

# **“I Am a Mathematician”: Using AI-Supported Planning to Build Numeracy Vocabulary and Identity in Year 1 Girls**

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## **Abstract**

This action research project investigated how the AI tool Perplexity supported personalised numeracy vocabulary development for Year 1 girls in an all-girls Catholic school in Victoria, Australia. The study responded to evidence that gendered confidence gaps in mathematics emerge rapidly and that mathematical vocabulary is a key predictor of numeracy achievement and self-efficacy. Seven Year 1 girls, representing diverse language, educational and social backgrounds, participated in a six-week intervention embedded within daily numeracy sessions.

Perplexity was used as a planning partner to generate explicit vocabulary-focused lessons aligned with the Victorian Curriculum and International Baccalaureate (IB) Primary Years Programme (PYP) outcomes, incorporating explicit instruction, guided practice and opportunities for independent application. Lessons featured AI-informed word walls, games, co-constructed definitions and visual supports, which were continuously adapted using assessment data and teacher judgement. Data were collected using a mixed-methods approach, including “Mathematics Online Interview” growth points, Essential Assessment pre- and post-tests, student work samples, mathematician journals, interviews, teacher observations, video reflections and a reflective teacher journal. Inductive analysis was used to organise, code and interpret the data across the action cycle.

Findings indicate that when prompts deliberately encoded assessment data, vocabulary targets and clear structures, Perplexity-supported planning shifted tasks from closed-answer focused activities to open tasks that elicited rich strategy talk and more precise mathematical

language. Most students demonstrated growth in numeracy vocabulary knowledge and use, alongside increased confidence in explaining strategies and a stronger sense of themselves as mathematicians. These findings indicate that AI can effectively enhance explicit vocabulary instruction and support personalised learning when it is mediated by teacher expertise and grounded in robust evidence of student learning. Together these findings also offer practical guidance for early years teachers who are seeking to use AI to personalise numeracy vocabulary instruction and disrupt emerging gendered patterns of confidence in mathematics.

### **Glossary**

In this study, AI refers to a digital tool that generates lesson ideas, scripts and resources in response to teacher prompts. Numeracy vocabulary is the mathematical language students need to understand and communicate concepts, such as add, subtract, altogether and greater than. Explicit instruction describes a structured teaching approach in which I clearly model new vocabulary, guide practice and provide feedback, rather than relying on students picking up terms incidentally.

### **Introduction**

Mathematics in the early years is language-rich and many Year 1 girls struggle to access and use the vocabulary they need to describe their thinking and feel confident as mathematicians. In my own classroom, I noticed that some students could perform mathematical procedures but lacked the words to explain their strategies or participate fully in discussion. I also observed that, although they were often able to carry out the required skills and arrive at correct answers, the girls were sometimes unable to respond to key mathematical questions because they did not understand the mathematical vocabulary when it was used in context. At the same time, planning explicit, differentiated vocabulary instruction for a diverse group of six- and seven-year-olds is time-intensive. These observations led me to

explore how artificial intelligence (AI) might support my planning so that I could offer my students more targeted, personalised opportunities for numeracy vocabulary development.

My research investigated the question “How does the use of AI in classroom planning support personalised numeracy vocabulary development in Year 1 girls?” The focus was on how an AI planning tool could help me design lessons that built both mathematical language and students’ confidence to use it.

Action research was the methodological framework for this project because it allowed me, as the classroom teacher, to systematically investigate my own practice while directly responding to the needs of my students (Mertler, 2024). Through cycles of planning, acting, observing and reflecting, I trialled AI-informed lessons, gathered evidence of how my Year 1 girls used numeracy vocabulary and adjusted my teaching along the way. This approach was well suited to a small, context-specific study where the goal was both to improve outcomes for a particular group of learners and to refine my professional practice in using AI responsibly and effectively in classroom planning.

### **Literature Review**

Research consistently demonstrates that gender disparities in mathematics achievement and attitudes emerge remarkably early in students' educational journeys and persist for many years throughout their education. International assessments and national data consistently indicate that boys outperform girls in mathematics, with this pattern evident not only in standardised test results but also in students’ self-efficacy and engagement with mathematical tasks (Hyde et al., 2008; OECD, 2023). The 2025 NAPLAN national results (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2025) exemplify this trend in the Australian context, showing boys consistently achieving higher proficiency

across "strong or above" and "exceeding" categories at all year levels, with gaps as large as 8.0 percentage points at the "exceeding" level in Year 5.

