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# Exploring the perceived knowledge of teacher educators and pre-service teachers on the differentiated instruction practices of teacher educators

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Inclusive education involves creating effective learning environments that welcome and meet the diverse needs of all students. Differentiated instruction (DI) has been identified as a key instructional approach to addressing the diverse needs of all students in regular classrooms. While there is a large body of literature on DI, that relating to the non-Western context is sparse. Using comprehensive model of DI as a conceptual framework, this study examined teacher educators' perceived usage of DI practices in teacher training institutions in Ghana. It used a questionnaire design based on the tenets of model for data collection. A total of 1,002 participants (199 teacher educators and 883 pre-service teachers) were recruited from four teacher training institutions in Ghana. The data were analyzed using confirmatory factor analysis, *t*-tests, and Hayes's model for performing moderation analysis. The results show differences between pre-service teachers and teacher educators, with the former rating the latter lower on the perceived usage of DI. The study concludes with a discussion on the training needs of teacher educators in the usage of DI and enabling them to effectively model appropriate differentiated teaching experiences to beginning teachers.

KEYWORDS

**inclusive education, differentiated instruction, teacher preparation, university colleges of education, children with disabilities, Ghana**

## 1 Introduction

Contemporary educational discourse has focused on the need for countries to create a conducive environment for the participation of all children in school (Organisation for Economic Cooperation and Development, 2018). In particular, Article 24 of the United Nations (2007) Convention on the Rights of Persons with Disabilities (CRPD), which entered into force in 2008, states that countries should ensure that persons with disabilities are not excluded at any level of the general education system. It requires all state parties to ensure an inclusive education system at all levels as well as lifelong learning to enable persons with disabilities to achieve their full human potential, sense of dignity, and self-worth, thereby

strengthening respect for human rights, fundamental freedoms, and human diversity. According to the Salamanca Statement (UNESCO, 1994), the key feature of inclusive education is the inclusion of all children in regular education, irrespective of their physical, intellectual, emotional, social, linguistic, or other conditions. The Sustainable Development Goals (SDGs) adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development reiterated that all states should ensure inclusive and equitable quality education and promote lifelong learning opportunities for all by 2030 (United Nations, 2016).

Following Ghana's March 2007 signing of the Disability Rights Convention (Human Rights Watch, 2012), it ratified the CRPD on August 21, 2012, affirming its responsibility to respect all people with disabilities. Building on these previous commitments, in 2015, it adopted inclusive education as a wider reform to create a more effective educational system and society (Ministry of Education, 2015). The current inclusive education policy acknowledges that everyone has the right to access education and that they can learn irrespective of differences in age, gender, ethnicity, language, disability, etc. To achieve this, the policy recognizes the need for the Ghanaian educational system to adapt educational structures, systems, and methodologies to meet the diverse needs of all children (Ministry of Education, 2015).

This global thrust for inclusive and equitable quality education for everyone has contributed significantly to diversity in classrooms around the world. This has resulted in the rethinking of pedagogical approaches that provide equitable educational opportunities to address the diverse needs of all students in inclusive settings (Organisation for Economic Cooperation and Development, 2018). Inclusive education requires pedagogical approaches that are effective in addressing and responding to the diverse needs of all learners. Flexible curricula and teaching and learning methodologies that are child-centered and more interactive have been described as effective in creating inclusive education environments for all (Woodcock et al., 2022). The successful implementation of inclusive education requires that teachers have the skills and supportive dispositions to be able to modify the curriculum and adopt inclusive and child-centered pedagogies to accommodate the diversity of student needs (Nketsia et al., 2020; Subban et al., 2023). Thus, teacher education programs across the globe are exploring ways in which to prepare teachers to adopt more child-centered inclusive pedagogical approaches.

Contemporary empirical studies have identified DI as an effective child-centered approach in addressing the diverse needs of all students in mixed-ability, heterogeneous, and inclusive classrooms (Smale-Jacobse et al., 2019; Alegria and Kelly-Williams, 2020; Pozas et al., 2021). Despite the importance of teacher education in equipping teachers with the knowledge and skills needed to adopt child-centered inclusive approaches such as DI, in non-Western contexts such as Ghana, there is a paucity of evidence on teacher educators' perceived competence and how they train initial teachers to utilize such approaches in their future classrooms. This study presents a comparison between teacher educators and their pre-service teachers regarding the competence of the former in DI.

## 2 Conceptual framework

The DI combines constructivist learning theory, learning styles, and brain development with empirical research on the factors influencing learners' readiness, interest, and intelligence preferences toward student motivation, engagement, and academic growth in school (Tomlinson and Jarvis, 2023). A differentiated classroom is a student-centered setting where the students are the real workers; the teacher's role involves coordinating time, space, materials, and activities. It is the responsibility of teachers to ensure student success by recognizing and removing barriers that deny equal access to excellence (Tomlinson and Imbeau, 2023). DI, therefore, is a teaching philosophy that entreats teachers to recognize and respond to the diverse background knowledge of students, their readiness and language preferences in learning, as well as their interests by providing them with different options for understanding subject content and different means of assessing what they learn (Tomlinson and Imbeau, 2023).

This study was guided by Tomlinson's comprehensive model of differentiation framework, which is made up of six models: content, process/product, learning environment, readiness, interest, and learning profile. The six models are further categorized into two domains: strategies (content, process/product, and learning environment) and readiness (readiness, interest, and learning profile). Strategies focus on what teachers are expected to alter to make learning accessible, and readiness refers to the ability of teachers to understand learners and tailor lessons to suit their needs.

First, students' readiness refers to their entry points relative to knowledge, understanding, or skills. For instance, for students with less developed readiness, teachers must identify and address the gaps in past learning and use more opportunities for direct instruction, more concrete activities and products, and a more deliberate learning pace. Alternatively, teachers can use more complex, open-ended, abstract, and multifaceted activities and products for students with advanced readiness. They can differentiate based on students' readiness by varying the levels of difficulty of the material covered in class (Algozzine and Anderson, 2007). Tomlinson (2014) further stated that student readiness is not fixed; therefore, students will struggle at some point, and many will be advanced at one point or another.

Second, Tomlinson (2014) described students' interests as their affinity, curiosity, or passion for a particular topic or skill. These are the things that capture the attention, curiosity, and involvement of students and are typically linked to their strengths, cultural context, personal experiences, and sense of need (Tomlinson and Marcia, 2013). For instance, students' interests in subjects differ based on their strengths, cultural context, personal experiences, and sense of need. Teachers may differentiate subject content by aligning key knowledge, understanding, and skills with students' affinities and topics of interest (Algozzine and Anderson, 2007).

Additionally, students' learning profiles refer to how they learn best. Learning profiles are structured by students' intelligence preferences, gender, culture, or learning styles. Some might prefer to learn alone or in groups; some might prefer logical or analytical learning approaches; others might prefer creative or application-oriented lessons. Thus, teachers can differentiate based on what they know about students' learning preferences, such as multiple forms of intelligence, talent, and learning styles (Algozzine and Anderson, 2007). Therefore, teachers should not label students as particular types of learners but, rather, offer diverse ways for students to approach their learning (Tomlinson and Marcia, 2013; Tomlinson, 2014).

