

# Research Participation as a Space for Teachers' Reflection and Re-evaluation of Student *Success*

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This paper explores how participation in research activities can function as a space for teachers of mathematics to share, negotiate, and re-evaluate their conceptions of student *success*. Drawing on a case example from a broader mixed-methods study, the paper illustrates how dialogic, activity-based research prompted moments of hesitation, tension, and reflection that extended beyond data collection. The findings suggest that research participation itself can support professional sense-making and reveal the conditions that shape how *success* is conceived and enacted in mathematics classrooms.

## Introduction

Educational research aims to support and improve the experiences of students and teachers in classrooms; however, a persistent research-practice gap remains, with this disconnect particularly pronounced in mathematics education (Goos, 2014). Teachers' work unfolds within "a complex ecology of people, policies, social practices, and social norms," where "teachers have to grapple with expectations and demands that are made *of* them and *on* them by various stakeholders" (Tan et al., 2015, p. 1584). Within this complexity, tensions and dilemmas frequently arise but are more often managed than resolved (e.g., Berry, 2007). Among these tensions are questions of what counts as *success*. Although frequently invoked in educational documentation, research, and discourse, *success* is rarely, if ever, explicitly defined. This lack of clarity compounds existing tensions, as teachers navigate competing expectations across the spaces and roles they simultaneously occupy. This paper draws on data from a larger study of how teachers of mathematics conceive and determine student *success*. What follows is a single illustrative case that traces one participant's journey across multiple research phases, marked by reflective moments, productive uncertainty, and tensions. This analysis reveals not only how *success* was conceived, but also how research participation itself can create opportunities for teachers to think aloud, wrestle with tensions, and engage in professional sense-making that they may rarely be afforded.

## Literature Review

Australian educational policies and national curriculum documents frequently cite the notion of "successful learners" as a central goal of schooling (e.g., Department of Education, Skills and Employment, 2019). Yet, these commitments are rarely accompanied by explicit definitions of what such *success* entails. Similarly, educational research – including mathematics education research – often references *success* when framing research aims, outcomes, and claims of impact, yet without specifying what this *success* entails. In the absence of clear descriptions despite diverse applications, meaning is left to be inferred by readers or assumed on contextual cues, leading to ambiguity and inconsistent interpretations.

Literature reflects markedly diverse – and at times conflicting – conceptions on what it means to be *successful* in mathematics education. In some accounts, *success* is associated with academic achievement and cognitive development (e.g., York et al., 2015), while others characterise *success* as students' ability to reproduce lower-order procedures in predetermined ways (e.g., Shepard, 2000). In contrast, other conceptions foreground – individually and in combination – problem-solving, creativity, collaboration, and engagement with mathematics in meaningful and socially situated contexts (e.g., Clarke, 1997; Ernest, 2015; Watt, 2005).

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*Success* also appears to be determined in different contexts, by different methods, and at different points in time by different stakeholders. For instance, *success* is associated with marks, grades, ranks, and scientific measurement, as well as through summative tasks or standardised assessment (e.g., Reid, 2019; Shepard, 2000; Watt, 2005). Other accounts link *success* with self-efficacy, affective domains, and productive dispositions that are self-determined and less readily measurable (e.g., Ernest, 2015; Kilpatrick et al., 2001). Collectively, these varying and often conflicting perspectives situate *success* as a complex and contested construct within mathematics education. In this study, investigating teachers' conceptions of *success* afforded unexpected opportunities to reflect on the tensions they experienced as they navigated these conflicts. This paper, therefore, asks: How can participation in research activities function as a space for teachers of mathematics to share, negotiate and re-evaluate their conceptions of student *success*?