Girls consistently report lower mathematics self-efficacy than boys, even when their achievement is equal or superior—a pattern observable as early as Year 1 (Else-Quest et al., 2010; Lindberg et al., 2013; OECD, 2014). Complementary evidence from Martinot et al. (2025) shows that although boys and girls begin schooling at similar performance levels, a measurable gender gap in mathematics emerges within the first year. This finding suggests that factors within the educational environment, rather than innate differences, play a key role in the development of these gaps. The significance of these early confidence differences cannot be understated, as self-efficacy beliefs serve as strong predictors of future engagement in mathematics and future career choices (Liu et al., 2024), creating a path that can limit girls' participation in Science, Technology, Engineering, the Arts, and Mathematics fields both at school and beyond.

One factor underpinning these early differences is mathematics vocabulary, which provides the conceptual foundation for numeracy learning. Evidence highlights that girls, who may face unique social and language-related barriers, are particularly disadvantaged in mathematics when explicit vocabulary instruction is lacking, leading to reduced confidence in engaging with key concepts (Martinot et al., 2025; Young-Loveridge, 2011). Key mathematical terms such as “more than,” “share,” or “greater than” not only predict short-term performance but are strong indicators of later mathematics achievement (Bleses et al., 2023; Ho et al., 2024; Purpura et al., 2017). As vocabulary acquisition is most rapid in the early years, this stage represents a critical intervention point for addressing emerging gaps before they become well established. Most interventions, however, remain generic in design, often overlooking the confidence and self-belief dimensions essential for Year 1 girls' success (Young-Loveridge, 2011).

The development of language is powerfully shaped by 21st-century childhood environments. For instance, Brushe et al.'s (2023) study revealed that each additional minute of screen exposure in young children is linked to substantial decreases in the number of adult words heard, vocalisations produced, and conversational turns with caregivers (Brushe et al., 2023; Massaroni, 2023; Tulviste & Tulviste, 2024). Brushe et al. note that, on average, three-year-olds can miss over 1,000 adult words and hundreds of conversational exchanges daily due to screen use. These deficits are reflected in reduced vocabulary and grammatical skills, and are most pronounced in children who have unsupervised and prolonged screen time (Massaroni, 2023; Tulviste & Tulviste, 2024). These patterns suggest that girls, in particular, may face added challenges: excessive screen time exposes girls to fewer spoken words and interactions, limiting their opportunity to build the key vocabulary that supports their mathematical understanding, reasoning and confidence. (Bezuidenhout, 2022; Nelson & Kiss, 2021).

Given the established role of numeracy vocabulary in supporting mathematics achievement, particularly for young learners, recent research has explored how emerging technologies such as AI can strengthen targeted explicit instruction. Scholars argue that AI can do more than streamline lesson design; it can personalise instruction to student interests and abilities, thereby enhancing engagement and achievement (Belloula, 2025; Nasser, 2024). Data also suggests that AI not only adapts pace and difficulty to suit diverse learners but also generates interactive and immersive tasks that nurture motivation, particularly in the early years (Nasser, 2024). Recent reviews emphasise AI's contribution to differentiated instruction, showing consistent links between adaptive technologies and measurable learning gains in both literacy and numeracy (Holmes et al., 2021; Zawacki-Richter et al., 2019). Other recent studies demonstrate that AI-enabled platforms can significantly improve mathematics achievement, with effect sizes ranging from 0.41 to 0.60 in primary settings,

suggesting substantial benefits for young learners developing numeracy vocabulary (Education Endowment Foundation [EEF], 2025). For female students specifically, emerging evidence indicates that AI-supported mathematics instruction can help address gender-related achievement gaps, with some interventions showing particular effectiveness in improving girls' mathematical performance and confidence (Gabriel et al., 2025). Moreover, the capacity of AI to provide suggestions for goals, strategies, and resources positions it as a valuable partner to teachers rather than a replacement (Luckin & Holmes, 2016; Van den Berg & du Plessis, 2023).