Moreover, the lesson content is that which teachers want students to learn from a particular curriculum material. In differentiated

classrooms, teachers provide diverse alternatives for individuals to learn the curriculum content as intensively and as quickly as possible. They modify the curriculum so that each learner can acquire knowledge, understanding, and skills. However, a differentiated classroom requires a quality curriculum with clear and compelling goals that can be used in ways that engage students cognitively and lead to understanding. Teachers need to organize the curriculum around knowledge, understanding, and skills that are essential for learners to know (Tomlinson, 2014). Some of the methods that teachers can use to help students access the curriculum include independent reading, partner reading, text-on-tape texts with images, etc. (Tomlinson and Marcia, 2013).

Process describes the activities that teachers design to make students use their key skills to make sense of, apply, and transfer essential knowledge and understanding (Tomlinson, 2014). It refers to how students come to understand or make sense of the content or think through or use the requisite knowledge, understanding, and skills (Tomlinson and Marcia, 2013). Products are the channels or mechanism through which students demonstrate and extend what they have learned. Teachers are required to provide several options for students to develop their final product or complete assessments that are authentic. These product options must be based on students' interests so that they can link what they have learned to something important and relevant to them. Teachers can ask students to construct their product formats; however, the learning outcome that they need to demonstrate remains constant across all options (Algozzine and Anderson, 2007; Tomlinson, 2014).

Lastly, the learning environment is expected to be modified for successful teaching and learning. In particular, teachers are expected to alter the classroom environment to ensure that all students are successfully included in the learning activities. This also encompasses the ability of teachers to use the right tone to communicate with students, foster collaboration among students, ensure the availability of resources, and the ability to use culturally responsive teaching pedagogy.

In this study, a synergy between the six components may be needed to paint a clear picture of teachers' competence in the use of differentiation. The reasoning here was that the ability of teacher educators to incorporate DI strategies to address pre-service teachers' needs, interests, and learning styles in their teaching could have a profound impact on the pre-service teachers in their future classroom teaching. This reasoning is in line with constructivist learning theory whereby the learner takes important lessons from the differentiated learning experiences provided by the teacher educators.

## 3 Teachers' implementation of DI

It is important to state here that there is a limited body of knowledge on teachers' DI-related competence. The extant literature has established that both pre-service and beginning teachers acknowledge the importance of DI in addressing the diverse needs of students in inclusive classrooms, although they find its implementation challenging (Brevik et al., 2018). Pre-service teachers view DI planning as time-consuming, requiring more work and energy than typical instruction (Goodnough, 2010; Aldossari, 2018). Others feel that it would be difficult to analyze formative assessment data and meet the needs of advanced and struggling learners effectively and consistently through DI (Dack, 2019). Other challenges that constrain teachers' usage of DI include high student–teacher classroom ratios, lack of educational equipment and instruments, classroom layouts that are not suitable for DI, high student-teacher ratios, heavy workload, and lack of teaching skills (Aldossari, 2018).

Another challenge preventing teachers from making effective use of DI is the lack of adequate knowledge and in-depth understanding of the model's underlying conceptual principles and the specific practical strategies required to translate it into practice (McCray and McHatton, 2011; Santangelo and Tomlinson, 2012). In a study by Goodnough (2010), pre-service teachers had little to no understanding of the philosophy of DI before taking a corresponding course. This is consistent with the findings of Nepal et al. (2021) in their qualitative study exploring Australian pre-service teachers' understanding of DI and the related concepts of inclusion and diversity. The study found that pre-service teachers demonstrated a predominantly narrow understanding of differentiation, interpreting it as an instructional strategy for adapting teaching to support struggling learners. In addition, the findings revealed that diversity was generally interpreted as referring to 'others' and that inclusion was described as a strategy to bring 'other' people into mainstream classrooms.

The lack of exposure of pre-service teachers to the comprehensive model of DI in teacher education programs results in their lack of adequate knowledge and in-depth understanding of its conceptual principles and specific practical strategies. This raises concerns about how effectively teacher education programs and teacher educators are preparing pre-service teachers for teaching in classrooms with increasingly diverse and complex student populations. According to Santangelo and Tomlinson (2012), it is contradictory for teacher educators to advocate for teacher candidates to use progressive, responsive, and learner-centered approaches such as DI but then use traditional, often ineffective, one-size-fits-all instruction. Santangelo and Tomlinson (2012) cited Darling-Hammond (2010) and Grossman et al. (2000) by reiterating the growing consensus that the dominant standardized, decontextualized, and didactic approaches to teaching and learning in teacher education lack efficacy.

To address this contradiction, several authors have advanced that teacher educators are not only expected to educate pre-service teachers about DI but are also expected to model the comprehensive framework of DI to them (Santangelo and Tomlinson, 2009; Dack, 2019). However, a study by Santangelo and Tomlinson, (2012) that explored teacher educators' perception and use of DI practices in a public university located in the middle-Atlantic region of the United States found that a comprehensive framework of differentiation was not being modeled by teacher educators for pre-service teachers, as teacher educators placed little value on and infrequently assessed pre-service teachers' readiness, interests, and learning profiles. Furthermore, they did not model how the content, process, and product could be differentiated to address the needs of all pre-service teachers (Santangelo and Tomlinson, 2012). Santangelo and Tomlinson (2009) maintained that the expansion of the use of DI could only be realized if teacher educators endorsed the philosophy, understood the model, and gained proficiency with a wide variety of instructional strategies. Teacher educators modeling DI practices will help prepare pre-service teachers for the wide levels of readiness they will encounter among students in contemporary classrooms. Modeling in teacher education is critical in promoting teacher candidates' understanding of specific instructional behaviors and strategies,

promoting positive changes in schools, and improving teacher educators' teaching (Santangelo and Tomlinson, 2012; Dack, 2019). Surprisingly, while some research has been carried out on the role of teacher education programs and teacher educators in preparing effective inclusive teachers (Nketsia et al., 2016, 2020), no studies have examined teacher educators' perceived usage of DI practices in teacher training institutions in Ghana. In addition, Tomlinson's (2005) comprehensive model of DI as a conceptual framework, has not been applied to study teacher educators' perceived usage of DI practices in teacher training institutions in Ghana. Consequently, this study advances empirical research and theory in this area.

### 3.1 Current study: aim and hypotheses

In 2015, Ghana adopted a policy on inclusive education to address the diverse educational needs of all children. The policy stated that the diverse educational needs of all Ghanaian school children attending regular education schools must be addressed through the use of DI approaches (Ministry of Education, 2015). Teacher education has long been identified as important to teacher preparation for the implementation of inclusive education (Nketsia et al., 2020). In Ghana, there is a dual teacher preparation track: university-level teacher preparation for all levels of education and basic education teacher preparation in colleges of education (Opoku et al., 2021). It is useful to mention here that Ghana has a three/four-tiered education structure: basic education (early childhood and grades 1–9), senior high (grade 10–12) school, and tertiary levels.

In the 2018/2019 academic year, the initial teacher education program for basic schoolteachers in the colleges of education in Ghana was upgraded from a three-year diploma program in basic education to a four-year Bachelor of Education degree program. More importantly, the government of Ghana in collaboration with Transforming Teacher Education and Learning in Ghana (T-TEL) developed a new national teacher education curriculum framework to guide the implementation of the four-year Bachelor of Education degree curriculum. These reforms seek to produce competent teachers who are sensitive to the needs of vulnerable groups, including girls and those with special educational needs and disabilities, and fully prepared to use a learner-centered pedagogy and an inclusive approach (Ministry of Education, 2015). However, less is known about teacher educators' understanding of the concept of DI and their preparedness to adopt it to address the diverse learning needs of students.

