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Preservice Teachers' Wellbeing in Mathematics Education

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Abstract: The study investigated first-year preservice teachers' affective, conative, cognitive, social, and physical wellbeing in a mathematics education subject at a regional university in Far North Queensland. Data collected included pre and post surveys with forty-nine preservice teachers, and interviews with preservice teachers and teacher educators. The pre and post surveys evaluated preservice teachers' belief statements about their wellbeing before and after a six-week module. Before the module, their belief statements suggested significant challenges. The post survey suggested an increased confidence with mathematics. Four themes that emerged from interview data analysis included the need to: address the emerging unbalanced wellbeing; address overlapping challenges for both preservice teachers and educators that negatively affect learning; understand that lack of challenges is detrimental to wellbeing balance; and develop guiding frameworks to address the emerging challenges. The paper discusses possible implications to the practice of teaching and learning in mathematics education and other subject areas.

Introduction

While teaching mathematics education to first-year preservice teachers in a Bachelor of Education primary degree at a regional university in Far North Queensland, the teacher educators observed that the preservice teachers seemed to display poor disposition, anxiety and a negative affect towards mathematics. This started a conversation among teacher educators on how to address first-year preservice teachers' poor attitudes and disposition towards mathematics. Hill and Seah (2022) argue that around the world, the prevalence of mathematics anxiety and disengagement point to a poor sense of student 'mathematical wellbeing' and define the concept as fulfilment of one's ultimate or core values, accompanied by positive feelings and functioning in mathematics education. Enhancing and fulfilling first-year preservice teachers' positive feelings, dispositions and functioning in mathematics education is essential as research suggests that these future teachers can transmit negative attitudes about mathematics to their future students. This can affect those future students' learning of mathematics (Clarkson et al., 2010; de Lourdes Mata et al., 2012). Hill et al. (2020) highlight that despite a growing focus in Australian education policy and practices on student wellbeing, there is very little attention exploring student and preservice teacher wellbeing within individual subject disciplines like mathematics.

Enhancing first-year preservice teachers' 'mathematical wellbeing' and addressing their poor levels of affect, resilience and dispositions towards mathematics can be a pre-requisite for their effective learning and future teaching of mathematics (Tait–McCutcheon, 2008; Seligman, 2012; Slavin et al., 2014; Caia et al., 2018). The Organisation for Economic Co-operation and Development [OECD] (2015) report suggests that learners need a balanced

set of cognitive, social, and emotional skills to succeed. Studies that have investigated predictors of learners' mathematics performance have focused mostly on cognitive skills and knowledge attainment. Despite the success of this line of work in explaining a sizeable amount of variance in mathematics performance (50–60%), a significant amount of variance remains unexplained (Caia et al., 2018). Explaining this significant amount of variance would require work that address other areas like wellbeing and disposition when learning mathematics. There is evidence that learners' affective and conative domains, and social skills can be cultivated and supported in learning and teaching practices (OECD, 2015; Slavin et al., 2014).

This study investigated first-year preservice teachers' affective, conative, cognitive, social, and physical wellbeing in mathematics education at a regional university in Far North Queensland. The affective domain involves beliefs in ability and skills and deals with the positive or negative emotional interpretation of perceptions, information, or knowledge. The conative domain involves tendencies to persist or exert effort and deals with the proactive as opposed to reactive aspect of behavior. It includes the personal, intentional, and striving components of motivation. The cognitive domain deals with the process of knowing and understanding; and the processes of making connections when encoding, processing, storing, and retrieving information (Huitt & Cain, 2005; Tait–McCutcheon, 2008). The next section discusses the construct of wellbeing adopted in this study.

A Construct of Wellbeing

The concept of wellbeing is complex and has many different impacts on learning across disciplines. Most researchers suggest that wellbeing is a multifaceted and multidimensional construct and highlight two broad categories of wellbeing: objective and subjective dimensions of wellbeing (Dodge et al., 2012; Seligman, 2012; Forgeard et al., 2011). The objective dimensions of wellbeing are generally considered as external to an individual and the subjective dimensions as internal to the individual. The subjective dimensions encompass factors such as happiness and accomplishment. This study will focus on the subjective aspects of wellbeing based on a person's perceptions, rather than objective dimensions. Although there is little consensus on any single definition of subjective aspects of wellbeing, Hill et al. (2020) highlight that there is a general agreement that subjective aspects of wellbeing can be conceptualised as feelings of flourishing, thriving and happiness; the idea that an individual is feeling good and functioning well. This means that a construct of wellbeing that encompasses the idea of feeling good and functioning well for preservice teachers in mathematics education is essential to enhance their professional learning and development.

