intellectual disabilities, are typically placed in segregated special schools, while only those who are viewed as more academically competent have a higher chance of being integrated into mainstream schools (Poon-McBrayer, 2004; Sharma et al., 2006). Even though the government faced criticism for lacking intentional commitment and legislative efforts in moving from integration to inclusive education, public and political pressure has led to some gradual changes in policies and measures that support the implementation of inclusive practices to help students with disabilities succeed in mainstream classrooms (Poon-McBrayer, 2014).

The number of students identified with disabilities in Hong Kong schools has increased more than double over the past decade (Legislative Council Secretariat, 2022; Legislative Council Secretariat, 2024). Increases in students with disabilities placed in mainstream schools accounted for most of these changes, while the number of students with disabilities in special schools has seen minimal changes. In 2023, there were 73,112 students with disabilities in mainstream settings, accounting for approximately 14 % of the student population in mainstream schools (Legislative Council Secretariat, 2024). More than 10,000 students in mainstream settings were identified to have autism. The teacher-to-student ratio in Hong Kong was 1:10.8 in the 2022/2023 school year, which was an improvement from 14.2 in 2012/2013 (Education Bureau, 2023). Unfortunately, the number of students with disabilities in mainstream settings has increased faster than the number of teachers who have received training to support them. Teacher assistants and professionals (e.g., school/educational psychologists, social workers, speech or occupational therapists) are common supports for students with disabilities placed in mainstream education, but their support intensity varies vastly, and collaboration with teachers can be limited (Chow, 2023).

There are reports of schools in Hong Kong showing unwelcoming attitudes toward autistic students or even denying their access to mainstream education (Ng & Ng, 2022; Peters & Forlin, 2011; Poon-McBrayer, 2004; Tait et al., 2016). Including diverse learners does not seem to be a priority for most schools in Hong Kong, where academic pressure is particularly high (Poon-McBrayer, 2014; Yuen, 2017). Efforts to increase the level of inclusive education in Hong Kong have been stymied by a lack of teacher expertise and motivation in educating students with complex needs in mainstream classrooms (Peters & Forlin, 2011). Nonetheless, the situation is

believed to be improving with the upsurge of students with disabilities enrolled in mainstream schools in recent years (Yang et al., 2024) and the increase in funding and grants that support schools to obtain resources and services that serve the needs of individual students (Yuen et al., 2022). Regarding autism, there is limited information circulating in Hong Kong, causing misconceptions as well as discrimination against autistic people and their families (Tait et al., 2016; Yu et al., 2020). Among Chinese teachers in mainland China, higher autism knowledge predicted lower stigma on a measure assessing attitudes toward inclusion and higher self-efficacy toward teaching autistic students (Lu et al., 2020). However, past research has documented limited training in supporting autistic students in teacher training programs in Hong Kong (Li et al., 2019).

5. Education for autistic students in Alberta, Canada

Since the second half of the twentieth century, attitudes and policies regarding autistic people in Canada have trended away from medicalization and exclusion and toward inclusion and recognition of their rights (Maich et al., 2020). In 1985, Canada included the rights of persons with physical and mental disabilities in its Charter of Rights and Freedoms. In 2010, Canada ratified the UN CRPD. Although Canadian law requires schools to provide appropriate programs and individualized services for students with disabilities (Towle, 2015), there are pronounced variations in disability legislation and educational approaches across provinces (Bunch, 2015). For example, Alberta, where we recruited the pre-service teachers from Canada who participated in this study, formally published its Inclusive Education Policy in 2015.

The number of students with disabilities educated primarily in regular classrooms differs significantly across provinces (Specht et al., 2016). For example, in Ontario, the most populated province in Canada, about 16 % of elementary students and 28 % of secondary students receive some form of special education support (People for Education, 2024). Students may also be grouped according to ability in alternative spaces such as segregated or specialized classes. Of the 352,595 Canadian students enrolled in specialized classrooms during the 2022–23 school year, nearly 30,000 students listed autism as an area of exceptionality (Government of Canada, n.d.). The teacher-to-student ratio in Canada was 13.8 for each teacher (2010–2011 school year), which was an improvement from 2001–2002, when the ratio was 15.9 (Statistics Canada, 2013). Alberta has observed a steady increase of students requiring specialized supports (including students with disabilities and gifted students) from 114,274 in the 2019/2020 school year to 120,329 in 2023/2024 (Alberta Education, 2025).

Although educators in Canada often support inclusive education, inclusive practice is still facing many barriers in its actual implementation, such as inconsistent practice guidance, inadequate teacher training, and challenges in getting support from peers and parents (Lindsay et al., 2013; Sokal & Sharma, 2017; Thompson et al., 2015). Moreover, appropriate educational assistant support and other necessary special education services are not always available. For example, over half of principals in Ontario reported that they recommended students with disabilities not attend school for the full day because of educational assistant shortages (People for Education, 2024). Like most provinces and territories in Canada, Alberta prioritizes inclusive education, although a cascade model means that students who are not successful in classrooms with similar-age peers would be placed in segregated settings and receive specialized educational programs (Timmons, 2006). According to the Education Annual Report 2023–24 (Government of Alberta, 2024), Alberta allocated $126 million over three years for specialized support to address classroom complexity by hiring additional educational assistants, certified teachers, counselors, and part-time staff. It has since gained a reputation nationally as a province with the most funding programs supporting children with disabilities, including autism (Salvino et al., 2022; Tran, 2024). Despite its relatively progressive move, the words of the policy express a rights-based focus on acceptance, which has been critiqued as not mandating schools to tackle systemic issues (Loreman, 2018). Despite a majority White population traditionally, Canada's ethnic and cultural diversity is rapidly changing, which creates a need for more culturally sensitive investigations of people's understanding of and attitudes toward autistic learners (e.g., Fong et al., 2021, 2024; Saade et al., 2023).

Growing efforts to support inclusive education for autistic (and all) students are evident across cultures (Goodwin et al., 2022). The broad curriculum for pre-service teachers is comparable in Alberta, Canada and Hong Kong, as it includes basic coursework about disabilities and inclusive education as well as a teaching practicum with exposure to diverse neurodivergent students in inclusive settings. However, cultural factors remain likely to affect how teachers from each culture feel about teaching autistic students in inclusive settings.