Existing studies on DI have mainly focused on either pre-service or in-service teachers (Goodnough, 2010; Aldossari, 2018; Brevik et al., 2018; Dack, 2019). In particular, limited attention has been paid to teacher educators' usage of DI in teacher preparation. The few studies that have used Tomlinson's (2005) comprehensive model of DI as a conceptual framework to study teacher educators' perceived usage of DI practices in teacher training institutions (Santangelo and Tomlinson, 2012) failed to establish whether Tomlinson's comprehensive model of differentiation framework is supported within the research context and did not examine the relationship between the components of Tomlinson's comprehensive model of differentiation framework. Also, the fidelity of Tomlinson's comprehensive model of differentiation framework is yet to be explored in non-Western contexts such as Ghana. The main aim of this study is to explore teacher educators' competence in the utilization of differentiation in their teaching. The teacher educators' ratings were compared to those of their pre-service students. In this study, the following hypotheses were suggested:

> Hypothesis I: The six components of Tomlinson's comprehensive model of differentiation framework will be supported in the Ghanaian context.
>
> Hypothesis II: There will be a relationship between the components of Tomlinson's comprehensive model of differentiation framework in the Ghanaian context.
>
> Hypothesis III: Participant type (teacher educator vs. pre-service students) will emerge as a moderator of the relationship between the two domains of differentiation: strategy and readiness.

To test the above hypotheses, the following research questions will be answered:

1. Will Tomlinson's comprehensive model of differentiation framework be supported in the Ghanaian context?
2. What are teacher educators' perceptions about the use of DI in Ghana?
3. Is there a difference between the perceptions of the pre-service teachers and teacher educators about the use of DI in colleges of education in Ghana?

## 4 Methods

### 4.1 Study participants

The study reported here drew on teacher educators and pre-service students recruited from four of the 38 public colleges of education in Ghana: College A situated in the Ahafo Region, College B in the Eastern Region, College C in the Northeast Region, and College D in the Western North Region. The colleges were selected based on convenience. The participants were guided by the following pre-set inclusion/exclusion criteria: (a) either a student or teacher educator in the four colleges who (b) is able to read in English; (c) understands DI; and (d) has the capacity to consent and participate in this study.

A total of 1,002 participants were recruited (119 teacher educators and 883 pre-service teachers) from four colleges of education in Ghana. The demographic information of the teacher educators is presented in Table 1. Among the teacher educator participants, 82% were male, while 18% were female. A majority of the teacher educators (54%) were between 40 and 49 years old, and most of them had a master's degree qualification (97%) as their highest educational certificate (see Table 1 for details).

The demographic characteristics of the pre-service teachers ($n = 883$) are presented in Table 2. Altogether, 60% of them were male and 40% female. More than half of them (57%) were at least 23 years old compared to 9 % who were at most 19 years old. A majority of them (59%) studied humanities (i.e., languages and social science-related courses), while 11% studied vocational and technical programs.

TABLE 1 Demographic characteristics of participants (teacher educators).

| Characteristic | *n* | % |
|---|---|---|
| Gender | | |
| Male | 98 | 82 |
| Female | 21 | 18 |
| Age | | |
| 29 and below | 5 | 4 |
| 30–39 | 26 | 22 |
| 40–49 | 64 | 54 |
| 50 years and above | 24 | 20 |
| Department | | |
| Humanities | 56 | 47 |
| Vocational studies | 14 | 12 |
| STEM | 49 | 41 |
| Highest qualification | | |
| Bachelor's degree | 4 | 3 |
| Master's degree | 115 | 97 |
| College teaching experience | | |
| 1–5 years | 31 | 26 |
| 6–10 years | 27 | 23 |
| 11–15 years | 27 | 23 |
| 16 years and above | 34 | 28 |
| Disability in class | | |
| Yes | 62 | 52 |
| No | 57 | 48 |
| Differentiated instruction | | |
| Yes | 66 | 56 |
| No | 53 | 44 |
| Inclusive education | | |
| Yes | 76 | 64 |
| No | 43 | 36 |

TABLE 2 Demographic characteristics of participants (pre-service teachers).

| Category ($N$ = 883) | *n* | % |
|---|---|---|
| Gender | | |
| Male | 531 | 60 |
| Female | 352 | 40 |
| Age | | |
| 19–20 | 82 | 9 |
| 21–22 | 299 | 34 |
| 23 years and above | 502 | 57 |
| Program | | |
| Humanities | 392 | 59 |
| Vocational studies | 94 | 11 |
| STEM | 268 | 30 |
| Level | | |
| First year | 192 | 22 |
| Second year | 256 | 29 |
| Third years | 222 | 25 |
| Fourth year | 213 | 24 |
| Disability in class | | |
| Yes | 386 | 44 |
| No | 497 | 56 |
| Differentiated instruction | | |
| Yes | 582 | 66 |
| No | 301 | 34 |
| Inclusive education | | |
| Yes | 779 | 88 |
| No | 104 | 12 |

## 4.2 Instrument

A two-part instrument was used for the data collection. Section one collected the participants' demographic information (see Tables 1, 2). Section two was adapted from the DI Scale (DIS) developed by Tomlinson (2005) based on the comprehensive model of differentiation framework. This is a multidimensional scale consisting of 60 items. The scale is comprised of seven sub-scales categorized into two main domains: instructional strategies and student readiness. The student readiness domain comprises three sub-scales: readiness (12 items), interests (3 items), and learning profile (6 items). The readiness domain is anchored on a five-point Likert scale, with responses ranging from strongly disagree (1) to strongly agree (5). The second domain, which focuses on the use of DI strategies, included four sub-scales: content (15 items), process/product (15 items), learning profile (6 items), and assessment (3 items).

The DI scale has recorded acceptable reliability in assessments of teachers and students in Portugal (Gaitas and Martins, 2017) and the United States (Santangelo and Tomlinson, 2012). In adapting the scale for the current study, some of the items were reworded to suit the study context [see De Vellis (2003) and Tomlinson (2005)].

Slight adaptations were made to the instrument to make it suitable for teacher educators and pre-service teachers (see Table 3). Face validation was checked to ensure that the items were not ambiguous. All items on the adapted DIS were anchored on a five-point Likert scale, with responses ranging from strongly disagree (1) to strongly agree (5). A composite mean of at least 4 suggested teacher educators' perceived competence in the adoption of DI.