AI tools demonstrate exceptional capability in generating curriculum-aligned resources and assessments, with teachers reporting time savings of up to 31% in lesson planning activities, allowing for increased focus on explicit instruction and student interaction (Education Endowment Foundation [EEF], 2025). This efficiency gain is particularly valuable in early childhood settings where educators must balance multiple developmental domains while ensuring mathematical vocabulary development receives adequate attention (Education Endowment Foundation [EEF], 2025). Furthermore, AI's role in lightening administrative burdens, while preserving the essential role of a teacher, represents a shift towards pedagogical models that are both flexible and inclusive (Holmes et al., 2021; Selwyn, 2019).

Nonetheless, there are still obstacles to the successful adoption of AI in schools by teachers. Teachers often lack training and confidence in AI tools (Xu & Warschauer, 2020), and ethical concerns about privacy, equity of access, and algorithmic bias persist (Selwyn, 2019; Williamson & Eynon, 2020). Therefore, while AI holds promise for advancing targeted vocabulary instruction and reducing early mathematics gaps, its effectiveness depends on professional development for teachers and the development of ethical guidelines.

In summary, research highlights that gender disparities in mathematics achievement and attitudes appear early, with vocabulary knowledge and confidence serving as critical

contributors (Hyde et al., 2008; Martinot et al., 2025). While mastery of numeracy vocabulary predicts achievement, Year 1 girls often encounter confidence barriers and reduced exposure to vocabulary-rich interactions. AI offers new opportunities for personalised instruction by adapting to individual learners' needs and supporting teachers in delivering targeted vocabulary development (Belloula, 2025; Nasser, 2024). However, to maximise its potential in addressing gender gaps, teacher training and ethical safeguards are essential (Selwyn, 2019; Xu & Warschauer, 2020).

### **Research Context**

Genazzano FCJ College is an all-girls' Catholic school in Victoria, Australia. Genazzano is an inclusive and dynamic learning community that values diversity and provides a balanced educational experience from Early Learning to Year 12. Guided by the principles of the Faithful Companions of Jesus, Genazzano nurtures both academic excellence and emotional wellbeing, encouraging young women to develop leadership, faith, and a confident sense of self. In this context, my participants were seven Year 1 girls aged 6–7 years old from my homeroom class. The whole class was invited to participate, given the small class size, and the group represented a range of language backgrounds, educational experiences, and social contexts, providing a rich and varied learning environment. This diversity offered valuable insights into how differentiated and inquiry-driven teaching practices, particularly in mathematics, supported early cognitive and linguistic development among young learners in an all-girls' school setting. Permission to participate was obtained through an EdSmart form, which informed parents of the purpose of the research, the types of data to be collected, and how data would remain anonymous. Confidentiality was protected through de-identification of all data, including the use of pseudonyms and the removal of any personal identifying details.

## The Action

The action phase of this project unfolded through a series of deliberately planned steps that integrated Perplexity into my everyday numeracy practice. I began by identifying key numeracy vocabulary aligned with the Victorian Curriculum 2.0 (ACARA, 2025), focusing on language connected to number, additive thinking and place value. Drawing on Mathematic Online Interview (MOI) data, Essential Assessment results and my own anecdotal notes, I selected terms that reflected both the curriculum expectations and the specific gaps evident in my learners. The focus group comprised Year 1 girls with diverse linguistic profiles, confidence levels and learning needs, which ensured that the intervention spoke directly to the range of experiences within my classroom while remaining manageable enough for close observation and reflection.

Once the focus and participants were established, I explored how different AI tools might support explicit vocabulary instruction. I trialled the same planning prompt across several platforms (see Figure 1) before selecting Perplexity as the primary planning partner, because it responded accurately to curriculum language, allowed me to embed assessment data and produced structures that aligned with my existing gradual release routines. Using Tyler Gaspich's PARTS framework (Gaspich, 2025) as a guide, I crafted prompts that specified the teaching persona, action, recipients, topic and desired structure.

