NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

Report on the consultation on the *Draft Primary Mathematics Curriculum*

February, 2023

Contents

Introduction

The National Council for Curriculum and Assessment (NCCA) is a statutory body of the Department of Education. The NCCA advises the Minister for Education on:

- curriculum and assessment for early childhood education, primary and post-primary schools.
- assessment procedures used in schools and examinations on subjects which are part of the curriculum.

This advice is developed through research, deliberation, consultation and networks.

The publication of Literacy and Numeracy for Learning and Life: The National Strategy to Improve Literacy and Numeracy among Children and Young People 2011-2020 (DES, 2011) set out a number of actions for revising the curriculum. Accordingly, the development of a new Primary Mathematics Curriculum (PMC) for Stages 1 to 4 was set out in NCCA's Strategic Plans, 2015–2017 and 2018-2021, and was further highlighted in the DES Action Plans 2017 and 2018.

This report presents the findings from a consultation on the draft PMC which took place between March 24th 2022 until June 30th 2022.

Background to developments

It was initially planned that the PMC, like the *Primary Language Curriculum/Curaclam Teanga na Bunscoile* (PLC/CTB), would be published in two phases, the first publication being the specification for Stages 1 and 2, followed by the specification for Stages 3 and 4. Accordingly, a draft specification for Stages 1 and 2 was developed and subject to consultation in late 2017 and early 2018, with a report of the consultation published in June 2018. That summer, a decision was made by the then Minister for Education and Skills, Richard Bruton TD, to publish the new PMC as a full specification from Stages 1 to 4. This decision was made following consideration of feedback from the system on the implementation of the *Primary Language Curriculum/Curaclam Teanga na Bunscoile* in two phases.

Since then, research and development work has continued on a fully extended specification. A research addendum (Dooley, 2019) and suite of five short research papers (Delaney, 2020; Leavy, 2020; Nic Mhuirí, 2020a, 2020b; Twohill, 2020) were added to the existing research complement. In addition to expanding the curriculum specification for Stages 3 and 4, a number of enhancements were made to the initial draft of the curriculum, in response to the findings from the consultation in 2017/2018 and the ongoing development work on the *Primary Language Curriculum/Curaclam Teanga na Bunscoile*. These include the repositioning of the Progression Continua to the Primary Mathematics Toolkit; the addition of a new chapter 'The Primary Mathematics Curriculum in Practice'; and the development of a set of mathematical concepts to support teachers' planning and preparation for teaching and learning. During this time, NCCA also developed an initial suite of eleven Support Materials to accompany the curriculum specification for this second consultation. Finally, in consulting on the PMC this time, consideration was also given to proposals put forth in the *Draft Primary Curriculum Framework* (NCCA, 2020) for a curriculum area in Stages 1 and 2 for Mathematics, Science and technology (MST).

Context for consultation

Consultation on the draft PMC followed an extensive consultation on the *Draft Primary Curriculum Framework* (NCCA, 2020), which itself had been extended as a resulted of COVID-19. Consequently, consultation on the draft specification and support materials took place predominantly in the summer term

2022 and provided an opportunity to anyone who wished to express a view on the draft to do so. For schools, this term is a particularly busy time in the academic calendar. With this consideration in mind, NCCA applied a number of communication strategies to promote and encourage engagement with the consultation. These included weekly social media posts; articles published in the INTOuch and Leadership+ publications; direct communications to education partners; and leveraging the support of Development Group members and members of the Board for Early Childhood and Primary.

Finally, of note, the consultation provided an opportunity for continued engagement and collaboration with colleagues in the Professional Development Service for Teachers (PDST) and National Council for Special Education (NCSE), who participated in aspects of our work with the School Network, such as attendance during school visits and the end-of-consultation event to listen to and learn directly from teachers which, in turn, would help them to shape CPD.

Methodology

To gather views on the PMC, four strands of consultation activity were employed which gathered data from a range of sources – see figure 1. The data collection procedures adopted in this consultation reflect the context and purpose of the consultation, as well as the social constructivist theoretical orientations of the curriculum itself (Merriam, 2009).

Overview of consultation strands and data sources

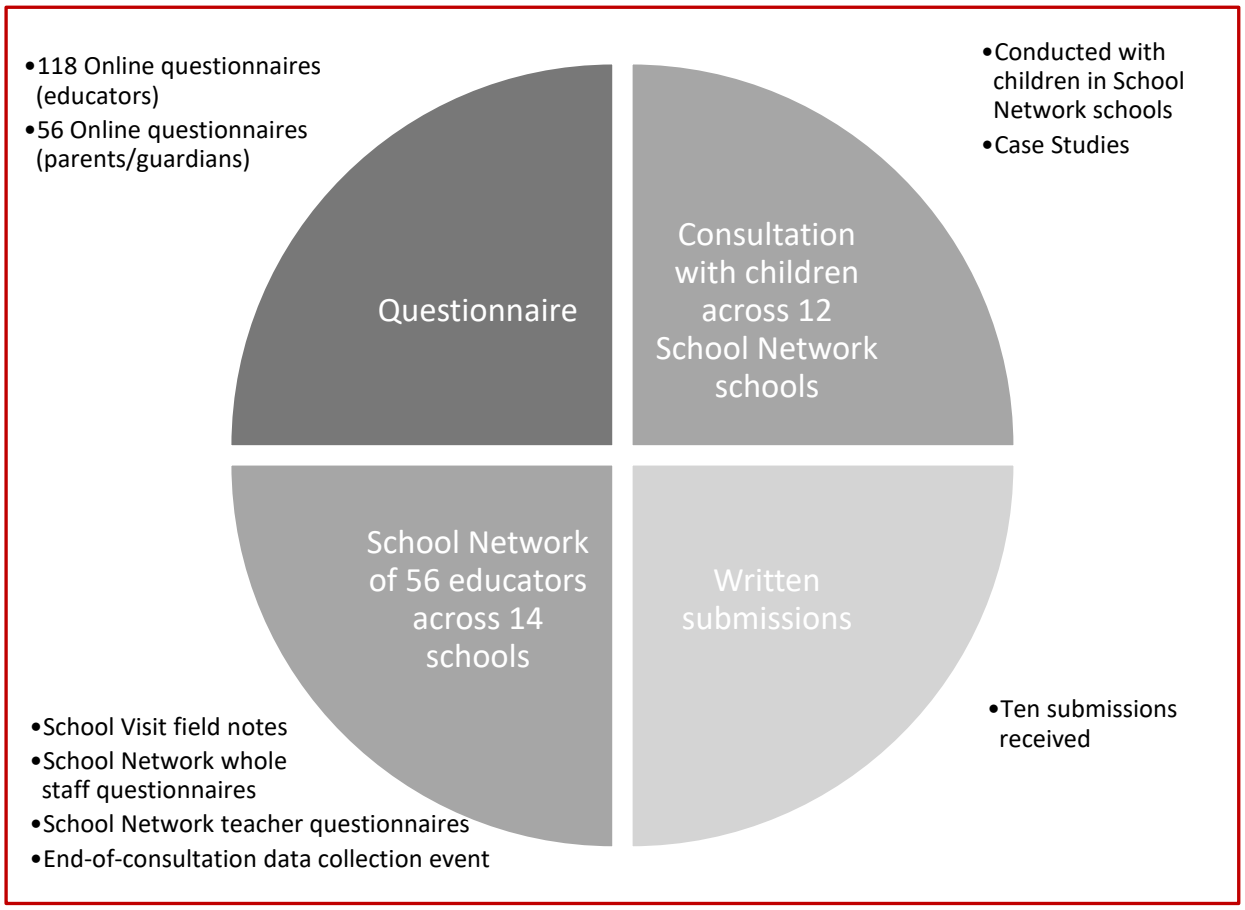

Figure 1. Overview of consultation strands and data sources 'at a glance'

Data collection

Questionnaires and written submissions

Two online questionnaires were published on April 26th and closed on June 30th. A questionnaire for educators (10 items) received 118 complete responses and a questionnaire for parents/guardians and others (16 items) received 56 complete responses. These questionnaires contained a mix of quantitative and qualitative items; and were deemed a reliable method given the consistent order of questions and structure they present (Bryman, 2008) and the accessibility and flexibility they offer to the end-user.

Quantitative data was collected using ordinal and Likert scales and was useful to quantify responses and feedback to the draft PMC, whereas qualitative data served to derive greater understanding and meaning from responses (Robson, 2011).

Individuals and organisations were also provided with the opportunity to submit written feedback on their overall response to the draft PMC, as well as more specific feedback in relation to curriculum rationale and aims; curriculum components; key pedagogical approaches; and the Primary Mathematics Toolkit. Ten written submissions were received.

School Network

A total of 14 schools participated in the School Network strand of the consultation between March 24th and June 15th 2022. Following a public call for expressions of interest in contributing to the consultation on the draft PMC, fifteen schools were initially shortlisted and recruited, of which 14 participated. The network represented both a geographical and contextual spread of school type, including: urban DEIS, rural DEIS, Scoil sa Ghaeltacht, Gaelscoil, special school, school with special classes, small rural and large urban. Across the 14 schools, a total of 56 teachers trialled the draft curriculum in their classrooms.

There were three collective meetings of the schools in the network, two online meetings in March and April 2022 and a face-to-face end-of-consultation event in June 2022. Data was gathered through group interviews, online forms, individual teacher questionnaires and field notes. In between the online meetings and face-to-face gatherings, two NCCA Education Officers visited each school, gathering data through professional conversations, participatory workshops and group interviews. To enhance the quality of data gathered and reported, the visiting Education Officers conducted a de-briefing session after each visit to shared reflections and observations. During the transcription and cleaning of the data gathered, this cross-analysis process continued. A key priority of this strand of the consultation was to facilitate teachers to share their own accounts of their observations, opinions and experiences with the draft PMC in practice. In-depth feedback and practical suggestions for refining and enhancing the curriculum were collected through discussions and workshops with teachers, as were deliberations on proposals for an MST curriculum area as proposed in the *Draft Primary Curriculum Framework* (NCCA, 2020).

Consultation with children

A research team from Mary Immaculate College conducted a consultation with children, attending 12 of the 14 schools in the School Network. Each of the 12 schools were visited twice. During the first visit involving one researcher, the study was explained, and instant cameras distributed and their use explained. Two researchers then visited each school 4-6 weeks later. Guided by Lundy's rights-based model of child participation (Lundy, 2007), several participatory methods were used during this visit to actively involve children in the research process and to enable their views to be interpreted through child-centred outlooks. Participatory strategies included student-as-journalist, student drawings and inscriptions, sorting exercises, photo-voice (using instant cameras), diamond ranking activities and child-led focus group discussions. Findings from this strand of the consultation can be found at [Link to be inserted prior to publication].

Data analysis

Analysis of quantitative data collected over the consultation period involved running descriptive statistics (frequencies) and tabulating the data before presenting it in graphic form for this report. Where there are anomalies in the responses, this is indicated in the findings. While 456 educator questionnaires were initiated, fall off between the identifier questions and question five was significant and in total, 118 were fully completed. Similarly, 133 parent/guardian questionnaires were initiated and 56 were fully completed, with similar fall off identified following the two identifier questions. For purpose of clarity, findings presented herein report on the responses from the fully completed questionnaires.