The study adopted Dodge et al. (2012) construct of wellbeing that centre on a state of equilibrium or balance that can be affected by life events or challenges. This construct of wellbeing builds on perspectives such as the dynamic equilibrium theory of wellbeing (Headey & Wearing, 1989), the effect of life challenges on homeostasis (Cummins, 2010) and the lifespan model of development (Hendry & Kloep, 2002). The construct of wellbeing proposes that a change in wellbeing occurs when an individual deviates from their state of equilibrium or balance between the challenges the individual encounters, and the resources they can draw from to counter the challenges. The construct of wellbeing focuses on three key areas: the idea of a set point for wellbeing; the inevitability of equilibrium; and the fluctuating state between challenges and resources. This dynamic construct of wellbeing can be represented with the seesaw model (Figure 1) and considers wellbeing as the balance point

between the psychological, social, and physical challenges faced by an individual and the resources they can draw from to counter the challenges.

Figure 1: Representation of Wellbeing (Dodge et al., 2012)

In this study, the wellbeing balance point refers to a learner's psychological, social, and physical challenges they face with the mathematics education subject and the psychological, social and physical resources they can draw from to counter the challenges. The seesaw represents the drive of the individual learner to return to a set point for wellbeing. This dynamic construct of wellbeing also reflects the viewpoint that a lack of challenges could lead to stagnation, which affects the balance of the see-saw. The dynamic construct of wellbeing reflects several strengths: simplicity, universal application, optimism, and a basis for measurement (Dodge, 2016).

In this project, the psychological challenges and resources are conceptualised as the affective, conative, and cognitive (Tait–McCutcheon, 2008) challenges and resources. Thus, the wellbeing balance point refers to a learner's challenges (affective, conative, cognitive, social, and physical) they face in the mathematics education subject; and the resources (affective, conative, cognitive, social, and physical) they can draw from to counter the challenges. This means that, when learning mathematics education, the wellbeing construct adopted in the study represents the drive for the individual learner to return to a balance set point between the challenges (affective, conative, cognitive, social, and physical) they face and their resources (affective, conative, cognitive, social, and physical) to counter the challenges.

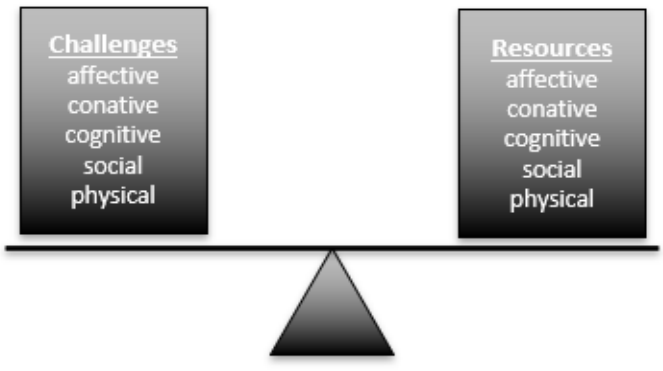

Figure 2: A Construct of Wellbeing

The construct of wellbeing encompasses the notion that the affective, conative, cognitive, social and physical wellbeing and capabilities are interconnected during the learning process (Dodge et al., 2012; Kloep et al., 2009). Addressing the interconnected challenges – resources construct of wellbeing is central when preservice teachers learn

mathematics education. Helping preservice teachers overcome the challenges they encounter when learning mathematics might require addressing their individual needs and resources pool, they can draw on to counter the emerging challenges. The study proposes that addressing this construct of wellbeing in mathematics education might enhance first-year preservice teachers' affective, conative, and cognitive wellbeing balance, as well as enhance their social and physical learning environments.

The notion of differentiation centres on addressing the needs of learners and has been a concern for educators and researchers for decades. According to Griful-Freixenet et al. (2020) differentiation refers to a design of inclusive teaching practice that reacts to the needs of students. In this way, an attempt is made to respond to specific needs of students within a class. Finkelstein et al. (2019) outline five observable aspects of inclusive practice that allow educators to design learning experiences that dismantle educational barriers for students. The five observable aspects include: collaboration and teamwork, instructional practices, organisational practices, social/emotional/behavioural practices and determining progress. Collaboration and teamwork include practices that involve the cooperation of teachers with other stakeholders. Instructional practice is concerned with teachers' creation and organisation of teaching and learning processes. Organisational practices include the modification of learning environments. The social/emotional/behavioural practices deal with how educators encourage positive classroom environments where students feel socially and emotionally included. Determining progress involves individualised assessment and monitoring of students' progress and achievements. This study proposes a design of inclusive teaching practice that focuses and monitors first-year preservice teachers' affective, conative, and cognitive wellbeing, as well as their social and physical learning environments.

