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Productive Dispositions of Non-formal Basic Education School Teachers Regarding Teaching Mathematics in Punjab, Pakistan

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ABSTRACT

Productive dispositions are an essential dimension of teacher competence because they influence instructional practices. Although mathematics teachers' competence has traditionally been examined through knowledge & understanding and performance& skills, limited attention has been given to teachers' productive dispositions, particularly within non-formal education settings. This study investigates the productive dispositions demonstrated by non-formal basic education (NFBE) teachers regarding teaching mathematics in Punjab, Pakistan. A descriptive research design was employed using structured interviews with 30 NFBE teachers using the proportionate cluster sampling technique. The interview protocol was developed around five dimensions of professional disposition: enthusiasm, self-confidence, perseverance, reflective and contextualized mathematics teaching practice, and willingness to share. Data were analysed through deductive thematic analysis by organizing participants' responses into predefined themes and codes. Results of the structured interview show that non-formal teachers generally demonstrated productive dispositions that contribute to teaching of mathematics in the context of non-formal education, despite teaching in resource-constrained environments.

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Introduction

Mathematics is widely recognized as a fundamental component of quality education because it develops logical reasoning, problem-solving, critical thinking, and decision-making skills of an individual that are essential for lifelong learning and socioeconomic development (OECD, 2023; UNESCO, 2024). Although curriculum reforms, instructional resources, and assessment systems contribute to mathematics achievement, teachers remain the most influential factor affecting mathematics learning. Their competence determines not only how mathematical concepts are taught but also how students experience mathematics in the classroom (Darling-Hammond, 2022; Hattie, 2023).

Teacher competence has traditionally been defined in terms of subject knowledge, pedagogical knowledge, classroom management, and assessment skills. However, contemporary research increasingly recognizes that effective teaching is not only determined by the pedagogical content knowledge but also depends on teachers' productive dispositions, including their beliefs, attitudes, values, commitments, and behavioural tendencies that shape instructional quality and student interaction (Council for the Accreditation of Educator Preparation [CAEP], 2022; Sockett, 2023). These dispositions influence how teachers motivate students, respond to learning difficulties, establish supportive classroom environments, adapt instruction, and engage in continuous professional improvement. These characteristics are more essential in non-formal classrooms, where teachers have to experience anxiety, negative attitudes towards math, and low confidence. A disposition that can be developed through appropriate instructional support and classroom experiences (National Council of Teachers of Mathematics [NCTM], 2023).

Teachers who demonstrate enthusiasm, patience, encouragement, reflective practice, and collaborative teaching are more likely to reduce mathematics anxiety, promote productive struggle, and improve students' conceptual understanding (Boaler, 2022; Keller et al., 2022). Conversely, negative teacher attitudes, excessive reliance on punishment, and inflexible instructional practices may discourage participation and reinforce students' beliefs that mathematics is difficult.

The significance of productive dispositions becomes even more evident in non-formal basic education (NFBE). In Pakistan, NFBE schools provide educational opportunities for out-of-school children who are excluded from formal education due to poverty, child labor, geographical isolation, migration, and other socioeconomic challenges. These schools often operate with limited resources, multigrade classrooms, irregular attendance patterns, and learners with diverse educational backgrounds, requiring teachers to demonstrate adaptability, resilience, and strong professional commitment to maximize learning despite challenging circumstances (UNESCO, 2024). Understanding the productive dispositions of teachers provides valuable insights into the competencies required for effective teaching of mathematics in marginalized educational contexts.

Recent international literature highlights that productive dispositions are an essential dimension of teacher competence. Research has shown the positive influence of teacher enthusiasm, reflective practice, collaborative learning, and growth-oriented teaching on students' mathematical engagement and achievement (Anthony & Hunter, 2022; Cai et al., 2022; Hattie, 2023). Nevertheless, empirical evidence regarding teachers' productive dispositions in developing countries remains limited, particularly in non-formal education. In Pakistan, existing studies have largely focused on curriculum implementation, pedagogical practices, mathematics anxiety, teacher content knowledge, and students' achievement, while comparatively little attention has been given to the productive dispositions that shape teachers' everyday instructional practices to teach mathematics, especially in non-formal schools.

The literature review identifies productive

dispositions, including enthusiasm, self-confidence, perseverance, reflective teaching, contextualized instruction, and collaborative learning act as essential components of teaching mathematics. Existing research examined these dispositions within the formal school context, but empirical evidence from non-formal education settings remains scarce. In Pakistan has primarily focused on pedagogical practices, curriculum implementation, mathematics achievement, and teacher knowledge, with comparatively little attention to teachers' productive dispositions. Furthermore, the present study addresses this gap by investigating these productive dispositions in the context of teaching mathematics in Punjab, Pakistan. The study contributes to a broader understanding of teacher competence and provides empirical evidence to inform teacher education, professional development, and policy initiatives aimed at improving mathematics teaching in non-formal education settings.