Using Tyler Gaspich's PARTS framework [DPL1], introduced at the 2025 ICGS conference, prompts were built around five elements: [DPL2]

- **Persona:** Who is speaking to the AI, such as a creative IB PYP Year 1 teacher using the Maths 2.0 Victorian Curriculum,
- **Action:** What the AI should do, for example write a mini-lesson script using the gradual release of responsibility model,



mathematics vocabulary wall featuring student-friendly definitions and visual supports. I treated these outputs as drafts rather than finished products, revising wording, adjusting cognitive demand and incorporating examples drawn from my students' own work and language. This ensured that the lessons remained developmentally appropriate and culturally situated within our classroom.

Implementation took place within daily numeracy sessions, with AI-planned lessons woven into existing units rather than standing alone as a separate program. Throughout the action phase, I monitored student responses closely, gathering formative assessment through observations, work samples, mathematician journals, and short conferences. These insights fed back into subsequent prompts and lesson adjustments, creating a feedback loop between student data, AI-generated suggestions, and teacher judgement. In this way, the action phase functioned as an iterative cycle: Perplexity supported planning efficiency and idea generation, while my ongoing decisions in the classroom personalised vocabulary instruction for each girl and kept the focus firmly on meaningful mathematical talk.

### **Data Collection**

Consistent with Mertler's (2024) exploratory mixed-methods framework, this study employed both qualitative and quantitative approaches, with qualitative data collected first to identify emerging patterns before introducing quantitative measures to confirm and extend findings. Using multiple types of data allowed me to form a complete view of how well the teaching methods worked and the extent of student learning, while capturing the complexity of personalised numeracy vocabulary development in Year 1 girls.

Qualitative data consisted of several sources. Mathematician reflection journals, incorporating thinking routines from Project Zero (Project Zero, n.d.), were completed by students before and after vocabulary-based mathematics lessons, providing insight into their

thinking and understanding over time. Pre- and post-action research interviews explored students' evolving use and comprehension of mathematical vocabulary in problem-solving contexts. Teacher observations, conducted by me throughout all phases of the intervention, documented student engagement, application of AI-suggested strategies, and adjustments made to meet individual learning needs. Additionally, the collection of student work samples allowed analysis of how mathematical vocabulary was represented in written and visual formats.

Quantitative data were drawn from two platforms: the MOI and the Essential Assessment testing system. The MOI provided measures of student progress against the Victorian Curriculum achievement standards. It captured strategies, reasoning, and specific mathematical vocabulary students used when explaining their thinking, with data collected at both the beginning, middle and end of the study. Essential Assessment generated further numerical data points on vocabulary understanding within problem-solving tasks, enabling comparison over time.

This integration of diverse, systematically gathered data sources ensured a credible, polyangulated representation of how AI-supported classroom planning and influenced personalised numeracy vocabulary learning for Year 1 girls.

### **Data Analysis**

I applied the inductive analysis framework of “organise, describe, interpret” (Mertler, 2024) to examine the collected data. Through a process of coding, I was able to sort and group the data in ways that highlighted recurring ideas connected to the research question on how AI-supported planning contributes to numeracy vocabulary growth in Year 1 girls. Evidence was considered across different phases of the action to identify changes in student confidence, accuracy in vocabulary use, and participation in numeracy discussions. This approach made it

possible to trace not only adjustments in planning practices but also the ways students engaged with and applied new vocabulary over time. To maintain rigour, I continually reviewed my interpretations and sought peer feedback, which helped strengthen the trustworthiness of the themes I identified and ensured they accurately reflected the data rather than researcher assumptions.

### **Discussion of Findings**

From my analysis, I identified four themes, which I then refined into thematic statements to frame the discussion of my findings.

#### **The Deliberate Engineering of AI Prompts Enhances Girls' Instructional Precision and Promotes Deeper Reasoning**

The effectiveness of AI as a planning tool was primarily determined by the quality of the prompts, particularly the extent to which they encoded assessment data, vocabulary targets, and a clear structure.