The Study Methods

The study was underpinned by constructivism which positions learners as active creators of their own learning (Van de Walle et al., 2019). Swars et al. (2007) suggest that although many preservice teachers enter university programs with negative affect, resilience and dispositions, research has shown that the preservice teachers' learning, and beliefs can be influenced by teacher education programs. The research addressed the question: How can wellbeing of first-year preservice teachers be enhanced in mathematics education.

The site of the study was a first-year mathematics education subject in a preservice teacher education program. In the subject, preservice teachers reviewed mathematics from the *Early Years Learning Framework* and up to year 10 level in the *Australian Curriculum: Mathematics* from a teacher's perspective. The subject introduced preservice teachers to the numeracy demands of professional life and to those of the learning areas that comprise the *Australian Curriculum*. In the Australian educational context, a subtle distinction is made between numeracy and mathematics. Numeracy is conceptualised as a learner's capacity, confidence, and disposition to use mathematics in their daily life.

The first-year mathematics education subject commenced with a six-week module that unpacked dispositions towards learning mathematics; as well as wellbeing domains (Tait–McCutcheon, 2008). In the module, preservice teachers explored seminal incidents in their life experiences in mathematics and/or numeracy and used the six stages of Gibbs' reflective cycle: Description, Feeling, Evaluation, Analysis, Conclusion, and Action plan (Dye, 2011). The preservice teachers also investigated strategies they will use with their future students to: address mathematics anxiety, model positive attitudes towards mathematics, and plan enjoyable experiences that provide a pleasant level of challenge and enable student success. Preservice teachers explored the notion of wellbeing and articulated

the challenges they faced and the challenges their future students might encounter in mathematics and/or numeracy classrooms. The subject was also responsive to the characteristics of students and of the regional education contexts and priorities. This included preparation for working in schools with significant populations of Aboriginal and Torres Strait Islander students.

Ethics approval was sought and received from the institutional ethics committee prior to conducting the project (H7628). Following ethics approval, forty-nine preservice teachers who represented approximately 25% of the overall cohort and four teacher educators consented to participate. The research data collected included pre and post surveys with the preservice teachers, three focus group interviews with preservice teachers and open-ended interviews with four teacher educators. The pre survey (N = 49) was administered before the six-week module in the mathematics education subject. The post survey (N = 47) was administered after the six-week module. The survey comprised of Likert scale items and open-ended questions. The Likert scale items were developed and piloted with the teacher educators to gain feedback on clarity and ease of completion, and adjustments were made as a result. The survey and open-ended interviews asked pre-service teachers about their belief statements on their wellbeing domains, that is, their affective, conative, cognitive, social, and physical challenges and the resources pool they drew from when learning mathematics education. The three-focus group interviews with preservice teachers occurred after the module. The interviews with four teacher educators also occurred after the module and focused on how to enhance preservice teachers' wellbeing when learning mathematics education. Data analysis of the pre and post survey belief statements was achieved by using the Wilcoxon's signed-rank non-parametric test. Data analysis of the interviews from preservice teachers and teacher educators was achieved through thematic coding (Creswell, 2012). The following section describes the findings that emerged from the data analysis.

Results from Surveys

According to Triola (2008) when comparing two independent samples where the outcome is not normally distributed and the samples are small, a non-parametric test is most appropriate. The Wilcoxon's signed-rank non-parametric test was used to analyse the pre and post surveys using the medians of the group's responses. The test statistic Z equals -0.825, which is in the 95% region of acceptance. The pre and post surveys are represented in the tables below as percentages of responses of the Likert response categories of Strongly Agree (SA); Agree (A); Undecided (U); Disagree (D); Strongly Disagree (SD). The pre (N = 49) and post (N = 47) responses for survey statements are represented as a rounded percentage for SA, A, U, DA, SD. The median of the group's responses is underlined and shaded in grey. The percentages of group responses on the pre and post surveys for the cognitive, affective, conative, social, and physical wellbeing are discussed in the following sections.

Cognitive Wellbeing Responses

The percentage responses of preservice teachers' belief statements on pre and post surveys on cognitive wellbeing were analysed. Table 1 presents a summary of responses on cognitive wellbeing belief statements.

Survey Statement		SA	A	U	D	SD
1. Overall, I have challenges with understanding mathematics.	pre	19	42	4	31	4
	post	4	26	37	33	0
2. It is important to deal with challenges of understanding mathematics.	pre	69	15	14	2	0
	post	74	15	11	0	0
3. I have resources/support to deal with challenges of understanding mathematics.	pre	0	34	50	8	8
	post	22	55	19	4	0

Table 1: Percentage Responses on Cognitive Wellbeing

The cognitive wellbeing pre survey responses indicated that before the six-week module, 61% of preservice teachers agreed or strongly agreed that they had challenges with understanding mathematics; 84% agreed or strongly agreed that it was important for them to deal with the challenges; and only 34% agreed or strongly agreed that they had the resources or support to deal with the challenges. This result might indicate a lack of balance between the 'challenge with understanding mathematics' and the resources pool to deal with the challenges (Dodge et al., 2012). Importantly, 84% of preservice teachers in the pre survey indicated that it was important for them to deal with the challenges of understanding mathematics. This finding supported the need for introducing the six-week module to help the individual preservice teachers to address the 'challenges with understanding mathematics' they faced.