Across each of the consultation strands, qualitative content analysis was employed to spotlight aspects of the qualitative data that related to the core lines of enquiry sought in the consultation (Schreier, 2014). A category system was employed where data could be defined and allocated to one or more categories (Kohlbacher, 2006). This overall approach to analysing qualitative data also allowed for deductive ways of category labeling. From there, patterns and themes in the data were identified through thematic coding of the data within each category (Braun and Clarke, 2006; Mayring, 2015); and themes and patterns were then arranged in relation to each other (Merriam, 2009). Braun and Clarke's six-phase thematic analysis process (2006) was useful to identify and attend to the important aspects within each theme. The strengths of using this overall approach was that the process was controlled methodologically; all data sources could be analysed step-by-step in a consistent way; and the approach allowed a necessary degree of flexibility (Kohlbacher, 2006; Schreier, 2014). To ensure the quality of analysis, each data set was cross-analysed, and inter-coder reliability checks were conducted. Comparisons of analyses found strong inter-coder reliability and small adjustments were made following deliberation.

Given the population of educators and parents in Ireland, a limitation of the consultation findings is the relatively low response rate to the questionnaires. Notwithstanding, the high response rate from parents to the National Parents Council (Primary) survey [See Written Submissions] helps to mitigate this limitation, albeit in terms of parental perspectives on the draft PMC. Similarly, ahead of submitting their written submission, the Irish National Teachers Organisation (INTO) held a number of face-to-face and online consultation events with their members, thus increasing feedback from teachers and school leaders.

When considering the findings, it may also be important to consider a key distinguishing factor between the School Network and other strands of data gathered across the consultation. The School Network participants had access, through online meetings and school visits, to direct input from the NCCA executive. This input aimed to support participants in their understanding of the vision, rationale and structure of the draft curriculum, so teachers could enact and trial the curriculum in their classrooms over the consultation period.

Report of the findings

Teacher Questionnaire

The questionnaire for teachers and other educators was structured under the following headings:

- Respondent profile
- Rationale and aims
- Structure and presentation
- Pedagogy and children's learning
- Supports.

Respondent profile

The questionnaire for educators received 118 completed responses. Figure 2 presents a breakdown of respondents, while figures 3 and 4 provide details on their length of time working in education and on their school contexts.

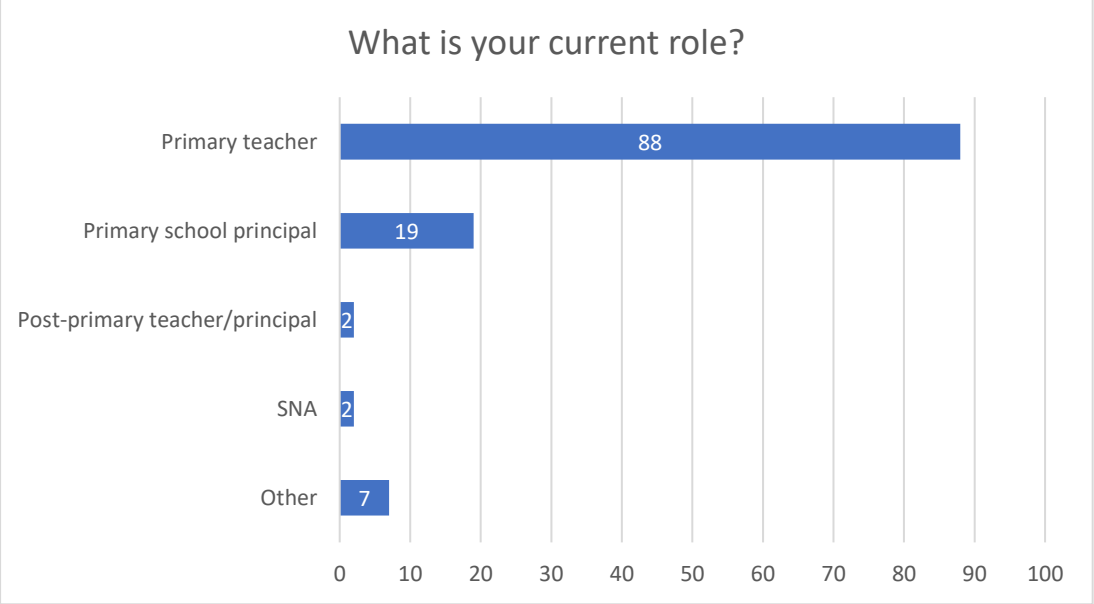

Figure 2: Breakdown of respondents to educator questionnaire

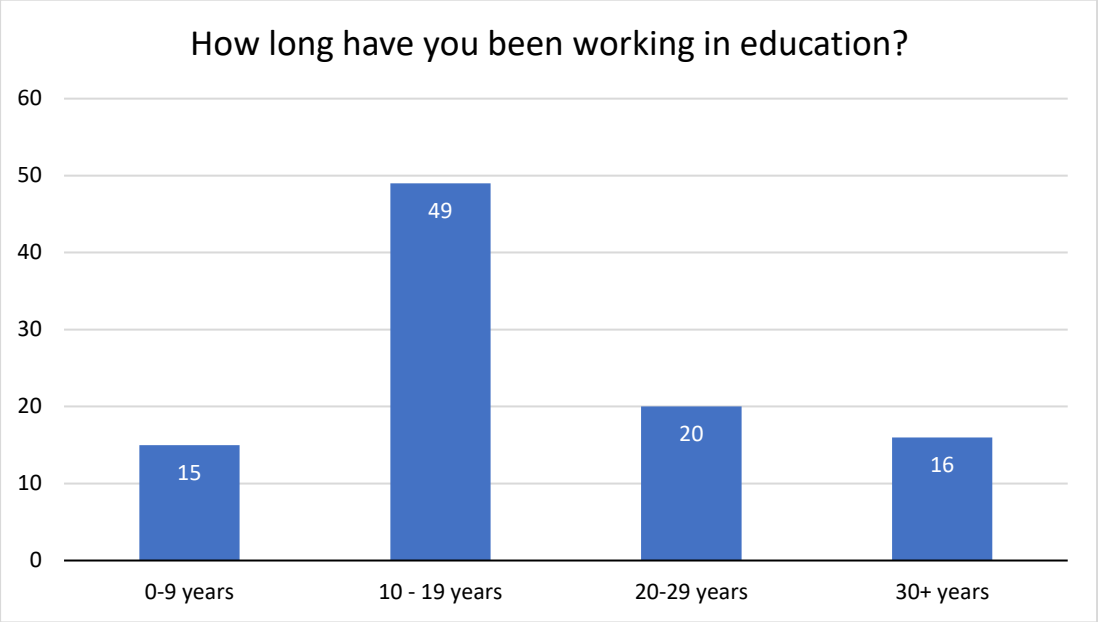

Figure 3: Respondents' experience in education (% of respondents)

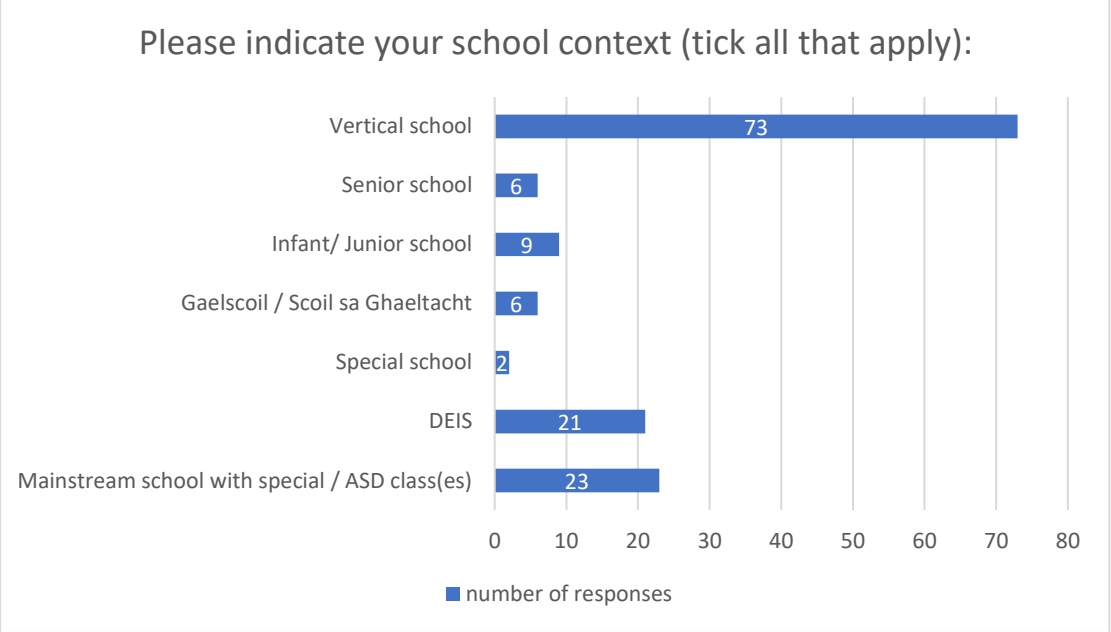

Figure 4: Breakdown of respondents' school contexts (more than one response allowed)

Rationale and Aims

Figures 5 and 6 present responses related to the rationale and aims of the draft PMC. There was strong agreement for all five statements within the rationale, with strongest agreement (96%) for 'Mathematics is everywhere and for everyone'. The lowest level of agreement (77%) was for the statement 'Every child is a mathematician', with which 15% of respondents either disagreed or strongly disagreed. In relation to the aims of the draft curriculum, 62% of respondents agreed that they are relevant and appropriate, with 24%

of respondents unsure. A majority of responses (52%) agreed that the draft PMC promotes the development of mathematical proficiency, with 32% unsure and 16% in disagreement.

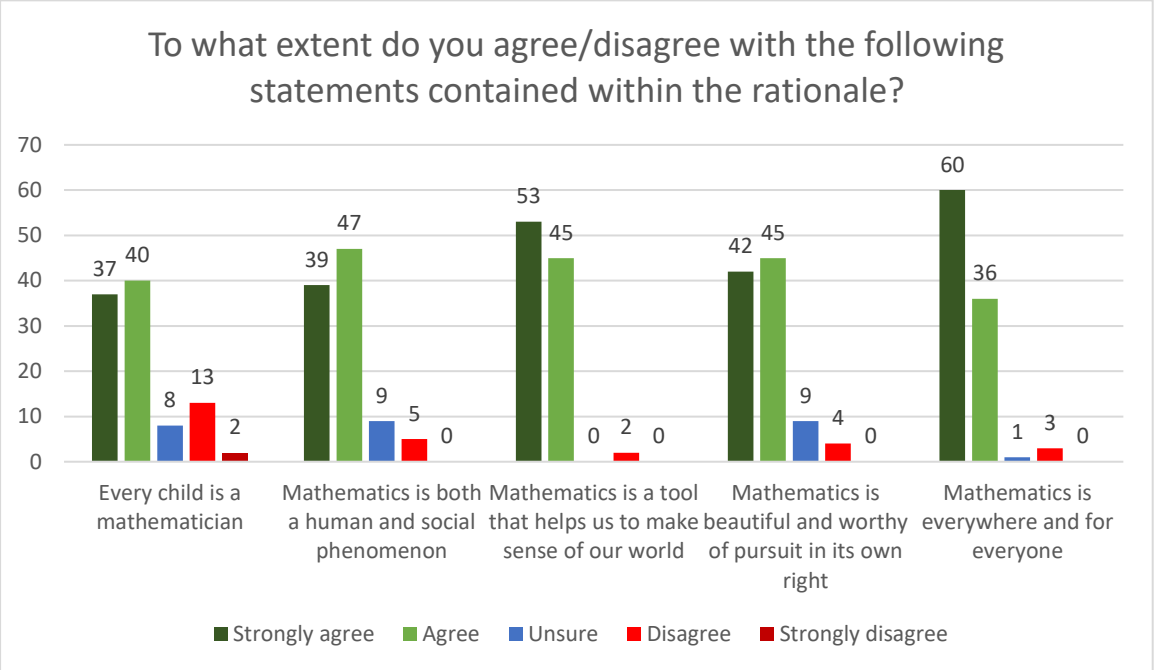

Figure 5: Level of agreement with the statements contained in the rationale (% of responses)