Conceptual Framework

The theoretical lineage is depicted as: Non-Formal Teachers' Standards → Standard 1: Teaching and Learning Competency → Disposition dimension → Rohman et al. (2023) → Five Productive Disposition Indicators → Interview questions → Deductive coding → Subcodes and parallel codes.

The operational definition of each theme is given below: Enthusiasm is defined as teachers' positive attitude, creating interactive learning experiences, and recognition of students' achievements. Self-confidence is defined as teachers' ability to create supportive learning environments that strengthen teachers' mathematical confidence. Perseverance is defined as teachers' encouragement of persistence, support to struggling learners, and growth-oriented learning. Reflective and contextualized mathematics teaching practice is defined as teachers' continuous reflection and connection of mathematics with learners' everyday experiences. Willingness to share is defined as teachers' promotion of collaborative learning, classroom discussion, and teaching practices.

Research Question

What are the productive dispositions of non-formal basic education school teachers regarding teaching mathematics in the province of Punjab, Pakistan?

Research Methodology

Research Design and Approach

This study used a quantitative, descriptive research design to examine the productive dispositions of non-formal basic education (NFBE) teachers regarding teaching mathematics in Punjab, Pakistan.

Population

The population comprised all male and female teachers working in non-formal basic education (NFBE) schools in Punjab province, operating under the Punjab Literacy and Non-Formal Basic Education Department, Government of Punjab. 18662 NFE schools are working in 36 districts of Punjab. The target population comprises all the male and female teachers teaching in three districts from three different regions of Punjab, including Bahawalpur district from the south region, Nankana Sahib district from the central region, and Jhelum district from the north region. The accessible population consisted of teachers from one tehsil from three districts (Ahmadpur from Bahawalpur, Nankana Sahib city from Nankana Sahib, and Pind Dadan Khan from Jhelum) from three different regions of Punjab, Pakistan.

Sample and Sampling Technique

The multistage proportionate cluster sampling technique was used to extract a sample from the population. The random sampling technique was used to select three districts of Punjab. A non-random purposive sampling technique was used to select tehsils, and then a proportionate cluster sampling technique was used to select 40 percent of NFE teachers. Stratification of data was made based on gender to account for data factors. Then 10 percent of the participants were selected from the given data of each tehsil. In this way, a sample of 30 NFE teachers was selected for a structured interview.

Purposive sampling was considered appropriate because participants were intentionally selected based on their experience of teaching mathematics in non-formal basic education schools. Only teachers who met the following criteria were included: currently teaching mathematics in NFBE schools; had teaching experience in non-formal education; were willing to participate voluntarily; represented different schools within Punjab. Purposive sampling enabled the researcher to collect information from teachers who possessed direct experience of teaching mathematics within the non-formal education context.

Research Instrument

Data were collected through a structured interview protocol developed from the productive disposition framework proposed by Rohman et al. (2023). The validated instruments were available to assess teachers' knowledge and performance, but no standardized interview protocol was identified for assessing the disposition dimension of the teachers. The structured interview was designed to measure five dimensions of teachers' productive dispositions regarding teaching 5th-grade mathematics based on indicators of Rohman et al. (2023). It includes enthusiasm, self-confidence, perseverance, reflective and contextualized mathematics teaching practice, and willingness to share. The structured format ensured that every participant received identical interview questions, thereby improving consistency and comparability of responses. Content validity of the structured interview protocol was established through expert review by mathematics education, teacher education, and a technical expert.

Data Collection and Analysis

Data were collected through a structured interview from 30 NFE teachers about productive disposition. Formal permission was obtained from the concerned district education officers (DEOs). Participants were informed about the purpose of the study. Interviews were conducted in their native language to facilitate the accurate expression of their views. With participant permission, interviews were audio recorded and then transcribed and analyzed using deductive thematic analysis. Participant responses were repeatedly reviewed according to predefined codes and themes: enthusiasm, self-confidence, perseverance, reflective and contextualized mathematics teaching practice, and willingness to share. Meaningful text segments were first coded using the predefined coding scheme. During analysis, additional sub-codes and inductive codes or parallel codes were incorporated where participants' responses extended beyond the initial framework due to mutually exclusive categories of themes. The findings were summarized to identify common patterns and variations in teachers' productive dispositions, with representative quotations included to illustrate each theme while maintaining participants' anonymity through identification codes (P1-P30). Ethical principles were followed throughout the study by ensuring voluntary participation, confidentiality, anonymity, and secure storage of interview recordings and transcripts, which were used exclusively for research purposes.