6. Cultural variations in autism stigma and support for inclusion

Consistent with the aforementioned evidence that autism stigma is often heightened in Eastern cultures (e.g., Kim et al., 2022; Lu et al., 2020; Obeid et al., 2015; Someki et al., 2018), the ethos of inclusion is more widely evident in Western societies. There are several ways to understand differences in attitudes toward inclusion across cultures. Individualistic cultures value individuality more, thus fostering a climate that accepts individual differences among students with disabilities more easily (van Steen & Wilson, 2020). Educators from Asian cultures may be more likely to take a needs-based approach to education, highlighting benefits of specialized teaching in segregated settings adapted to the needs of each student (in this model students with disabilities are viewed as uniquely challenged and thus in need of unique supports), while educators in Western cultures more often take a rights-based approach, wherein all students are viewed as being entitled to the same type of education (in this model all students are believed to share both challenges and strengths; Lu et al., 2020; Ravet, 2011). Furthermore, principles of inclusion may not match cultural expectations in many Southeast Asian nations, like Hong Kong, where education systems tend to be based on principles of meritocracy, creating a competitive schooling environment that marginalizes students with disabilities who are already challenged academically and behaviorally (Low et al., 2018; Lu et al., 2020; Wong et al., 2015). Consequently, teachers may avoid students with disabilities and

believe that they are best taught by special education teachers in separate classrooms instead of accommodating them in inclusive settings (Forlin et al., 2009; Loreman et al., 2007; Low et al., 2018; Sharma et al., 2006).

7. Accepting inequality: predictor of stigma and reduced support for inclusion?

Despite policies that express support for inclusion, Hong Kong, unlike Canada, still does not have relevant legislation to protect inclusive education or rectify educational inequities (Goodwin et al., 2022), which may reflect differences in people's attitudes toward inequality (Pratto et al., 1998) across cultures. Social dominance orientation (SDO), or believing that dominant groups should continue to suppress subordinate groups (Ho et al., 2015), has been associated with reduced support for inclusion and increased stigma toward autistic people and people with other marginalized identities (e.g., Haqanee et al., 2014; Navarro-Mateu et al., 2019; Waisman et al., 2023). Although people initially suspected that stigma toward various conditions might be elevated in more collectivistic cultures (where group harmony is prioritized) relative to more individualistic cultures (where individual attainment is prioritized) (Papadopoulos et al., 2013; Triandis, 1995), stigma was instead particularly high among individualistic people who strive for personal distinctiveness yet also accept inequality (Gillespie-Lynch et al., 2019; Kim et al., 2022; Rao et al., 2010). People in East and Southeast Asia tend to exhibit an ethos of comparing autistic differences with the social norm and preferring conformity over expression of individual differences (Tait et al., 2016; Kim et al., 2023). This pressure to suppress individual differences may be associated with a preference for dominance in tight cultures (Chen et al., 2024). Therefore, we anticipated that educators in training in Hong Kong, which is more culturally tight than Canada (Uz, 2015), would report higher SDO than their Canadian counterparts, which in turn could predict higher autism stigma.

More broadly, although SDO focuses on keeping marginalized people down, it might be part of a broader array of attitudes that includes oppressing, and not appreciating, other forms of life. Indeed, when Singer and Blume coined the term neurodiversity, Singer (2017) originally likened valuing neurological diversity to respecting biodiversity. While appreciation of neurodiversity and biodiversity are theoretically related (e.g., Tarragnat, 2025) and many climate activists are neurodivergent (Elizabeth, 2021), this relationship has not been examined empirically. We hypothesized that appreciating diversity in general, including valuing biodiversity, would make people more willing to accept individual differences such as autism, and thus report lower stigma. Indeed, Chinese people (compared to Swiss) reported less positive attitudes toward biodiversity, which could be explained by cultural values that tend to emphasize the instrumental use of nature (Lindemann-Matthies et al., 2014). Experiences with nature may also help people see others as more human (Cheng et al., 2024). Therefore, we hypothesized that educators in training in Hong Kong would report lower appreciation of biodiversity and higher autism stigma compared to those in Canada.

8. Autism training for current and aspiring educators

Direct training can be an important first step toward increasing support for educational inclusion and autism knowledge and decreasing stigma toward autistic people (Khamzina et al., 2024; Kim et al., 2024a). As discussed, most extant research about autism and/or inclusive education trainings has been conducted in Western cultures with predominantly white participants. Cross-cultural comparisons are scant, and Asia is underrepresented in existing research. In early cross-cultural work, pre-service teachers from Hong Kong reported substantially less contact with people with disabilities and more concerns about implementing inclusion than their counterparts in Canada and Australia (Sharma et al., 2006, 2008). This variation may be attributable to the lack of legislation supporting inclusive education in Hong Kong (Sharma et al., 2008).

Brief trainings that incorporate psychoeducation about autism have been associated with improved autism knowledge, attitudes toward inclusion, and self-efficacy among college students, pre-service teachers, and practicing educators (e.g., Obeid et al., 2015; Saade et al., 2021, 2023; Someki et al., 2018; Waisman et al., 2023). Autism and inclusive education trainings for current and aspiring educators vary in their duration from brief to year-long multi-course programs (e.g., Khamzina et al., 2024; Rakap et al., 2015; Saade et al., 2021, 2023). Although there is value in varied durations of training, many existing trainings focus on Applied Behavior Analysis (ABA) as the primary "evidence-based" support for autistic learners (Alexander et al., 2015; Corona et al., 2017; Leblanc et al., 2009; Ling & Mak, 2012; Rakap et al., 2015). The term "evidence-based" is placed in quotes due to the growing critiques of the evidence base for autism interventions (e.g., Bottema-Beutel, 2023). This overfocus on ABA as a support for autistic students in existing trainings limits their social validity, given reports from some autistic people that ABA traumatized them by framing their differences as deficits that needed to be normalized (Anderson, 2023; see Allen et al., 2024 for a more neurodiversity-affirmative approach to ABA). Teachers have also reported that autism trainings focused excessively on tracking behaviors and not enough on helping autistic students learn (Lindsay et al., 2013). The medical model approach underlying many existing autism trainings could inadvertently increase rather than decrease autism stigma. Indeed, an autism training with an ABA focus conducted in Hong Kong led to increased knowledge and self-efficacy among educational staff but less interest in helping autistic students (Ling & Mak, 2012). Available information about the training suggests that it focused on stereotypical "autistic deficits" (e.g., reduced Theory of Mind) and lacked a focus on autistic strengths.

