NSW Department of Education

Targeted Early Numeracy (TEN)

Final evaluation report

Centre for Education Statistics and Evaluation

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NSW GOVERNMENT

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Summary – the short story

Targeted Early Numeracy (TEN) is an Early Stage 1/ Stage 1 intervention aimed at students in Kindergarten to Year 2 whose facility with number suggested they were at risk of scoring in the lowest two bands in Numeracy NAPLAN in Year 3. The intention of the intervention is to enable teachers to support Kindergarten to Year 2 students to achieve minimum standards of numeracy by the end of Year 2. TEN was developed and introduced by the NSW Department of Education in 2009 for use as a small group intervention.

The evaluation of TEN was conducted by the Centre for Education Statistics and Evaluation in 2018 and 2019 and considered the impact, implementation and use of the intervention.

Key findings

Impacts of TEN on student learning and teacher practice

- We have no evidence that TEN is achieving its goal of supporting Kindergarten to Year 2 students' facility with numbers to reduce their risk of scoring in the lowest two bands in numeracy NAPLAN in Year 3. We have been unable to effectively measure TEN's impact on numeracy learning outcomes due to the reduced departmental oversight of TEN and the inconsistent implementation of the intervention in schools. One reason for this reduced departmental oversight was the delegation of key decision-making to schools, which left the department without data on which schools had adopted TEN and how they were deploying it.
- We do not have outcome data to measure changes in teacher practice as a result of TEN, again due to reduced departmental oversight and inconsistent implementation of TEN.
    - However, most educators have reported increased confidence in teaching numeracy and understanding numeracy teaching practices through their use of TEN.
    - Educators also indicated that they adjusted their own teaching practice when using TEN through altering their implementation of the intervention, making curriculum adjustments and altering their learning and teaching strategies.

Why are we unable to effectively measure TEN's impact?

The department has reduced oversight of the intervention, at least in part due to the move to delegate greater decision-making to schools and the transfer of professional curriculum support into schools. As a result:

- The implementation of TEN is inconsistent. TEN is not being implemented in schools as was intended and therefore we cannot adequately measure whether it is meeting its intended goals.
- There is inconsistency in implementation in terms of year group, targeted students, frequency of lessons, grouping of students, assessment of students and areas of the mathematics syllabus that are targeted through TEN.
- The original facilitated training model has changed over time. There is now a lack of consistency in both the quality of TEN training and its delivery.
- While principals still supported the implementation of TEN in their schools, educators no longer had access to the same intensive training model for TEN.

Lessons learned

The department needs to know whether interventions, such as TEN, lead to positive student outcomes. For the department to be able to measure the effectiveness of interventions, evaluation needs to be built into the development of interventions. This would enable the department to access necessary data to complete a rigorous and reliable outcome evaluation.

Evaluation should also be an ongoing process for the duration of the time interventions are implemented in schools, and in particular, should be prioritised during the scaling-up phase of an intervention.

Key considerations

In improving numeracy interventions and measuring their effectiveness, it is important that the department:

- maintains and supports program fidelity by ensuring interventions align to the current syllabus outcomes
- maintains adequate records and corporate administrative knowledge
- provides educators with high quality, evidence-based training and ongoing support and professional learning
- builds evaluation into the development of interventions and prioritises evaluating interventions throughout their lifecycles.

It is also the responsibility of schools to ensure that interventions are implemented as intended in classrooms, and do not become a replacement for the syllabus.

Background to the evaluation

Evaluation aim

This evaluation aimed to measure the impact of TEN on student learning outcomes and teacher practice.

To inform this outcome evaluation and to frame recommendations, we conducted a process evaluation which sought to assess:

- reasons schools choose to use TEN
- reasons schools choose not to use TEN
- how schools use TEN
- perceptions of what is working well with TEN
- perceptions of TEN training and its delivery.

Method

Data

To measure the impact of TEN on student outcomes, we used a cross-sectional Ordinary Least Squares approach and a propensity score matching approach as a robustness test.

We used a mixed method design to answer the process evaluation questions and gather teacher perception data. We collected data using two surveys of school principals and educators and conducted semi-structured interviews with key stakeholders.

More detail on data sources is in Appendix B (page 21).

Scope

Because we did not have access to reliable administrative data about which schools were currently using or had ever used TEN, we surveyed principals in Term 1, 2018 to ask about their school's TEN usage. The 62% of schools (n = 1,028) that responded to this survey were in scope for the evaluation. For the remaining 38% of schools, we had no reliable and consistent data on their TEN usage either currently or previously. Therefore, these schools were out of scope for the evaluation.

Background to Targeted Early Numeracy (TEN)

Original TEN model

TEN is an early years numeracy intervention initiated by the department in 2009 aligned to the NSW Numeracy Continuum for use in K-2 classrooms. TEN, as a numeracy intervention, was designed to complement the teaching of the NSW syllabus, and specifically focused on a small portion of the Working Mathematically and Content components. Count Me in Too (CMIT) influenced the development of TEN, and TEN and CMIT share a similar research base.[1]

Goal of TEN

TEN was designed as a Tier 2 numeracy intervention – an intervention for small groups or individual instruction for academically at-risk students. The intended target group for TEN was students in Kindergarten to Year 2 whose facility with number suggested they were at risk of scoring in the lowest two bands in Numeracy NAPLAN in Year 3. The intention of the intervention is to enable teachers to assist Kindergarten to Year 2 students' facility with number to achieve minimum standards of numeracy by the end of Year 2.

What TEN was designed to look like

Year groups
K-2

Tier of intervention
Tier 2, small group

Time and frequency
Short, focused and frequent

Grouping
Focus students selected for targeted teaching according to similar need

Assessment
Formative assessment every day with summative reporting every five weeks

Numeracy components
Strategically targeted learning activities focusing on foundation number knowledge (Number and Algebra in the NSW syllabus), designed in addition to regular mathematics teaching

Target and motivation
Focus on students at risk of not meeting minimum standards

Intended use of TEN

The intervention involves short, focused and frequent learning activities, implemented as part of regular mathematics lessons. TEN is intended to complement other teaching programs and strategies used during regular teaching. The TEN guidelines[2] identify the following key components:

- explicit and systematic teaching
- small group instruction
- strategically targeted activities focusing on developing early arithmetic strategies
- monitoring student progress every day and assessing progress every five weeks, identifying targets and planning future instruction.

TEN training and its delivery

The initial TEN model included a comprehensive training component for TEN trainers. Training for TEN was overseen by the department and there was a high level of fidelity in both the content of the training and in the support TEN trainers received.

The initial implementation of TEN involved TEN trainers working in schools to:

- provide professional learning to teachers and future TEN trainers
- provide in-class support for teachers
- assist teachers with data analysis
- monitor student outcomes.