Findings

Theme 1: Enthusiasm

Code: 1 Teacher Attitude Toward Mathematics

The findings revealed considerable variation in teachers' attitudes towards teaching mathematics. Most teachers expressed a positive attitude toward teaching mathematics, which was influenced less by their personal preference for mathematics and more by students' engagement and learning success. Despite these negative experiences, they emphasized their professional responsibility to teach mathematics effectively. Positive and negative attitudes toward teaching mathematics are prior sub-codes, and mixed/conditional attitude toward teaching math is a parallel code.

Teacher P13 showed enthusiasm, stating, *"I feel happy to teach Math. I like math"*. Teacher P16 stated: *"I feel very happy when students understand mathematics. When they understand the concept, I*

enjoy teaching it even more". Similarly, another teacher, P3, explained: *"I feel good when students give positive responses. If they do not even try, then I do not feel satisfied."* Teacher P6 remarked: *"I don't like mathematics, but I have to teach it honestly. If I don't understand something, I learn it from YouTube before teaching my students"*. Another participant, P19, shared: *"Mathematics gives me anxiety because I did not continue studying it after matriculation, but I still try my best because it is my duty."*

Code: 2 Engagement & Interactive Learning

Another important indicator of enthusiasm was engagement and interactive learning, in which teachers' commitment to making mathematics interesting and understandable for students. Teachers frequently incorporated learner-centred instructional approaches: interactive learning experiences, hands-on activities, real-life examples, and differentiated instruction to engage learners with different ability levels, which are deductive sub-codes of a structured interview. Few teachers reported that students' interaction develops through scaffolded instruction, seating arrangements, native language, and positive reinforcement, which promote more interaction among students. Parallel codes are seating arrangements and native language,

Teacher P21 explained about differentiated instruction, *"I use different methods for all three categories of students: a very intelligent student who can understand a difficult concept, an average student who does not understand it, and I have to find an easier way to teach them how to do it."* Teacher P3 said about interactive learning, *"Make them group so that all students learn from each other, learn from a brilliant student. I will teach the brilliant one again if they do not learn to teach their fellow."* Teacher P14 gave several real-life examples: *"I count money, buy and sell, calculate, measure in meters and km, watch time, and give daily life examples."* Participant P10 described a scaffolded approach: *"I give them less work until they complete it with proper understanding."* Teacher P4 explained that a positive reinforcement is: *"If a struggling student gives a correct answer, then ask others to clap for him/her and give stars on his/her face."* Participant P1 explained about activity-based teaching: *"I first teach through activities using lines, pencils, and counting materials. After students understand practically, I move towards written questions."* Teacher P4 stated about the seating arrangements, *"Those students who lack interest in math are seated in the front row, and conduct cross-questioning with them."* Teacher P30 explained the supportive learning: *"Children learn rapidly when they are taught with love, but when they are taught with anger, they get nervous."* Teacher P29 explained a language adaptation approach: *"I teach in Urdu simply; our textbook is written in English."*

Code: 3 Recognizing and Celebrating Progress

The findings of the data revealed that teachers consistently recognize and celebrate students' progress and achievements through prior sub-codes of clapping, material rewards (candy, snacks, and gifts), recognizing students by giving them medals, cups, and certificates, visual recognition marks like stars, and verbal encouragement to sustain students' motivation and interest in mathematics. They believed that acknowledging the efforts of learners encouraged continued participation. But some participants additionally reported parallel codes that are positive comparison, differentiated recognition based on effort Level, and calling parent-teacher meetings for recognition, neighborhood, and community recognition increase students' success rate.

Teacher P3 shared this experience of using clapping to encourage others: *"Clap for him, encourage others by making him an example."* Teacher P5 described using material reward: *"Give candy as motivation; if he got candy, then I can also perform well to get it and try to do work quickly."* Teacher P7 gave "stars on their copies and faces" as visual recognition marks. *Teacher P6 explained that he/she gave '20 rupees for good work.* Teacher P2 said that she uses *"encouraging words, " such as " very good, excellent," and "saying greeting words; congratulations for verbal*

encouragement and praise." Teacher P1 described giving *"medals and cups based on progress and regularity.* "Teacher P3 described using positive comparison: *"Encourage others by making him an example that if he can do than you can also perform well. Then, other students try to perform better.* "Teacher P17 gave differentiated recognition based on effort level: *"I cannot say that one student is very good and another is dull to discourage others. If some students perform well, then I give a star or a good on copies and say, ' You did well with your struggle. If a student made little effort, I tell them to you did effort but need more effort."* Participant P20 stated: *"When students perform well, I call their parents and tell them about their improvement. Parents become happy, and children become more motivated."*

Theme 2: Self-Confidence

Code: 1 Building Student Confidence

In the second indicator of self-confidence, the findings revealed that non-formal mathematics teachers regarded self-confidence as a prerequisite for successful mathematics learning and intentionally adopted instructional strategies that strengthened students' belief in their own mathematical abilities. Participants consistently reported prior sub-codes of encouragement, scaffolded instruction, activity-based learning, contextualized learning, differentiated instruction, active board participation, peer tutoring, and creating a friendly environment that consistently builds students' confidence. Few teachers encourage students to use collaborative learning, negative reinforcement, and active board participation. The parallel codes also included contextualized learning, differentiated instruction, negative reinforcement, and active board participation; they were not previously designed for deductive coding.