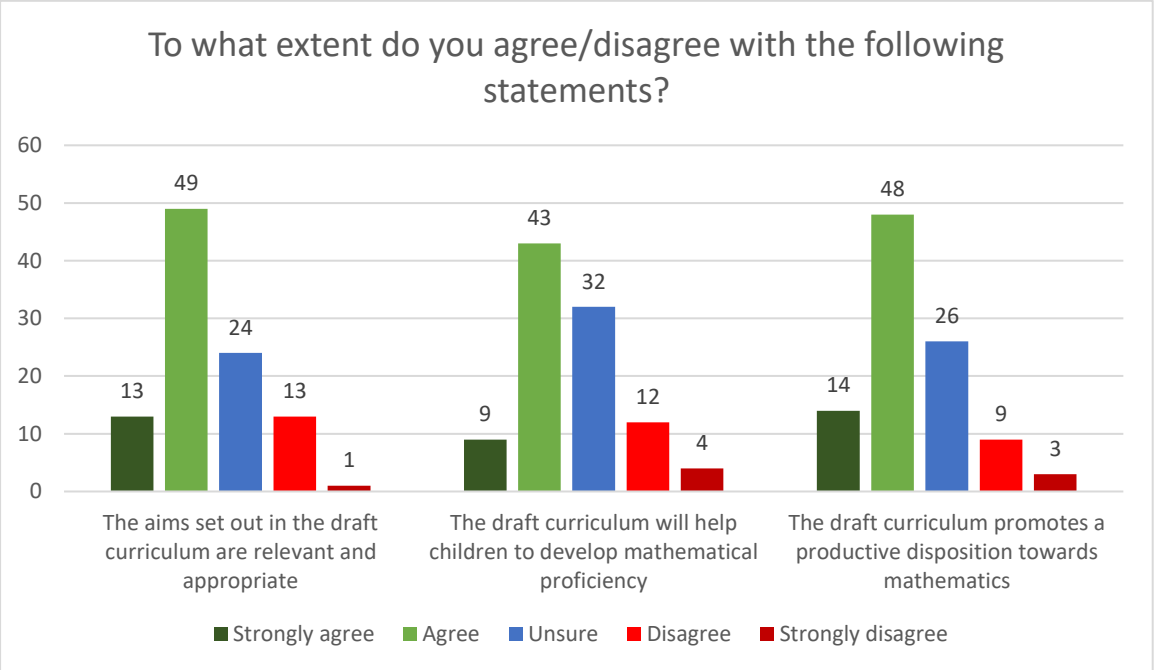

Figure 6: Level of agreement with statements around the curriculum aims (% of responses)

Structure and presentation

The questionnaire presented four statements associated with the structure of the draft PMC (see Figure 7). 61% of respondents agreed that the new structure fits with how they organise mathematics learning in their classroom, with 21% unsure and 18% in disagreement. In response to whether the Learning Outcome Labels are relevant and appropriate, 48% agreed, 24% unsure and 28% disagreed. In terms of the number of learning outcomes at each stage, 38% agreed the number as being appropriate, 32% unsure and 30% disagreed.

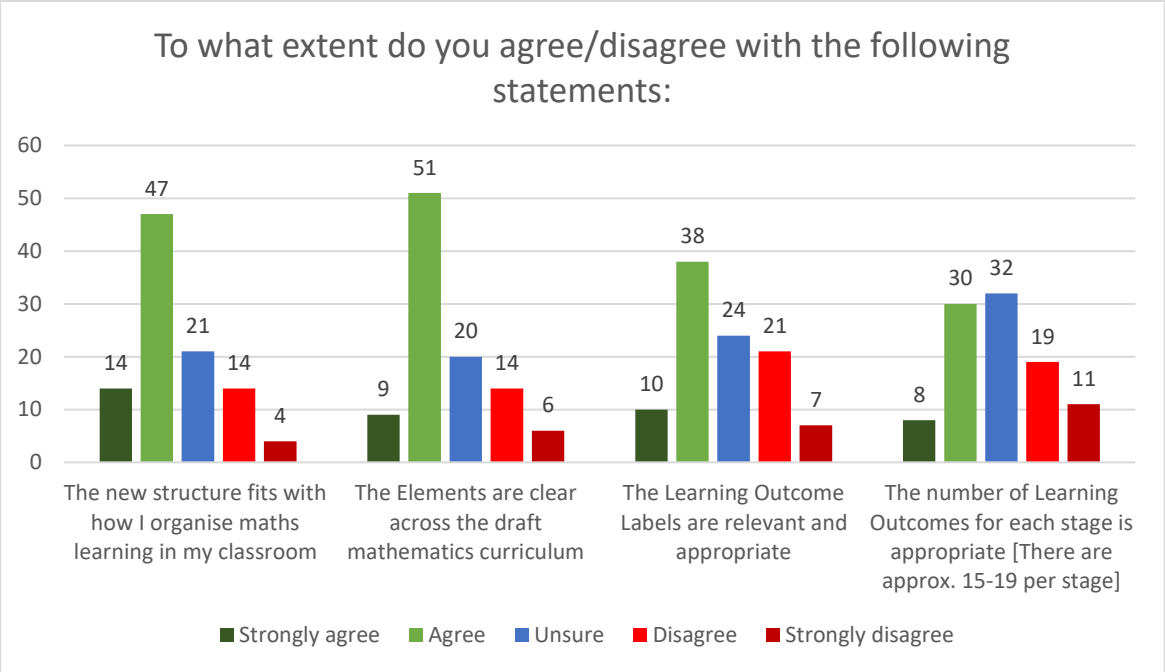

Figure 7: Level of agreement with statements around curriculum structure and presentation (% of responses)

The questionnaire asked respondents for any additional comments they had about how the draft PMC is presented, structured and/or organised. The following overarching points emerged as pertinent:

- The overall aim and rationale underpinning the draft curriculum is welcomed.
- Concerns raised around the lack of detail contained within the learning outcomes, describing them as "vague" and "broad". Calls made for more specific details or clearer targets around what children should know or achieve by the end of class levels, to help ensure continuity of learning across classes.
- Concerns shared that the structural change is too significant, is not user-friendly, and may be difficult for teachers to follow and implement.
- Suggestions posed include more visibility of 'number sense' and 'early mathematical activities'; more explicit links between the elements and learning outcomes; less ambitious learning outcomes across the stages.

Pedagogy and children's learning

The questionnaire asked respondents to indicate to what extent the five pedagogical practices outlined in Chapter 6 align with current practice (see Figure 8). While results are broadly similar across all five practices, promoting maths talk received the highest score for 'to a great extent' (45%). Overall, fostering

productive disposition received the lowest combined total for 'to a great extent' and 'to some extent' with 87%.

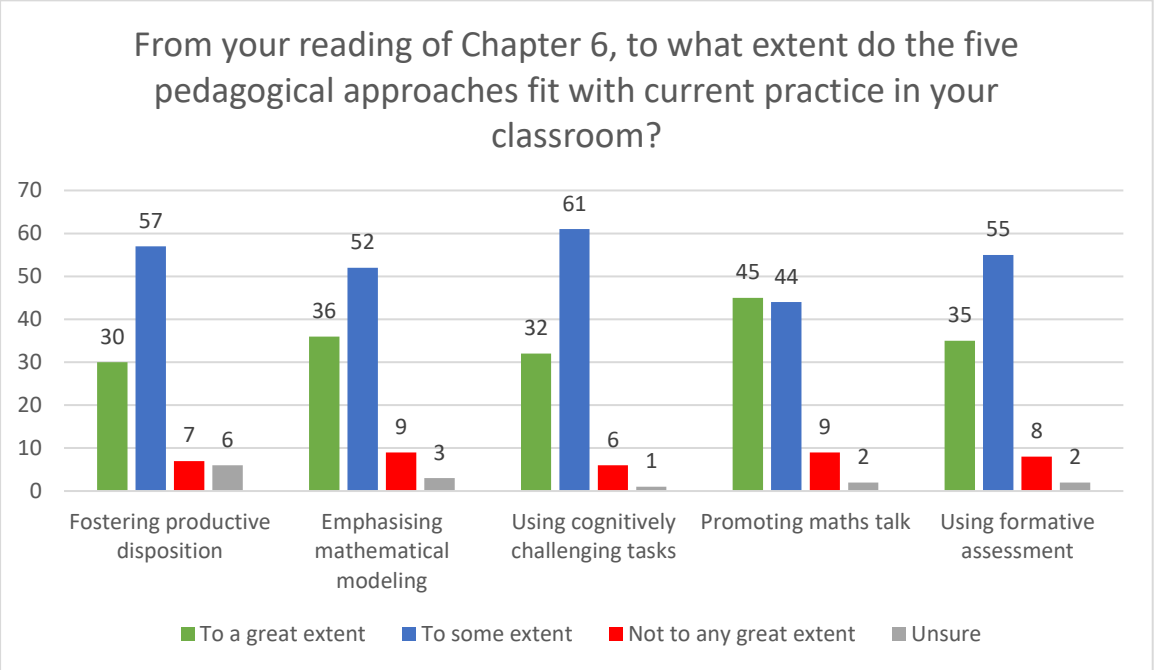

Figure 8: Level of agreement that pedagogical practices will align with current practice (% of responses)

Figure 9 presents responses on key statements linked with learning, inclusion and transitions. 76% of respondents agreed that the draft PMC highlighted the importance of playful and meaningful learning. In response to the statement "The curriculum does not encourage learning as a social and collaborative process", 60% of respondents disagreed, with 29% unsure and 11% in agreement. 70% of respondents agreed that the draft curriculum promoted the development of computational and creative skills, with 21% unsure and 9% disagreeing. When asked their level of agreement around the draft curriculum attending to children with diverse language abilities and needs, 44% of respondents were unsure, 32% in agreement and 24% in disagreement. 47% of respondents agreed that the draft curriculum is inclusive of every child, with 31% unsure and 22% disagreeing. There was a stronger degree of agreement that the draft curriculum acknowledges and supports the transition from pre-school to primary (57%) over the transition from primary to post-primary (45%), with significant cohorts unsure (32% and 42%).