Three elements of the TEN training model that were perceived by TEN administrators as being integral to the perceived initial success of TEN were:

- side-by-side support for educators in their classrooms provided by a TEN trainer
- delivery of effective professional learning to TEN trainers
- trainers who were exceptional teachers with high-quality leadership skills and a deep understanding of numeracy development.

Usage of TEN

Three quarters of schools with Early Stage 1/Stage 1 students stated they had used TEN in Kindergarten, Year 1 or Year 2 classrooms at some point from 2010 to 2017.

1 For more information about the background of TEN refer to Appendix A.
2 NSW Department of Education. (2013). Targeted Early Numeracy. NSW Department of Education. cese.nsw.gov.au/evaluation-repository-search/targeted-early-numeracy

Key findings – the more detailed story

Impact on student learning outcomes

There is no evidence that TEN is achieving its goal of enabling teachers to support Kindergarten to Year 2 students' facility with number to reduce their risk of scoring in the lowest two bands in numeracy NAPLAN in Year 3.

As part of our outcome analysis, we did not find any positive impacts of TEN on student learning outcomes. We were unable to attribute student progress and improvement in numeracy outcomes to TEN. Further, any perceived impacts on students' numeracy outcomes (as measured through survey and interview data that gathered educators' perceptions) are difficult to attribute to TEN due to:

- the inconsistent implementation of TEN in schools
- the move away from the original TEN model
- the quality of the data about TEN use in individual classrooms
- the loss of teacher observation and Best Start data caused by moving from PLAN1 to PLAN2 in 2018.

This outcome evaluation was severely hampered by data quality issues. In particular, inadequate record keeping on TEN exposure and implementation meant that TEN exposure could only be ascertained through a retrospective survey conducted in 2018. For a number of reasons, our estimate of TEN exposure is likely to suffer from serious measurement error (most likely, over-reporting). Given the retrospective nature of the data collection, measurement error is also likely to be higher for earlier years.

The statistically estimated impacts of TEN are generally close to zero and not statistically significant.

- This is also true when considering impact for:
  - student's gender
  - student's Aboriginality
  - parental education
  - parental occupation
  - school location
  - level of school advantage
  - length of principal tenure at the school
  - school's utilisation of TEN.
- For students deemed to be 'emergent' in Early Numeracy Strategies in the Kindergarten Best Start Assessment, three years of TEN exposure is associated with 0.22 fewer correct responses to questions on the Year 3 NAPLAN Number, Patterns and Algebra minor aspect. While this is a statistically significant result in the opposite direction we would anticipate, this result is not considered reliable due to the attribution concerns stated above.

Impact on teacher practice

There is no outcome data to support an impact of TEN on teacher practice, however educators did self-report some positive impacts of TEN on their own teaching practice.

Classroom observations measuring the impact of TEN on teacher practice were not feasible to be included in this evaluation. This is primarily because we did not have access to adequate record keeping on the use of TEN at a within-school level in 2018 and 2019 (when this evaluation was conducted) to enable us to gather baseline data to conduct pre-and-post implementation classroom observations.

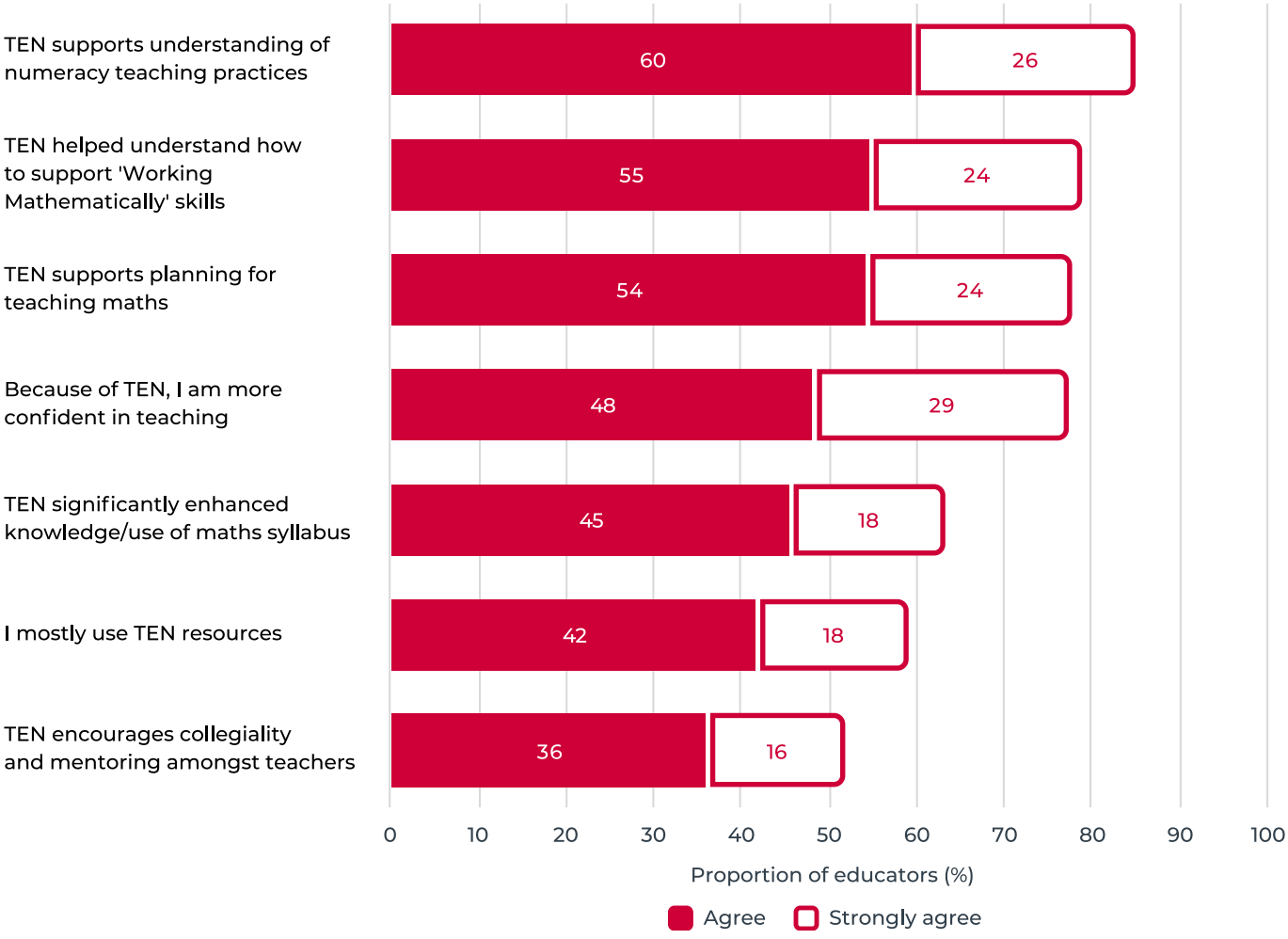
The same reasons outlined above have also hampered our ability to measure TEN's impact on student outcomes, meaning that we were unable to find outcome data to support an impact of TEN on teacher practice. However, we did find some perceived impacts of TEN on teacher practice through our surveys and interviews, with respondents reporting improved teacher practice as a result of TEN.