Participant P14 explained encouragement: *"If the child says that he cannot do it, I tell him that he can do it with practice. I never discourage him because confidence develops when children believe they can succeed."*. Similarly, another participant P5 stated: *"I always remind students that nothing is impossible. If other students can solve the question, then they can also learn it with effort."* Participant P20 explained Active board participation: *"When children solve questions on the board by themselves, they become proud of their work and more confident in mathematics."* Participant P1 stated Scaffolded instruction: *"I teach one-digit questions first, then two digits, and only after students understand those concepts do I move to more difficult questions."* Participant P11 reported Activity-based learning: *"Children become confident when they first perform mathematics through activities because they can see the answer practically before writing it."* Participant P13 used Negative reinforcement: *"Sometimes I become strict, but I never want children to lose confidence. If they become afraid, they stop asking questions."* Participant P18 explained Contextualized learning: *"Children become confident because they already use money at home. When mathematics is connected with daily life, they realize they already know many concepts."* Participant P17 stated Differentiated instruction: *Every child cannot learn at the same speed. I teach according to their level so that everyone develops confidence."*

Code: 2 Creating a Safe & Supportive Learning Environment

Many participants create a safe & supportive learning environment through supportive learning environment, activity-based learning, physical environment, and psychological safety. Few teachers reported that negative reinforcement, self-belief, gender-based and age-based seating segregation, equal treatment and non-discrimination, and parental communication are essential. Parallel sub-codes include: gender-based and age-based seating segregation, equal treatment and non-discrimination, and parental communication.

Participant P2 explained a supportive learning environment: *"Students ask me questions freely because they know I will explain again without becoming angry."* Participant P2 remarked on self-belief: *"I never tell students that they cannot do mathematics. I always encourage them because once children lose confidence, they stop trying."* Another participant, P15, gave psychological

safety: *"Children should not be afraid of the teacher. If they are comfortable with me, they ask questions and learn better."* Participant P4 made it clear that: *"Set rules of not laughing at other students. If I ask a question to one student, other students can not interrupt to show that I have more knowledge."* Participant P26 described activity-based learning: *"We are all students. I sit with them to play games."* Participant P14 described *"locking the classroom door to ensure their physical safety."* Participant P25 also mentioned that *"there was separate seating for younger and older students."* Participant P1 explained several methods of negative reinforcement, including: *"Give fear of punishment. Call the child with an angry voice, say 'bind your hands and close your feet and drop your head'. Stare at children.* Participant P1 described the seating arrangement as *"boys with boys and girls with girls."* Participant P1 emphasized treating all students equally, *"Share your things with your fellows who have no pencil, etc. Don't hate others if your fellow has dirty clothes."*

Theme 3: Perseverance

Code: 1 Developing Perseverance

The third indicator is perseverance, where the findings revealed that non-formal mathematics teachers viewed perseverance as an essential productive disposition that enables students to continue learning despite experiencing difficulties in mathematics. The majority of teachers promote perseverance in students through scaffolded instruction, motivation, peer-assisted learning, and differentiated support strategies. Few teachers reported that productive struggle, fear reduction, instructional materials, negative reinforcement, and parental communication are also important to promote perseverance in students. Parallel sub-codes include: differentiated support state, negative reinforcement, and parental communication.

Participant P1 explained Scaffolded instruction: *"I first teach one-digit questions, then two digits, and gradually move toward difficult concepts. When students master each step, they become willing to continue learning."* Similarly, another participant, P7, stated: *"If children cannot solve a question today, I continue explaining it tomorrow until they understand. I never leave them without learning the concept."* Participant P17 used statements for motivation such as *"You can do it," "Keep trying,"* and *"Nothing is impossible,"*. Participant P5 described productive struggle: *"Whenever students say that they cannot solve mathematics, I tell them that they can do it if they keep practicing."* Participant P3 explained productive struggle: *"Sometimes I deliberately erase my own solution and solve it again. When students see that even teachers struggle, they become more willing to continue trying."* Participant P21 stated Peer-assisted learning: *If a student understands the concept well, I ask him to explain it to weaker students because they learn more comfortably from each other."* Participant P17 explained Instructional materials: *"When students did not understand HCF and LCM from the board, I showed them videos on a laptop. After watching, they understood much better."* Participant P29 Differentiated support strategies: *"Every child has a different pace. I teach according to their level because forcing difficult work only discourages them."* Participant P12 explained Negative reinforcement: *Sometimes I become strict, but I never want children to stop trying because of fear."* Participant P27 stated Parental communication: *If a child continues struggling, I discuss it with parents so that we can help the student together."*

Code 2: Growth Mindset

Most teachers have a growth mindset to encourage students to see mistakes as opportunities for learning rather than failures. They also believe that mistakes are inevitable due to their young age. Few teachers also say that mistakes should not happen and use negative reinforcement. According to them, mistakes can be reduced by giving a supportive learning environment, using practice as a correction strategy, step-by-step teaching to identify mistakes, using concrete examples, and constructive feedback. Parallel sub-codes include: using concrete examples, and mistakes are inevitable due to their young age.