## 4.3 Procedure

The study and its protocols were approved by the e Human Research Ethics Committee of Western Sydney University (H14956), Australia, and the Ghana Tertiary Education Commission. Four colleges were conveniently selected based on ease of access and the availability of the participants to the research assistants recruited to collect the data from the schools. Written consent was then obtained from all the principals of the participating colleges. Two research assistants met the teacher educators and pre-service teachers in their

TABLE 3 Summary of perceived level of DI.

| | Items | *M* | *SD* |
|---|---|---|---|
| | Content | 3.98 | 0.66 |
| C2 | I/our tutors use text materials that present content at varying levels of complexity. | 3.99 | 0.96 |
| C3 | I/our tutors allow students to select from multiple text options (e.g., read one of three). | 3.89 | 1.04 |
| C11 | I/our tutors use strategies to support comprehension and retention of the content presented in text materials (e.g., chapter outlines, guided reading questions). | 4.07 | 0.92 |
| C12 | I/our tutors use strategies to support comprehension and retention of the content presented in class (e.g., lecture outlines, end-of-class summaries). | 4.06 | 0.92 |
| C15 | I/our tutors solicit students' feedback to help select/adjust the content presented within a given semester | 3.90 | 1.06 |
| | Process/product | 3.82 | 0.84 |
| PP4 | I/our tutors allow each student to select his/her preferred grouping format (e.g., work independently or with a partner). | 3.69 | 1.23 |
| PP12 | I/our tutors create enrichment opportunities for students who complete activities/assignments with minimal effort. | 3.77 | 1.10 |
| PP15 | I/our tutors solicit students' feedback to help create/adjust activities/assignments used within a given semester. | 3.98 | 1.07 |
| | Learning environment | 3.97 | 0.76 |
| LE4 | I/our tutors take deliberate efforts to ensure students participate consistently and equitably during class. | 4.13 | 0.94 |
| LE5 | I/our tutors take deliberate efforts to enhance students' attitudes/motivation toward course content. | 3.97 | 1.00 |
| LE6 | I/tutors follow up privately on behaviors or circumstances of concern (e.g., absences, low grades, and conflict between Students). | 3.77 | 1.18 |
| | Student readiness | 3.97 | 0.76 |
| R6 | There is a strong link between students'/our academic skills and their/our course performance. | 3.88 | 1.04 |
| R7 | My/Our understanding of differences in individual students' basic academic skills impacts what/how I/we teach/learn | 4.09 | 0.94 |
| R9 | My/Our understanding of the differences in individual students' study skills impacts what/how I/we teach/learn. | 3.93 | 1.02 |
| | Interest | 3.96 | 0.77 |
| I1 | Students in my/our courses differ significantly in their interests with regard to course content. | 3.95 | 1.00 |
| I2 | There is a strong link between students'/our interests and their/our course performance. | 3.96 | 0.96 |
| I3 | My/Our understanding of the differences in individual students' interests impacts what/how I/we teach/learn. | 3.97 | 1.01 |
| | Learning profile | 3.95 | 0.74 |
| LP1 | Students in my/our courses differ significantly in their preferred learning modalities (e.g., visual, auditory or kinesthetic; active or passive; multiple intelligence, preferences). | 3.98 | 1.04 |
| LP2 | There is a strong link between students'/our learning modalities and their/our course performance. | 3.93 | 0.99 |
| LP3 | My/Our understanding of differences in individual students'/our learning modalities impacts what/how I/we teach/learn. | 3.96 | 1.01 |
| LP6 | My/Our understanding of differences in individual students'/our grouping orientations impacts what/how I/we teach/learn | 3.93 | 0.99 |

respective colleges to inform them about the study. Following this, the research assistants delivered printed questions to the teacher educators and pre-service teachers. A designated sealed box was placed in the staff and student common rooms for the participants to deposit the survey after completion.

The data were collected in English – the medium of instruction at all school levels in Ghana. The survey contained cover letters detailing the purpose of the research, ethical procedures guiding the study, and guidelines for completing the survey. The participants were given 2 weeks to complete the survey. Consent was implied, and the participants were informed that they were free to withdraw from the study at any time without notice to the researchers. They were neither reimbursed nor offered incentives for their participation. They were also assured that neither their identity nor the name of their school would be used in the reporting of the study.

## 4.4 Data analysis

The completed questionnaires were audited before being entered into SPSS for analysis. Based on central tendency theory, the data were presumed to be normally distributed because of the large sample size (Field, 2013).

To answer research question 1, confirmatory factor analysis (CFA) was computed to determine the validity of the DIS and its fidelity in a non-Western context. The following cut-offs were used to

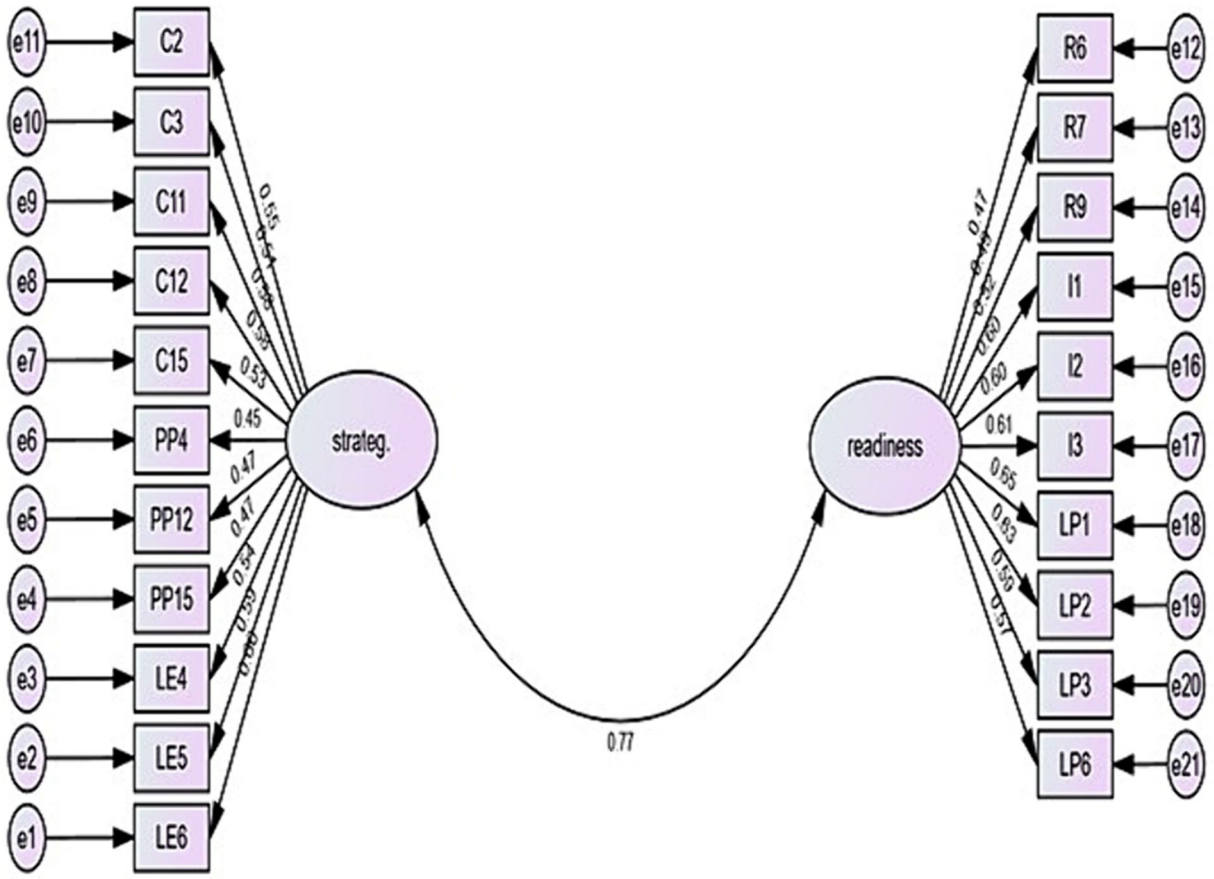


FIGURE 1
Summary of the model with appropriate fit indices.

determine the appropriateness of the data: chi-square ≤ 5, a comparative fit index (CFI) and Tucker–Lewis index (TLI) of 0.95 or greater, a root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) of between 0.03 and 0.08, and a regression weight of at least 0.50 (Hu and Bentler, 1999; Byrne, 2016; Schumacker and Lomax, 2016). For unacceptable values, modification indices were used to ascertain erroneous covariances between the items. While some of the items were correlated, some were removed to improve the fit indices (Byrne, 2016). Subsequently, the correlation between the sub-scales was observed as follows: small (0.10–0.30), moderate (0.31–0.50), and large (at least 0.51).