Given that medical model training approaches may amplify stigma, teacher training about autism and inclusion should be neurodiversity-affirmative, emphasizing that neurological diversity confers strengths, challenges, and neutral differences and encouraging educators to build on their students' strengths and interests (Hamsho et al., 2024; Van Den Plas et al., 2024). The central idea underlying both educational inclusion and neurodiversity-affirmative approaches is the importance of appreciating and supporting all forms of diversity (Jamanis & Vogler-Elias, 2023). Neurodiversity-affirmative approaches should be reflected not only in the training materials but also in the process of developing them, which should center on the lived expertise of neurodivergent people.

To begin to center autistic perspectives, the training developed for the current study was adapted from the aforementioned participatory training, which was found to be more effective than a non-participatory training in improving college students' autism knowledge, stigma, and attitudes toward inclusion (Gillespie-Lynch et al., 2022).

9. Study aims and hypotheses

In the current study, we sought to: (1) Evaluate if participation in an online autism training is associated with improved autism knowledge, stigma, and attitudes toward inclusion of pre-service teachers, (2) Examine predictors of autism stigma among pre-service teachers in Hong Kong and Canada, and (3) Explore participants' open-ended responses about autism and how community members treat autistic people and their families to identify misconceptions and discrimination related to autism stigma in respective cultures. We hypothesized that participation in our training would be associated with reduced autism stigma and improved autism knowledge and attitudes toward inclusion across cultures. We hypothesized that baseline autism stigma would be heightened among pre-service educators in Hong Kong relative to those in Canada. We expected higher quality contact with autistic people, autism knowledge, and appreciation of biodiversity and lower SDO to be associated with lower autism stigma across cultures.

10. Method

10.1. Participants

Research ethics were approved by the respective ethics committees at The Chinese University of Hong Kong and University of Lethbridge. Participants were recruited from teacher preparation programs in two major public universities, one in Hong Kong and one in western Canada. We sent mass emails to students to promote an online study that would educate them about autism. All participants gave voluntary informed consent online before the study began. Participants who successfully completed assessments and training received a gift card of HKD $100 and CAD $20 in Hong Kong and Canada, respectively, which were a common rate for participating in one-hour research in each country (approximately USD $13 in Hong Kong and USD $14 in Canada).

In Hong Kong and Canada, respectively, there were 170 and 141 potential participants who attempted the study and 87 and 77 participants who completed the training and pre-/post-assessments. After screening out invalid survey responses (e.g., repeated attempts, response set), 57 and 55 pre-service teachers from Hong Kong and Canada, respectively, were included in the final sample. Most participants were females (73.7 %, $n = 42$ in Hong Kong; 78.2 %, $n = 43$ in Canada). Most were between the ages of 18 and 24 (70.2 % in Hong Kong; 78.2 % in Canada) or 25 and 34 (26.3 % in Hong Kong; 14.5 % in Canada), while the remaining were between 35 and 44 years old. The samples from the two cultures did not differ in age ($p = .12$). Most participants were in their fourth or fifth year of study (84 % in Hong Kong; 96 % in Canada), but Hong Kong participants were overall significantly more advanced in their formal teacher education program (Table 1). The percentage of participants who indicated having prior training in autism was similar across cultures (54 % in Hong Kong, 47 % in Canada) (p = .50). One participant in each culture identified as autistic. Most participants did not report close relationships with autistic people (2 participants in Hong Kong and 3 in Canada reported having an autistic sibling and 1 participant in Canada, and none in Hong Kong, reported having an autistic romantic partner).

11. Materials

Since this study was conducted during the COVID-19 pandemic, all assessment and training materials were uploaded to Qualtrics for participants to access at their convenience. Participants completed a demographic survey before the training (e.g., age, educational background, family background, relationships with autism, prior experience teaching autistic students, confidence interacting with

Table 1
Comparison between pre-service teachers from Hong Kong and Canada.

Construct	Country mean (SD) or percentage		*p* value	Effect size
	Hong Kong	Canada		
Own formal education level^	4.32(1.24)	3.93(.60)	< .001 * **	$r = .25$
Maternal education level^	4.28(2.73)	3.51(1.35)	.91	$r = .01$
Had prior autism training	54.4 %	47.3 %	.57	$r = .07$
Had prior experience educating autistic students	52.6 %	23.6 %	.002 **	$r = .30$
Pleasant past experiences with autistic people^	2.84(.90)	4.05(.95)	< .001 * **	$r = .57$
Confidence educating autistic students^	3.44 (.93)	4.20(.68)	< .001 * **	$r = .24$
Confidence interacting with autistic peers	3.51 (.93)	3.96(.72)	.01 *	$r = .42$
Autism knowledge (baseline)	111.88(10.09)	123.18(8.14)	< .001 * **	$d = 1.23$
Autism stigma (baseline)^	21.37(5.23)	14.22(4.53)	< .001 * **	$r = .59$
SDO^	16.95(5.35)	12.42(4.24)	< .001 * **	$r = .42$
Biodiversity appreciation	47.81(4.46)	49.44(5.67)	.09	$d = .32$