When educators felt that they understood the purpose and strategies of TEN, their self-reported capacity to effectively diagnose and cater to the needs of students in their early years who were not progressing mathematically seemed to improve. Specifically, the majority of educators reported that they were more confident to teach numeracy as TEN supported their understanding of:

- numeracy teaching practices
- planning for teaching mathematics
- the mathematics syllabus.

Figure 1: Impact of TEN on teaching practice (Source: CESE classroom practice survey 2018)

Q: To what extent do you agree with the following statements? (n = 803)



Educators using TEN also reported improved learning and teaching practices including:

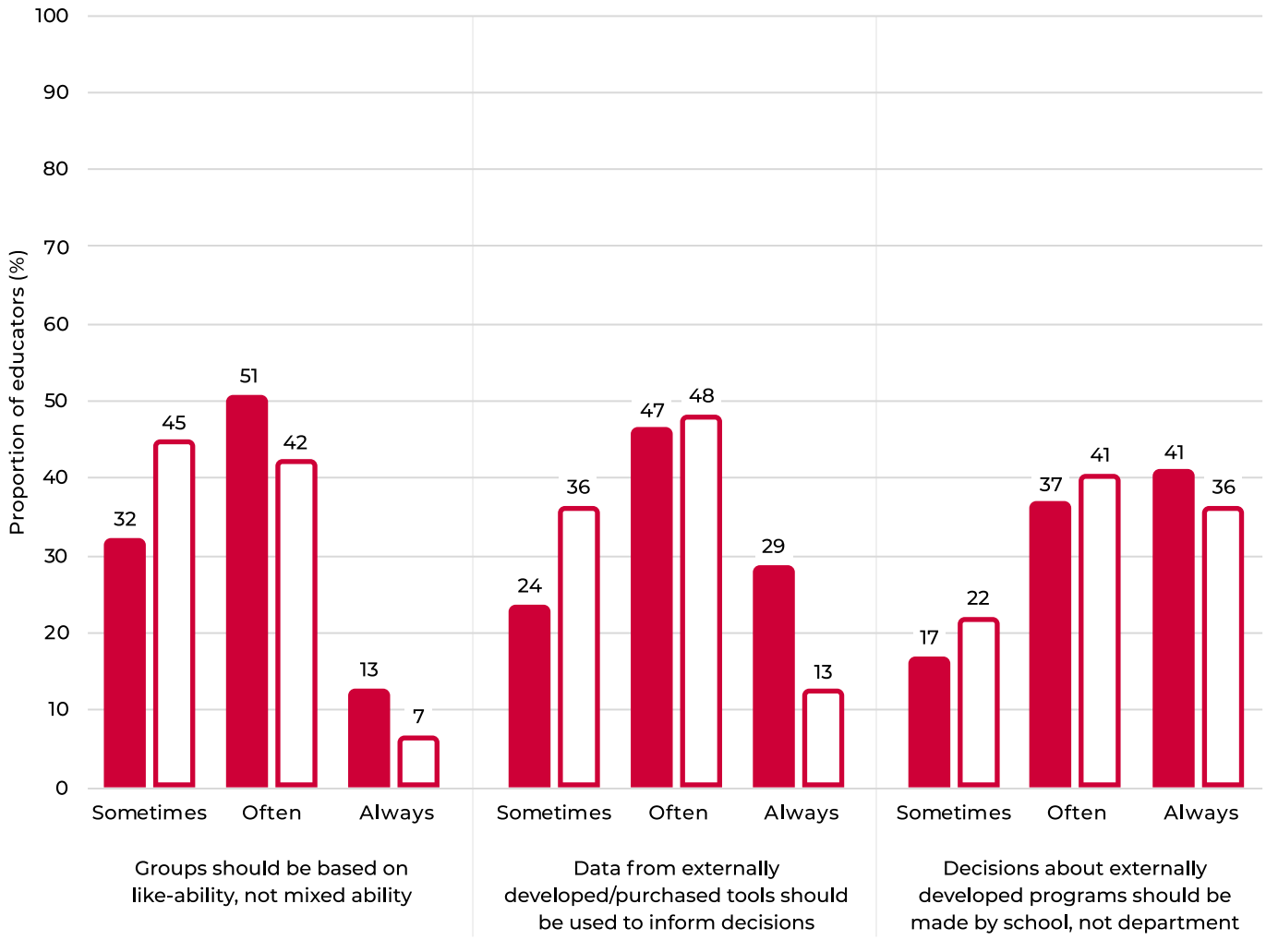
- diagnosing students' numeracy needs
- differentiating according to student need
- conducting mathematics assessments
- using a common mathematics language
- collecting regular mathematics data to facilitate tracking.

The majority of educators who were using or were trained in TEN also had stronger beliefs that:

- 'schools should make decisions about whether to use externally (outside of the school) developed programs'
- 'externally developed data tools be used to inform assessments'
- 'students be grouped according to their ability'.

Figure 2: Beliefs about classroom practice (Source: CESE classroom practice survey 2018)

Q: Please indicate how often you think the following statements should apply



Note. 'Never' is not displayed here due to low proportions, accounting for between 1% and 6% of responses.

Why can't we effectively measure impact?

We are unable to effectively measure TEN's impact on student outcomes and teacher practice due to inconsistency in terms of the implementation of TEN and TEN training and its delivery. This inconsistency is as a result of the department having reduced oversight of the intervention and schools having greater licence to deploy interventions as they chose.

The department has reduced oversight of TEN, which has led to issues with both its implementation in schools and its associated training. As a result, we are unable to effectively measure the impact of TEN on student outcomes and teacher practice.

One reason for this reduced oversight was the changes to the way the TEN model was funded and implemented.[3] As a result, principals were provided with more authority to implement interventions, such as TEN, in their schools. Given the initial level of departmental oversight, this represented a substantial change to the way TEN was developed, monitored, delivered, refined and supported. This likely led to a decrease in schools' understanding of the original intent and purpose of the intervention and therefore not maintaining program fidelity by extending the intervention across K-6 classrooms.

Principals continued to be supportive of TEN after the introduction of the LSLD reform, as indicated by the high proportion of schools who continued to implement TEN after 2012. While principals often did allocate funds for educators in their schools to receive professional learning in TEN, this professional learning was typically less intensive than when the department managed implementation of the intervention. There was considerable variation in the training educators received at both a between-and-within school level.