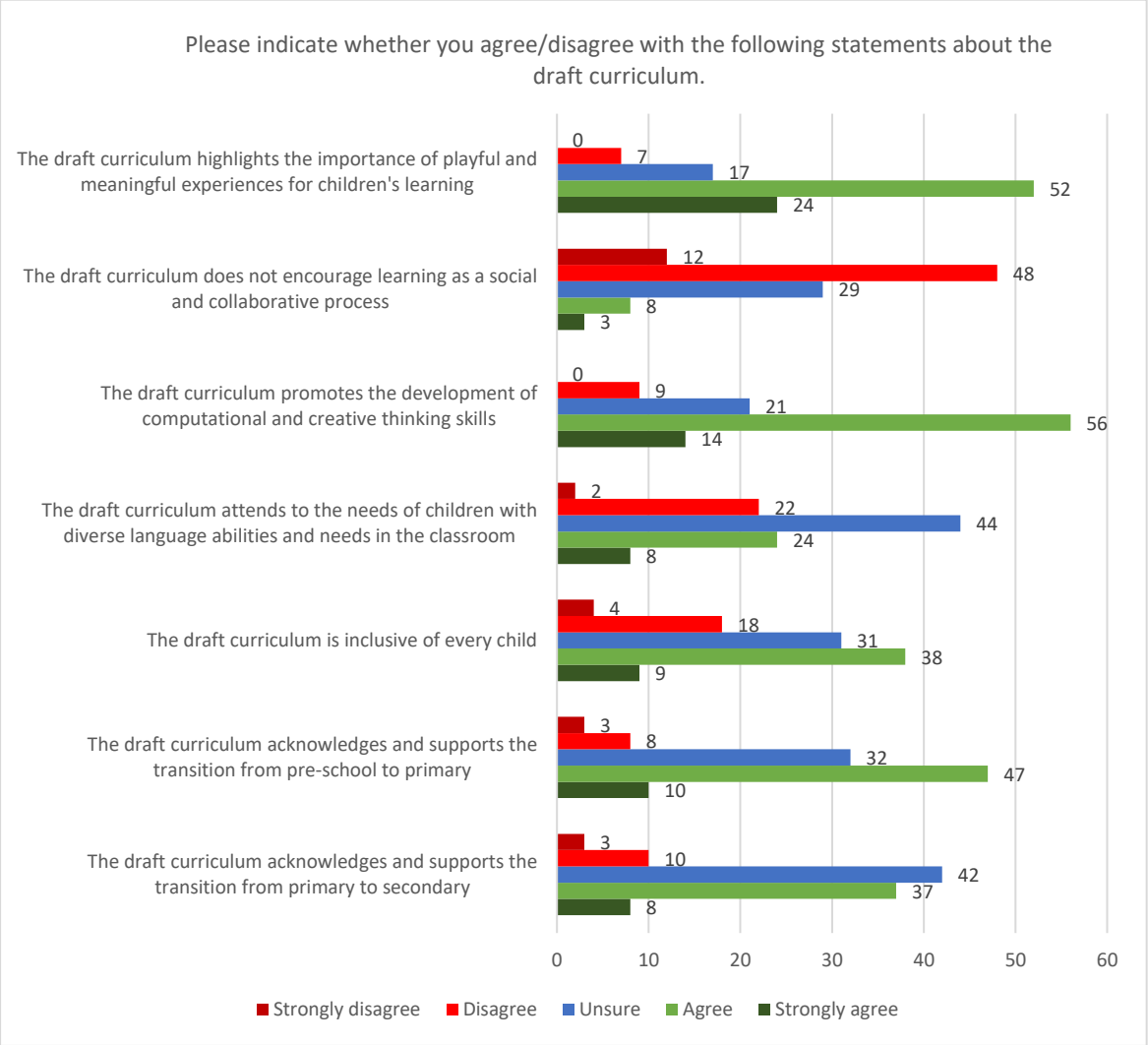

Figure 9: Level of agreement with statements linked with the draft curriculum (% of responses)

Respondents were asked if there were parts of the draft curriculum that could/should be removed. Individual responses included the following points:

- The draft PMC is too lengthy and should be reviewed and reduced. One suggestion is that each progression continua should run to no more than one page per Learning Outcome Label.
- Removal of specific topics such as long division and elements of money.
- The addition of content in the areas of algebra and shape and space was noted, with a question on what had been removed to make space for these areas.

Supports

Respondents were asked to rank the usefulness of the different parts of the Primary Maths Toolkit in supporting the enactment of the curriculum. The mathematical concepts were deemed very supportive by 33% of respondents, somewhat supportive by 48%, not supportive by 12%, with 7% unsure. The support materials were rated almost identically, with just 1% more finding them not supportive. The progression continua were deemed very supportive by 27%, somewhat supportive by 39%, not supportive by a quarter of respondents, with 9% unsure.

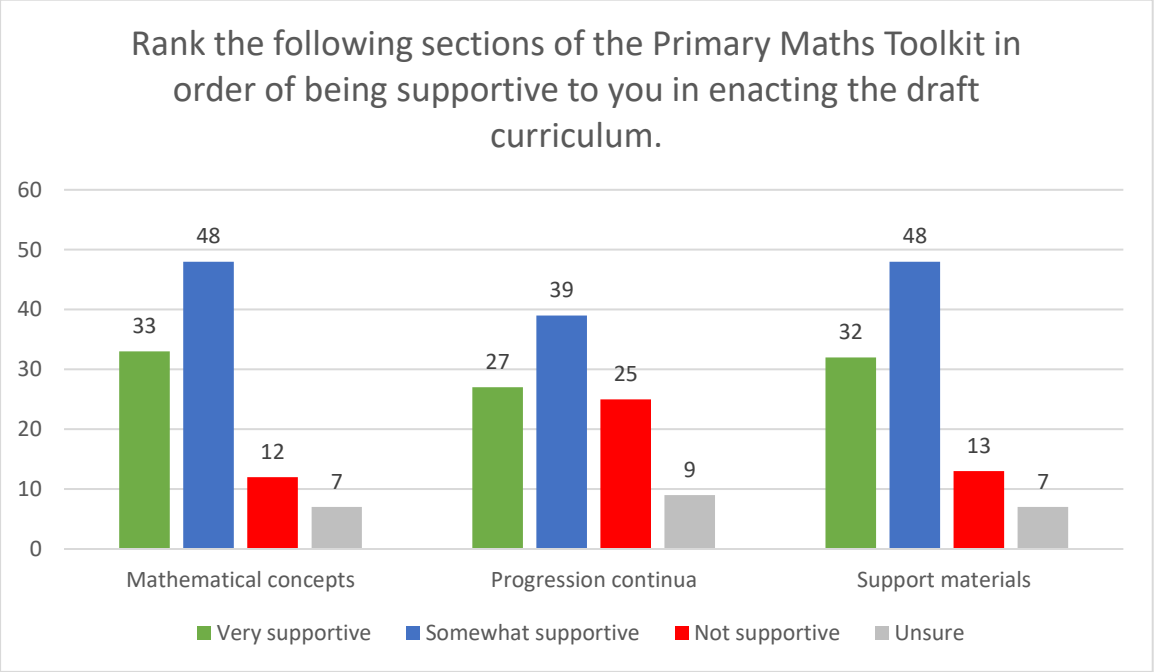

Figure 10: Level of support for each of the sections of the Primary Maths Toolkit (% of responses)

When asked about the positioning of the mathematical concepts, a large majority (87%) felt that they should sit in both the specification and Primary Maths Toolkit (see Figure 11).

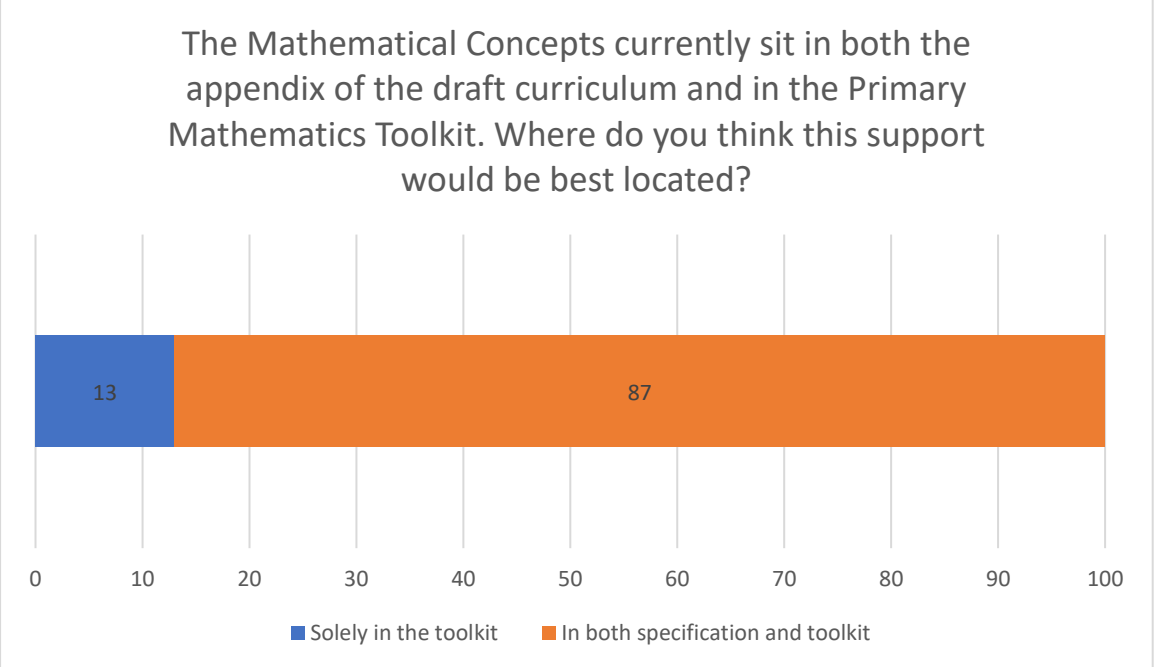

Figure 11: Preference for the location of mathematical concepts (% of responses)

Respondents cited the following supports they would like to see developed to support the enactment of the new PMC:

- Examples of enactment in multiple school situations, including modelled lessons.
- Examples of cognitively challenging tasks, inclusive activities and mathematical modeling.

- Easy navigable integration links across the curriculum.
- An online version of the curriculum with interactive links.
- Supports for recorded preparation (short-term and long-term; at a glance overview / reference sheets per strand area)
- Support for specific curriculum topics such as number sense teaching tools, play, inclusion, integration, computational thinking, algebra, mathematical language progression and developing productive dispositions.

In addition to these curriculum supports, respondents also cited the need for greater time allocation for maths, CPD opportunities, and funding and resources.

Finally, the questionnaire asked about confidence levels in using the draft PMC to plan and prepare for mathematical teaching and learning. 14% of respondents felt very confident, 36% fairly confident, 42% not confident and 8% unsure.

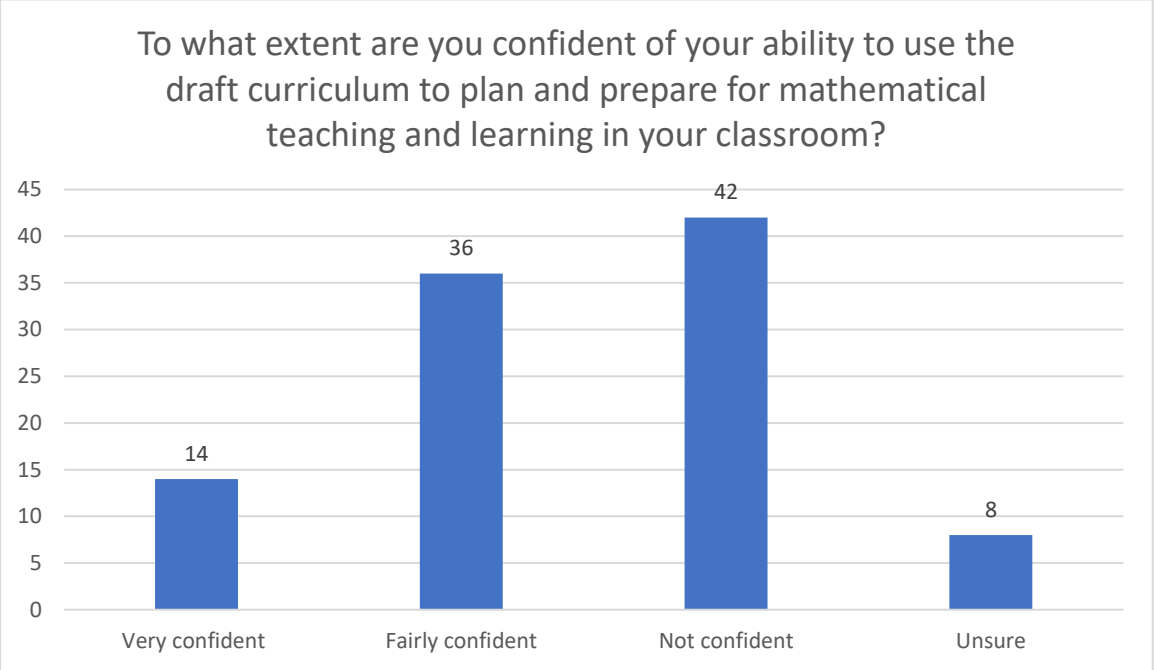

Figure 12: Level of confidence to use the draft curriculum to plan and prepare for mathematical teaching and learning (% of responses)

Parent / Guardian Questionnaire

Respondent profile

The questionnaire for parents/guardians received 56 completed responses. As noted in the next section, this figure is in addition to a survey conducted by the NPC (Primary) that gathered 868 responses. Figure 13 presents a profile of the 56 respondents (more than one response allowed for this question), while Figure 14 provides a snapshot of respondents' relationship with mathematics.