Note. Reported *p* values reflect independent-samples t-tests except when those that were not normally distributed, which were analyzed with Mann-Whitney U tests (marked ^).
* *p* value < =.05; * * *p* < =.005; * ** *p* < =.001

autistic students as an educator or fellow student, and pleasantness of prior interactions with autistic individuals). We conducted pre- and post-assessments immediately before and after the training, incorporating various measures and questions related to our research objectives. Except when noted, all rating scales used this 5-point Likert scale: strongly agree, agree, neither agree or disagree, disagree, and strongly disagree. We report two types of internal consistency for each measure: alpha (to allow comparison with the extant autism stigma research) and McDonald's omega (which is endorsed by many statisticians as more trustworthy than alpha, partially because it does not assume, but not test for, a unidimensional structure like alpha does; Watkins, 2017). Although more trustworthy, omega calculations rely on a factor analytic model and thus require larger sample sizes than alpha. In SPSS 29, which was used in the current study, omega is calculated using maximum likelihood factor analysis of the item correlation matrix (Hayes & Coutts, 2020). There is no definitive rule for the sample size needed to calculate omega. However, a recent simulation study revealed that omega models often failed to converge with sample sizes of 40, yet there were few effects of sample size on omega estimates as long as the sample was 60 or greater (Malkewitz et al., 2023). Given that the sample sizes in each country were low in the current study ($n = 57$ in Hong Kong; $n = 55$ in Canada), the reported omegas focus on the full sample across countries, as some omega models (i.e., autism knowledge, attitudes toward inclusion, biodiversity appreciation in Hong Kong in particular, and social desirability) failed to converge when analyzed with only the smaller sample sizes available in each country, which is consistent with Malkewitz and colleagues' (2013) findings.

Three scales were used in pre- and post-assessments to assess the differences in participants' stigma, knowledge, and inclusive attitudes toward autistic students. The *Social Distance Scale* (Bogardus, 1933) asked participants to indicate their willingness to engage with autistic people at various levels of intimacy (e.g., "I would be willing to have lunch with an autistic student"; Gillespie-Lynch et al., 2022; items in Appendix A). The 10-item Scale, with 5 reverse-scored items, yielded good internal consistency estimates at pre-test (Canada $\alpha = .88$; Hong Kong $\alpha = .82$; ω full sample =.90). Higher scores indicate more explicit stigma.

Participatory Autism Knowledge-Measure (PAK-M; Gillespie-Lynch et al., 2022) contained 29 items (9 reverse-scored) assessing knowledge about autism (e.g., "There is one intervention that works for all people with autism", which is false). Items were modified in previous studies to reflect the latest development in autism research, updated diagnostic criteria, and participatory input from autistic co-researchers. It exhibited good internal consistency estimates at pre-test (Canada $\alpha = .82$; Hong Kong $\alpha = .80$; ω full sample =.88). Higher scores indicate more knowledge.

Teacher Attitudes Toward Inclusion Scale (TATIS; Cullen et al., 2010) was adapted to assess attitudes about inclusion of autistic students (Saade et al., 2021). It contains 14 items (4 reverse-scored) about educational inclusion (e.g., "All autistic students should be educated in regular classrooms with non-handicapped peers to the fullest extent possible."). It exhibited borderline performance in its pre-test internal consistency estimates (Canada $\alpha = .69$; Hong Kong $\alpha = .73$; ω full sample =.72). Due to a technical error, attitudes toward inclusion were assessed on a slightly different rating scale in Hong Kong (i.e., "somewhat agree" instead of "agree") relative to Canada. Higher scores indicate more positive attitudes about inclusion.

To explore factors related to autism stigma, the following questions and measures were also included in pre- or post-assessments. Before the training, participants were asked the following open-ended questions to gauge their perceptions toward autism and how the people around them treat the autism community: "What is autism? Please define 'autism' in your own words.", "How do people in your community/ities treat autistic people?", and "How do people in your community/ities treat family members of autistic people?".

Post-training, participants completed measures hypothesized to be associated with stigma. *Social Dominance Orientation Scale* (Ho et al., 2015) was used to measure participants' preference for hierarchy and inequality in social groups. It contains 8 items (4 reverse-scored) that asked participants how much they prefer dominance in groups where lower-status members are oppressed (Dominance subscale) and how much they support keeping hierarchy and inequality in social systems (Egalitarianism subscale). This scale had good internal consistency at post-test (Canada $\alpha = .75$; Hong Kong $\alpha = .81$; ω full sample =.95).

Given that there was no existing scale to assess biodiversity appreciation, we used prior biodiversity research to develop our own *Biodiversity Scale*. We adapted items used by environmental researchers to assess attitudes toward the tenets of biodiversity and conversation (Berry et al. (2018); Buijs et al. (2008); Kelemen et al. (2013). Items are available in Appendix A. This scale had borderline to good internal consistency at post-test (Canada $\alpha = .80$; Hong Kong $\alpha = .69$; ω full sample =.95).

Social Desirability Scale (Reynolds, 1982) was adopted to assess social desirability in participants' responses, but due to its unacceptably low internal consistency (Reynolds, 1982; Canada $\alpha = .47$; Hong Kong $\alpha = .46$; ω full sample =.55), it was not included in final analyses.

Autism training module. This study utilized the same self-paced, online training module as Gillespie-Lynch et al. (2022), which was a participatory autism training developed in collaboration with autistic students. The translated Chinese version of the full training is available in the appendix. It consisted of PowerPoint slides with texts, illustrations, and videos presenting information on current research-based knowledge about autism across the lifespan. The training included topics such as diagnostic criteria (e.g., DSM-5 classification and its changes from previous editions), disparities in diagnosis (e.g., racial disparity, gender differences), aetiology (e.g., biogenetic bases, comorbidity, common myths of causes of autism), early identification (e.g., early warning signs, diagnostic tools), prevalence (e.g., updated prevalence, changes in prevalence), intervention approaches (e.g., fostering social communication in naturalistic settings, environmental modification, strengths-based approach), the neurodiversity movement (e.g., core beliefs to treat autism as a neutral or positive human trait, autism as an identity instead of a disease to be cured, debate about person-first/identity first languages and functioning labels), and the future for autistic adults (e.g., transition to postsecondary education and workplace, voices from adult self-advocates). Participants completed the self-paced training module by scrolling through and reading the slides. Periodic comprehension checks and minimum time per slide were recorded to ensure participants read and understood the contents before moving on to the next section. The median completion time of assessments and training was 3385 s (range = 1352 - 44791 s) in Hong Kong and 3792 s (range = 1087 - 84383 s) in Canada.