The Local Schools, Local Decisions reform

In 2012, the New South Wales Department of Education launched the Local Schools, Local Decisions (LSLD) education reform. LSLD was designed to give NSW public schools more authority to make local decisions about how best to meet the needs of their students. LSLD focuses on five interrelated reform areas: making decisions, managing resources, staffing schools, working locally and reducing red tape. A cornerstone element of LSLD is the introduction of a new needs-based approach to school funding through the Resource Allocation Model (RAM).[4]

A further contributing factor to this loss in departmental oversight was the transfer of curriculum support and expertise from the department into schools. This had a strong impact on TEN training and its delivery and the support schools received to use TEN. As a result of the discontinuation of this support in 2014, even if a principal wanted to provide more intensive professional learning opportunities for TEN to the educators in their schools, these were often not available.

3 For a more detailed timeline of the implementation of TEN, refer to page 25.

4 For more information about the Local Schools, Local Decisions reform refer to education.nsw.gov.au/about-us/educational-data/cese/publications/cese-evaluations/local-schools-local-decisions-evaluation

Implementation of TEN in schools

TEN has not been implemented consistently or with program fidelity in all schools. In the majority of schools and at the system level, TEN is not being implemented as was originally designed. The successful implementation of TEN is in part determined by all teachers who implement the intervention having a clear understanding of both the underlying rationale of TEN and the critical features of TEN that are required to maintain a high-fidelity intervention.

Educators reported using TEN in their classrooms as a:

- Tier 1 intervention (whole class) for 50% of the time
- Tier 2 intervention (small group, within class – as per TEN intentions) for 38% the time
- Tier 3 intervention (individual student, withdrawal) for 12% of the time.

However, given the lack of understanding currently within schools of the original intent and purpose of TEN, we are not confident that those educators who reported using TEN as intended were actually doing so.

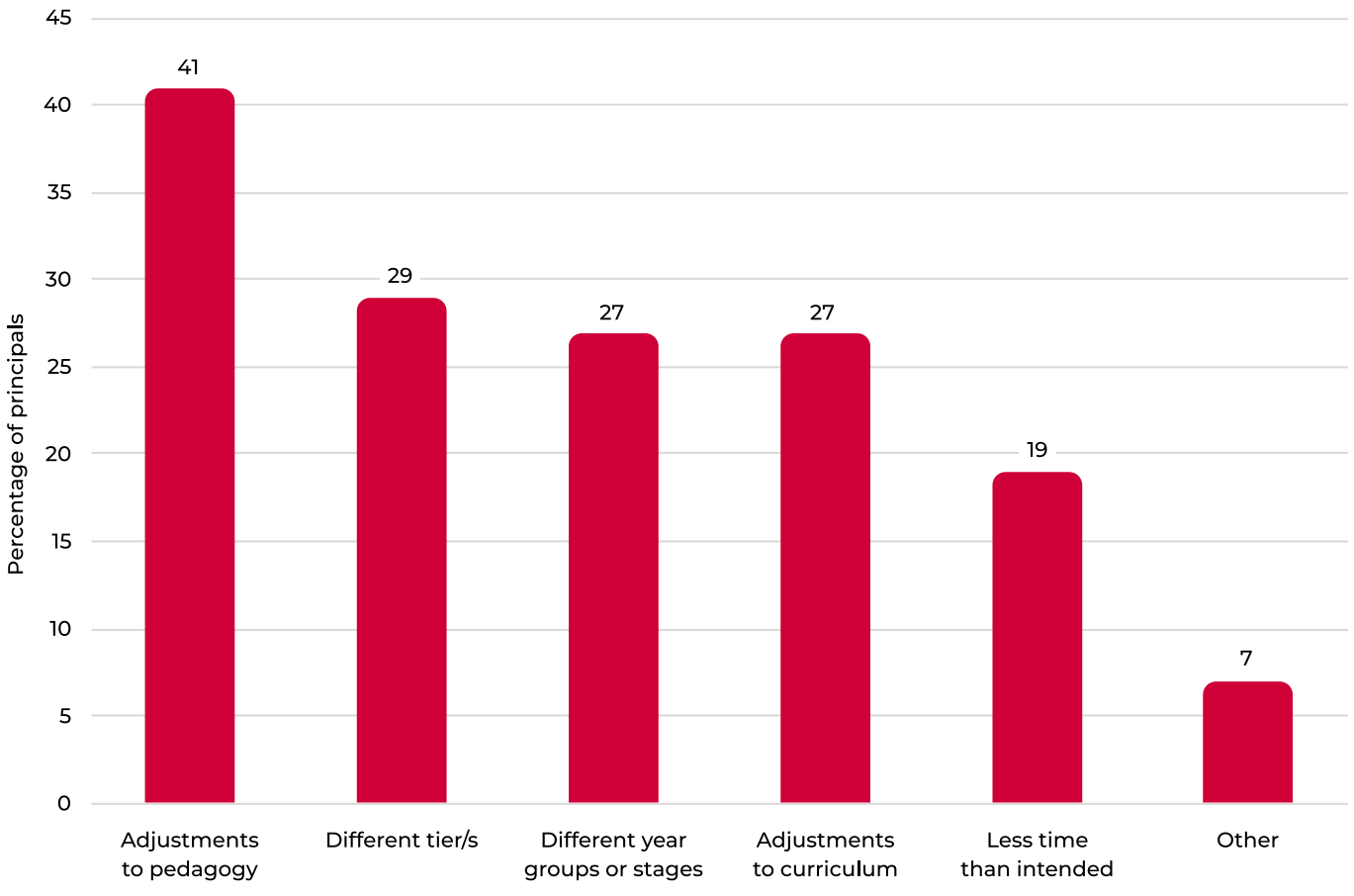
> "But it's not really run as a program, since I've been here. I'm not sure if it was before that, but definitely not run as an actual intervention program."
>
> **Instructional leader, school that uses TEN**

Of the two thirds of educators who reported varying their implementation of TEN, these variations were based on:

- year group
- tier
- frequency
- grouping of students
- assessments of students
- numeracy components
- target and motivation.

Figure 3: Alterations to TEN (Source: CESE numeracy initiatives survey 2018)

Q: When using TEN, how does your school alter it? (Multi-response, n = 487)



TEN is designed for use with a small focus group/s of students who would benefit from the same targeted teaching that not all students in the class needed. It was designed to be employed within a normal block of teaching focused on mathematics and numeracy. However, some respondents said they altered TEN by incorporating alternative pedagogies and curricula, which could indicate an overreliance on TEN as a replacement for quality numeracy instruction.

It was the initial intention of the developers that TEN, as a numeracy intervention, be used to complement the teaching of the NSW syllabus, with TEN focusing on a small portion of the Working Mathematically and Content components. However, we found that it has been used in some schools as a replacement for the syllabus. This is problematic as TEN is underpinned by the Numeracy Continuum and TEN was not designed to include all elements of the mathematics syllabus and nor did it always directly map to intended outcomes of the mathematics syllabus.