The cognitive wellbeing post survey indicated a decrease from 61% to 30% of preservice teachers who agreed or strongly agreed that they continued to have challenges with understanding mathematics after the six-week module. This result might be indicative of an increased awareness for the need to understand mathematics for the 31% of the preservice teachers. There was also an increase from 34% to 71% of preservice teachers who agreed or strongly agreed that they now had some resources or support to deal with the challenges. The significant pre to post survey response changes might indicate that most preservice teachers felt that they had acquired sufficient exposure to the strategies in the module that sought to enhance their growing understanding of mathematics. This is consistent with an observation from Caia et al. (2018) that addressing preservice teachers' wellbeing domains can be a pre-requisite for effective learning. However, 30% of preservice teachers continued to have 'challenges with understanding mathematics' and seemed to require more support to deal with the challenges. This might indicate a need to redesign a more targeted intervention that would address the preservice teachers' individual needs on their challenges with understanding mathematics.

Affective Wellbeing Responses

The percentages responses of preservice teachers' belief statements on pre and post surveys on affective wellbeing were similarly analysed. Table 2 presents a summary of responses on affective wellbeing belief statements.

Survey Statement		SA	A	U	D	SD
1. Overall, I have challenges with liking and enjoying mathematics.	pre	30	19	15	21	15
	post	26	26	15	22	11
2. It is important to like and enjoy mathematics.	pre	35	31	26	0	8
	post	37	37	12	7	7
3. I have resources/support to help with liking and enjoying mathematics.	pre	0	19	54	19	8
	post	15	33	30	15	7

Table 2: Percentage Responses on Affective Wellbeing

The affective wellbeing pre survey responses indicated that before the module, 49% of preservice teachers agreed or strongly agreed that they had challenges with liking and enjoying mathematics; 66% agreed or strongly agreed that it was important for them to like and enjoy mathematics; and only 19% agreed or strongly agreed that they had the resources or support to help them with liking and enjoying mathematics. A significant pre survey result in this affective domain is that most preservice teachers (66%) indicated their belief of the importance of having positive affect towards mathematics. However, the pre survey indicated that 81% of preservice teachers were undecided or did not have the resources or support to deal with the challenges of developing positive affect towards mathematics. This result supported the need for the six-week module to help the preservice teachers to develop positive affect towards mathematics.

The affective wellbeing post survey indicated a slight increase from 49% to 52% of preservice teachers who agreed or strongly agreed that they still had challenges with positive affect towards mathematics. There was an increase from 66% to 74% of preservice teachers who agreed or strongly agreed that it was important for them to have positive affect towards mathematics; and an increase from 19% to 48% of preservice teachers who agreed or strongly agreed that they had the resources or support to help them to develop positive affect towards mathematics. Having positive disposition towards mathematics is central to learning mathematics (Slavin et al., 2014) and about half of the preservice teachers indicated in the post survey that they continued to have challenges with positive disposition towards mathematics after the six-week module. This result might indicate that the module had not equipped them with adequate resources or support to deal with the challenges of developing positive affect towards mathematics. This calls for a rethink on how to design more targeted intervention strategies that would enhance positive disposition towards mathematics for about half of these preservice teachers.

Conative Wellbeing Responses

The percentage responses of preservice teachers' belief statements on pre and post surveys on conative wellbeing were similarly analysed. Table 3 presents a summary of responses on conative wellbeing belief statements.

Survey Statement		SA	A	U	D	SD
1. Overall, I have challenges with persistence when learning mathematics.	pre	8	38	8	23	23
	post	11	44	11	22	11
2. It is important to deal with the persistence challenges.	pre	42	38	8	4	8
	post	44	33	15	8	0
3. I have resources/support to deal with the persistence challenges.	pre	4	38	42	12	4
	post	15	44	26	11	4

Table 3: Percentage Responses on Conative Wellbeing

The conative wellbeing pre survey responses indicated that before the module, 46% of preservice teachers agreed or strongly agreed that they had challenges with persistence when learning mathematics; 80% agreed or strongly agreed that it was important for them to deal with persistence challenges; and 42% agreed or strongly agreed that they had the resources or support to deal with the challenges of developing persistence when learning mathematics. This pre survey result which indicated that although 80% of the preservice teachers agreed or strongly agreed that it was important for them to deal with the challenges of persistence when learning mathematics, and 58% of them indicated that they were undecided or did not have

the resources or support to deal with the challenges highlighted a state of unbalanced conative wellbeing (Dodge et al., 2012). This unbalanced conative wellbeing supported the need for intervention programs to equip preservice teachers with resources to deal with the challenges of persistence when learning mathematics.