When assessment data and explicit vocabulary targets were embedded within the PARTS framework, AI-generated outputs shifted from closed tasks demanding correct answers to more open-ended learning experiences that elicited students' strategic thinking. For instance, the initial prompt "You are a creative Year 1 teacher using the Victorian Maths Curriculum 2.0, write a lesson script to use during a mini lesson (using the gradual release of responsibility model) for Year 1 students about the addition strategy of counting on whilst explicitly exploring the vocabulary counting on, add, more" produced a structured script followed by an independent task focused primarily on procedural accuracy (see Figure 2). Once anecdotal notes and MOI growth-point data were attached as PDF files and embedded into the prompt, the resulting independent task (see Figure 3) shifted to allow multiple valid responses and keep students productively engaged while I conducted small-group instruction or conferencing. This addition of data files (D) to the PARTS framework, creating PARTSD,

demonstrated that embedding evidence altered AI-generated outputs, enabling tasks that supported differentiated practice rather than closed, answer-focused tasks.

**Figure 2:**

AI generated “You Do” Task

3. You Do – Independent Practice (5–10 minutes)

Teacher:

“Now it’s your turn to try *counting on*! I’ll give you a few addition problems. Use your fingers or a number line if you need.”

Examples:

- $6 + 2$
- $3 + 4$
- $7 + 1$

Prompt as students work:

“Which number will you start from?”

“How many more are you counting on?”


“Can you tell me your answer using our words *counting on*, *add*, and *more*?”

Extension (for fast finishers):

**Figure 3:**

AI generated You Do Task when data is inputted

**You Do**

 addition stories.docx

Activity Prompt:

- “Make up your own *addition* story using *counting on*.”
- “Choose any two groups of objects or counters. You choose how many go in each group!”
- “Show or tell how you find the total by *counting on*. You could draw a picture, build with blocks, or use counters. If you want, you can even act out your story.”
- “Remember to use our special words: *counting on*, *add*, *more*!”

Examples (for modelling if needed):

- “I have 5 yellow buttons. I *add* 4 more blue buttons. I start at 5 and count on—6, 7, 8, 9. So, 5 *add* 4 more is 9.”
- “There are 7 dinosaurs on the mat. 2 more come to join. I count on—8, 9. Now there are 9 dinosaurs!”

Within these revised tasks, AI-generated materials incorporated explicit opportunities

for students to explain and justify their reasoning using target vocabulary such as "count on," "add," and "more." Across reflection journals and interviews, students increasingly used this vocabulary in their own words, for instance describing part–part–whole as "you get 2 parts, add them together to make the whole" and explaining that "when you have 3 and 4, it makes 8 altogether," suggesting that repeated, AI-supported exposure contributed to the internalisation of key numeracy terms. This streamlined preparation and reduced teacher workload by automating the creation of curriculum-aligned materials, while professional judgement remained crucial for checking accuracy and suitability. This finding mirrors wider research that AI is most effective when aligned with learner data and instructional intentions rather than treated as a generic content generator (Belloula, 2025; Holmes et al., 2021; Zawacki-Richter et al., 2019).

In my reflection journal I noted that planning time “now takes a fraction of the time,” allowing increased in-the-moment responsiveness during lessons and enabling a greater proportion of planning time to be devoted to Tier 1 and Tier 2 interventions. MOI data indicated that four of seven students advanced by at least one growth point, with no student declining, particularly on items requiring explanation of strategy; thus suggesting that well-designed, data-informed prompts enabled AI to act as a purposeful planning partner that enhanced instructional precision and promoted deeper student reasoning.

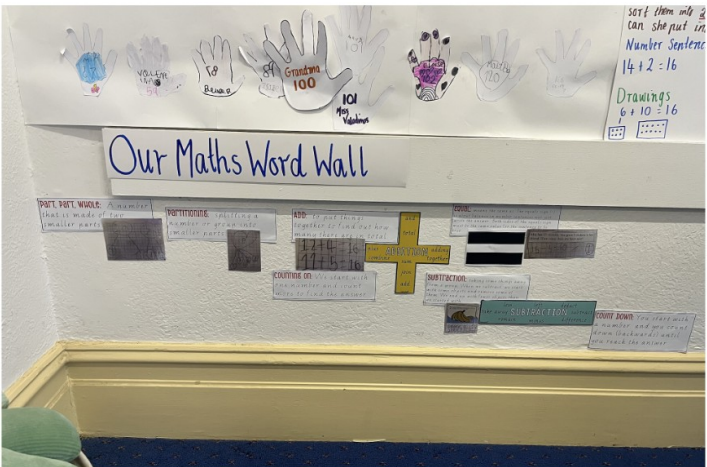
### **An AI-Supported Maths Vocabulary Wall Builds Girls’ Confidence and Precision in Their Mathematical Thinking**

AI-supported vocabulary curation enhanced students' confidence and precision. During lesson planning, the Mathematics Vocabulary Wall (see Figure 4) was proposed by AI, and the definitions were collaboratively refined using AI to ensure clarity and consistency.