Participant P22 explained Mistakes as a learning

opportunity: *"Children should make mistakes because that is how they learn. If they never make mistakes, we cannot know what they need to improve."* Teacher P4 stated Supportive learning environment: *I never discourage students after mistakes. Instead, I explain the concept again until they understand."* Teacher P1 explained practice as a correction strategy: *"Teach on the board, 'Give work to repeat 10 times."* Teacher P11 spoke about a step-by-step approach to identifying mistakes: *"If they can't do a question, then I say to them, I guide them to solve it at that step, and they can do it easily."* Teacher P17 had a very strict viewpoint, saying, *"Students who concentrate on math do not make mistakes. But students who do not concentrate on math, they always make mistakes. Mistakes should not occur in math if your concept is clear."* Teacher P19 said, *"I sometimes punish them. If students make mistakes, I repeat the lesson for a day and then punish them the next day to write it."* Teacher P15 gave constructive feedback by providing extra time for students who were struggling: *"If he makes a mistake with the next question, then I guide him to correct the previous question."* Teacher P4 described using concrete objects for division: *"Ask them to divide 4 concrete objects (books, pencils) among 4 students in division questions. Now, how many are left if each student has one book?"*

Code: 3 Support for struggling students

Most strategies used by NFE teachers to support students struggling with math are remedial support, emotional encouragement, and basic concepts clarity (tables, basic operations). Few teachers use other strategies of reduced tasks for workload management, peer-assisted learning, contextualized examples, adaptive instruction, negative reinforcement, and teacher as facilitator. Parallel sub-codes include: peer-assisted learning, contextualized examples, adaptive instruction, negative reinforcement, and teacher as facilitator.

Participant P2 explained remedial support: *"I give extra time after school because weak students need more practice than others."* Teacher P7 reinforced the emotional encouragement: *"Children are taught with love that there is nothing in the world that a person can't do. Whatever you try, you will do it. If you make them believe that you can do it, then you do it."* Teacher P11 described a basic concepts clarity: *"Those who do not have a good grasp of the basics of math, I will check their understanding level to improve further. I start from step by step, move them from addition to subtraction to multiplication, from lowest to highest tables, from one digit to two to three-to-four-digit questions."* Participant P19 explained peer-assisted learning: *"Sometimes students understand better from classmates because they are not afraid to ask them questions."* Teacher P9 remarked on workload management: *"If a child can solve only one question correctly today, I consider that success. Tomorrow we will move further."* Teacher P13 used contextualized examples: *"For subtraction, you have 10 rupees, you purchase a pencil for 5 rupees, how much do you have left?"* Teacher P23 uses adaptive instruction: *"Every student has different abilities and levels of interest; I teach them accordingly."* Teacher P9 described the teacher role as a facilitator and *rejected the pressure-based approach of his own teachers' use.*

Theme 4: Reflective and Contextualized Mathematics Teaching Practice

Code: 1 Application of Math Concepts

The fourth indicator is reflective and contextualized mathematics teaching practice that measures how teachers connect math concepts to real-life situations relevant to their students. The majority of teachers use examples of transactional numeracy, like (shopping, purchasing, and money exchange), use measurement & spatial numeracy, savings, and tell the necessity of math. But fewer teachers use examples of intergenerational financial mediation, entrepreneurial thinking, temporal numeracy (time telling, duration calculation), domestic numeracy, cultural and religious importance of mathematics, and differentiated learning. Parallel sub-codes include: the necessity of math, the cultural and religious importance of mathematics, and differentiated learning.