The conative wellbeing post survey indicated an increase from 46% to 55% of preservice teachers who agreed or strongly agreed that they still had challenges with persistence when learning mathematics. There was an increase from 42% to 59% of preservice teachers who agreed or strongly agreed that they had resources or support to deal with the persistence challenges. This meant that after the six-week module, 41% of preservice teachers were still undecided or did not have the resources or support to deal with the challenges of developing persistence when learning mathematics. Preservice teachers indicated very strongly in both surveys that persistence when learning mathematics is important. This result is consistent with Hill and Seah (2022) who argue for the need to enhance and fulfill preservice teachers' positive feelings, dispositions and functioning in mathematics. However, the pre to post survey response change on having the persistence and resources to deal with the challenges were relatively small. This might indicate that a more comprehensive intervention program targeting the conative wellbeing was required for these preservice teachers.

Social Learning Environment

The percentage responses of preservice teachers' belief statements on pre and post surveys on social learning environment were similarly analysed. Table 4 presents a summary of responses on social learning environment belief statements.

Survey Statement		SA	A	U	D	SD
1. Overall, I have challenges with social learning environment when learning mathematics.	pre	4	8	16	38	34
	post	0	37	19	22	22
2. It is important to deal with the social learning environment challenges.	pre	23	23	35	11	8
	post	22	55	11	11	0
3. I have resources to deal with the social learning environment challenges.	pre	4	19	46	23	8
	post	0	34	48	11	7

Table 4: Percentage Responses on Social Learning Environment

The social learning environment pre survey responses indicated that before the module, 12% of preservice teachers agreed or strongly agreed that they had social learning challenges when learning mathematics; 46% agreed or strongly agreed that it was important for them to deal with the challenges; and 23% agreed or strongly agreed that they had the resources to deal with the challenges. The post survey indicated an increase from 12% to 37% of preservice teachers who agreed or strongly agreed that they had social learning challenges when learning mathematics. There also was an increase from 46% to 77% of preservice teachers who agreed or strongly agreed that it was important for them to deal with the social learning challenges; and an increase from 23% to 34% who agreed or strongly agreed that they had resources to deal with the challenges.

An interesting result in the social learning environment is that before the module, a relatively small number of preservice teachers, only 12% agreed or strongly agreed that they had challenges, and after the module the percentage increased to 37%. The trend is similar on the belief statement on resources to deal with the challenges. This might indicate that before the module, some preservice teachers had limited awareness of the importance of social

learning environments in mathematics education, and that the learning experience from the module introduced or exposed to the preservice teachers the importance of social learning environments in mathematics classrooms. The result is consistent with Slavin et al. (2014) work that advocates for importance of enhancing social skills and social learning environments in teacher education programs. This might suggest a need to redesign a more targeted intervention program that would enhance the preservice teachers' continued appreciation of the importance of developing positive social learning environments in mathematics classrooms.

Physical Learning Environment

The percentage responses of preservice teachers' belief statements on pre and post surveys on physical learning environment were similarly analysed. Table 5 presents a summary of responses on physical learning environment belief statements.

Survey Statement		SA	A	U	D	SD
1. Overall, I have challenges with the physical learning environment when learning mathematics.	pre	12	16	28	26	16
	post	7	30	7	45	11
2. It is important to deal with the physical learning environment challenges.	pre	38	16	30	8	8
	post	22	37	26	11	4
3. I have resources to deal with the physical learning environment challenges.	pre	0	19	58	15	8
	post	7	30	44	15	4

Table 5: Percentage Responses on Physical Learning Environment

The physical learning environment pre survey responses indicated that before the module, 28% of preservice teachers agreed or strongly agreed that they had challenges with the physical learning environment; 54% agreed or strongly agreed that it was important for them to deal with the challenges; and 19% agreed or strongly agreed that they had the resources to deal with the physical learning environment challenges. The post survey indicated an increase from 28% to 37% of preservice teachers who agreed or strongly agreed that they had challenges with the physical learning environment. There was also an increase from 54% to 59% of preservice teachers who agreed or strongly agreed that it was important for them to deal with the physical learning environment challenges; and an increase from 19% to 37% of preservice teachers who agreed or strongly agreed that they had the resources to deal with the physical learning environment challenges.