## Methodology

The aim of the larger study was to examine how Australian primary and secondary teachers conceived and determined student *success* in mathematics classrooms. It was conducted in three phases: an online survey (n = 139), activity-oriented focus groups (n = 40 across 18 groups) and semi-structured individual teacher interviews (n = 10). The analysis presented in this paper draws primarily on the focus groups and interviews, as these phases generated rich instances of shared reflection, negotiation, and re-evaluation. To avoid resembling "individual interviews done in group settings" (Colucci, 2007, p. 1423), the focus groups incorporated four interactive activity-based tasks designed to create participant-led dialogic spaces in which participants articulated their reasoning, explored conflicting conceptions, and negotiated interpretations collectively. The interviews further explored teachers' conceptions, experiences, and assessment of *success*, as well as inviting participants to reflect on preliminary findings.

Focus groups, conducted either in-person or virtually, involved teachers from early childhood to senior secondary years across government, Catholic, and independent sectors in six of the eight Australian states and territories. Ten of these teachers, representing similar demographic diversity, participated in individual interviews. Recruitment for both focus groups and individual interviews occurred through voluntary expressions of interest linked at the conclusion of the initial online survey. All sessions were video recorded and transcribed. Initial manual coding informed an inductive thematic analysis following Braun and Clarke's (2006) six phases, with illustrative excerpts and emerging themes organised iteratively across broader analytic stages. From this process, several particularly insightful case examples emerged. This paper focuses on one such case involving "Isaac", a secondary mathematics teacher and Head of Mathematics at a Queensland independent school, with 12-15 years of experience. Isaac participated in all three phases of the study and, during focus groups, was randomly paired with "Frank," a secondary mathematics teacher from the government sector in New South Wales whom he had not previously met.

## Results

Like other focus groups, the discussion began with how their schools currently measure student *success*. Isaac, like Frank, described NAPLAN, PAT-M, grades, and a strong emphasis on in-class exams that were "*pretty prescriptive*" with "*pretty closed, procedural questions*", as well as a strong focus on Problem-Solving and Modelling Tasks aimed to "*try and maximise the Year 12 results*". Isaac added that Year 9 focused more on "*how well students are engaging with real-world maths*," though this is not included in their formal reporting.

### **Focus Group Activity 1:**

The pair began the first activity – an open-response Y-Chart task – in which participants were asked what *success* looks like, sounds like and feels like in an ideal mathematics

classroom. For the most part, they worked quietly and individually, recording complementary ideas such as “*kids debating/disagreeing with each other*,” “*excitement, cheering and congratulation each other on solving a difficult problem*” (sounds like), “*teacher not the hardest worker in the room*,” “*calm, confident, anxiety free*” (feels like), “*kids working ‘messily’ and quickly – just trying to get their thinking down in writing*,” and “*collaboration*” (looks like). Notably, despite earlier discussion of their schools’ measures of *success*, there was no mention of standardised assessment, grades or exams. Before moving on, I asked whether there was anything they wished to add. At this point, Isaac offered:

Yeah, I just...just an observation that this is not...doesn’t look maths specific to me. Like I would probably write this about many subjects.

Clarifying whether this was simply an observation or whether he felt more “*mathematics-specific*” ideas should be included, Isaac replied:

Well, I was trying to think of more mathematical because I’m a maths teacher, so I’m like...[pause] feel like there should be more maths stuff in there, but they’re just the things that came to me.

Although nothing further was added, the exchange appeared to prompt a moment of reflection for Isaac – one that seemed to unsettle him and which he would later return to.

### **Focus Group Activity 2**

The group proceeded to the next activity, which involved 26 statements representing different ways *success* might be indicated through engagement with learning mathematics. Participants were asked to collectively evaluate the statements aloud and select their ten most valuable representations of/for *success*, before prioritising nine of those from Very High Priority to Very Low Priority (Diamond 9). As Isaac and Frank discussed the indicators, attention turned to students justifying their thinking and communicating solution pathways. At this point, Isaac returned to his earlier observation:

I think that’s probably what I was talking about before, Rebecca, about it [Y-Chart responses] not being necessarily mathematical. But this one that does...I do think it speaks to mathematics.