For research question 2, means were first computed to determine the level of understanding of DI among the teacher educators. Afterward, a *t*-test was computed to explore the difference between the pre-service teachers and teacher educators. The assumption of homogeneity of variance was observed to ensure that it was not violated.

For research question 3, Hayes's (2015) process Model 1 was used to explore the influence of participation type on the relationship between strategy and readiness. Beliefs about strategies were operationalized as the dependent variable, and beliefs about readiness were used as the independent variable. Participant type (teacher educators vs. pre-service teachers) was used as moderators, and the following were set: bootstrapping at 5,000, a bias confidence interval of 95%, and a significance level of 0.05 at most.

# 5 Results

## 5.1 Fidelity of comprehensive framework

The DI scale was subjected to CFA. An initial computation showed a poorly fit and unacceptable model: chi-square = 5.49 (CMIN = 6,180, df = 1,126), CFI = 0.73, TLI = 0.75, RMSEA = 0.07, and SRMR = 0.06. However, iterate moderation and deletion of items with erroneous correlations helped improve the fit indices: chi-square = 2.56 (CMIN = 607.48, df = 237), CFI = 0.94, TLI = 0.93, RMSEA = 0.04, and SRMR = 0.04 (see Figure 1), with beliefs about readiness yielding 10 items and beliefs about teaching strategies yielding 11 items.

Concerning the sub-scales, the CFA was as follows: chi-square = 2.33 (CMIN = 405.75, d = 174), TLI = 0.95, CFI = 0.96, RMSEA = 0.04, and SRMR = 0.04. The items on the sub-scales were as follows: strategies (content = 5, process = 3, learning environment = 3) and beliefs about readiness (students' readiness = 3, interests = 3, learning profile = 4) (see Figure 2).

The reliability of the scale using Cronbach's alpha was as follows: beliefs about readiness, 0.83, and beliefs about teaching strategies, 0.81. The reliability of the total scale was 0.88. The reliability of the sub-scales was as follows: content = 0.70, process = 0.60, learning environment = 0.65, students' readiness = 0.64, interests = 0.68, learning profile = 0.72.

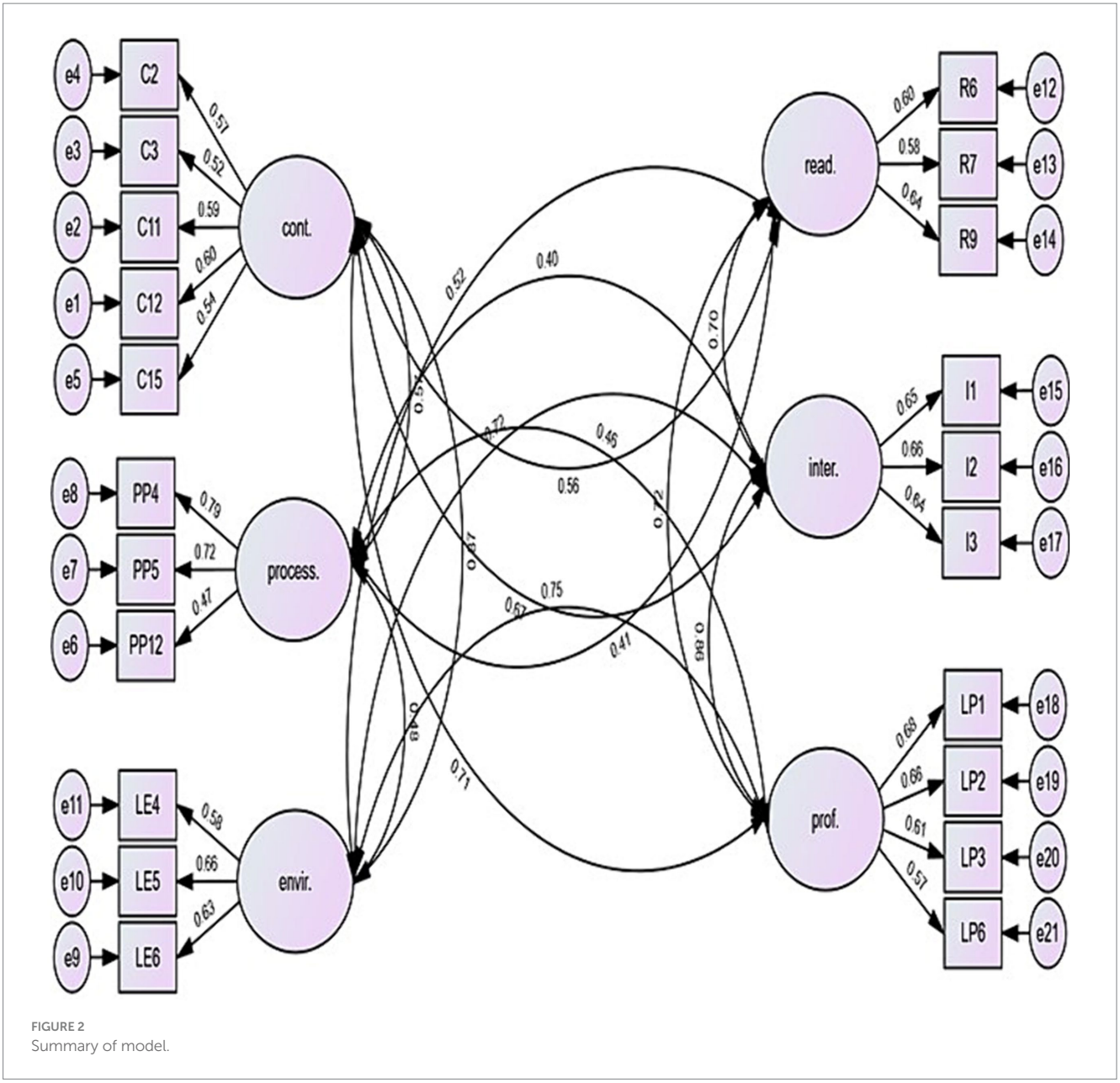


FIGURE 2
Summary of model.

The results also showed a high correlation between the domains, beliefs about readiness, and beliefs about teaching strategies ($r = 0.77$). Concerning the sub-scales, the results showed a moderate to large correlation between the latent variables (see Figure 2).