An interesting observation is that there are significant changes in the pre to post survey agreed or strongly agreed on challenges with the physical learning environment (28% to 37%) and agreed or strongly agreed on the resources to deal with the challenges (19% to 37%) after the module; and a slight increase of 5% on the statement dealing with the importance of addressing the physical learning environment challenges. One possible interpretation is that before the six-week module, some preservice teachers might have had limited awareness of the importance of well-developed physical learning environments when learning mathematics. However, the slight increase of 5% might indicate that the module might not have articulated adequately to the preservice teachers the importance of well-structured physical environments in the teaching and learning of mathematics. This result supports the observation by Swars et al. (2007) that preservice teachers' beliefs can be influenced by well-structured teacher education programs. This calls for a more comprehensive intervention program that articulates the importance of well-structured

physical environments in the teaching and learning of mathematics for the preservice teachers.

Results from Interviews

Four themes that emerged from thematic coding (Creswell, 2012) of interview data from preservice teachers and teacher educators include the need to: address the emerging unbalanced wellbeing for preservice teachers; address the overlapping challenges that can exist for preservice teachers and educators that can negatively affect learning; understand that lack of challenges can be detrimental to wellbeing balance; and develop guiding frameworks to help both educators and preservice teachers to address the emerging challenges and adjust the teaching and learning practices.

Emerging Unbalanced Wellbeing

Preservice teachers suggested lack of balance between the challenges (affective, conative, cognitive, social, and physical) they experienced during learning and the resources pool to counter the challenges. The challenges that were highlighted by preservice teachers included: (a) affective – feeling nervous about mathematics, leading to avoidance of mathematics, performance anxiety, and exam/test anxiety; (b) conative – giving up too easily, lacking of self-belief about their own ability, and not wanting to feel exposed; (c) cognitive – understanding the mathematical language and procedures – that is, too many steps and complex concepts to remember and follow, and that one can forget them easily. The social and physical environment challenges that were common with the preservice teachers included: (a) building social relationships with peers – not feeling comfortable enough to approach educators and peers when they are stuck; and (b) not having enough access to learning resources.

The issues highlighted by educators were also related to preservice teachers' affective, conative, cognitive, social, and physical challenges they encountered. The challenges highlighted by educators included: (a) affective – making preservice teachers feel good and optimistic about doing mathematics and addressing previous negative experience with mathematics, (b) conative – making preservice teachers more resilient and taking responsibility for their learning, and (c) cognitive – developing preservice teachers' conceptual and contextual understanding of mathematics and numeracy. Educators highlighted they had limited resources to deal with some of the affective, conative, and cognitive challenges presented by preservice teachers. Educators also highlighted social and physical environment challenges they encountered. These challenges included: (a) making personal connections and relationships with preservice teachers because of the large numbers in classes, and (b) encouraging collaborative learning and peer-to-peer learning among the preservice teachers.

Overlapping Challenges Negatively Affect Learning

The study found that overlapping challenges exist for both preservice teachers and educators that can negatively affect learning. Most of the challenges highlighted by the group of preservice teachers overlapped with issues highlighted by educators. Both preservice teachers and educators suggested that to maximise participation, conceptual development and

cognitive wellbeing, it is essential to first address the affective and conative wellbeing, and the social and physical components of learning. The preservice teachers highlighted lack of preparedness and strategies to address the challenges they faced when learning mathematics education and strategies to use with their future students. This included addressing the potential challenges faced by diverse groups of their future students including Aboriginal and Torres Strait Islander students.

The teacher educators suggested that the six-week module was helpful to highlight the importance of wellbeing in the mathematics education subject. However, they felt that the module did not provide adequate strategies to deal with individual preservice teachers' unbalanced challenges and resources situations. The strategies in the module were general ones and not targeted to differentiate for the individual needs of preservice teachers. The educators also indicated that to enhance the learning of all preservice teachers in the group, there was a need to proactively plan to address emerging challenges using strategies that also differentiated for individual needs.

Lack of Challenges is Detrimental to Wellbeing Balance

The study found that the notion of preservice teachers being presented with challenges when learning about mathematics and numeracy is not necessarily negative. Both preservice teachers and educators highlighted that lack of challenges for preservice teachers when learning mathematics and numeracy can adversely affect their learning and professional development. The educators suggested that challenges are important for preservice teachers to grow academically and professionally and that without challenges there is limited growth. When a particular mathematics or numeracy learning experience is not challenging, it might mean that the standards are too low. The suggestion was that the challenges – resources balance was important for preservice teachers because it enhanced not only their wellbeing but their learning and professional development. However, the challenges presented to the preservice teachers needed to be counter balanced with resources they can draw on to enhance their learning.