This comment stood out because Isaac’s tone suggested he perceived the Y-Chart responses as constrained in some way. Yet the task was deliberately open-ended, with participants retaining full control over what they recorded. Isaac’s return to the idea of “*mathematical*” appeared driven less by the task design itself and more by an underlying tension between how *success* was being conceived and what he may have expected from the activity, a reading supported by subsequent reflections. Nevertheless, as the group continued to evaluate and select their ten statements, Isaac began to make broader connections, reflecting aloud on what they had selected and discarded:

It’s an observation here...the ones that we’ve ditched...they’re indicators of some *success*. But I feel like if you get the green ones right first [their selections], then the other stuff kind of follows.

The “*green ones*” referred to students’ willingness to give things a go, adopting a positive relationship with mathematics, ‘seeing’ the relevance of mathematics ideas to their world, justifying their mathematical workings, and solving problems without solution methods provided. By contrast, the discarded statements included good scores on summative and standardised assessments, report grades, and mastery of curriculum standards. As he worked, Isaac appeared to be evaluating their selections, using the process to actively reflect on his own conceptions of *success* rather than simply completing the task solely for research purposes.

Despite never having met, Isaac and Frank collaborated thoughtfully and productively, advocating, negotiating and challenging one another. At times, Isaac referred to statements as “*another mathematical one*” or “*a maths-specific one*” – a subtle echo of his earlier comments. Yet during the prioritisation stage, he was observed relegating these more discipline-specific indicators in favour of dispositional and process-oriented indicators (i.e. the “*green ones*”).

However, when reviewing the final selections, Isaac added a rushed comment, spoken almost under his breath:

It's very, they're all...we've picked very, like, general. [Quick, low mumbling] Maybe that's part of the trap. But, um, I'm happy enough!

While Frank readily agreed with the final choices, Isaac's fleeting remark – “*maybe that's part of the trap*” – hinted at a growing unease with the indicators of student *success* they had chosen, despite their close alignment with the earlier Y-Chart responses. Quickly buried, the comment nonetheless raises questions about why Isaac felt caught or tricked, exposing another small crack in his certainty – one that would become increasingly visible as the tasks progressed.

### **Focus Group Activity 3**

The third task presented 18 statements representing different approaches to determining *success* in mathematics classrooms, again asking participants to select their ten most valuable. Isaac and Frank quickly selected indicators such as a shift in student confidence, teacher questioning, teacher observation, and a shift in student engagement. Similarly, they discarded A-E grades and NAPLAN results. However, a subtle distinction was observed whereby Frank appeared to approach the task through the lens of what he valued – consistent with the task's intent – whereas Isaac reasoned more in terms of what he typically did or did not implement.

### **Focus Group Activity 4**

Following a similar format, the final task presented 16 statements related to assessment design and implementation. Participants were asked to identify the ten factors they most considered when implementing assessment to determine student *success*. While Frank immediately engaged, Isaac's readiness to participate – unlike in earlier tasks – noticeably slowed. His directness appeared to waver, alongside a shift in body language. Isaac's tone became more cautious, even tentative, as he explained:

I usually try and plan my teaching and planning first, and, like, I usually think about the assessment as the final product as opposed to...picking an assessment method that is valuable to my [planning].

For Isaac, ‘assessment’ appeared to be almost automatically associated with summative and reporting purposes, and far less as a means to support learning or inform teaching and planning. These reflections appeared to unsettle Isaac; his posture shifted as he slumped back in his chair, fist resting against his face, becoming more inwardly focused.

Appearing more challenged by this activity, the pair hesitated over their selection; their reasoning became less clear and, at times, contradicted earlier convictions. For example, their previous emphasis on students' broader mathematical understanding and the role of feedback was set aside when asked to consider assessment design specifically. Sensing their struggle, I attempted to clarify how they were approaching the task in relation to *success*, to which Isaac – still leaning away, hands clasped behind his head – carefully, almost haltingly explain that:

In reality, I never have an assessment task where I'm **not** trying to determine student *success*. I never really implement...deliberately implement assessment tasks where I'm not interested to determine student *success*. Although I definitely recognise there are shortcomings in the way I do it.