> "And when we did first implement, it was very structured – we did follow it pretty much to the letter of the law. But as we refined it, the staff would throw in things that we feel that would be beneficial and expand on that as well."
>
> **Instructional leader, school that uses TEN**

The majority of educators said they used some form of assessment in order to assess learning needs of students in relation to TEN. However, we found a lack of consistency and general oversight in how schools use these assessment tools and results for TEN. It may be that educators are unclear about the various purposes and uses of assessment. Most educators reported assessing students every five weeks. However TEN guidelines state that educators should use formative assessment strategies with students every day to inform next steps in their teaching, and to report on student understanding in relation to the NSW Numeracy Continuum every five weeks. The distinction between assessment and reporting as well as formative and summative assessment appears to have been lost over time and requires greater clarity and clearer communication.

Training and delivery of TEN

The quality of TEN training and its delivery is also now inconsistent. Due to a reduction in central expertise and a shift towards a 'train the trainer' model of delivery, the department no longer has widespread oversight or knowledge of:

- how teachers are being trained in TEN (including the quality, content, support for in-school practice, delivery mode and timing of training)
- how trainers are being trained in TEN
- ongoing support provided to schools and TEN trainers.

> "The program pedagogy is good. The problem lies in the capacity of the teachers [without adequate training]."
>
> **Deputy principal, school that uses TEN**

The comprehensive training model was perceived by TEN administrators as being integral to the initial success of TEN. Benefits of this initial training model that are no longer seen at a system level include:

- consistency of implementation and program fidelity
- the department having good administrative records of schools using TEN
- schools and trainers feeling supported at a system-level.

Perceptions of TEN in schools

Reasons schools choose to use TEN

Schools primarily report choosing to use TEN in order to support students to improve their numeracy outcomes and to support teachers through professional learning.

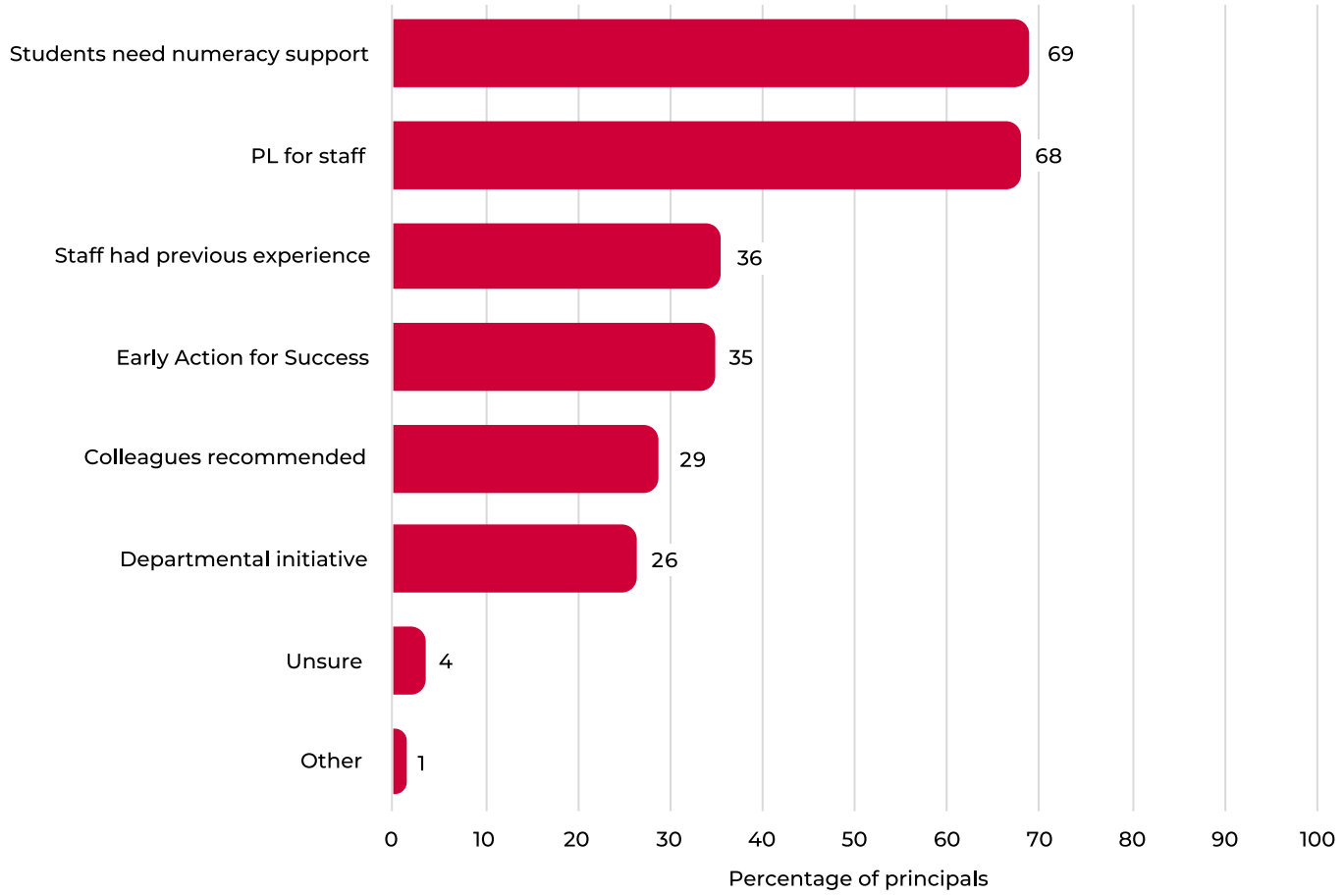
For schools that had used TEN:

- Most schools chose TEN because they wanted a 'numeracy intervention to support students' with the aim of improving student numeracy outcomes or because they wanted 'professional learning to support their teachers'.
- Other common reasons for choosing TEN included having 'previous experience with or a recommendation to use TEN', the school was 'part of the Early Action for Success (EAfS) strategy'[5] or because 'the intervention was designed by the department'.

> "So it was just [TEN] was what was offered so we jumped at it. Being a school that does not often get programs offered to us we just jumped at the opportunity to be part of something."
>
> **Principal, school that uses TEN**

Figure 4: Reasons schools chose to use TEN (Source: CESE numeracy initiatives survey 2018)

Q: Why did your school choose to use TEN? (Multi-response, n = 698)



5 Early Action for Success is the department's program for implementing the NSW government's State Literacy and Numeracy Action Plan: education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/early-action-for-success

Reasons schools choose not to use TEN

A large proportion of principals were unsure why their school did not use TEN. For the remainder of principals, the most frequently reported reasons for not using TEN included implementation costs, a lack of need for the intervention and training accessibility issues.