The Chinese version of the training and measures used in Hong Kong was translated and adapted by a team of bilingual researchers,

including several students (senior undergraduate and postgraduate in Psychology and Education) and a lead academician. Forward and backward translations were conducted blindly by different team members. The Chinese version was discussed and finalized by the whole team to ensure terminology and contents were identical to the original version while maintaining cross-cultural relevance and understanding (Krach et al., 2017).

12. Data analysis

An alpha level of.05 was used for all analyses, conducted in SPSS 29. We used descriptive analyses to identify non-normal distributions (e.g., skewness and/or kurtosis statistics greater than 1.96 times their standard error; Field, 2009). Given that stigma and SDO were not normally distributed, we used Kendall's tau rank correlations. Correlations between stigma and major variables (i.e., autism knowledge, attitudes toward inclusion, SDO, biodiversity appreciation) as well as demographic factors postulated to be related to stigma were calculated. Changes in autism stigma and knowledge following training were evaluated using mixed ANOVAs with country as a between-subjects variable (with a follow-up non-parametric analysis for stigma). Given that attitudes toward inclusion were assessed on a different scale in Canada and Hong Kong, changes in attitudes toward inclusion were assessed separately in each country using paired-samples t-tests.

Open-ended responses were qualitatively coded utilizing content analysis (Mayring, 2004) by two co-authors blinded to country. We first familiarized ourselves with the data, then used open coding to identify main ideas in all the responses. Major codes represented general themes (e.g., promotes discrimination), while subcodes were more specific details nested within major codes (e.g., treated as "abnormal"). Two co-authors initially co-coded 20 % of the data. Inter-rater reliability of over 80 % was obtained for the "What is Autism?" question. However, reliability was not initially obtained for one major code about community treatment of autistic people due to subcodes inconsistently being categorized as examples of their major code. One of the original coders and a new coder, an autistic co-author, revised these coding schemes and attained reliability above 80 %. Chi-square tests were used to compare codes across countries.

13. Results

Although no differences in prior autism training were reported, participants in Hong Kong reported more formal education and experience educating autistic people than Canadian participants (Table 1). Yet they also exhibited less pre-test autism knowledge and reported lower quality prior contact with autistic people, less pre-test confidence interacting with autistic people as educators and peers, and higher pre-test autism social distance and SDO than participants in Canada.

14. Baseline correlations

The following correlations were consistently found in Hong Kong and Canada. As hypothesized, higher autism knowledge and higher biodiversity appreciation were associated with lower social distance toward autistic people (Appendices B and C). Confidence educating autistic people and interacting with autistic peers was inversely associated with social distance. Also, more positive attitudes toward inclusion were associated with greater confidence interacting with autistic peers, more knowledge, and less social distance. Heightened SDO was associated with reduced support for inclusion, lower biodiversity appreciation, and heightened social distance.

Differences across countries were found in the following correlations. Only in Canada, more pleasant past experiences with autistic people were associated with more positive attitudes toward inclusion and less social distance. Similarly, past autism training was only associated with heightened knowledge, confidence interacting with autistic peers, and quality of contact in Canada. Conversely, prior experience educating autistic people was only associated with more confidence educating autistic people and heightened biodiversity appreciation in Hong Kong.

15. Changes with training

As hypothesized, social distance was lower in Canada (pre-test: M=14.22, SD=4.53; post-test: M=13.00, SD= 3.85) than Hong Kong (pre-test: M=21.39, SD=5.27; post-test: M=19.04, SD=5.95; $F(1109)$= 54.88, $p < .001$; $\eta^2 = .34$). Also as hypothesised, social distance improved with training in both countries from pre-test (M=17.84, SD=6.08) to post-test (M=16.05, SD=5.85), $F(1109)$= 33.21, $p < .001$; $\eta^2 = .23$). A trend toward an interaction between country and social distance change was observed, $p = .07$; $\eta^2 = .03$.[1]

As hypothesized, attitudes toward inclusion improved from pre-test (M=49.02, SD=6.10) to post-test (M=52.28, SD=6.21) in Hong Kong, $t(56) = -5.11$, $p < .001$; d= .67. Attitudes toward inclusion also improved from pre-test (M=54.07, SD=4.86) to post-test (M=58.44, SD=6.51) in Canada, $t(54) = -6.80$, $p < .001$; d= .92.

Autism knowledge was higher in Canada (pre-test: M=123.18, SD=8.14; post-test: M=132.75, SD=9.75) than Hong Kong (pre-test: M=111.88, SD=10.09; post-test: M=119.84, SD=10.94; $F(1110)$= 48.79, $p < .001$; $\eta^2 = .31$). Knowledge improved with training in both countries from pre-test (M=117.43, SD=10.76) to post-test (M=126.18, SD=12.72), $F(1110)$= 179.46, $p < .001$; $\eta^2 = .62$). No interaction between country and knowledge change was observed, $p = .22$; $\eta^2 = .01$.

[1] Follow-up non-parametric analyses revealed the same pattern of improvements in stigma in Hong Kong ($p < .001$) and Canada ($p = .002$).

16. Predictors of change with training

Given that pre-test social distance and SDO were substantially higher in Hong Kong than Canada, we examined if pre-test social distance or SDO impacted training effects. In Canada, higher pre-test social distance (more stigma) was associated with greater reductions in social distance from pre-test to post-test, $\tau b = 0.48$, $p < 0.001$. This association was not significant in Hong Kong, $p = .091$. SDO was not associated with social distance change in either country, $ps > .44$.

17. Comparing open-ended responses

Qualitative coding of post-test responses to the question, "What is Autism?", revealed that most participants included social-communication difficulties in their definitions (see Table 2 for summary of significantly different codes across countries; see Appendices D-F for detailed coding results). Participants in Hong Kong were more likely to state that autistic people experience difficulties expressing emotions, more frequently referenced restricted interests and repetitive behaviors, and more often included stereotypical misconceptions in their definitions (e.g., all autistic people are the same, autistic people are antisocial). Comparatively, participants in Canada were more likely to refer to autism as a spectrum.

Participants often described community members treating autistic people in ways that promote discrimination (Appendix E). Participants in Hong Kong were more likely to describe community members treating autistic people as weird and without respect than participants in Canada. They were also less likely to say community members promoted acceptance of family members of autistic people and were more likely to say community members treat family members with pity than participants in Canada (Appendix F).