Stumbling through his words and accompanied by strained non-verbal cues, Isaac eventually admitted, “*The reality is I just write assessment tasks.*” This statement – along with his self-correction around “*deliberately*” – revealed both resignation and struggle: resignation in the sense that ‘assessment’ is treated as something habitual and procedural, and struggle in recognising that such proceduralism may conflict with deeper aspirations and conceptions of *success* in mathematics classrooms. He again reasserted that he would “***never set out to implement assessment tasks where [he's] not interested in determining student success.***” Frank, too, appeared to grapple with his own reflections.

At this stage, their visible struggle prompted a slight pivot from the script. To keep the task constructive, I gently drew on earlier activities to prompt reflection. But before I could continue, Isaac interjected firmly, stressing that the task asked which factors they *currently* consider, not which factors “*should be*” considered. His tone carried a defensive edge, and sensing this shift, I immediately stepped back and affirmed his interpretation, although this distinction was not explicitly specified. Isaac then softened slightly, noting that his responses would differ under a “should consider” framing. As Frank reflected aloud on “typically structured assessment,” it was then – almost out of nowhere – that Isaac articulated the crux of his struggle:

I think probably what I’m finding – just again, it’s just a reflection here – is that...what I consider to be successful in a maths classroom, when I look at that and I compare that to the techniques that I employ when I’m implementing assessment, they kind of don’t match up. That’s what I’m...that’s what I’m seeing here. Things that I do for assessment aren’t really geared at the things I said were most important. So that’s kinda why I think I’m having trouble with this one, just because [pause] I recognise that what I’m doing is not ideal. Hmmm... what else?

Isaac did not linger on this reflection. Yet, after waves of resistance, deflection, and frustration, he had openly acknowledged a misalignment between his professed values of *success* and the assessment practices he routinely employed. His swift turn away from this admission may reflect both the weight of that admission and the challenge of sustaining such recognition. But, in that brief moment, Isaac gave voice to a central concern echoed across the study: teachers’ stated conceptions of student *success* often “*don’t match up*” with the practices they feel compelled to enact within institutional spaces. Despite initial hesitation, the pair soon re-engaged with the task, actively discussing statements and sharing examples. Isaac remained physically leaned into the activity, and the confident pace of his contributions returned. Earlier emotions and side-comments settled, and nothing further of note emerged. Before concluding, Isaac appeared – even amid the discomfort – motivated to pursue these ideas further.

### ***Semi-Structured Individual Interviews:***

I was unsure whether Isaac would volunteer for the semi-structured individual interviews conducted several months later. Yet his willingness to do so – and the depth of engagement that followed – proved invaluable. Isaac showed little hesitation in sharing his thoughts and experiences, even when grappling with challenging or uncomfortable ideas.

From the outset, Isaac was forthcoming and reflective, frequently thinking aloud, pausing to reframe ideas, clarify his thinking in real time, and sharing detailed personal anecdotes. Like many participants, he differentiated *success* from achievement and performance, emphasising how *success* in mathematics is accessible to *all* students but becomes unrealistic when narrowly (mis)interpreted as academic performance alone. He explained that “*kids are on different time frames*” and argued that reducing fear and encouraging a willingness to have a go better equip them to draw on mathematics when and however they may need it in their lives – echoing *success* as an individual endeavour. As Isaac attempted to describe a ‘*successful student*’ and an ‘*unsuccessful student*’, his thinking shifted in real-time. Initially, he drew on what he called “*the traditional view*,” describing ‘*successful students*’ as those who “*think abstractly*,” “*pick up things*” quickly, and can “*perform mathematical tasks*.” Yet, he reflected aloud that as “*articulate[d] it*” – particularly when attempting to describe an ‘*unsuccessful student*’ – other ideas emerged. Instead, he concluded that “*the successful student is the one that gets in and gives it a go*.” While acknowledging teachers’ role in developing students’ mathematical capacities, Isaac returned to the centrality of dispositions, noting the difficulty of fostering confidence, attitudes, and willingness to participate when students, parents, and broader school communities often associate *success* with grades, ranks, and comparisons. He further described how, in practice, the exhausting and unforgiving pace of his courses often relegates students’ mathematical learning to a secondary concern. At times, his words became unsteady as he grappled with his own complicity in this shared professional reality:

The reality is...I've got 25 kids. I have pressures. Teachers, I think, don't make it their number one priority to get kids into learning. I have to move on. I have to proceed. I can't wait for you...so teachers are, like, I think, we, myself, think I aim for it, but it's not a prerequisite for me to keep going with my course like I'm going to do. I'm going to do what I can in the time and energy that I have to try and get you "in". But that's pretty limited. Then, ready or not, here we go!