Participant P1 explained transactional numeracy: *"If students know that a pencil costs twenty rupees*

and they have fifty rupees, they immediately understand subtraction by calculating how much money remains." Similarly, another teacher, P16, stated: *"When children go to the market, they must calculate money correctly; otherwise, they can easily be cheated. That is why mathematics is important in their daily lives."*

Participant P12 remarked on domestic numeracy: *"Parents often ask educated children to count money at home because they themselves cannot calculate accurately."* Participant P4 explained entrepreneurial thinking: *"If students buy something for fifteen rupees and sell it for seventeen, they can calculate their profit. These examples prepare them for future business."* Teacher P13 illustrated a saving approach by explaining: *"If you save ten rupees every day for thirty days, how much money will you have at the end of the month?"* Participant P3 stated temporal numeracy: *"If students leave home at seven fifteen and arrive at school at seven forty-five, they calculate the time themselves."* Teacher P24 remarked on measurement & spatial numeracy: *"When families buy milk, vegetables, or wheat, they always use measurements. So, children understand these concepts quickly because they already see them every day."* Participant P30 stated the necessity of math: *"Without mathematics, life becomes very difficult because every job requires calculations."* Participant P17 explained: *"Mathematics is present in every home. We calculate expenses, cooking ingredients, and shopping every day."*

Code: 2 Reflective Teaching Practices

The second aspect of this theme focused on teachers' reflective practices. Participants consistently described monitoring students' learning during lessons and modifying instruction whenever learners experienced difficulty. The majority of teachers reflect on and improve their math teaching practices, and they are open to asking questions, using instructional adaptation, through time management, and self-reflection. Fewer teachers show resistance to change in teaching methods, and report that they notice non-verbal cues, use reciprocal teaching between the teacher and the students to identify their misconceptions, and adapt language, use professional learning, continuous improvement, and enthusiasm. Parallel sub-codes include: language adaptation, professional learning, continuous improvement, enthusiasm, and time management.

Participant P2 explained non-verbal cues: *"Students' faces tell me whether they understand. If they look confused, I know I need another explanation."* Teacher P12 explicitly opens by asking students to evaluate his teaching: *"I ask them to tell me how I should teach you."* Teacher P9 explained, self-reflected: *"When the kids start feeling tired, I think that I have taught them more today. I think that I shouldn't do this to them in the future."* Participant P2 remarked on reciprocal teaching: *"Sometimes I pretend that I forgot the solution and ask students to teach me. They become excited and explain everything correctly."* Participant P18 stated instructional adaptation: *"If students cannot understand my explanation, I search YouTube for another teaching method before the next lesson."* Participant P29 explained language adaptation: *"If children cannot understand English explanations, I immediately teach the same concept in Urdu or Punjabi."* Participant P16 explained professional learning: *"Training changed my teaching completely. Before training, I taught verbally, but now I use activities and group learning."*

Theme 5: Willingness to Share

Code: 1 Student Participation and Discussion

The fifth indicator is willingness to share, where the findings revealed that non-formal mathematics teachers deliberately fostered students' willingness to share mathematical ideas. The majority of teachers use different methods to encourage student participation and discussion in math lessons by creating a friendly classroom environment, using group-based learning, cross-questioning & Socratic dialogue, activity-based learning, and reciprocal teaching. Few teachers reward and recognition-based motivation, intentionally demonstrate mistakes for students' participation, prior knowledge activation, learning

from personal experience, and fear-based teaching. Parallel sub-codes include: intentionally demonstrating mistakes for students' participation, prior knowledge activation, learning from personal experience, and fear-based teaching.

Participant P23 explained how to create a friendly classroom environment: *"Students should never hesitate to ask questions. I tell them they can ask me again and again until they understand."* Similarly, another participant, P18, stated: *"I become like a friend to my students because fear reduces participation, while friendliness encourages discussion."* Participant P2 remarked on group-based learning: *"I divide students into groups and ask each group to solve the same question. Afterwards, they explain their answers to the whole class"*. Similarly, another teacher, P13, explained: *"Students learn better when they work together because they explain concepts to each other using simple language."* Participant P5 stated cross-questioning & Socratic dialogue: *"After explaining the question, I ask students to teach me the same method. When they become the teacher, they remember the concept much better"* Teacher P3 explained Reciprocal teaching: *"I ask students why multiplication starts from the right side instead of simply telling them the rule."* Participant P14 stated Reward and recognition-based motivation: *I reward students who answer questions correctly because other children also become interested in participating."* Participant P21 explained activity-based learning: *"Children participate much more when they are involved in activities rather than only listening to explanations."* Participant P3 explained intentionally demonstrating mistakes for students' participation: *"Sometimes I intentionally solve the question incorrectly so that students identify my mistake. Then I know they are paying attention."* Participant P10 remarked on Prior knowledge activation: *"Before starting today's lesson, I always ask what students already know. Then they become interested in learning the new topic."* Participant P22 explained Teacher learning from personal experience: *When I was a student, I was afraid to ask questions because my teachers were very strict. That is why I encourage my students to ask anything freely."*

Code: 2 Collaborative Learning

Collaborative learning emerged as a second major aspect of willingness to share. The majority of NFE teachers promote collaborative learning among students in their classroom by peer tutoring, cooperative learning & shared accountability, and competitive group motivation. Few teachers reported that peer assessment, multi-grade classroom management, relationship building and trust development, addressing negative peer dynamics, and collaborative math problem-solving are also important for collaborative learning. Parallel sub-codes include: multi-grade classroom management, relationship building and trust development, addressing negative peer dynamics, and collaborative math problem-solving, which are also important for collaborative learning.