## 5.2 Perceived level of understanding of DI

Means were computed to understand the perceptions of teacher educators and pre-service teachers about the teacher educators' usage of DI. The total mean scores of the DIS was 3.94 (0.56). Regarding the two domains, the means were as follows: beliefs about readiness ($M = 3.96$, $SD = 0.67$) and beliefs about strategies, ($M = 3.93$, $SD = 0.61$) (see Table 3 for the means of the sub-scales and individual items).

A simple *t*-test was computed to understand the difference between teacher educators and pre-service teachers on each DI domain. The results showed a significant difference between the participants on overall DI, $t(210.97) = -3.25$, $p = 0.001$, Cohen's $d = 0.22$. The mean scores showed that the teacher educators' ($M = 4.05$, $SD = 0.36$) DI-related self-ratings were higher than the ratings provided by their pre-service students ($M = 3.93$, $SD = 0.58$).

Differences were also observed in the domains: beliefs about readiness [$t(198.10) = -2.72$, $p = 0.007$, Cohen's $d = 0.20$], and beliefs about strategies [$t(198.10) = -2.80$, $p = 0.006$, Cohen's $d = 0.21$]. The mean scores showed that the teacher educators' (beliefs about strategies, $M = 4.05$, $SD = 0.44$; beliefs about readiness, $M = 4.07$, $SD = 0.43$) self-ratings were higher for each of the domains compared to the ratings of their pre-service students (beliefs about strategies, $M = 3.91$, $SD = 0.63$; beliefs about readiness, $M = 3.94$, $SD = 0.65$).

Similar observations were made on the following sub-scales: content [$t(198.20) = -3.68$, $p = 0.001$, Cohen's $d = 0.27$]; learning environment [$t(172.55) = -2.84$, $p = 0.005$, Cohen's $d = 0.23$]; student

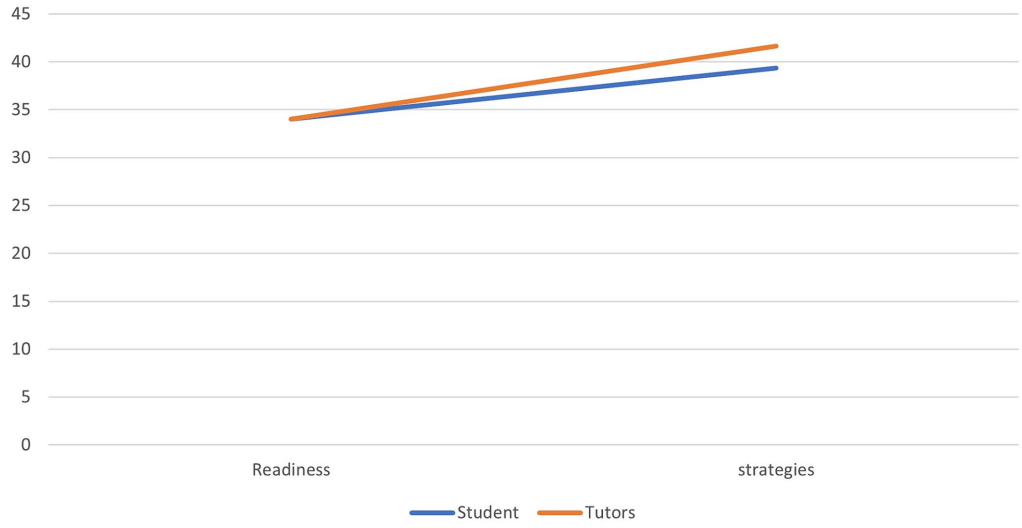


FIGURE 3
Interaction between participant type on DI.

readiness [$t(172.55) = -2.84$, $p = 0.003$, Cohen's $d = 0.23$]; and interest [$t(198.56) = -3.70$, $p = 0.001$, Cohen's $d = 0.27$]. The teacher educators rated themselves more highly on content, learning environment, student readiness, and interest compared to the ratings from the student teachers. However, no difference was found between the participants on process/product [$t(1000) = 1.28$, $p = 0.20$, Cohen's $d = 0.13$] and learner profile [$t(195.98) = -0.39$, $p = 0.70$, Cohen's $d = 0.03$].

## 5.3 Moderation effects of participant type on DI

Hayes's (2015) model was used to estimate the effect of participant type (teacher educators vs. pre-service students) on the relationship between the domains (beliefs about readiness and beliefs about strategies). Beliefs about strategies were operationalized as the dependent variable, and beliefs about readiness were used as the independent variable. Participant type was also used as a moderator.

The results showed a direct effect of participant type on beliefs about strategies, $b = 11.29$, $p = 0.02$, 95% [2.10, 20.48]. Similarly, readiness had a direct effect on strategies, $b = 0.95$, $p = 0.001$, 95% CI [0.71, 1.19]. Participant type had a significant interaction effect on the relationship between beliefs about readiness and beliefs about strategies, $b = -0.26$, $p = 0.02$, 95% CI [−0.49, −0.04]. Participant type and beliefs about readiness made only a 3% significant contribution to the variance in beliefs about strategies. However, the contribution of beliefs about readiness in the variance in beliefs about strategies was 40%.

Individually, if the participants were pre-service students, the interaction between beliefs about readiness and beliefs about strategies was significant, $b = 0.68$, $p = 0.001$, 95% CI [0.63, 0.74]. Similarly, if they were teacher educators, the interaction between beliefs about readiness and beliefs about strategies was significant, $b = 0.42$, $p = 0.0002$, 95% CI [0.20, 0.64]. Figure 3 shows that when perception was low, the teacher educators and pre-service students did not differ in terms of readiness. However, as perception increased, the teacher educators scored higher on perceived strategies than their student teachers.

# 6 Discussion

The purpose of this study was to explore the competence of teacher educators regarding the usage of DI in the classroom. This was achieved with both teacher educators and their students (pre-service teachers) rating their competence in the usage of DI during teaching. The researchers reasoned that the competence of teacher educators in the implementation of DI could be a valuable learning experience for future teachers. Hypothesis I was proven by the study findings, with Tomlinson's comprehensive model of DI supported in an African setting. This is the first study to support Tomlinson's comprehensive model of DI in a context. Another finding that stands out from the results reported earlier is that the model confirmed that DI is a multidimensional and interrelated construct (content, process, learning environment, readiness, interest, and learning profile). These results have corroborated the idea of Santangelo and Tomlinson (2012) who argued that fidelity to an instructional model or approach is necessary to achieve its expected benefits. In an effort toward implementing inclusive education, teachers need to develop an in-depth understanding of each of the constructs before they can support all students in the classroom. Teachers in Ghana are unable to provide effective teaching services to all children, especially those with disabilities, in regular classrooms (Nketsia et al., 2020). The findings provide some indication that training in the comprehensive model of DI could go a long way to enable them to meet the learning needs of all students in regular classrooms.