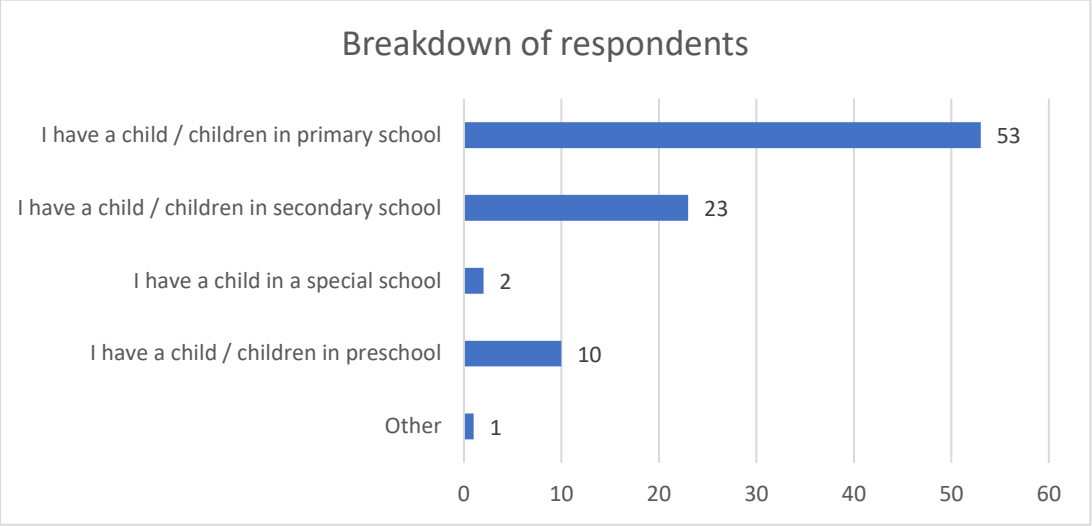

Figure 13: Breakdown of parent / guardian profile

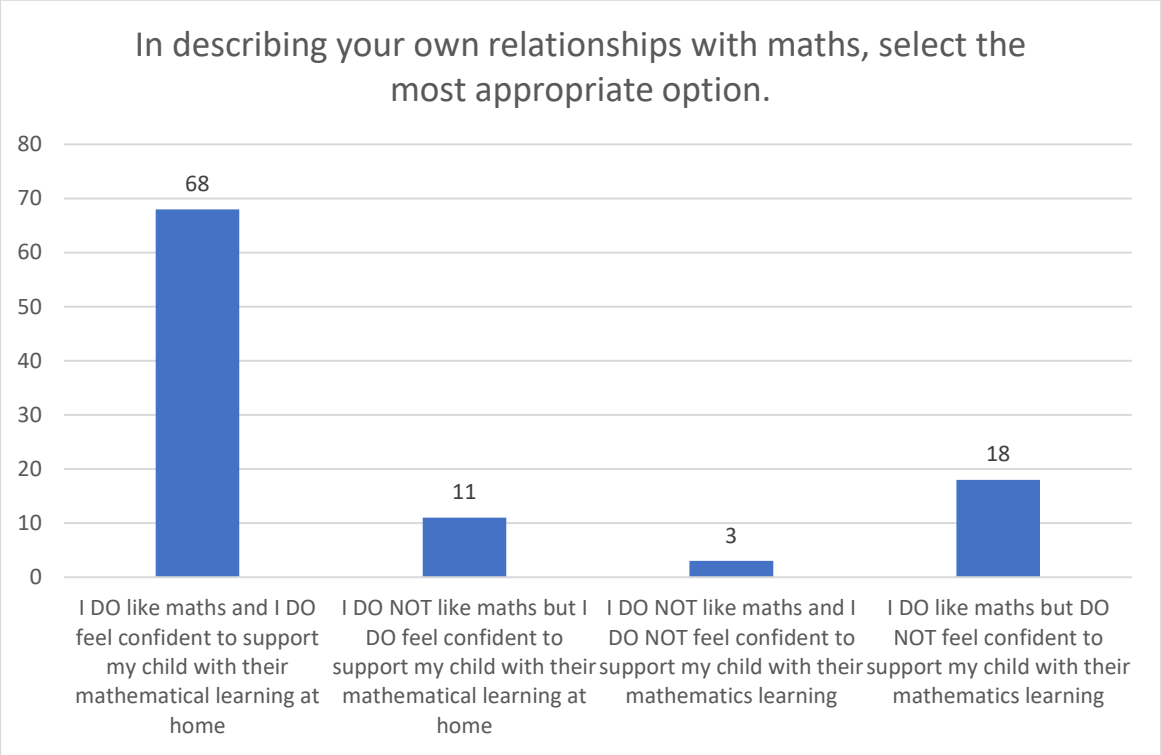

Figure 14: Respondents own relationship with mathematics (% of respondents)

Aims and rationale

59% of respondents agreed or strongly agreed that the purpose of maths education is clearly outlined in the draft PMC, with 29% unsure, and 12% disagreeing (see Figure 15). Meanwhile, two thirds of respondents agreed or strongly agreed that the aims convey what is important in primary maths, with 23% unsure and 11% disagreeing.

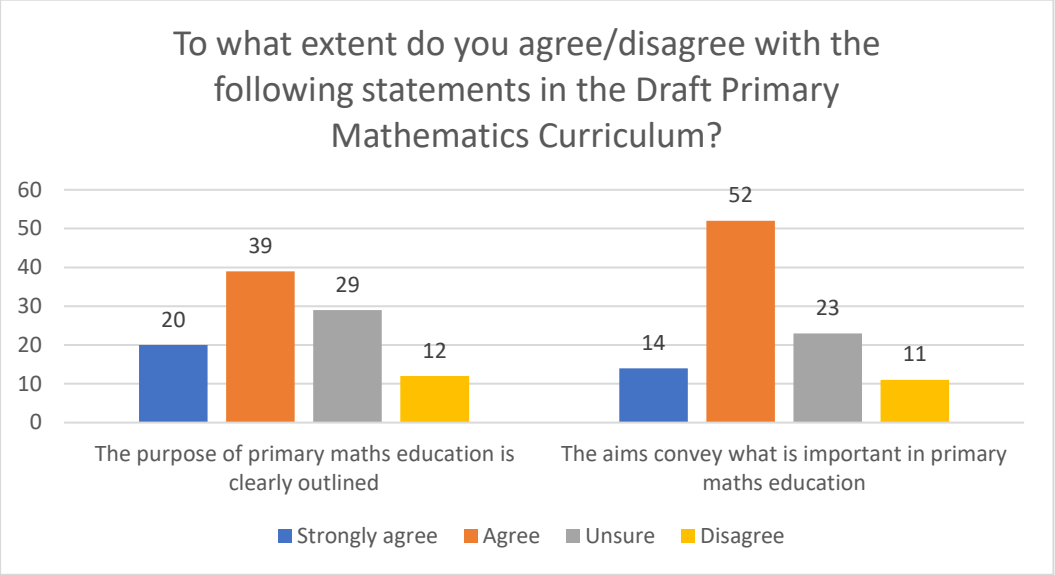

Figure 15: Level of agreement with statements relating to the purpose and aims of the new PMC (% of respondents)

Priorities for children's learning

When asked to rank what were the priorities for children's learning (see Figure 16), 'Children should have positive attitudes towards maths and view it as useful to their lives both in and out of school' emerged as the top priority with 24%. This was followed by options relating to the acquisition of a high standard of mathematical understanding (17%), opportunities to discuss and share their thinking and ideas (17%), opportunities to be challenged (17%) and provided with space to make sense of their mathematics (16%). Finally, 'Children should perform well on classroom-based and standardised tests' was deemed least important with a 9% rating.

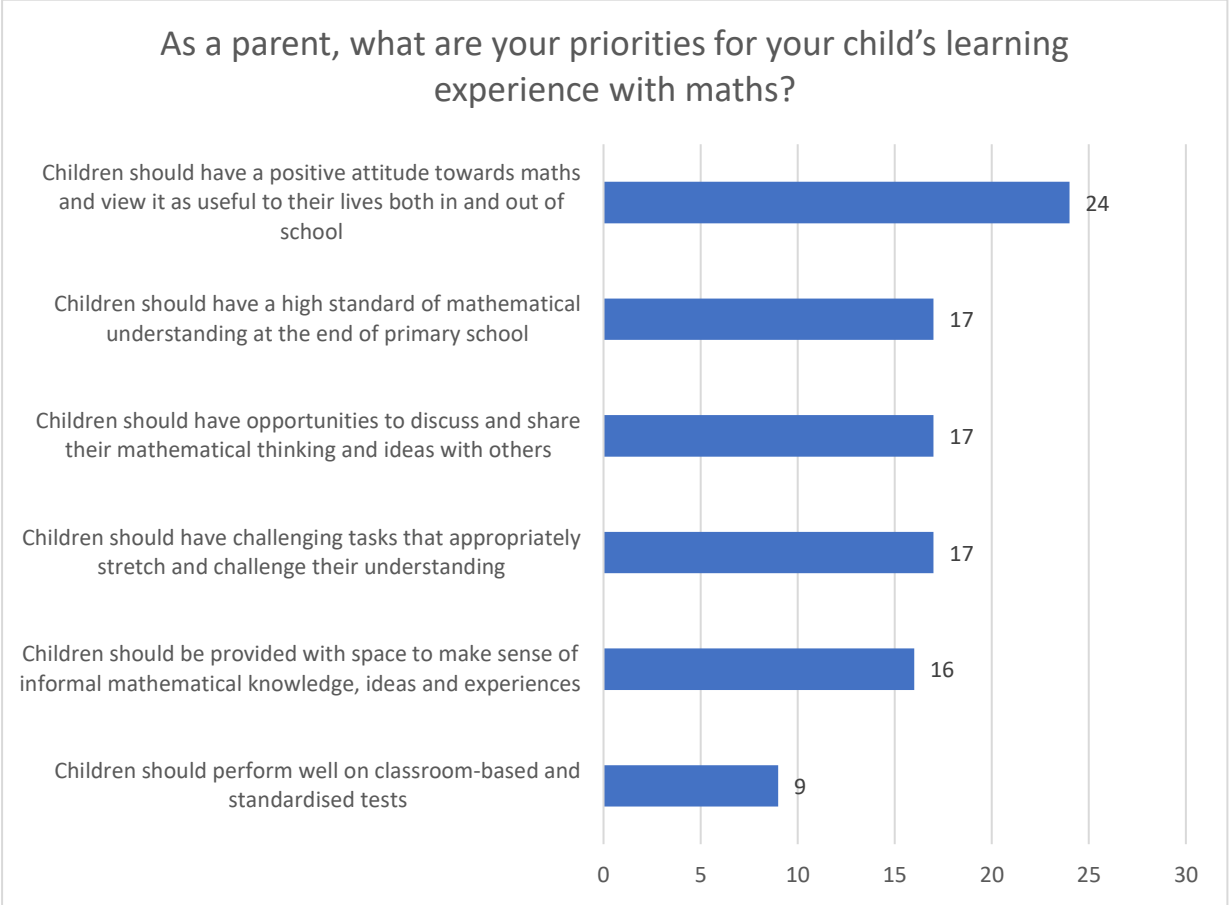

Figure 16: Priorities for children's learning (% prioritisation score from ranking exercise)

When asked what positive aspects of mathematical learning should be maintained, respondents ranked active learning and problem-solving as the top two priorities, with using concrete materials, mental calculations, maths language and group work ranked relatively equally favourably (see Figure 17).