The AI-designed wall featured student-friendly definitions for key terms such as "subtract," "altogether," and "part-part-whole," and we further enhanced it by adding annotated student work samples. For example, we displayed a student's drawing of "part-part-whole" alongside the definition, or showed Student A's own words "you get 2 parts, add them together to make the whole" next to the formal term. This multi-modal approach, pairing definitions with authentic student examples, ensured that learners encountered consistent language across mini-lessons, reflections, and problem-solving tasks, enabling the girls to internalise mathematical language and use it more accurately when explaining strategies to peers.

**Figure 4:**

AI- Generated Mathematics Vocabulary Wall.



The impact of a consistent mathematical language was evident in student work and reflections. Journal entries and interviews captured evidence of internalisation as Student B described counting on as "you lock the number in your head and you count on the smallest number," while Student C wrote that "counting on means locking a number in our head," echoing the shared strategy language that had been explicitly taught. When prompts included explicit use of vocabulary such as "altogether," "difference," and "equal," AI-generated scripts

included reflection stems like "I am a mathematician because..." and "Today I learned..." prompting students to verbalise their strategies in their own words. Student A's progression from initially describing addition as "you get 2 parts, add them together to make the whole" to later explaining counting on using "lock the number in your head" demonstrated increasing precision with part-part-whole and counting-on language, suggesting that the girls' internalisation of vocabulary was deepening over time.

Students also corrected earlier misconceptions through use of the shared vocabulary. Student G initially believed that "sum" meant "just a little bit" but later described finding the difference as "you count forward from the part," indicating a shift toward viewing difference as a strategy rather than only an answer. Student E reflected that "I am a mathematician because I'm good at subtraction" and that maths words "help you... when you are stuck," explicitly linking vocabulary to problem solving and self-efficacy. These changes align with research showing that early numeracy vocabulary strongly predicts later mathematics achievement and confidence, especially for girls who may experience language-related barriers (Bleses et al., 2023; Ho et al., 2024; Purpura et al., 2017; Young-Loveridge, 2011).

As AI standardised curriculum-aligned wording, planning time shifted away from repeatedly drafting definitions toward listening to student talk and prompting refinement from informal to precise language; for example, moving from "take some away" to distinguishing explicitly between "count on" and "count back" in explanations. Thus, AI-generated vocabulary resources functioned as starting points for dialogic use rather than static word lists, supporting Year 1 girls to communicate their mathematical thinking with growing clarity, confidence, and ownership.

## **Personalised Learning in Girls is Enhanced When AI Supports Rather Than Replaces Teacher Decision-Making**

Findings indicate that AI supported personalisation only when embedded within ongoing teacher decision-making and in-the-moment instructional adjustments. I observed in my reflections that “the “You do” tasks [generated by AI] were close-ended even when specified to make them open-ended/low floor-high ceiling,” highlighting the tendency of default outputs to narrow rather than expand student thinking. When these tasks were deliberately re-designed by the teacher, they began to reveal distinct strategies. Student E reasoned that “if you have 2 numbers close together instead of counting backwards you count forwards to find your answers,” while Student A explained, “I am counting by 2 to find out how much I have in each group,” showing flexible use of skip-counting in grouping contexts.

In subtraction, Student C explained, “I put 12 in my head and 9 on my fingers and counted back,” drawing directly on classroom talk about which number to “lock in your head.” Only through intentional adaptation did AI-generated tasks become genuinely low-floor, high-ceiling experiences responsive to emerging strategies in this cohort. Teacher judgement remained central because students' learning needs and preferences could not be fully captured in generic prompt data.

The importance of this mediation was particularly evident when attendance disruptions due to illness affected participation. Student F thrived in quieter spaces, stating, “I can think,” while Student E preferred collaborative discussion, explaining, “I like to share my thinking with others.” AI was helpful for generating general support and extension ideas, but professional judgement was essential for deciding where to re-enter the learning sequence for

each girl and what level of cognitive demand was appropriate. Thus AI functioned as a scaffold for teacher-led personalisation rather than a replacement for it.