The study findings also supported Hypothesis II, with a moderate to high correlation between the domains or sub-scales of the comprehensive model. Most importantly, a high correlation and the moderation computation showed the contribution of readiness to the variance in strategies. This result further supports the argument by Santangelo and Tomlinson (2012) that a model of differentiation

should reflect the interdependence between environment, curriculum, assessment, and instruction. Santangelo and Tomlinson (2012) identified a critical gap between formative assessment and instructional plan because most of their participants indicated they do not regularly assess pre-service teachers; readiness levels, interests, or learning profile characteristics. The current investigation has empirically found the interdependence between environment, curriculum, assessment, and instruction. This arguably suggests that before teacher educators in Ghana can implement DI in their classrooms, they need to be trained on the importance of using daily formative assessment to gather information about student readiness (varied readiness needs, varied interests, and preferred approaches to learning) to enable them to effectively modify the content, process, product, and/or learning environment for their students. This aligns with the proposition that understanding the learner is the first stage toward meeting their learning needs (Tomlinson, 2014). In Ghana, teachers have been found to lack understanding of student diversity, with negative impacts on teaching and learning processes (Opoku et al., 2015; Naami and Mort, 2023). It would be fair to argue that the foundation of DI exposes educators to individual differences and ways in which to become equipped with the pedagogical skills needed to modify the content and learning process to meet the needs of students. The training of teacher educators to enable them to develop an understanding of DI ought to consider the two domains.

An interesting pattern was observed in the mean rating of the teacher educators and their pre-service students. For instance, while the educators rated themselves highly on each of the sub-scales, the pre-service teachers were neutral on each sub-scale. There are existing findings regarding teacher education programs not having sufficient content on DI (Santangelo and Tomlinson, 2012; Dack, 2019). Moreover, there is extant literature on in-service teachers complaining about the mismatch between their theoretical knowledge and actual teaching practices (Smets and Struyven, 2020; Gibbs and McKay, 2021). It has been widely reported that Ghana's teacher education system places a greater premium on theoretical skills than practical skills (Nketsia et al., 2020). Thus, previous findings could hold in this study. While teacher educators may have pedagogical knowledge, they may struggle to provide practical guidance to their students. To better inform curriculum revision in Ghana, further investigation is needed to develop clear insight into the skillset and training needs of teacher educators.

The study findings provided empirical support for Hypothesis III, as participant type moderated the relationship between the strategies and readiness domains. The participant types did not differ in terms of readiness but did in terms of strategies. In the Ghanaian literature, it has been reported that even teachers in higher education prepare their lessons with little consideration of the needs of students with diverse needs and abilities (Odame et al., 2019). Consequently, more weight can be given to the ratings by the teacher educators and pre-service teachers. It can be inferred that the teacher educators did not modify the curriculum, process, and learning environment. One reason could be the large class sizes that the teacher educators may be handling (Aldossari, 2018; Valiandes and Neophytou, 2018), thereby leaving them little time to make modifications to their teaching. Another reason could be related to the nature of the teaching syllabus. The teacher educators have had to race against time to complete their syllabus and prepare students for external examinations (Nketsia et al., 2016, 2020). This could leave them with little time to ensure that the learning environment and process have been adapted to suit the needs of all students. Conversely, it could be argued that while the teacher educators might be using DI, they did not allow time to explain the procedures to their students. Nevertheless, follow-up studies could potentially develop clear insight into the experiences of both teacher educators and their pre-service students.

## 7 Study limitations

The study findings cannot be generalized because of some limitations. First, this study adopted convenience sampling to recruit participants from four of the 46 public and private colleges of education in Ghana. Teacher educators and pre-service teachers outside of the study scope could not contribute to this study. Future researchers could replicate the study in private colleges or recruit a wide range of participants to compare their findings with those of our study. Again, the results were derived based on self-report measures (surveys), and the addition of qualitative methods such as observations and interviews could have verified the claims made by the participants. Future researchers should consider mixed methods for data triangulation. Finally, although the study recruited a large sample, there were relatively few teacher educators compared to the pre-service teachers. Although differences in sample size might not have influenced the results, future studies should consider recruiting a similar or equal number of participant groups and conduct invariance testing to determine whether they have a similar understanding of the survey items.

## 8 Conclusion and implications for practice

The current study used Tomlinson's comprehensive DI model as a lens to assess the perceived competence of teacher educators about the usage of DI in classrooms. Teacher educators and their pre-service students rated the competence of the former. The study findings supported the three study hypotheses. First, the findings confirmed the tenets of the comprehensive DI model in the Ghanaian context. Furthermore, a relationship was found between the two domains of DI: strategies, and readiness. Moreover, participant type moderated the relationship between strategy and readiness. However, the overall ratings showed the ambivalence of the participants regarding DI. The teacher educators had higher self-ratings than the ratings provided by their pre-service students. Therefore, this study has filled an empirical and theoretical gap in establishing the fidelity of Tomlinson's comprehensive model of differentiation framework in non-Western contexts such as Ghana as well as the relationship between the components of Tomlinson's comprehensive model of differentiation framework.

Ghana has been struggling to adequately prepare teachers to practice inclusive education. This study focused on the skillset of those who are expected to train teachers for regular schools. The study was conducted on the foundation that trainees learn from their trainers and has provided some indication of the perceived competence of teacher educators concerning best inclusive pedagogies such as DI. The findings showed that each of the tenets (content, process, learning environment, readiness, interest, and learning profile) of DI could be vital in the future training of teacher educators. To better inform teacher development, there could

be follow-up engagement between teacher educators and pre-service students about gaps in terms of experiences and skills. Following this, appropriate DI curriculum models could be developed to train teacher educators involved in teacher development in Ghana. Moreover, teacher educators should be trained to use Tomlinson's comprehensive model of differentiation framework to model DI for pre-service teachers to ensure that they are prepared to include all students in mainstream settings using the DI approach.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

The studies involving humans were approved by Human Research Ethics Committee of Western Sydney University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

## Author contributions

WN: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. MO: Data curation, Formal analysis, Methodology, Validation, Visualization, Writing – review & editing. MA: Data curation, Formal analysis, Resources, Validation, Investigation, Writing – review & editing. WM: Supervision, Validation, Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## References

Aldossari, A. T. (2018). The challenges of using the differentiated instruction strategy: a case study in the general education stages in Saudi Arabia. *Int. Educ. Stud.* 11, 74–83. doi: 10.5539/ies.v11n4p74

Alegria, B., and Kelly-Williams, S. (2020). Improving practice: exploring the effectiveness of differentiated instruction in a standard 1 Belizean classroom. *Caribb. J. Educ.* 43, 24–46. doi: 10.46425/c024302m1662

Algozzine, B., and Anderson, K. M. (2007). Tips for teaching: differentiating instruction to include all students. *Prev. Sch. Fail. Altern. Educ. Child. Youth* 51, 49–54. doi: 10.3200/PSFL.51.3.49-54

Brevik, L. M., Gunnulfsen, A. E., and Renzulli, J. S. (2018). Student teachers' practice and experience with differentiated instruction for students with higher learning potential. *Teach. Teach. Educ.* 71, 34–45. doi: 10.1016/j.tate.2017.12.003

Byrne, B. M. (2016). *Structural equation modeling with AMOS: basic concepts, applications, and programming. (3rd)* Edn. New York: Routledge. doi: 10.4324/9781315757421

Dack, H. (2019). Understanding teacher candidate misconceptions and concerns about differentiated instruction. *Teach. Educ.* 54, 22–45. doi: 10.1080/08878730.2018.1485802

Darling-Hammond, L. (2010). Teacher education and the American future. *J. Teach. Educ.* 61, 35–47.