18. Discussion

The objective of this research was to evaluate associations between an online autism training and the knowledge and attitudes toward autism among pre-service teachers in Hong Kong and Canada. We also examined factors associated with stigma toward autistic people (social distance) cross-culturally. As hypothesized, autism knowledge, attitudes toward inclusion, and biodiversity appreciation were lower and social distance toward autistic people and SDO were higher in Hong Kong relative to Canada at pre-test. Results indicate that participation in our training was associated with improvements in autism knowledge, social distance, and attitudes toward inclusion for pre-service teachers across Hong Kong and Canada. Different from a broad curriculum covering a range of special education needs, our autism training provides pre-service teachers with comprehensive information specifically about autism that can prepare them to educate diverse autistic students. Not only does it cover factual information, it also presents the neurodiversity framework, which is infrequently discussed in traditional teacher training (Wood et al., 2022). Moreover, the relatively brief training delivered online via a self-paced platform also demonstrates high cost-effectiveness especially during the COVID-19 pandemic when in-person professional development and coaching were not feasible. Although improvements in knowledge and attitudes alone may not be sufficient to produce desired behavioral changes (Stirman & Beidas, 2020), training in such a didactic format appears to be an important first step that can help aspiring teachers better understand autism as they learn to adopt teaching practices that support autistic students. Future research can evaluate how this training can serve as a psychoeducational component and be integrated into teacher training curriculum to gradually improve teachers' skill set working with autistic students.

Aligning with prior research (Kim & Gillespie, 2023; Someki et al., 2018; Waisman et al., 2023), higher autism knowledge and lower SDO were associated with lower social distance. Our study is the first to document relationships between higher appreciation of

Table 2
Codes of pre-service teachers' responses to the three open-ended questions that were significantly different between Hong Kong and Canada.

Code/Subcode (SC)	Hong Kong %	**Canada %**	*p* value
"What is autism?"			
Difficulty expressing emotions (SC)	19.3 %	3.6 %	.02 *
Restricted interest and repetitive behaviours	38.6 %	20.0 %	.04 *
Focused/Specific interest (SC)	19.3 %	5.5 %	.04 *
Spectrum	3.5 %	34.5 %	< .001 * **
Common misconceptions	47.4 %	5.5 %	< .001 * **
Stereotypes (SC)	28.1 %	3.6 %	< .001 * **
All autistic people are the same (SC)	10.5 %	0 %	.03 *
Antisocial/Self-isolated (SC)	29.8 %	1.8 %	< .001 * **
"How do people in your community/ies treat autistic people?"			
With respect (SC)	1.8 %	12.7 %	.03 *
Think they're weird (SC)	14.0 %	1.8 %	.03 *
"How do people in your community/ies treat family members of autistic people?"			
Promotes acceptance	15.8 %	44.4 %	.002 * *
With respect (SC)	3.5 %	16.7 %	.03 *
With pity/sympathy	47.4 %	13.0 %	< .001 * **
Treated as "normal"	3.5 %	22.2 %	.004 * *

Note. Reported *p*-values were derived from chi-square tests except when the assumption of 5 per cell was not met, in which case Fishers exact tests were used.
* *p* value < =.05; * * *p* < =.005; * ** *p* < =.001

biodiversity, lower SDO, lower social distance toward autistic people, and higher support for inclusion. Collectively, these findings suggest that challenging power inequalities, including power imbalances favoring humans over other animals, is part of celebrating differences. In other words, how much teachers value equality and respect individual differences has important implications for how they treat autistic students. Although training and coursework in diversity, equity, and inclusion are increasingly emphasized in university curriculum, it is less clear how such issues are addressed in training for pre-service teachers, in particular learning about autism and other learning differences. While traditional special education coursework focuses on imparting factual information about disabilities, it is equally important to infuse a multicultural, diversity, and social justice approach into these courses to better equip educators for supporting students with diverse learning differences holistically (e.g., Faloughi & Herman, 2021). Moreover, advocacy movements can also leverage the concept of biodiversity, which is more commonly known and perhaps involves less political baggage, to promote solidarity across struggles. For example, Greta Thunberg views autism as key to her strengths as an environmental advocate (Elizabeth, 2021). A biodiversity metaphor is used in a school curriculum to introduce neurodiversity to young children (Zahir et al., 2024). However, Hong Kong educators reported worse attitudes toward autism than Canadian educators, despite a comparable level of biodiversity appreciation across sites, which suggests that additional factors, including variations in SDO and culturally specific misconceptions, like those documented in participants' open-ended responses, drive autism acceptance.

Our findings shed light on cross-cultural differences in the training educators receive to work with autistic students. Participants in Hong Kong reported more prior experience teaching autistic students, which might be due to a service learning component of the course on students with special education needs at the sampled university in Hong Kong. However, despite this supposed advantage, Hong Kong participants still reported higher pre-test social distance and exhibited lower knowledge than their Canadian counterparts, who had less formal education and experience teaching autistic students. Moreover, confidence interacting with autistic people as an educator was related to different factors across the two cultures. Specifically, increased confidence was associated with having past teaching experience with autistic students in Hong Kong, whereas it was associated with higher autism knowledge in Canada. Taken together, it is possible that practical teaching experience would instill more confidence in Hong Kong educators, while their Canadian counterparts may benefit more from a cognitive approach to boost their efficacy in teaching autistic students. Such findings have implications for designing educator training across cultures by emphasizing specific educational activities to more effectively prepare teachers for teaching autistic students in each culture. Future research should use a larger sample and an experimental design to directly test differential effects of various training components across cultural contexts.