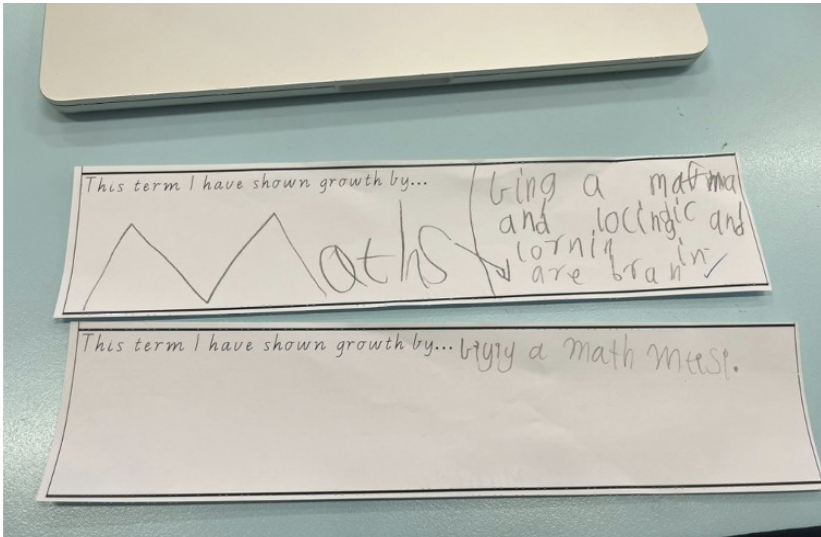
Personalisation accelerated when assessment data deliberately shaped AI prompts. Drawing on Essential Assessment pre-and post-tests, five of seven students demonstrated growth of at least one year (from indicator F, end of Foundation, to 1, end of Year 1) in under five months, alongside more confident use of mathematical language in explanations. Teacher mediation emerged when Student G's shift from "sum" as "just a little bit" to "you count forward from the part" aligned with gains on strategy-based MOI items. Student B's movement from "I don't know" to using "count on" and "altogether" in explanations underscored that real personalisation emerged from ongoing teacher-student relationships, with AI serving as a powerful but supportive planning support.

### **"I am a Mathematician": AI-Supported Lessons Enhance Girls' Mathematical Identity and Agency**

Mathematical self-belief and participation appeared to flourish as students came to see themselves as "the kind of person who does maths." They increasingly described themselves as mathematicians as their vocabulary and strategy talk became more confident. Three students explicitly described their growth in identity terms, writing, "This term I have shown growth by... being a mathematician," "being a math master," and "locking learning in our brain." These phrases echoed earlier journal stems such as "I am a mathematician because..." where students identified themselves as "good at subtraction," "good at sharing," or "thinking about numbers," suggesting that identity talk had become a familiar classroom routine rather than an isolated prompt.

**Figure 5:**

Student Written End-of-Term Reflections



These self-descriptions emerged in open reflections, not in tightly scaffolded identity tasks, indicating that the routines built around AI-supported lessons had normalised talk about mathematical identity. Student D explained that “mathematician... means that you try your best,” while Student E added that a “Mathmatician [sic]... means having fun and trying your best,” both linking identity to perseverance and enjoyment rather than speed and accuracy alone. Vocabulary and identity intertwined, as words first encountered in AI-mediated prompts were gradually taken up in students’ own descriptions of who they were as learners of mathematics.

Crucially, these identities were rehearsed in shared spaces, not only in written work. Teacher reflections noted that students began “looking forward to sharing what they’ve learned after each session,” with “a noticeable increase in the number of students volunteering to share, including those who previously tended not to participate.” AI-assisted scripts and reflection prompts created predictable spaces where girls could talk through their thinking

using accessible sentence stems, lowering the social risk of speaking aloud and positioning mathematical talk as a normal, shared practice. Students who once offered one-word responses began to give fuller explanations, often drawing explicitly on identity language and newly learned vocabulary.