Guiding Frameworks to Address the Emerging Challenges

A common concern among the educators was a lack of guiding protocols they could use to address the emerging and sometimes overlapping challenges they identified. They suggested a need for guiding protocols and frameworks they could use to proactively plan and address preservice teachers' fluctuating challenges – resources situations when learning mathematics and numeracy. They highlighted that the guiding frameworks could be used to adjust practices in mathematics and numeracy classrooms. Significantly, both preservice teachers and educators identified that the cognitive wellbeing and understanding of mathematics was important. However, initially it was imperative to address and develop the affective and physical wellbeing, and the conative and social components of wellbeing to maximise participation.

Discussion

This section discusses the possible implications to the practice of teaching and learning. As suggested previously, the emerging wellbeing can be represented as a balance

between the challenges (affective, conative, cognitive, social, and physical) the preservice teachers face and the resources (affective, conative, cognitive, social, and physical) they draw from to counter the challenges when learning about mathematics education. The study suggests that teaching and learning practices and experiences that have the challenges – resources balance as illustrated in Figure 3 lead to optimal learning and professional growth. When preservice teachers are presented with more challenges than resources, this might lead to frustrations and disengagement, resulting in a state of unbalanced wellbeing. Similarly, when preservice teachers are presented with more resources than challenges, this might lead to boredom, stagnation and can harm learning and academic and professional growth (de Lourdes Mata et al., 2012), also resulting in a state of unbalanced wellbeing. This position is also highlighted by Dodge (2016) who argues that the dynamic construct of wellbeing balance can also reflect the viewpoint that a lack of challenge will lead to stagnation, which will also affect the balance of the see-saw as illustrated in Figure 3.

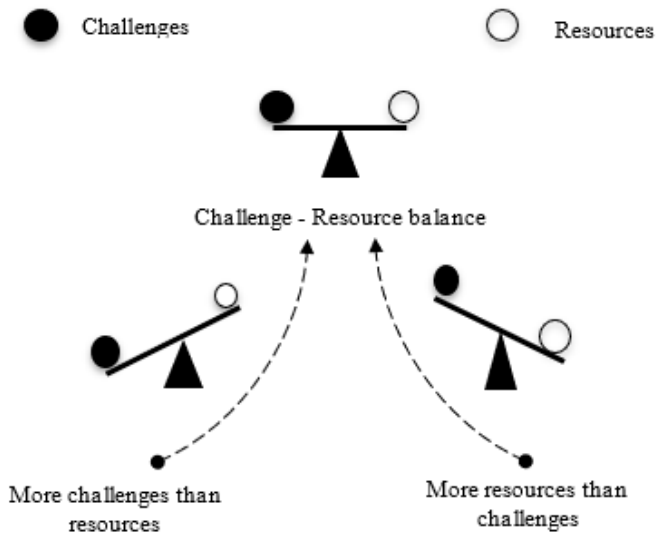

Figure 3: Challenge – Resource Construct

This requires educators to design mathematics and numeracy learning frameworks, practices and experiences that are challenging without becoming too frustrating for preservice teachers because they do not have access to the pool of resources to draw from. Griful-Freixenet et al. (2020) position is that an attempt should be made to respond to specific needs of students within a class. Thus, the challenges – resources balance is important for preservice teachers because it enhances not only their wellbeing but their professional learning and development. Addressing preservice teachers' fluctuating states between challenges and resources can be the central role for teacher educators. Educators need to articulate the challenges – resources balance that encourages appropriate and optimal preservice teacher learning and development. This requires pedagogical approaches that focuses on creating a challenging and enriching learning environment and making sure that preservice teachers are properly supported.

The study revealed both preservice teachers and educators emphasised that addressing the cognitive wellbeing was important. However, initially it was imperative to emphasise, address and develop the affective and physical wellbeing, and the conative and social components of wellbeing. Finkelstein et al. (2019) emphasise organisation of teaching and learning that includes modification and monitoring of learning environments, and the

social/emotional/behavioural practices that deal with encouraging positive classroom environments where students feel socially and emotionally included. This might suggest that for optimal learning to occur for preservice teachers, there needs to be balance of the challenges and resources for affective and physical wellbeing, and conative and social wellbeing, to enhance cognitive wellbeing balance and the understanding of mathematics. This emerging construct of wellbeing balance is illustrated in Figure 4. It is also important to also understand that while Figure 4 is presented as hierarchical, the components of wellbeing are interconnected during the teaching and learning process.