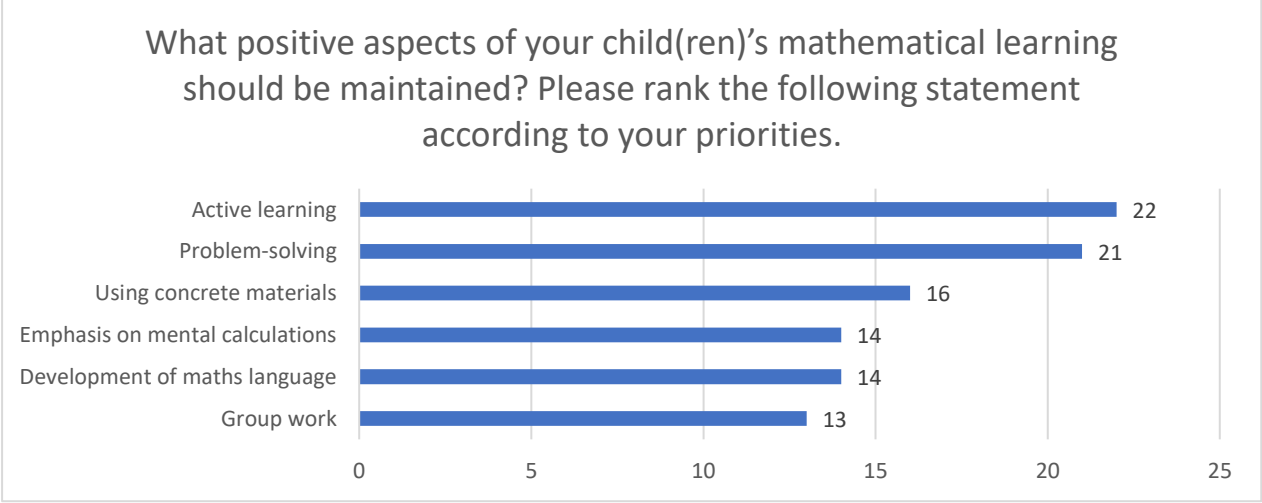

Figure 17: Positive aspects of learning that should be retained (% prioritisation score from ranking exercise)

Respondents reacted to statements associated with COVID-19 related school closures and their experience in supporting their child's maths learning. 15% of respondents agreed or strongly agreed with the statement 'I couldn't help my child with maths', with a significant 83% in disagreement. Half of respondents disagreed that they learned maths alongside their child, while 46% agreed. 46% of respondents agreed that maths teaching is best left to the teacher, with 34% in disagreement and 20% unsure. Half of respondents agreed they knew where to access supports to help their child with maths, with 32% disagreeing and 18% unsure. A majority of 68% of respondents knew more about how their child learns maths, with 18% disagreeing and 14% unsure.

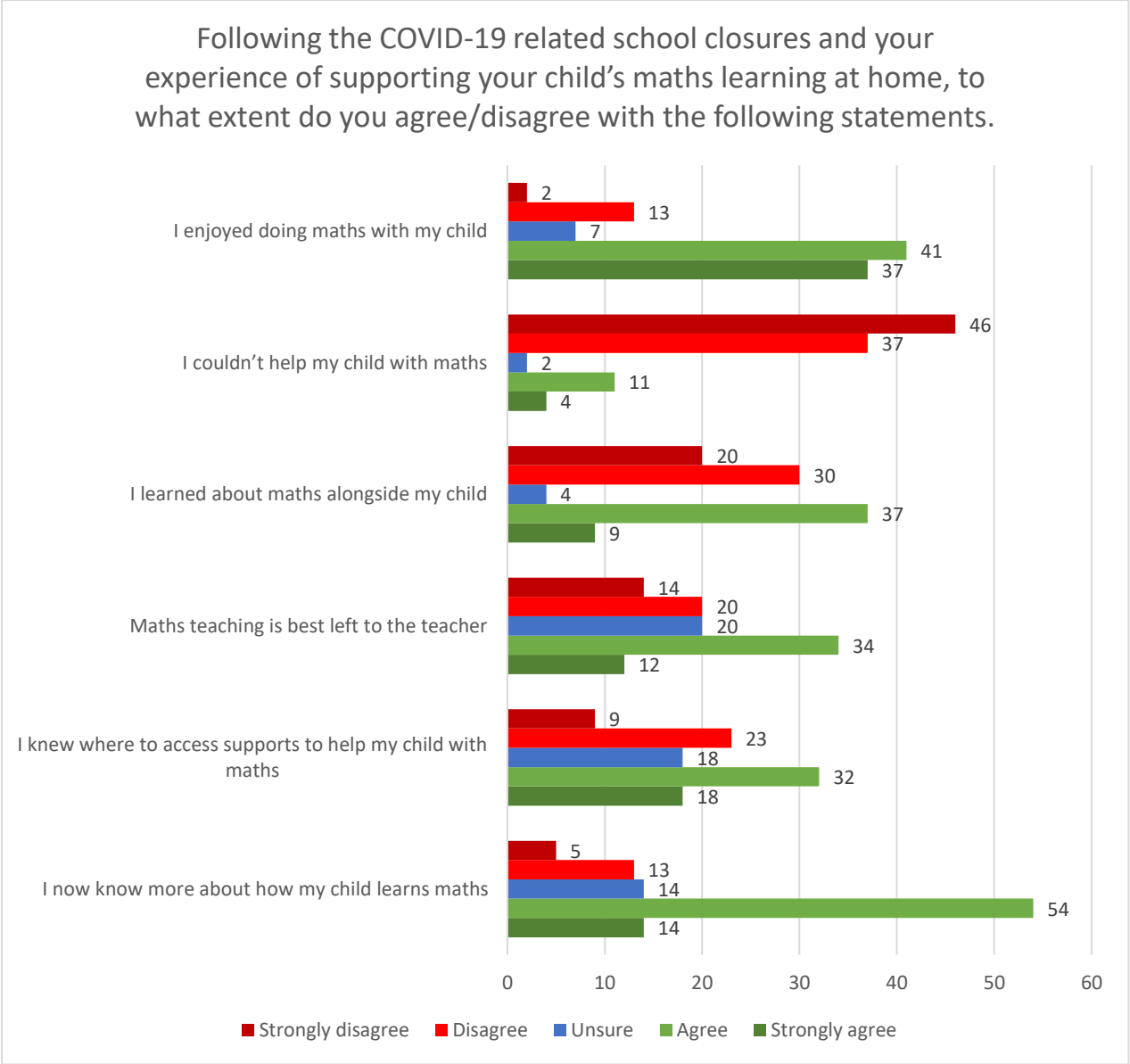

Figure 18: Level of agreement with statements associated with COVID-19 and school closures (% of respondents)

Suggested supports and final comments

Respondents were asked to identify supports they would like to see available alongside the new maths curriculum to help with their child's maths learning at home. The following points were shared:

- An overview of the new maths curriculum and what changes are taking place.
- Age-related and class-related learning overviews and supports.
- Supports, examples and videos in specific areas such as maths games, problem solving, procedural methods, mental maths, reducing anxiety towards maths and how maths relates to real-life.
- Identify useful and 'safe' online resources for children's maths learning.
- Homework that is "more than just tables".

Finally, parents / guardians were provided with an opportunity to share any final comments they had on the draft PMC. In response, the following points were shared:

- The importance of concrete materials was emphasised to make maths more engaging.
- Concern was expressed regarding the complexity and level of content in the progression continua.
- A call for clarity around what children are expected to learn in each class.
- A call for further integration of elements of computational thinking, coding and computer science in the primary mathematics curriculum.
- Foundational number facts and mental mathematics were emphasised as being very important for children, and should be prioritised ahead of the calculator.
- A call for further emphasis on the links between maths and everyday life.
- The importance of establishing and maintaining communication between school and home in relation to children's maths learning was highlighted.
- A call to have challenging learning experiences for high achieving children.
- A call to regularly upskill teachers and parents.
- A call to forefront independent and child-directed learning.
- The statement in the rationale that states 'every child is a mathematician' was specifically welcomed, with one respondent noting "*all children are capable and this positive mindset towards maths is so important for life. We want out children to make mistakes and think creatively*."

Written submissions

NCCA received ten written submissions in response to the draft PMC. These submissions along with a list of the respondents can be found in the Appendix. Permission to share these submissions was received by all ten respondents. This section provides a brief synopsis of the main themes which emerged across these submissions.

A number of the positive aspects of the draft PMC highlighted within the submissions include the solid structure, rationale and aims of the curriculum specification. The vision for children to develop mathematical proficiency was welcomed, in particular the emphasis on productive disposition. Respondents highlighted the child-centred nature of the curriculum which will provide for a more unique and individualised learning journey and positive play-based learning experiences for children. The mathematical concepts are considered a good addition to the curriculum, as is the emphasis on building on children's prior understanding and skills. Respondents also welcomed the new Support Materials, particularly those focused on rich learning environments, maths talk and cognitively challenging tasks.

A number of the written submissions expressed concerns about the Learning Outcomes not providing sufficient specification or links to specific baseline standards (linked to class-based norms), which some believe may lead to ambiguity and difficulties, particularly for newly qualified teachers. One submission

expressed the wish for more explicit connection between Learning Outcomes and Progression Continua; and more specific statements on the role of the teachers and 'what' to teach when enacting the curriculum. Some submissions called for more explicit reference to inclusion; the origins and purpose of Learning Outcomes; play; engagement; computational thinking; and pedagogies such as 'interactive direct instruction' within the curriculum specification, while other submissions called for greater emphasis on digital skills and financial literacy.

The submissions suggested the potential for enhanced coherence between the new curriculum and the *Primary Language Curriculum/Curaclam Teanga na Bunscoile* (NCCA, 2019), the *Draft Primary Curriculum Framework* (NCCA, 2020) and guidance on *Preparation for Teaching and Learning* (NCCA, 2021), as well as greater alignment with the Junior Cycle key skills (NCCA, 2015) and *Aistear* (NCCA, 2009). They also called for a review of the language register to be more accessible and coherent with how children express and represent their learning.

In providing additional supports as part of the Primary Mathematics Toolkit, suggestions provided in the written submissions point to the need for greater clarity on how to use the curriculum for planning purposes; examples of the five aspects of Mathematical Proficiency; supports which attend to improving teacher confidence; the provision of authentic examples of children's learning that reflect typical Irish classroom situations; and the addition of links and useful features to navigate between different components of the curriculum in the online version of the specification.

Finally, in addition to feedback on the curriculum, a number of submissions expressed the need for improved conditions to enable meaningful enactment of the curriculum including reduced class sizes; resources and funding; time for providing hands-on activities. Respondents also highlighted the need for professional development that is practical, tailored, which allows time and space for teachers to collaborate and understand the structure and philosophy which underpins the curriculum, and which offers practical lesson demonstrations.