Students also demonstrated growing ownership of mathematical learning. For instance, Student G shared that "after yesterday's lesson she went to Officeworks and bought an addition and subtraction book," showing that mathematical thinking had extended beyond the classroom. These patterns align with literature suggesting that structured opportunities to voice reasoning, combined with relationally safe environments, can disrupt early gendered patterns of low self-efficacy for girls in mathematics (Else-Quest et al., 2010; Hyde et al., 2008; Gabriel et al., 2025; Liu et al., 2024). In this context, AI did not define students' identities but underpinned consistent routines and prompts that allowed Year 1 girls to practise naming themselves as mathematicians in ways that were authentic, joyful, and sustainable.

## **Conclusions**

My research found that deliberately integrating the AI tool Perplexity into classroom planning strengthened Year 1 girls' numeracy vocabulary, confidence and sense of themselves as mathematicians, helping them to challenge earlier patterns of low confidence and limited participation. By embedding assessment data, target vocabulary and clear lesson structures into prompts, I was able to design more open, language-rich tasks that encouraged students to articulate their strategies rather than simply produce correct answers. Across assessments, work samples and reflections, most girls used key mathematical terms with increasing accuracy and independence. This suggests that explicit, consistent vocabulary

instruction supported by Perplexity can positively shape both learning outcomes and learner agency.

The project also reshaped my understanding of teaching and learning, positioning AI not as a replacement for teacher expertise but as a planning partner that freed time and cognitive space to listen closely to student talk, differentiate in the moment and intentionally build positive mathematical identities, while limitations such as high absenteeism, a very small cohort and a short timeframe constrained continuity, collaborative discussion and longer-term tracking.

My findings suggest that thoughtfully mediated AI-supported planning can be a powerful lever for strengthening young girls' mathematical language, confidence and identity in all-girls early years classrooms, while also offering adaptable routines that could be applied in co-educational settings to disrupt emerging gendered patterns in numeracy. In future cycles I plan to work with a larger cohort over a longer period, incorporating systematic analysis of small-group dialogue, follow-up assessment data and student focus groups, and continue to refine evidence-informed prompting and reflection on student language so that every girl is supported to see herself, and speak, as a confident and capable mathematician.

### **Reflection Statement**

This project has fundamentally reshaped how I see both teaching and research. I began with only a vague sense of what I was signing up for and no prior experience of conducting formal research in my own classroom. No one at my school had previously completed a project like this, so there was no well-worn path to follow. Yet, through the process, I came to understand the power of AI not as a replacement for teachers, but as a genuinely useful professional tool. I learned that when used thoughtfully, AI can significantly reduce the planning and documentation load that so often pushes work–life balance out of reach for

teachers, freeing more time and headspace for the parts of the job that matter most: listening to students, noticing their thinking and designing responsive learning experiences.

At the outset, I felt both excited and apprehensive. I had not dabbled in AI at all before being accepted into this project, and the idea of experimenting with it while also trying to conduct rigorous action research felt daunting. Choosing a focus was itself a major hurdle; as a generalist primary teacher, the possibilities across literacy, numeracy and inquiry felt endless, and it took time to narrow my attention to numeracy vocabulary for Year 1 girls. As the project unfolded, however, my initial nervousness gave way to curiosity and, eventually, real confidence. I learned a great deal about myself as a teacher, including my capacity to design careful prompts, interrogate data, and maintain a strong sense of professional judgement even while working with powerful new technology.

Several highlights stand out for me now. Seeing my Year 1 girls begin to use precise mathematical language and to describe themselves as mathematicians was deeply affirming and reminded me why this work matters. Sharing my preliminary findings with colleagues at Genazzano was another turning point; it helped me see that this project has value beyond my own classroom and can contribute to a broader, hopeful conversation about AI and girls' learning. I am profoundly grateful to my research advisor, Nuria Tapias Nadales, for her generous feedback and steady guidance, and to my mentors Anita Kellier and Loretta Wholley, whose encouragement made the project feel possible on the most demanding days. I would also like to thank Alli Lehmann, Head of the Genazzano Institute, for inviting me to present my early findings to staff, and Junior School Curriculum Leader Bridie Stillman, who was a trusted colleague to think with about teaching practice and data. Most of all, I am thankful for my 2025 Year 1 class, whose humour, honesty and enthusiasm made this journey not only professionally rich, but genuinely joyful.

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