De Vellis, R. F. (2003). *Scale development: theory and applications*, vol. *26*. *2nd* Edn. Thousand Oaks, CA: Sage Publications.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. University of Sussex, United Kingdom: Sage Publications Ltd.

Gaitas, S., and Martins, M. A. (2017). Teacher perceived difficulty in implementing differentiated instructional strategies in primary school. *Int. J. Incl. Educ.* 21, 544–556. doi: 10.1080/13603116.2016.1223180

Gibbs, K., and McKay, L. (2021). Differentiated teaching practices of Australian mainstream classroom teachers: a systematic review and thematic analysis. *Int. J. Educ. Res.* 109:101799. doi: 10.1016/j.ijer.2021.101799

Goodnough, K. (2010). Investigating pre-service science teachers' developing professional knowledge through the lens of differentiated instruction. *Res. Sci. Educ.* 40, 239–265. doi: 10.1007/s11165-009-9120-6

Grossman, P. L., Valencia, S. W., Evans, K., Thompson, C., Martin, S., and Place, N. (2000). Transitions into teaching: Learning to teach writing in teacher education and beyond. *J. Literary Res.* 32, 631–662.

Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivar. Behav. Res.* 50, 1–22. doi: 10.1080/00273171.2014.962683

Hu, L. T., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model. Multidiscip. J.* 6, 1–55. doi: 10.1080/10705519909540118

Human Rights Watch (2012). *World report*: Human Rights. New York, United States of America: Human Rights Watch.

McCray, E. D., and McHatton, P. A. (2011). "Less afraid to have them in my classroom": understanding pre-service general educators' perceptions about inclusion. *Teach. Educ. Q.* 38, 135–155,

Ministry of Education (2015). *Inclusive education policy*. Republic of Ghana: Ministry of Education.

Naami, A., and Mort, K. S.-T. (2023). Inclusive education in Ghana: how prepared are the teachers? *Front. Educ.* 8:1056630. doi: 10.3389/feduc.2023.1056630

Nepal, S., Walker, S., and Dillon-Wallace, J. (2021). How do Australian pre-service teachers understand differentiated instruction and associated concepts of inclusion and diversity? *Int. J. Incl. Educ.* 28, 109–123. doi: 10.1080/13603116.2021.1916111

Nketsia, W., Opoku, M. P., Saloviita, T., and Tracey, D. (2020). Teacher educators' and teacher trainees' perspective on teacher training for sustainable development. *J. Teach. Educ. Sustain.* 22, 49–65. doi: 10.2478/jtes-2020-0005

Nketsia, W., Saloviita, T., and Gyimah, E. K. (2016). Teacher educators' views on inclusive education and teacher preparation in Ghana. *Int. J. Whole Sch.* 12, 1–18,

Odame, L., Osei-Hwedie, B., Nketsia, W., Opoku, M. P., and Nanor Arthur, B. (2019). University preparation and the work capabilities of visually impaired graduates in Ghana: a tracer study. *Int. J. Incl. Educ.* 25, 1287–1304. doi: 10.1080/13603116.2019.1609102

Opoku, M. P., Badu, E., Amponteng, M., and Agyei-Okyere, E. (2015). Inclusive education at the crossroads in Ashanti and Brong Ahafo regions in Ghana: Target not achievable by 2015. *Disabil. CBR Inclusive Dev.* 26, 63–78. doi: 10.5463/dcid.v26i1.401

Opoku, M. P., Nketsia, W., Alzyoudi, M., Dogbe, J. A., and Agyei-Okyere, E. (2021). Twin-track approach to teacher training in Ghana: exploring the moderation effect of demographic variables on pre-service teachers' attitudes towards inclusive education. *Educ. Psychol.* 41, 358–377. doi: 10.1080/01443410.2020.1724888

Organisation for Economic Cooperation and Development (2018). *Preparing our youth for an inclusive and sustainable world: the OECD PISA global competence framework*. Paris, France: OECD Publishing.

Pozas, M., Letzel, V., Lindner, K.-T., and Schwab, S. (2021). DI (differentiated instruction) does matter! The effects of DI on secondary school students' well-being, social inclusion and academic self-concept. *Front. Educ* 6:729027. doi: 10.3389/feduc.2021.729027

Santangelo, T., and Tomlinson, C. A. (2009). The application of differentiated instruction in postsecondary environments: benefits, challenges, and future directions. *Int. J. Teach. Learn. High. Educ.* 20, 307–323,

Santangelo, T., and Tomlinson, C. A. (2012). Teacher Educators' perceptions and use of differentiated instruction practices: an exploratory investigation. *Action Teach. Educ.* 34, 309–327. doi: 10.1080/01626620.2012.717032

Schumacker, E., and Lomax, G. (2016). *A Beginner's guide to structural equation modeling. 4th* Edn. New York: Routledge.

Smale-Jacobse, A. E., Meijer, A., Helms-Lorenz, M., and Maulana, R. (2019). Differentiated instruction in secondary education: a systematic review of research evidence. *Front. Psychol.* 10, 23–66. doi: 10.3389/fpsyg.2019.02366

Smets, W., and Struyven, K. (2020). A teachers' professional development programme to implement differentiated instruction in secondary education: how far do teachers reach? *Cogent Educ.* 7:1742273. doi: 10.1080/2331186X.2020.1742273

Subban, P., Bradford, B., Sharma, U., Loreman, T., Avramidis, E., Kullmann, H., et al. (2023). Does it really take a village to raise a child? Reflections on the need for collective responsibility in inclusive education. *Eur. J. Spec. Needs Educ.* 38, 291–302. doi: 10.1080/08856257.2022.2059632

Tomlinson, C. A. (2005). *The differentiated classroom: responding to the needs of all learners*. Upper Saddle River, NJ: Pearson Education.

Tomlinson, C. A. (2014). *The differentiated classroom. 2nd* Edn. Alexandria, VA: Association of Supervision and Curriculum Development.

Tomlinson, C. A., and Imbeau, M. B. (2023). *Leading and managing a differentiated classroom*. Arlington, Virginia: ASCD.

Tomlinson, C. A., and Jarvis, J. M. (2023). "Differentiation: making curriculum work for all students through responsive planning & instruction" in *Systems and models for developing programs for the gifted and talented*. J. S. Renzulli et al., (Eds), (New York: Routledge), 599–628.

Tomlinson, C. A., and Marcia, B. I. (2013). *Leading and managing a differentiated classroom*: Association for Supervision and Curriculum Development.

UNESCO (1994). *The Salamanca statement and framework for action on special needs education*. Spain: Paris, UNESCO/Ministry of Education.

United Nations (2007). *Convention on the rights of persons with disabilities*. New York, NY: United Nations.

United Nations (2016). *Transforming our world: the 2030 agenda for sustainable development*. New York, NY: United Nations.

Valiandes, S., and Neophytou, L. (2018). Teachers' professional development for differentiated instruction in mixed-ability classrooms: investigating the impact of a development program on teachers' professional learning and on students' achievement. *Teach. Dev.* 22, 123–138. doi: 10.1080/13664530.2017.1338196

Woodcock, S., Sharma, U., Subban, P., and Hitches, E. (2022). Teacher self-efficacy and inclusive education practices: rethinking teachers' engagement with inclusive practices. *Teach. Teach. Educ.* 117, 103802–103812. doi: 10.1016/j.tate.2022.103802