For schools that had never used TEN:

- A third of principals said they were unsure why their school chose not to use TEN, possibly due to a change in school leadership or historical records no longer being available or accessible.
- For principals that gave a reason why their school chose not to use TEN, many said it was 'costly to implement', they were 'already achieving good results with other interventions', they 'did not have access to training' or staff were 'already competent in numeracy'. Many of these choices were facilitated by the Local Schools, Local Decisions reform, which moved funding and implementation responsibilities from the department to schools, allowing principals to make their own choices about which numeracy initiatives to use in their school.

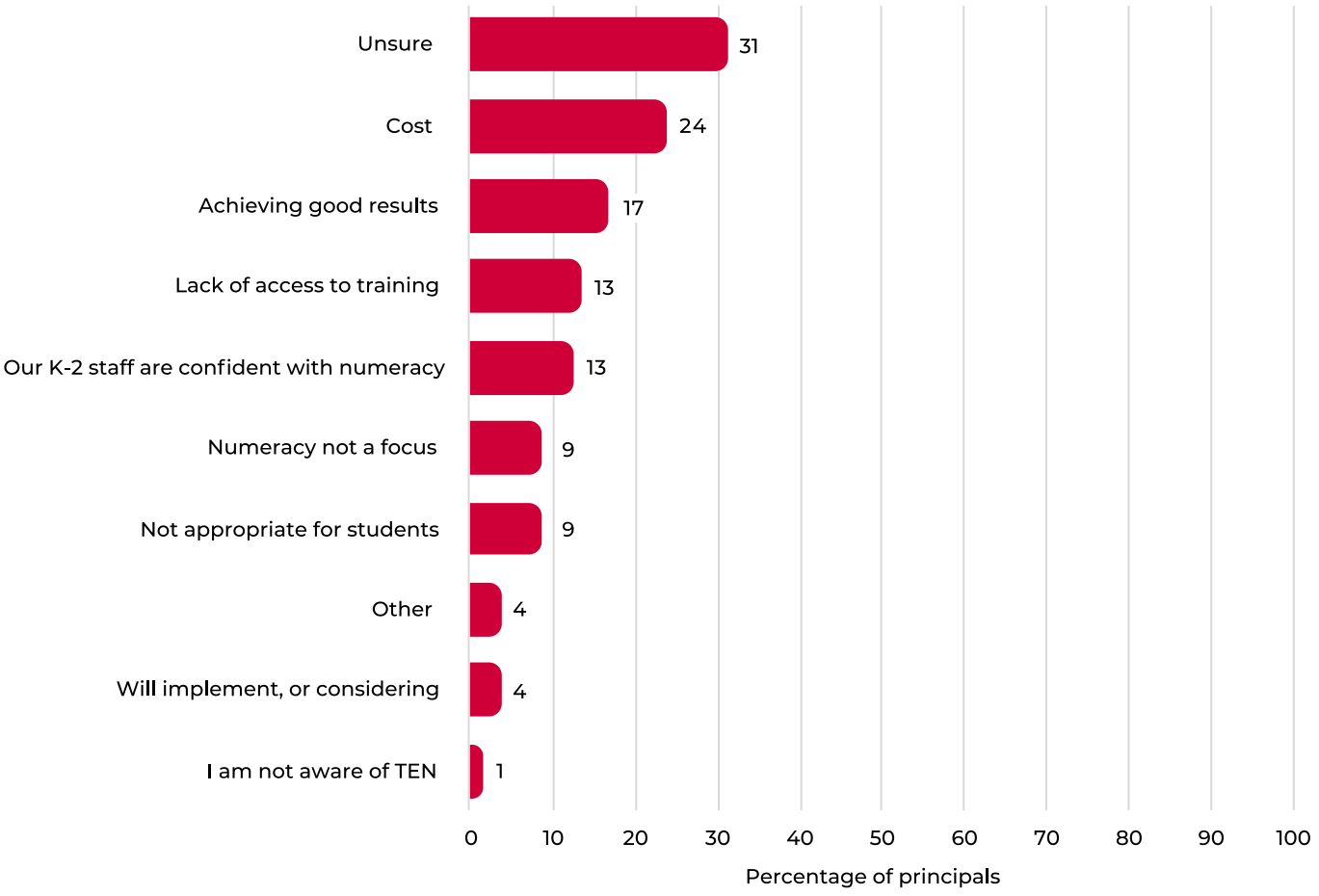
> "There are too many changes coming through, and then it's sold as – this is the latest that you have to do. So as a school [leader] and the one that has to manage the money because we have to justify money all the time, you then say to your teachers, 'Listen, I don't want to put the funds in something that's going to die tomorrow."
>
> **Principal, school that does not use TEN**

For schools that previously used TEN:

- Some schools that had moved away from TEN said they would consider using it again if there was more 'accessible and less expensive training' (especially for regional schools), 'professional learning support' (school-based and ongoing), and 'information on how TEN could be used with Years 3-6'.

Figure 5: Reasons schools chose not to use TEN (Source: CESE numeracy initiatives survey 2018)

Q: Why did your school choose not to use TEN? (Multi-response, n = 301)



Perceptions of what is working well with TEN

The majority of educators perceive TEN as improving their understanding of and practice in teaching numeracy and cited additional benefits for professional learning, networking and resource provision.

Educators using TEN report having improved knowledge and understanding of:

- sound mathematics pedagogy
- how students learn mathematics in the early stages
- a range of appropriate teaching strategies according to student need
- mathematics education research
- syllabus connections.

Educators using TEN report having access to professional learning and networking opportunities including:

- mentoring via demonstration lessons and feedback on practice
- networking opportunities
- time to build relationships, to gain credibility and for teachers to collaborate and discuss pedagogy.

> "It's [a] really, really well implemented, effective, deep learning program, not a one-off thing which a lot of them are."
>
> **Principal,**
> **school that uses TEN**

> "I like that the kids like it and they seem to really enjoy it and it's not so much just sitting down and doing maths, they're involved, they're talking, they're having fun, they're changing roles, they're becoming teachers themselves. So, teaching their little groups and just really enjoying the games and learning just the basic skills in a fun way, I guess."
>
> **Teacher,**
> **school that uses TEN**

Educators using TEN report logistical benefits including:

- requirements that were straightforward, with lessons short (10 minutes) and relatively easy to deliver and
- enabling the purchase of resources and release time for staff. Of note, this was only true for those schools involved in the early model of TEN where release time and provision of resources were funded centrally by the department.

Educators using TEN report having observed student benefits, with:

- students becoming more self-regulated and independent learners
- students enjoying hands-on TEN activities.

Perceptions of TEN training and its delivery

While most educators felt their training in TEN was sufficient, there was a general need for additional ongoing professional learning support and more resource development and provision.