This reflection captures the relentlessness of teaching within tightly timed structures, where the demand to 'keep going' eclipses deep learning, and systemic pressures to meet coverage goals undermine intentions to foster authentic mathematical engagement and student *success*. Despite his earlier attention to discipline-specific indicators, Isaac became increasingly critical of how mathematics itself is framed and enacted in classrooms. He described a prevailing emphasis on "*right and wrong answers*" – a framing that acts both as a comfort and a constraint:

[Sigh] We often gear the learning towards, like, there are right or wrong answers because that's something we really love about maths. For a lot of people, they love that. And so...if you make questions simple enough, then everyone can experience success of, like, getting something right. So, I think we've institutionally trained students to be like, well, I'm successful/not successful based on if I'm getting right or wrong answers.

Isaac acknowledged how this culture limits what students come to experience as *success*:

But there's a whole other...world of maths out there that is not about right or wrong answers, and we kind of don't spend much time on that, traditionally. So, kids never get to experience the *success* of like...learning something new or seeing an application of something or seeing something in a way that no one else in the class saw. Like, I think they're all measures of *success*, but kids don't really get to access that too much.

He also reflected – with a mix of frustration and empathy – on how teachers of mathematics, himself included, may unintentionally perpetuate this perception:

I think...we do it out of a good place but we're like, oh, you got that right? Go to the next one!...We think you've spent years failing in maths. You're going to come into my classroom and succeed and get things right. But then we kind of perpetuate that cycle of maths is right or wrong.

These reflections illustrated Isaac's growing awareness of entrenched pedagogical tensions in which well-intentioned efforts to build students' confidence by simplifying mathematics can inadvertently reinforce the very right-or-wrong dichotomy teachers hope to disrupt. His critique extended beyond content or method – areas he initially foregrounded – to question the socio-cultural logics of mathematics teaching itself, and how norms operating across institutions and classroom spaces constrain conceptions of *success*.

Later in the interview, when presented with preliminary findings from earlier phases of the study, including the Y-Chart themes, Isaac described mathematics as "*a vehicle*" rather than the *focus* of *success*. He emphasised broader dispositions – "*being active, being hands-on, being curious, working with other people... being able to deal with a struggle*" – as the foundations for lifelong growth. These reflections are particularly striking given his earlier frustrations during the focus groups – including during this very activity. Not someone inclined to acquiescence, through the process of participation and reflection, Isaac appeared to work through these tensions and actively re-examine his own conceptions of student *success*.

Reflecting on other preliminary findings, Isaac spoke candidly about how systemic pressures shape the day-to-day classroom realities. He observed that the performance metrics most dominant in schools are precisely those least valued by teachers. He again described the tyranny of pace in the pursuit of grades and scores, noting how accountability measures often eclipsed deeper mathematical engagement, dispositional and process-oriented qualities and teachers' preferences for formative, real-time interactions with students. Yet he admitted that he rarely plans for these higher-valued ideals because they are not what institutions prioritise. Isaac described feeling "*almost divided*" between what he valued professionally and what institutional spaces prioritised. He articulated a core dilemma echoed across the study: what teachers value in their professional spaces is often precisely what institutional spaces fail to

recognise, reward or make room for. Amid these admissions, however, he imagined an alternative grounded in professional trust – one in which he felt permitted to foreground a mathematics classroom where his conceptions of *success* were seen, felt and heard, trusting that summative measures would “*just automatically fall into place*”.