Participant P19 stated Peer tutoring: *Brilliant students teach weaker students because sometimes children understand classmates better than teachers"*. Participant P4 explained Cooperative learning and shared accountability: *When groups receive the same marks, students help each other because everyone succeeds together."* Participant P15 stated Competitive group motivation: *Each group tries to finish first, but they also help each other because they all want their group to win."* Participant P5 explained multi-grade classroom management: *"While I teach one class, students in another class listen to each other's work and help one another until I return."* Participant P20 explained Relationship building and trust development: *"Some children make fun of others instead of helping them, so we teach them to respect and support every classmate."* Participant P7 observed: *"Children share their problems more openly with friends because they do not feel embarrassed."*

Discussion

The findings of this study indicate that teachers' productive dispositions extend beyond content knowledge and instructional skills to include enthusiasm, self-confidence, perseverance, reflective and contextualized teaching practices,

and willingness to share knowledge through collaborative learning.

Teacher enthusiasm is recognized as a significant predictor of students' engagement, motivation, and achievement in mathematics. It reflects teachers' commitment, dedication, passion, and genuine interest in facilitating learning rather than merely positive emotions (Keller et al., 2022). Enthusiastic teachers are more likely to employ learner-centred approaches, including activity-based learning, questioning, collaborative tasks, games, and contextualized examples that sustain students' interest and improve conceptual comprehension (OECD, 2023).

Research further indicates that enthusiastic teachers use positive reinforcement such as praise, classroom recognition, and constructive feedback to encourage participation and strengthen learners' intrinsic motivation (Ryan & Deci, 2020). Recent research indicates that teacher enthusiasm positively influences students' motivation, academic engagement, classroom participation, and achievement in mathematics (Frenzel et al., 2021). Positive attitudes of teacher emotions are often transmitted to students through classroom interactions, resulting in greater interest in mathematics and reduced mathematics anxiety. Even teachers with limited confidence in mathematics often demonstrate strong professional commitment by improving their instructional practices through self-directed learning and continuous professional development (UNESCO, 2024). However, evidence regarding teacher enthusiasm in non-formal education settings remains limited, particularly in developing countries.

Teachers' productive dispositions play an important role in developing students' mathematical confidence. According to Albert Bandura's Social Cognitive Theory, self-efficacy develops through learning experiences, verbal encouragement, observation of successful peers, and emotionally supportive environments (Bandura, 1997; Schunk & DiBenedetto, 2021). Teachers who encourage questions, appreciate effort, and provide constructive feedback create psychologically safe classrooms that reduce mathematics anxiety and promote active participation (OECD, 2023).

Recent studies also emphasize the importance of activity-based learning, differentiated instruction, and peer collaboration in strengthening learners' confidence (National Council of Teachers of Mathematics [NCTM], 2023; Tomlinson, 2021). Likewise, preventing peer bullying, ensuring equal treatment, and maintaining positive communication with parents contribute to emotionally secure learning environments that encourage students to engage confidently in mathematics (UNICEF, 2022). Peer learning similarly contributes to confidence development. Another study indicates that students frequently feel more comfortable discussing misconceptions with classmates than directly approaching teachers (Johnson & Johnson, 2021). Limited research has explored how non-formal education teachers cultivate confidence among disadvantaged learners.

Perseverance is widely recognized as an essential disposition for teaching mathematics because mathematical understanding develops through sustained effort and continuous practice. Individuals with a growth mindset belief that mathematical ability develops through effort, are more likely to persist through challenges and view mistakes as opportunities for learning (Carol S. Dweck, 2006; Yeager et al., 2023). Teaching mathematics promotes perseverance by encouraging productive struggle, providing scaffolded instruction, offering constructive feedback, and supporting students emotionally during challenging learning tasks.

Recent empirical studies have shown that teachers who consistently communicate messages emphasizing effort, practice, and gradual improvement foster greater resilience and higher mathematics achievement among students (Boaler, 2022). Vygotsky's concept of the Zone of Proximal Development continues to inform differentiated mathematics instruction, suggesting that learners achieve greater success when teachers provide temporary support that

gradually decreases as competence develops (Shurr & Taber-Doughty, 2021). Little empirical evidence exists regarding how teachers working in Pakistan's non-formal education sector intentionally cultivate perseverance while teaching mathematics in multigrade and resource-constrained classrooms.

Reflective teaching enables teachers to evaluate instructional effectiveness and continuously improve classroom practice. According to Donald A. Schön (1983), reflective practitioners modify their teaching by evaluating instructional effectiveness, identifying learners' difficulties, modifying teaching strategies, and continuously improving classroom practice. Recent studies indicate that reflective teachers frequently adapt explanations, incorporate technology, simplify instruction, and modify assessment practices to improve students' understanding (Darling-Hammond, 2022; Hattie, 2023). Teachers frequently interpret learners' facial expressions, classroom participation, questioning patterns, assessment performance, and verbal responses as indicators of conceptual understanding (Farrell, 2021).