When asked to describe autism in their own words, Canadian participants more frequently highlighted the spectrum nature of autism, suggesting they are inclined to respect variations within autism. In contrast, participants in Hong Kong were more likely than their Canadian counterparts to provide more stereotypical descriptions (e.g., autistic people are all the same and like to isolate themselves away from the world) and to report that people in their community described autistic people as weird. These narratives exemplify the stigmatized conceptions of autism that are highly prevalent in Chinese societies (Mak & Kwok, 2010; Ng & Ng, 2022; Kwok and Kwok, 2022). These findings align with evidence for both higher social distance toward autistic people and higher SDO in Hong Kong as compared to Canada, which suggests people in Hong Kong tend to exert power over marginalized people with lower privilege or social status. In other words, people in Hong Kong tend to view autism as inherently less desirable and less valuable, which goes contrary to the neurodiversity paradigm. Furthermore, stereotypical images of autism that contribute to undervaluing and othering autistic people may be perpetuated by the Chinese term for autism, "自閉症," which literally means a self-isolated disorder. This word can essentialize autism and create a wrong impression that autistic people always immerse themselves in their own world and isolate themselves. Future trainings need to consider culturally specific misconceptions and broader socio-cultural factors to target stigmas about autism that are particularly relevant to the local community.

Relatedly, neurodiversity is still a foreign concept and relatively unknown in Chinese societies, which may be a possible factor that stymies acceptance and celebration of autistic differences in Hong Kong. Although Hong Kong has shown progress toward increasingly supporting principles of the neurodiversity paradigm, intentional advocacy or explicit discussion of this framework remains limited in this community (Lam and Wong, 2024). Future studies should examine if aspects of our training specifically focused on neurodiversity could be a determining factor that improves stigma in Hong Kong, which would provide evidence for the need to introduce the paradigm shift more broadly. Recent studies examining a culturally adapted neurodiversity-affirmative training in another culturally tight Asian context, South Korea, revealed that it led to improvements in autism stigma and knowledge (Kim et al., 2024a; b; 2025). Therefore, neurodiversity-affirmative approaches to autism training can be beneficial even in regions with strong adherence to norms. More neurodiversity-affirmative autism training should be adopted for educators in Hong Kong.

19. Limitations and future directions

There are several limitations to this study. First, the small sample size and high incompletion rate limit generalizability. Second, the use of a quasi-experimental design prohibits causal inferences about the training. Randomized control trials should be used in future research. This study should be viewed as a first step in a broader line of research. Indeed, other researchers have built toward experimental approaches by using a quasi-experimental approach to refine measures before conducting a randomized design (e.g., Kim et al., 2024a; b). Long-term effects of training and its impact on teachers' behaviors toward autistic students and students' learning should also be monitored.

Also, self-reported attitudes might be influenced by social desirability bias, which we could not assess adequately in the current study due to the unacceptable internal consistency of the social desirability measure. Our choice to assess biodiversity appreciation and SDO solely at post-test, to minimize participant burden given that they were conceptualized as individual differences, could have led scores on these measures to be influenced by the contents of the training itself. Future research could consider using additional

measures, such as measures of implicit attitudes and behavioral indicators of stigma, to more accurately assess associations and demonstrate intervention effects. Due to our female-biased sample, we did not examine gender effects on stigma. Future research could adopt large-scale population surveys to explore how demographic attributes, personal experiences, and varied potential predictors that have been identified in prior research lead to autism stigma, especially in cross-cultural contexts.

Anecdotal feedback collected from participants, especially in Hong Kong, suggested the need to improve the autism training to fit with local contexts by, for example, using culturally familiar terminology and examples and addressing issues important to the local community. Nonetheless, no research priority setting exercise has been conducted in Hong Kong (for Canada see Frazier et al., 2018), and thus an important first step is to identify major issues of concern to the local autism community in Hong Kong. Future training development should be guided by an authentic participatory approach that actively involves autistic individuals throughout all aspects of intervention development and assessment. Although we adapted a participatory training for the current study and one of the co-authors of this study is autistic, this study itself is not participatory given the lack of sustained involvement by autistic collaborators throughout the full process. Future research should also adopt a culturally responsive framework that emphasizes local experts and knowledge when co-designing and adapting trainings.

20. Conclusion

Participation in a brief online autism training was associated with reduced autism stigma and improved knowledge about and inclusive attitudes toward autistic students among pre-service teachers in Hong Kong and Canada. Providing quality educational experiences for autistic students is a responsibility shared by teachers, administrators, and policymakers. To promote inclusion, we must work together to challenge inequality by recognizing the value of all forms of diversity, including neurological diversity and biodiversity. By recognizing that struggles for justice are interrelated, we can more effectively advocate for respect for all forms of diversity and collaboratively develop trainings and structural changes to protect all beings.

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CRediT authorship contribution statement

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Social Distance Scale adapted for the autistic population

1. I would be willing to have lunch with an autistic person.
2. I would NOT be willing to work with an autistic co-worker.
3. I would be willing to spend an evening socializing with an autistic person.
4. I would NOT be willing to take a class with an autistic person.
5. I would be willing to start a collaborative project with an autistic person.
6. I would NOT be willing to make friends with an autistic person.
7. I would be willing to hire an autistic employee.
8. I would NOT be willing to have an autistic person marry into my family.
9. I would be willing to marry or date an autistic person.
10. I would NOT be willing to have an autistic boss.

Appreciation of Biodiversity scale.

1. Humans are part of nature.
2. Nature is here for humans to use it.

3. Humans are better than other animals.
4. Every animal deserves respect.
5. All animal species have a right to exist, regardless of their ability to benefit or harm humans.
6. Any effort to conserve animal species should be balanced by other concerns.
7. Modern humans are limited by our loss of connections with the natural world.
8. Protecting other species is a moral responsibility.
9. Humans, other animals, plants, mountains, the earth itself, are all part of a shared community.
10. We need to recognize that other species are as important as humans.
11. When we destroy nature, we destroy humans too.
12. The mere existence of other species is valuable, even if humans never experience them.

Appendix B

Correlations between key variables in Hong Kong.	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Confidence educating autistic students									
2. Confidence interacting with autistic peers	.72 * **								
3. Pleasant past experiences with autistic people	.27 *	.24 *							
4. Autism Knowledge	.06	.05	.10						
5. Autism Stigma	−.27 *	−.22 *	−.13	−.44 * **					
6. Attitudes Inclusion	.21	.33 * *	.10	.26 * *	−.35 * **				
7. SDO	−.10	−.13	−.04	−.24 *	.30 * *	−.22 *			
8. Biodiversity appreciation	.16	.15	.05	.18	−.31 * **	.16	−.23 *		
9. Prior experience educating autistic students	.32 *	.22	.48 * **	.13	−.17	.14	−.02	.24 *	
10. Prior autism training	.14	.03	.07	.13	.08	−.01	−.05	.03	.05

Note: Kendall's tau correlation coefficients reported above; * $p < =.05$; * * $p < =.005$; * ** $p < =.001$.