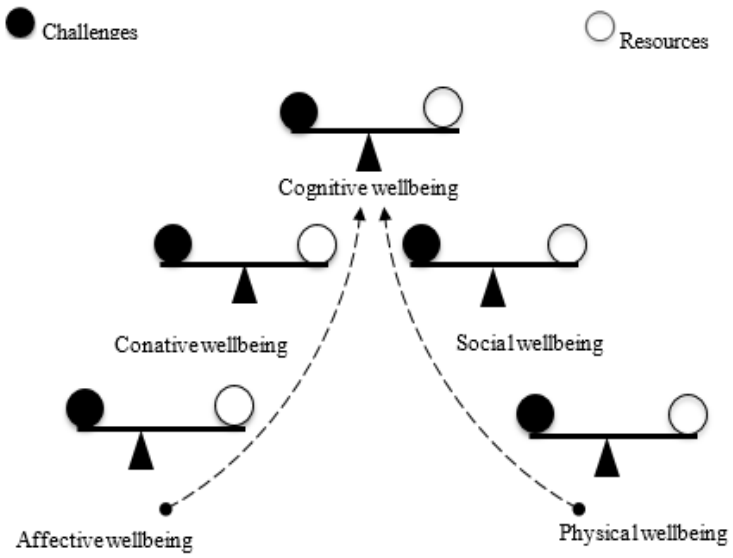

Figure 4: Emerging Construct of Wellbeing Balance

Thus, when learning, the emerging construct of stable wellbeing can be conceptualised as when preservice teachers have the affective, conative, cognitive, social, and physical resources pool they need to meet the affective, conative, cognitive, social, and physical challenge presented by the mathematics. When preservice teachers have more challenges than resources, the see-saw dips, along with their wellbeing, and vice-versa (Dodge et al., 2012). Each time a preservice teacher meets a mathematics or numeracy challenge, the system of challenges and resources pool come into a state of imbalance, as the preservice teacher is forced to adapt his or her resources to meet this challenge (Kloep et al., 2009). When conceptualised from this perspective, the construct of preservice teachers' wellbeing encompassing the affective, conative, cognitive, social, and physical domains can be considered a major indicator of the quality of mathematical teaching and learning practices and experiences, and a basis for measurement of academic and professional growth.

The emerging construct of wellbeing balance illustrated in Figure 4 can be a central organisational tool for educators when planning mathematics and numeracy teaching and learning frameworks, practices, and experiences. This means that preservice teachers' wellbeing if understood as the fluctuating state between the challenges they encounter and the resources they draw from, then it can be addressed and supported through intentional curriculum design and practices (Slavin et al., 2014). There is a need for educators to proactively address the construct of preservice teachers' wellbeing balance. The construct of wellbeing balance can also have the potential to inform preservice teachers' future teaching practices and enhance their future students' learning and wellbeing in mathematics classrooms. The emerging construct of wellbeing balance can be a lesson planning tool that

can address the potential challenges students encounter and the pool of resources they can draw from when learning. A framework such as this needs to be carefully and deliberately developed, to facilitate the right diagnostic and formative assessment, mapping and support structure that enhances preservice teachers' wellbeing balance when learning about mathematics and numeracy.

The study suggests that it is not a lack of motivation or lack of ability that resulted in preservice teachers having poor levels of affect, resilience and positive dispositions towards mathematics and numeracy. Rather, most preservice teachers can be in danger of finding themselves in such positions or circumstances if their challenges – resources balance construct is not well addressed. A position articulated by Clarkson et al. (2010) and de Lourdes Mata et al. (2012) is that these preservice teachers can transmit these negative attitudes about mathematics to their future students, which can affect those students' future learning of mathematics. There is need for proactive, holistic, and comprehensive support structures that address the construct of preservice teachers' wellbeing that encompasses the affective, conative, cognitive, social, and physical domains when learning about mathematics and other subject areas. This could also include professional development for educators to help with assessing and mapping preservice teachers' emerging wellbeing balance when learning about mathematics and other subject areas.

Conclusion

The paper reported on research that investigated first-year preservice teachers' affective, conative, cognitive, social, and physical wellbeing in mathematics education at a regional university in Far North Queensland. Pre and post surveys belief statements asked preservice teachers on the level of challenges they encountered, the importance to deal with the challenges, and the resources or support levels to deal with the challenges. Before the six-week module, preservice teachers' belief statements suggested that they had significant challenges and limited resources. The post survey suggested an increased awareness and confidence with mathematics. The focus group interviews with preservice teachers and educators occurred after the six-week module. Four themes that emerged include the need to: address the emerging unbalanced wellbeing; address the overlapping challenges that exist for preservice teachers and educators that negatively affect learning; understand that lack of challenges is detrimental to wellbeing balance; and develop guiding frameworks to help address the emerging challenges. The study concluded that teaching practices that enhance student wellbeing can be a pre-requisite for effective and optimal learning. However, the study acknowledges the small number of preservice teachers who participated and recommends that further research be conducted with greater numbers of preservice teachers in different contexts. The study hopes to encourage further dialogue and research on students' wellbeing when learning mathematics and other subject areas.

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