Contextualized mathematics teaching complements reflective practice by connecting mathematical concepts with learners' everyday experiences. Using examples from shopping, budgeting, measurement, agriculture, and household activities enables students to recognize the practical relevance of mathematics while improving conceptual understanding (Anthony & Hunter, 2022; Cai et al., 2022). These approaches are particularly valuable in non-formal education, where instruction often needs to address learners' immediate social and economic realities. Although international research strongly supports reflective and contextualized mathematics instruction, limited studies have investigated how non-formal basic education teachers integrate these practices while responding to the unique socioeconomic realities of disadvantaged learners in Pakistan.

Collaborative learning has become a central characteristic of effective mathematics instruction because it promotes discussion, reasoning, and shared problem-solving. Drawing on Lev Vygotsky's sociocultural theory, contemporary research emphasizes that mathematical understanding develops through social interaction, dialogue, and peer collaboration (Johnson & Johnson, 2021). Teachers who encourage questioning (NCTM, 2023), reciprocal teaching (Palincsar, 2021), peer tutoring, and group-based learning (Boaler, 2022) create classrooms where students confidently exchange ideas and learn from one another.

Recent evidence further suggests that collaborative learning strengthens mathematical reasoning, communication skills, confidence, and classroom engagement (Slavin, 2020; Liljedahl, 2021). Studies have noted that group activities may unintentionally reinforce peer dominance, unequal participation, or negative social interactions if teachers fail to monitor collaborative processes effectively (Gillies, 2021). However, teachers must also monitor peer interactions to prevent bullying and ensure equitable participation. Although collaborative learning has been widely examined in formal education settings, comparatively little research has explored how non-formal basic education teachers employ peer learning, reciprocal teaching, and cooperative problem-solving while managing multigrade classrooms with limited instructional resources.

Conclusion

This study examined the productive dispositions of non-formal basic education teachers regarding mathematics instruction in Punjab, Pakistan. The findings indicate that teachers' productive dispositions extend beyond content knowledge and instructional skills to include enthusiasm, self-confidence, perseverance, reflective and contextualized teaching practices, and willingness to share knowledge through collaborative learning. Results of the structured interview show that non-formal mathematics teachers have a variety of productive dispositions combined to contribute to effective mathematics teaching in the context of non-formal education despite the difficulties. In the first indicator of enthusiasm, the

majority of teachers show a positive attitude towards teaching mathematics. The majority of NFE teachers develop engagement and interaction of students through differentiated instruction, interactive learning experiences, hands-on activities, and real-life examples. Teachers recognize and celebrate students' progress and achievements mostly through clapping, material rewards (candy, snacks, and gifts), visual recognition marks like stars, and verbal encouragement. In the second indicator of self-confidence, the majority of NFE teachers build students' confidence through activity-based learning, contextualized learning, differentiated instruction, active board participation, peer tutoring, and by creating a friendly environment. The majority of teachers create a safe & supportive learning environment through supportive learning environment, activity-based learning, physical environment, and psychological safety. The third indicator is perseverance, in which the majority of teachers promote perseverance in students through scaffolded instruction, motivation, peer-assisted learning, and differentiated support strategies. Most teachers have a growth mindset to encourage students to see mistakes as opportunities for learning rather than failures. They also believe that mistakes are inevitable due to their young age. Most strategies used by NFE teachers to support students struggling with math are Remedial support, emotional encouragement, and basic concepts clarity (tables, basic operations). The fourth indicator is reflective and contextualized mathematics teaching practice that measures how teachers apply math concepts to real-life situations relevant to their students. The majority of teachers use examples of transactional numeracy, measurement & spatial numeracy, savings, and explain the necessity of math. The majority of teachers reflect on and improve their math teaching practices, and they are open to asking questions, using instructional adaptation, through time management, and self-reflection. The fifth indicator is willingness to share, in which the majority of teachers use different methods to encourage student participation and discussion in math lessons by creating a friendly classroom environment, using group-based learning, cross-questioning & Socratic dialogue, activity-based learning, and reciprocal teaching. The majority of NFE teachers promote collaborative learning among students in their classroom by peer tutoring, cooperative learning & shared accountability, and competitive group motivation.

The findings of this study have several limitations. This study was conducted on a relatively small sample of thirty NFE teachers, which limits the generalizability of the findings. The structured interviews enabled systematic data collection and relied on teachers' self-reported instructional practices rather than direct classroom observations. This study was conducted within the non-formal education sector; the findings may not fully represent productive dispositions among teachers working in formal schools.

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