The National Parents' Council (Primary) submission is based on an extensive questionnaire survey carried out by the organisation. This captured the perspectives of 868 parents/guardians and 196 children. These surveys provide useful insights for curriculum development, such as discerning dispositions and relationships with mathematics; priorities for children's learning in primary school; and experiences of at-home learning during the COVID-19 pandemic. These surveys also provide a useful steer for developing support materials for parents to help their children's mathematical learning at home. Responses to questions specifically related to the current curriculum found that children experience issues with fractions and problem-solving, particularly written problems; and expressed the wish for more in-class time to make sense of their mathematical learning. There was a notable proportion of parents who described the current curriculum as over-simplified; and reported wanting mathematics to be more challenging, particularly noting the opportunities for greater progress and development of learning in the early years. Some parents also raised the issue of literacy-dense problem-solving activities and questioned the merit of tables and mental maths activities. Given the substantial response to these surveys, they offer an important contribution to the child and parental perspectives gathered during the consultation.

School Network Findings

This section will present the findings of the data collected from the school network. It is presented under four main headings. These are:

- Curriculum specification and structure
- Teachers' perspectives of key changes
- Teacher toolkit
- Enacting the curriculum.

Curriculum specification and structure

Curriculum rationale and aims
The rationale presented in the draft specification garnered much discussion. Most teachers welcomed the key statements of the rationale, recognising them as critical in the mindset change required for the new curriculum to make a significant difference to children's mathematical learning. The statement 'Every child is a mathematician' drew particular discussion, with some teachers highlighting that currently not all children would self-identify as mathematicians, instead putting significant weight on whether they get an answer right or wrong. It was felt that this statement was important to foster a change in attitude towards mathematics and help children to see and understand that there is more to mathematics than just providing the correct answer. The network welcomed the overall aim of the draft PMC. While recognising each of the elements of mathematical proficiency as important, the highest degree of importance was attributed to conceptual understanding, productive disposition and adaptive reasoning. Teachers highlighted that the current curriculum is "packed and loaded", and that these new aims require a slower approach with more time for thinking and discussion.

Structure, presentation and alignment
There was a broad welcome for the infographics and general presentation of the draft specification. Preference was expressed for a shorter rather than a longer specification document, and in this light, it was suggested that the content could be laid out in a simpler fashion. Teachers recognised the structural alignment between the draft PMC and the PLC/CTB. However, many teachers expressed a view that the initial rollout of the PLC/CTB still holds negative connotations for many and that schools are still at the early stages of enactment. However, the use of the term 'learning outcome label' was raised as challenging, as was the incoherence between the use of 'elements' in the PLC/CTB and draft PMC.

In terms of the presentation, teachers commented favourably on the infographics used in the draft specification. It was felt that they summarise key messages and ideas in a very succinct way. Some teachers noted that the use of colours in some of the infographics could be further enhanced, as well as colour coding across the curriculum documents to allow for easier navigation.

Teachers also commented on alignment with mathematics in post-primary school. It was emphasised that the journey between the two sectors should be smooth for students. Some teachers noted that the shift in focus from 'the answer' to 'the journey to the answer' would help children once they leave primary schools. It was also suggested that the learning experiences in the progression continua be reviewed against what is contained within the mathematics curriculum at junior cycle level.

Using learning outcomes
Participants shared mixed responses to the move to using learning outcomes. Some teachers responded that they were less overwhelmed by the volume of learning outcomes compared to the current learning objectives. They also noted that learning outcomes provided more freedom, room for creativity and an opportunity to meet the children where they are at. Small schools welcomed the learning outcomes running across two years. On the other hand, some teachers expressed concerns that the learning

outcomes were overly broad and not having specific learning targets for each class may lead to much confusion and a drop in standards. It was highlighted that using learning outcomes would test teachers' subject content knowledge and there was a call for more scaffolded support in using the learning outcomes. Some teachers felt that the structure of the 1999 curriculum ensured accountability in terms of learning, whereas the draft PMC leaves greater responsibility with the individual teacher. It was noted that teachers' initial experience of such freedom and agency can be a scary one. Teachers called for a stronger bridge between the current curriculum and the draft PMC, with more support required to mediate the learning outcomes. They felt more details or further indicators were needed to show what learning is contained within the learning outcomes.

Language register

The language in the draft specification was deemed, overall, to be accessible. The practical suggestions included in Chapter 6 were welcomed by teachers, commenting that they are presented in a very concise and clear way. However, some parts of descriptor text used in the same chapter were deemed overly academic and complex and there was a call to review such text to ensure it is accessible. While it is expected that there will be some new language used (examples given such as fostering productive disposition or cognitively challenging tasks), this should be kept to a minimum and only be used to describe new practices or ideas. To avoid repetition, it was suggested that the phrase "Through appropriately engaging learning experiences children should be able to ..." should not be presented in front of every learning outcome. The glossary was welcomed as a useful tool, with a popular suggestion shared to also have a hover-over function in the online version of the curriculum documents.

Feedback on proposals for a new curriculum area of Mathematics, Science and Technology

There was a general welcome for the curriculum area 'Mathematics, Science and Technology', as proposed in the *Draft Primary Curriculum Framework* (NCCA, 2020), with participants highlighting that there is good familiarity with the idea of STEM in the system currently. It was stressed that the curriculum area needed to be structured in a clear and user-friendly way and address the issue of curriculum overload. In this way, the functionality of the curriculum documentation will be critically important, and the new maths curriculum needs to align with what follows.

Linking learning outcomes from a planning perspective would be useful, but it was also felt that the subjects could be linked on a deeper level, for example, through skills and an inquiry-based learning framework. It was agreed that project work would be a useful practical pedagogical approach to link the areas.

Teachers' lack of experience with meaningful integration was raised as an issue. Specific worked-through examples would be required, showing how projects are planned for and worked-through. Teachers will need to see how they can bring different learning outcomes together and how the subjects need each other to solve big questions or dilemmas. Participants strongly called for a list of examples of appropriate themes or questions that teachers could use if they wished. These examples should be updated on a yearly basis and would provide meaningful and current ideas.

Primary Maths Toolkit

In terms of the Primary Maths Toolkit, teachers in the school network worked with the mathematical concepts, progression continua and eleven draft support materials. In the final school network questionnaire, participants were asked to rate the overall usefulness of these different aspects of the Primary Mathematics Toolkit (see Figure 19).

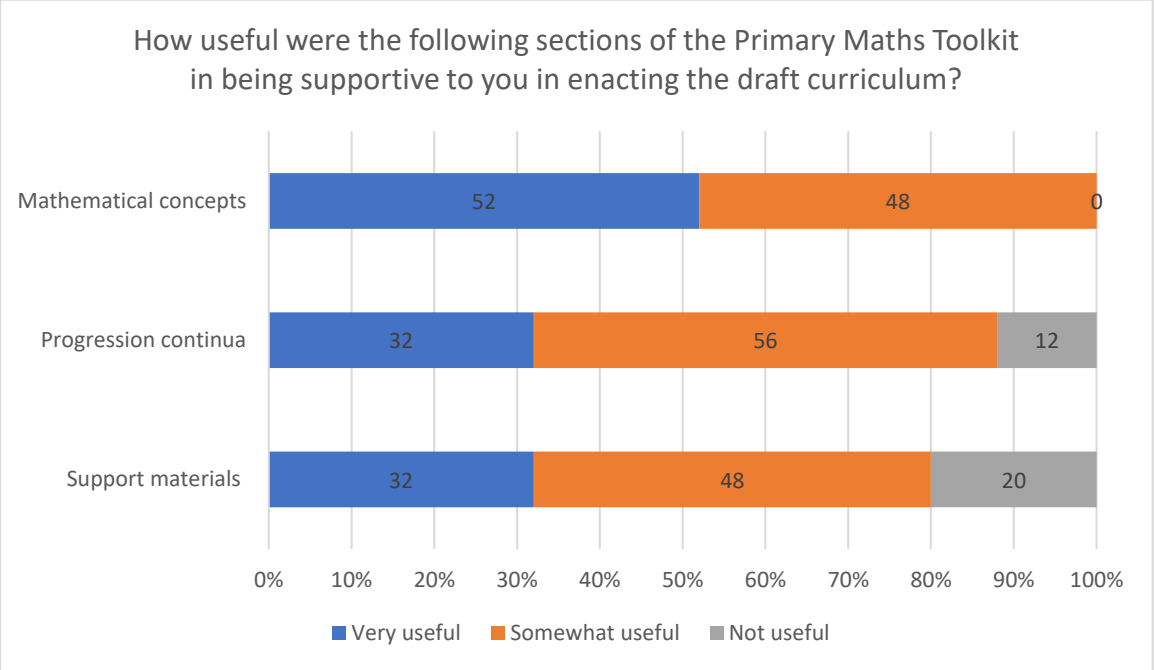

Figure 19: The level of usefulness of the different aspects of the Primary Maths Toolkit

Mathematical Concepts

Overall teachers welcomed the inclusion of the mathematical concepts in the toolkit, recognising them as a useful bridge between the learning outcomes and the progression continua. Teachers commented that the mathematical concepts were helpful and useful in making learning more concrete. Overall, it was felt that the mathematical concepts should sit solely in the support space. However, some teachers called for further support in using learning outcomes. Suggestions were shared in terms of improving the presentation of the concepts to ensure that teachers are aware that they are not learning outcomes.

Progression continua

Concern was expressed as to the level of content contained within the progression continua, with some teachers describing it as 'crowded' and 'overwhelming'. While acknowledging that these are located in the support space, teachers still felt that it could put teachers under pressure to try and provide learning experiences in all these areas. It was felt that some learning described within them was difficult to comprehend, especially in the upper milestones. These upper milestones were labelled as too advanced by many teachers, with some commenting that even sixth class children who are working at a very high level in mathematics would be unable to engage with them. There was a call for these later milestones, in particular, to be reviewed. Others wondered whether the pedagogical practices as espoused in the draft specification could be further knitted into the learning experiences contained in the progression continua.

It was felt that the current statements were not very rich and called for more practical aspects to be included. It was suggested that these should be reviewed to reduce the level of content and make them further accessible.

The lower milestones of the progression continua were singled out by those working in special education as being particularly inclusive and helpful. They felt that the language is inclusive of all children, with phrases in the progression continua such as 'is present at', 'is exposed to' and 'experiences' deemed very helpful. There was an acknowledgement of the development work completed since the last consultation in ensuring these steps were inclusive of every child. It was felt that this emphasised the message that every child, regardless of their ability or need, can experience rich mathematical learning in a very meaningful way.

Support materials

In their review of the support materials, teachers highlighted elements that were deemed particularly useful. Practical ideas such as sentences stems, talk moves, prompt questions, opportunities for maths talk were welcomed, as well as specific examples of tasks and teaching activities. Teachers called for a stronger focus on such practical ideas across all current and future support materials across the various stages across all strands. It was highlighted that some of the text in the current materials could be reduced to ensure they are kept relatively short, thus enabling teachers to pick up the main ideas more quickly. It was suggested that extraneous text around the rationale of different ideas isn't necessarily needed by teachers. Further suggestions were also provided in terms of language used in the draft support materials, with teachers pointing out that in some cases the language used was very academic in nature.

Those working in special education asked that support materials be mindful of children of all needs. For example, the draft support material 'Supporting the Development of Maths Eyes at Home and in the Community' could include references to sensory area of maths in the environment, such as noticing a colour or touching things in a supermarket. Additionally, there were calls for the development of SEN pathways, similar to those developed for the PLC/CTB, to further support inclusion.