Still, Isaac remained acutely aware that teachers of mathematics “*exist within bigger systems*” – a dynamic that felt inescapable, regardless of intention or effort – and that these “*system expectations*” can themselves become “*barriers*” to enacting the mathematics classrooms they value. The emotional intensity of these tensions became most visible when Isaac spoke not only of professional expectations but also of livelihood, family and fear – words that, at times, seemed difficult for him to articulate:

Teaching is such a stable job. And yet, there’s this sense...there’s this...it’s not...we don’t live in fear, but we’re like...our job security and our family and like...these are factors.

His hesitant phrasing – “*it’s not... we don’t live in fear, but...*” – exposed an unease rooted less in a fear of professional inadequacy than in a fear of non-compliance; of straying too far from expectations and norms perceived to safeguard stability and security. He continued:

It’s like I don’t know if I’m prepared to go out on a limb. I don’t know if I’m prepared to do something different. I’ll just play it safe. And that comes back to like, well, I’m feeding a family, and this is not...I don’t spend all day, every day doing this. So, it’s gotta be manageable as well. And I think there’s a real element of playing it safe, too. I think – even if we’re not told to prioritise NAPLAN, ATAR and grades – inherently, we’re like, what’s the **safest** course of action here? I know if I do this, I won’t get in trouble...I don’t even know if we’re conscious of that.

The proximity of safety and fear highlights the emotional cost of navigating institutional spaces that equate conformity with security, where professional safety may come at the expense of the very professional freedoms needed to pursue broader, more enduring conceptions of student *success* in mathematics education.

## Discussion

This paper examined how participation in research activities can function as a space for teachers of mathematics to share, negotiate, and re-evaluate their conceptions of *success*. The case of Isaac illustrates how engagement in dialogic, activity-based research can act as a catalytic professional space, prompting moments of hesitation, discomfort, reframing, and critical reflection as he candidly grappled with nuanced conceptions of *success* and the realities between intent and enactment. Although the study was not designed to explicitly seek out professional tensions, Isaac’s participation was marked by moments of destabilisation and re-evaluation as he confronted tensions between professional values, institutional expectations, and classroom practices. Many of Isaac’s tensions resonated with Berry’s (2007) binary illustrations, including ‘confidence and uncertainty’, ‘action and intent’, ‘safety and challenge’, and ‘valuing and reconstructing’. As Berry (2007) notes, “as interconnections between tensions became apparent, new knowledge of practice is brought to light” (p. 120), offering new frames for interpreting and organising experiences. In this case, research participation created conditions in which tensions were not only articulated but became generative sites for reflection. For example, Isaac observed that the performance metrics most dominant in schools were often those least valued by teachers, drawing attention to the constraining influence of measurement culture and limited professional trust.

Like other participants, Isaac’s engagement extended beyond responding for the purposes of the study, suggesting a growing readiness to grapple with his own professional thinking and, possibly, an increasing trust in the research space. Participation prompted reflection on practice itself, transforming the research process from a data-collection exercise into a professionally resonant encounter that may feed forward into future thinking, learning and teaching. Isaac’s moments of candid reflection and self-interrogation reinforce that research participation can enable forms of professional meaning-making that may be rarely afforded within tightly

structured and time-pressured education systems. This reflective engagement contributed to richer and more nuanced understandings of student *success* across the broader study, as teachers were afforded time, space, and permission to pause, interrogate, and play within their professional spaces.

## Implications

Rather than positioning participants as data sources alone, as teachers of mathematics shared, negotiated, and re-evaluated their conceptions of student *success*, the research activities functioned as a reciprocal space through which they gained clarity and insight into their own beliefs and experiences while also generating deeper insight into teachers' conceptions for the purposes of the study. Importantly, this occurred without the study being framed as action research or professional development. Instead, the research design positioned participation as a productive site for professional inquiry, supporting teachers' sense-making while also informing the study. Attending to how research spaces are experienced may therefore offer one way to narrow the research-practice gap by allowing research to simultaneously serve analytic and practice-oriented purposes. For researchers – particularly early-career researchers – these findings underscore the value of designing methodologies that foreground participants' meaning-making rather than only research outcomes.

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