Most educators reported receiving training in TEN from accredited trainers based outside of their school (42%) or accredited trainers based in their school (56%). The remaining educators (2%) received training from unaccredited colleagues or another source.

> "I mean, I know a lot of it is train the trainer and you come back and you teach, but I think just having that outside perspective coming in a little bit is a huge difference. And especially to people who may be a little bit resistant to change."
>
> **Instructional leader, school that uses TEN**

While the majority of educators reported their training to be sufficient, more than a third reported not receiving any ongoing support. Of the educators who did receive ongoing support, most received this support from a 'fellow teacher', 'TEN trainer' or 'instructional leader'. While we are unable to provide specific figures, it is likely that at least some of the educators who provided this ongoing support were not accredited in TEN.

A small group of educators who received support from principals had the highest levels of confidence to use TEN in their classroom practice compared to those who received support from others. Educators who received support from fellow teachers had the lowest levels of confidence to use TEN in their classroom practice.

> "So, at the start of each year, any new staff that we have that need TEN training, I provide release for them to have the day's training... And then subsequently to that, the trainer is given additional time so that she can go and support them in classrooms."
>
> **Principal, school that uses TEN**

The majority of teachers interviewed or surveyed for the evaluation requested more:

- ongoing professional learning support
- resource development and provision.

The type of support teachers requested differed based on their early training experiences with TEN. Teachers involved in the early professional learning model felt their resources needed updating or were looking for new ideas for activities. Those teachers not involved in this early model, where support and resource development and provision were more common, wanted more intensive ongoing support and additional resources.

TEN trainers and administrators noted a number of challenges in their roles, including:

- reluctant teachers made the introduction of TEN difficult at first
- the differing needs of schools meant that trainers felt their capacity was stretched
- managing the travel between schools due to distance was challenging
- a sense of isolation from other TEN trainers meant that there was no one with whom trainers could de-brief with, and gain advice and receive validation and encouragement from
- it was difficult to fit the TEN lessons into a crowded timetable
- constant turnover of staff meant constant up-skilling of new teachers, which took more time in a busy workload
- it was difficult to manage the workload while training others and still teaching their own class.

Conclusions

Lessons learned

The department needs to know whether interventions, such as TEN, lead to positive student outcomes.

The department needs to be able to measure the effectiveness of interventions. In order to do this, we need access to reliable and consistent intervention information and outcome measures. Building in evaluation at the outset of an intervention can ensure high quality data is available and can be used to effectively measure an intervention's impact on expected outcomes, including student learning outcomes.

Evaluation should also be an ongoing process for the duration of the time interventions are implemented in schools, and in particular, should be prioritised during the scaling-up phase of an intervention.

> "What I found is that the teachers who don't have a good understanding of how mathematics works in the development of number sense in particular tend to use TEN as a process rather than a pedagogical intervention. And they tend to [use TEN] across the class rather than with a targeted group."
>
> **Deputy principal, school that uses TEN**

> "It's very difficult [for teachers] to try to learn before or after school, and in their own time. They really need to have some release time to actually engage and to think. So I think funding is imperative, if they're going to use the program."
>
> **TEN trainer**

Key considerations

In improving the implementation of numeracy interventions in schools, it is important that the department:

1. Maintains and supports program fidelity.
   - Ensures numeracy interventions align to the current syllabus outcomes.
   - Supports teachers to develop and continuously refine a sound understanding and evidence base to inform their classroom practice. Provides teachers with explicit, detailed examples of quality mathematics lessons to show how to put research into practice.
   - Provides educators with centralised support for departmental initiatives that are led by the department's Learning and Teaching directorate.
2. Maintains adequate records and corporate administrative knowledge.
   - Maintains administrative records of numeracy interventions at both a departmental and school level.
   - Makes use of tools including PLAN2 to enable the department access to state-wide data to support the use of interventions.
3. Provides educators with high quality, sustained, evidence-based professional learning opportunities that include reflection and feedback on teaching practices.
   - Improves resource development – for example, an accessible, up-to-date, well maintained website.
   - Builds opportunities for mentoring and collegiality.
   - Provides ongoing professional learning for all educators already trained in numeracy interventions as well as new teachers.
   - Ensures professional learning models for intervention programs include release time for educators and trainers.
4. Builds evaluation into the development of interventions and prioritises evaluating interventions throughout their lifecycles.

It is also the responsibility of schools to ensure that interventions are implemented as intended in classrooms, and do not become a replacement for the syllabus.

Appendices

A: Additional information about TEN

TEN and the Numeracy Continuum and syllabus

The Numeracy Continuum K-10 underpins TEN.[6] A typical TEN lesson involves identifying a particular learning need that is evident in a number of students within a class. The teacher will then use the Numeracy Continuum to place these students in focus group/s for targeted teaching. The teacher then conducts short, small group teaching that integrates explicit and systematic teaching focused on supporting the development of early arithmetic strategies. Of note, the Numeracy Continuum does not address all aspects of the NSW mathematics syllabus and, as TEN is based on the Continuum, TEN does not support the entirety of the syllabus. For this reason, it was the expectation of the department and TEN developers that TEN would be used to complement the syllabus as a part of teaching and learning in mathematics but was not intended to replace the syllabus nor to be a main component of mathematics teaching.