Appendix C. Correlations between key variables in Canada

	1.	2.	3.	4.	5.	6.	7.	8.	.9
1. Confidence educating autistic students									
2. Confidence interacting with autistic peers	.60 * **								
3. Pleasant past experiences with autistic people	.56 * **	.40 * **							
4. Autism Knowledge	.28 *	.35 * **	.35 * **						
5. Autism Stigma	−.38 * **	−.44 * **	−.34 * *	−.44 * **					
6. Attitudes Inclusion	.29 *	.25 *	.27 *	.31 * **	−.30 * *				
7. SDO	−.03	.04	−.02	−.31 * *	.34 * **	−.20 *			
8. Biodiversity appreciation	.07	.008	−.002	.24 *	−.22 *	.18	−.30 * *		
9. Prior experience educating autistic students	.04	.21	.008	.11	.08	.07	.05	.03	
10. Prior autism training	.20	.32 *	.34 *	.40 * **	−.12	.14	.01	.12	.25

Note: Kendall's tau correlation coefficients reported above; * $p < =.05$; * * $p < =.005$; * ** $p < =.001$

Appendix D. Coding of pre-service teachers' responses to the question "What is autism?"

Code/*Subcode*	Hong Kong %	Canada %	*p* value
Difficulty in social interaction/communication	63.2%	67.3%	.70
Difficulty interpersonal skills	15.8%	10.9%	.58
Difficulty with relationships	3.5%	3.6%	1.00
Difficulty expressing emotions	19.3%	3.6%	.02 *
Restricted interest and repetitive behaviours	38.6%	20.0%	.04 *
Repetitive behaviour	10.5%	16.4%	.42
Focused/Specific interest	19.3%	5.5%	.04 *
Importance of daily routine	12.3%	1.8%	.06
Sensory difficulties	10.5%	10.9%	1.00
Specifiers	1.8%	1.8%	1.00
Language impairment	1.8%	0%	1.00
Intellectual difficulties	0%	1.8%	.49
Severity	5.3%	16.4%	.07
Varying functioning levels	3.5%	7.3%	.43
Spectrum	3.5%	34.5%	< .001 * **
Neurodevelopmental	15.8%	20.0%	.63
Difference in thinking and processing	8.8%	3.6%	.44

(*continued on next page*)

(*continued*)

Code/*Subcode*	Hong Kong %	Canada %	*p* value
Neurodiversity aligned viewpoint	7.0%	12.7%	.36
Autism associated with strength	1.8%	1.8%	1.000
Difficulties arise from society	3.5%	1.8%	1.000
Common misconceptions	47.4%	5.5%	< .001 * **
Stereotypes	28.1%	3.6%	< .001 * **
All autistic people are the same	10.5%	0%	.03 *
Antisocial/Self-isolated	29.8%	1.8%	< .001 * **
Other	7.0%	10.9%	.52

Note: Reported *p*-values were derived from chi-square tests except when the assumption of 5 per cell was not met, in which case Fishers exact tests were used.
* *p* value < =.05; * * *p* < =.005; * ** *p* < =.001.

Appendix E. Coding of pre-service teachers' responses to the question "How do people in your community/ies treat autistic people?"

Code/*Subcode*	Hong Kong %	Canada %	*p* value
Promotes acceptance	35.1%	52.7%	.09
With support	5.3%	5.5%	1.00
With respect	1.8%	12.7%	.03 *
With tolerance	8.8%	5.5%	.72
Patiently	7.0%	1.8%	.36
With pity/sympathy	1.8%	1.8%	1.00
With empathy	1.8%	0%	1.00
Treated as "normal"	7.1%	14.5%	.24
Treated like everybody else	1.8%	7.3%	.20
Promotes rejection/discriminating	61.4%	45.5%	.13
Treated as "abnormal"	15.8%	10.9%	.58
Think they're weird	14.0%	1.8%	.03 *
Stereotyping	22.8%	12.7%	.22
Think they're hard to deal with	8.8%	0%	.06
Avoids/ignores them	7.0%	7.3%	1.00
Little or no understanding	14.0%	5.5%	.20
Characteristics of autism from DSM−5	12.3%	3.6%	.16
Social communication	10.5%	3.6%	.27
Not Sure	1.8%	7.3%	.20
Other	5.4%	1.8%	.62

Note: Reported *p*-values were derived from chi-square tests except when the assumption of 5 per cell was not met, in which case Fishers exact tests were used.
* *p* value < =.05; * * *p* < =.005; * ** *p* < =.001.

Appendix F. Coding of pre-service teachers' responses to the question "How do people in your community/ies treat family members of autistic people?"

Code/*Subcode*	Hong Kong %	Canada %	*p* value
Promotes acceptance	15.8%	44.4%	.002 * *
With support	3.5%	11.1%	.16
With respect	3.5%	16.7%	.03 *
With tolerance	1.8%	0%	1.00
Patiently with time	1.8%	0%	1.00
With pity/sympathy	47.4%	13.0%	< .001 * **
With empathy	8.8%	1.9%	.21
Treated as "normal"	3.5%	22.2%	.004 * *
Treated like everybody else	3.5%	13.0%	.09
Promotes rejection/discriminating	14.0%	16.7%	.80
Treated as "abnormal"	3.5%	0%	.50
Think they're Weird	1.8%	0%	1.00
Stereotyping	3.5%	1.9%	1.00
Not sure	7.0%	9.3%	.74
Other	10.5%	3.7%	.27

Note: Reported *p*-values were derived from chi-square tests except when the assumption of 5 per cell was not met, in which case Fishers exact tests were used.
* *p* value < =.05; * * *p* < =.005; * ** *p* < =.001.

Appendix G. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.reia.2025.202651.

Data availability

The authors do not have permission to share data.

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