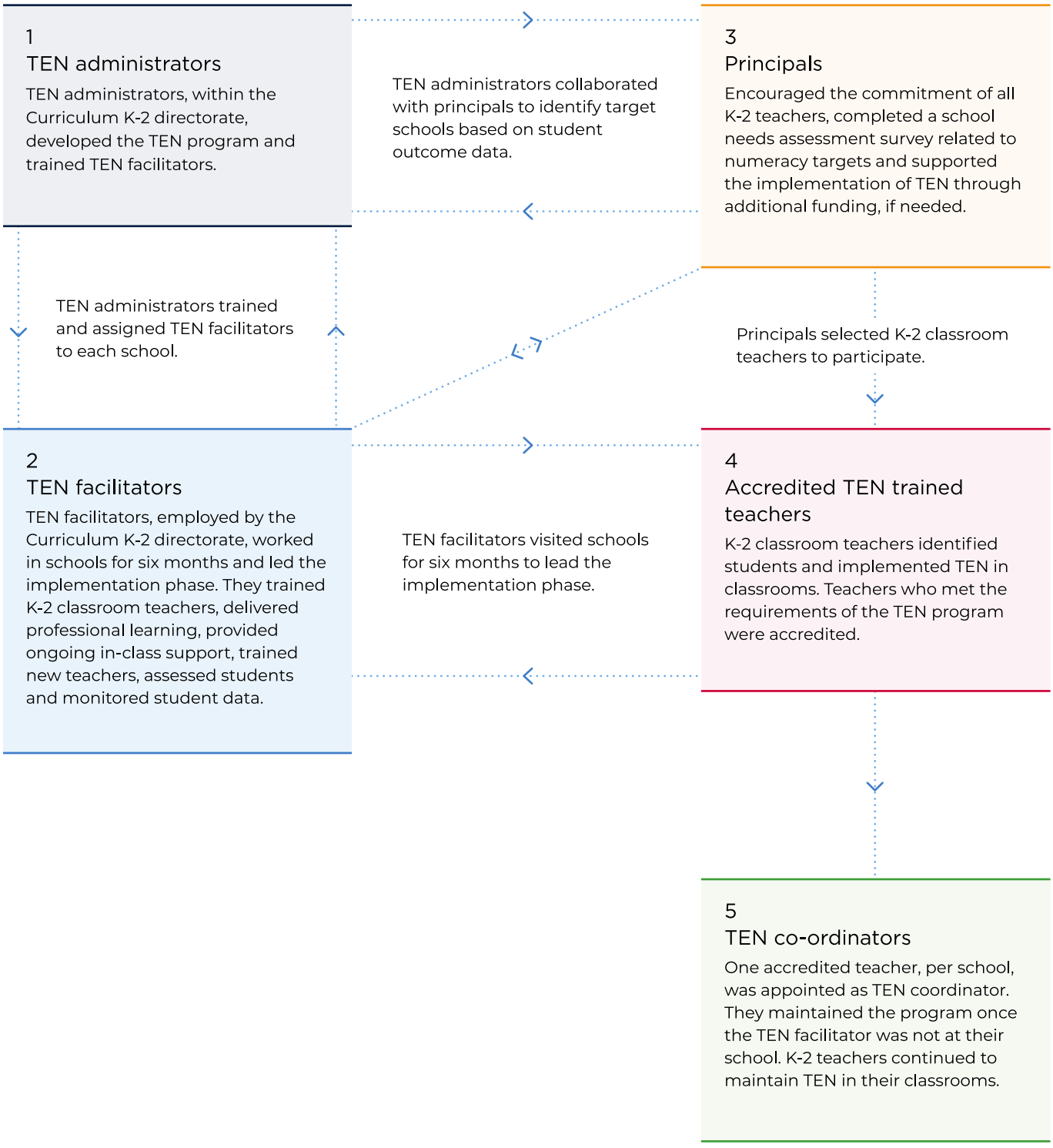
Role of classroom teachers

Initial guidelines for TEN stated that the responsibilities of classroom teachers included:

- identifying students to be included in intervention groups
- administering the TEN assessment and analysing student responses
- placing students on the Numeracy Early Learning Plan
- preparing an intervention program aimed at addressing the individual needs of students within the intervention group/s
- implementing explicit teaching strategies in early number through short, focused, frequent numeracy sessions
- recording and monitoring student progress twice per term for at least a semester.

6 The Numeracy Continuum K-10 describes how students' progress from simple to increasingly sophisticated strategies when solving number and measurement problems. The Numeracy Continuum has been replaced by the national literacy and numeracy progressions from 2018: education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/teaching-and-learning-resources/learning-progressions

TEN implementation model



TEN implementation timeline

2009

- TEN was developed and piloted by the NSW Department of Education.
- Facilitators were hired and trained in TEN.

2010

- Regional coordinators were asked to identify schools that would benefit from TEN.
- K-2 classroom teachers from identified schools received training and intensive implementation support from a department appointed TEN facilitator.
- K-2 classroom teachers who completed the training requirements were accredited as TEN trained teachers.
- One accredited teacher, per school was appointed as a TEN coordinator and was responsible for maintaining the ongoing implementation of TEN within their school, including sending the school's TEN data to the regions TEN facilitator every five weeks.

2012-2014

- Local Schools, Local Decisions (LSLD) meant greater decision-making at school level and less oversight from the department, which led to changes in the way the TEN model was implemented.
- Principals were provided with more authority to implement programs in their schools
- TEN facilitators were replaced with TEN lead trainers.
- K-2 classroom teachers who completed the training requirements under the lead trainer were accredited as TEN trained teachers.
- K-2 classroom teachers with accredited TEN training trained the other K-2 classroom teachers at their school. These K-2 classroom teachers are not accredited in TEN because they were not been trained by TEN lead trainers.

2017

- The department conducted a pulse check of the implementation of TEN.
- TEN lead trainers were provided a TEN masterclass and accredited TEN trainers were provided a two day TEN refresher.

B: Data sources

Surveys

We developed two surveys to inform the TEN evaluation.

Numeracy initiatives survey

In February 2018, we sent the numeracy initiatives survey online to principals of all schools with Kindergarten to Year 2 students (n = 1,668). We received 1,042 complete or partial responses from schools, a response rate of 62%. In some cases, principals may have delegated the action of completing the survey to a staff member. Therefore, we refer to respondents of this survey as 'schools', not 'principals'.

This survey asked about:

- any numeracy initiatives used in schools
- reasons for choosing to use or not use TEN
- year groups in which TEN was implemented
- how schools altered TEN.

From the 1,028 valid responses[7], 70% (n = 720) came from schools that used or had previously used TEN and 30% (n = 308) from schools that had never used TEN.

Classroom practice survey

In August 2018, we sent the online classroom practice survey to 9,080 K-6[8] educators teaching in the schools that responded to the first survey and had indicated in that survey they had used TEN at some point over the period 2009 to 2017. We received responses from 1,301 educators. The response rate of 14% was artificially low and reflected our inability to target the survey to educators who were teaching students in Early Stage 1/Stage 1.

This survey asked educators about:

- their teaching experience, including their experience with TEN (for example, years of practice)
- their beliefs about classroom practice (for all numeracy programs used)
- their beliefs about how TEN complements classroom practice
- their experiences of the TEN training and support they received
- how they used TEN in the classroom (assessment tools, delivery)
- their beliefs about how TEN has impacted their teaching practice.

Interviews

To gain a more in-depth understanding and to gather different perspectives about how TEN was implemented, we interviewed a stratified, random sample of educators in schools using TEN (n = 22), principals in schools that had previously used TEN (n = 5), current or former TEN trainers (n = 6) and TEN administrators (n = 6).

Administrative data

We analysed selected MyPL[9] TEN course content to inform the training analysis.

We used student attainment data, including Best Start Kindergarten Assessment and National Assessment Program – Literacy and Numeracy (NAPLAN) data, to measure the impact on student numeracy outcomes.

7 Fourteen survey respondents did not answer question two about whether the school did or did not use TEN, leaving 1,028 valid responses to analyse.
8 We sent the survey to all K-6 teachers at schools that had previously identified as using TEN to ensure we included TEN teachers who may have changed roles since teaching TEN.
9 MyPL is the department's online portal that allows all staff to manage their professional learning.

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