Suggestions for support materials

Participants from the school network provided suggestions for further supports. A key suggestion that was proposed involved the creation of an online central hub for all mathematics associated resources and support materials. It was agreed that such a "one-stop shop" should be user-friendly and link all curriculum documents to make preparation and planning easy for teachers. Linked to the five pedagogical practices, teachers called for a bank of examples or ideas to support each. For instance, teachers felt examples of appropriate cognitively challenging tasks for each stage in each strand area would be important to ensure teachers become accustomed to this practice. Furthermore, it was suggested that a sharing facility be established to allow teachers share resources created in such areas. This would help with preparation and ensure teachers' time is used in a more effective way.

There was a significant call to update the current planning tool. It was felt by teachers that the current tool is cumbersome to use and doesn't link with all components of the teacher toolkit associated with the PLC/CTB. Teachers also spoke about the recently published Guidance on Preparation for Teaching and Learning, and how support materials should connect further with the ideas contained within this publication. Additionally, there was a call for video exemplars to show teachers implementing the new PMC in the classroom and talking about their experiences.

The area of parent / guardian involvement and support was given significant focus in the feedback from schools. It was strongly recommended that parents/ guardians need to understand what changes are being

made with the new PMC and the reasons for these changes. Some teachers commented that parents/ guardians can be focused on standardised test scores, and the key messages contained within the new PMC would need to be communicated to them directly to help re-orientate this focus. Furthermore, it was suggested that up-to-date resources be developed for parents of children in each stage, providing them with helpful tips and games that link to the learning taking place in school. Teachers noted that parents/ guardians often seek resources to help with their child's mathematics learning at home and having a one-stop shop for such materials would be very important and useful. It was reminded that for schools with large populations of children with EAL, the support materials geared at parents should be translated into multiple languages. This would be helpful in trying to bridge the cultural and linguistic barriers faced.

Finally, in relation to assessment, there was a call for direct supports to help teachers in the area of assessing prior knowledge, given its centrality in every classroom. Teachers called for assessment ideas to be closely linked to all curriculum documentation associated with the new PMC.

Teachers' perspectives of key changes

Children's learning

School Network teachers observed that children were more motivated and engaged when they enacted the pedagogical practices recommended in the draft PMC. Teachers highlighted that a broader range of learning preferences and abilities were catered for through the use of these practices. The benefits of maths talk were highlighted, especially for EAL learners, those who may have held negative dispositions towards mathematics or those who traditionally struggled with maths. One teacher reported a "significant change in the classroom culture, where children were open to talking about their ideas". Fostering a productive disposition towards maths was highlighted as being extremely positive, especially for children in the senior classes, who tend to put significant emphasis on achieving the right answer. Teachers felt that placing more emphasis on the process and understanding would yield dividends in the long run. It was commented that the use of cognitively challenging tasks provided opportunities for fun and active learning, with a focus on playful pedagogy deemed important for children in all classes. It was felt that in the upper end of primary school, maths can lose its sense of fun and this can often impact on children's attitudes towards the subject. The promotion of formative assessment as a practice encouraged an increase in peer- and self-assessment. In the final school network questionnaire, participating teachers were asked to consider to what extent the pedagogical practices will enhance children's learning experiences (see Figure 20).

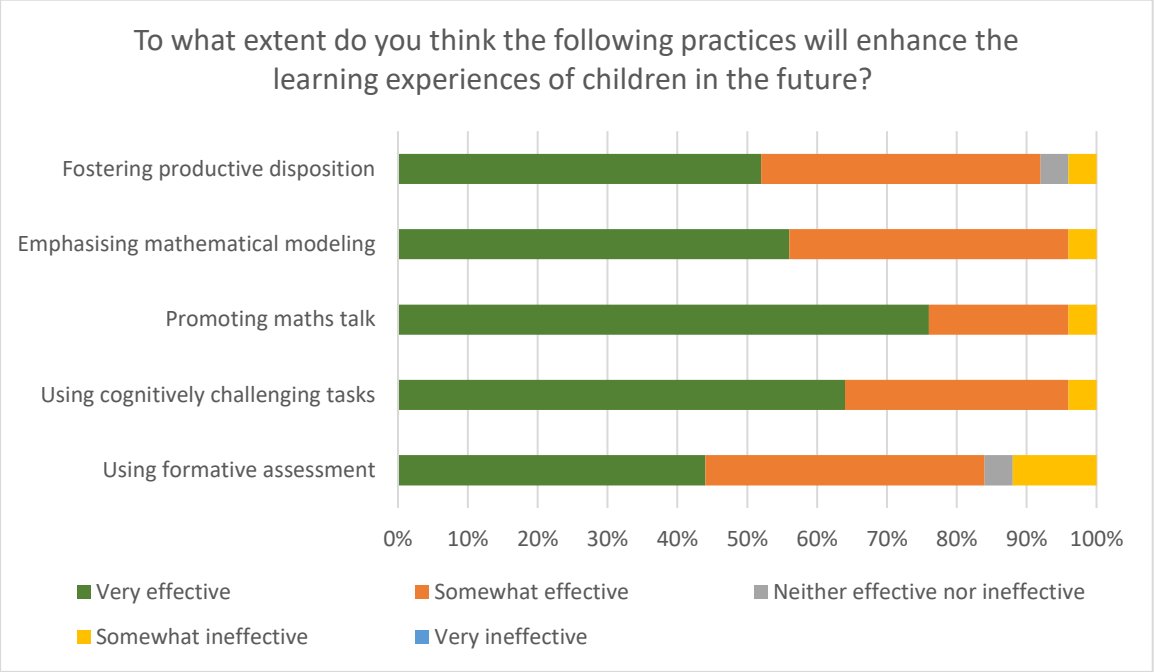

Figure 20: The extent to which the pedagogical practices will enhance children's learning experiences

Some teachers noted that the new pedagogical practices, while very beneficial, were very time consuming and expressed concerns as to how they were expected to teach the same level of content as before. Homework was also raised as something that should be looked upon differently going forward. Schools shared some novel ways in which they have changed homework practices in maths.

Role of teachers

Many school network teachers noted the shift in their role as a teacher when enacting the curriculum. Teachers noted in particular that allowing children more time to grapple with maths learning, and not rushing to intervene were keen professional learning opportunities. Others spoke about experiencing a changed mindset, with the focus no longer on simply achieving the right answer, and more about instilling a positive attitude towards maths and providing opportunities for children to become involved in their maths learning. One teacher spoke about a "renewed enthusiasm" they felt for the pedagogical practices being emphasised.

Some teachers noted that the role of the Special Education Teacher (SET) may also need to evolve, with communication between the class teacher and SET extending beyond content covered to include how to approach maths learning. To support fostering a productive disposition amongst children, some participants felt that a greater emphasis on in-class support would be more appropriate, especially in the senior classes.

Enacting the curriculum

Opportunities

As well as the benefits to learning and teaching, as outlined above, participants in the school network identified additional opportunities associated with the introduction of a new PMC. Addressing the challenge of curriculum overload was raised by a large number of participants. Reducing overload and the

volume of content are seen as very important in order to allow time for more meaningful mathematical learning experiences for children that incorporate the pedagogical practices as outlined in the draft PMC.

Participants across the school network identified the role of parents/ guardians as critical. Schools identified this time as an opportunity to reach out to parents about how mathematics teaching and learning is changing, and address concerns they might have.

Teachers saw the development of a new mathematics curriculum as an opportunity to update content. Some teachers asked if there was still a need to keep such a strong emphasis on number-based concepts in every class. It was suggested that calculators should be given further visibility, especially in the more senior classes. Teachers shared experiences of how children's real-world experiences with certain mathematical topics has changed in the last twenty years. For instance, with money, children have less experience with coins and cash than before, and it is important the curriculum reflects such change.

Participants felt that engaging with the consultation provided an impetus for open conversations about mathematics in their school. Topics arose around inclusion, the use of textbooks and mathematical pedagogy, all of which were deemed beneficial to the overall mindset of teachers in the schools.

Perceived challenges

Curriculum overload was raised as a significant current challenge in the system. Teachers spoke about pressures to 'cover' content to ensure all topics are covered prior to standardised testing. Teachers spoke about having insufficient time for any kind of depth of learning with the current curriculum, and felt that if this issue isn't addressed, there would be very limited change to pedagogy, with teachers most likely inclined to turn to textbooks.

Standardised testing was deemed the most significant challenge by the vast majority of teachers in the school network. It was felt that the high-stakes culture associated with the assessment would need to change if schools were to meaningfully foster a productive disposition towards mathematics amongst children. Some schools called for standardised testing to be reduced to every two years, while others felt it should be paused fully and a full evaluation conducted of its purpose and repercussions on children's learning of mathematics.

Working with broad learning outcomes was recognised as a significant change for participants in the school network. Some participants felt that it could lead to a discrepancy in quality of curriculum enactment or standards from one teacher or one school to the next. Others felt it would pose challenges in relation to preparation and planning. It was expressed that newly qualified teachers (NQTs) need to be well prepared to work with the new PMC as soon as they begin teaching, with the view expressed that NQTs could find it particularly challenging to work with.

Participants in the school network highlighted that substantive change in teaching and learning is required if the new PMC is to be successfully enacted. Schools will need appropriate time to explore, prepare for and realise the changes espoused in the new curriculum. If the appropriate amount of time or CPD is not provided, teachers felt that this could lead to significant problems in relation to enactment. Schools also called for all education partners to ensure their messaging is updated to reflect changes associated with the new PMC, thus helping to achieve a smooth enactment. Teachers hold strong hopes that the system will support and enable schools to bring this new vision for children's learning in mathematics to life.

Changing culture

While the school network primarily welcomed the changes in relation to pedagogy and learning in the draft PMC, they warned that that it will take time and effort to change current habits and mindsets. Allowing teachers time to have deep, professional conversations about current practice is an important step in this process. In this light, it was felt that school leadership would have an important role to play. To help support schools in adapting to the new PMC, a very clear and explicit rationale for change is needed, and this needs to be clearly communicated to schools and parents/guardians.

When sharing some of the benefits that the teachers themselves had experienced over the course of the consultation, key facets were noted, including developing a shared responsibility, utilising effective communication, having an openness to change and new ideas, and a willingness to support colleagues were all deemed important. The issue of teacher confidence was underscored as being central to the process. Teachers will need a safe environment to make and evaluate changes.

Supporting curriculum enactment

There was a strong and resonant call for an appropriate amount of time and CPD to be allocated for the rollout of the new curriculum. Schools called for face-to-face, sustained and collaborative CPD in order to allow for the standard of enactment that meets the ambitious nature of the curriculum. It was suggested that CPD should focus on what the new PMC will look like in the classroom. While theoretical underpinnings, background readings and research can all be signposted, they should not take up significant time in the CPD sessions. New areas of the curriculum, including pedagogy and new content areas should be a key focus of the CPD. New areas related to algebra and shape and space would have to be given priority, and teachers enabled to build their own conceptual understanding of these areas.

Feedback indicated a preference for full-day, in-school and in-person CPD, enabling professional conversations relevant to the specific school context to take place. Such conversations need to be scaffolded for schools and time built in for meaningful reflection. Given their experiences of previous CPD and in-service, schools stressed the importance of a sustained model of support where teachers could shadow colleagues, see good practice modelled and collaborate as professionals, including clustering small schools where appropriate. Indeed, concerns were expressed by teachers that without such an approach to CPD and supports, they would not be sufficiently confident and equipped to enact the new curriculum. Schools also called for Initial Teacher Education institutes to advance preparations with current students to help ensure they are ready to engage with the PMC.

In terms of a timeline for enactment, it was strongly opined that “meaningful time was needed for meaningful change”. Participants felt a slow, structured approach to its introduction will help schools. It was also agreed that schools should be able to try one aspect of the curriculum at a time, for instance, start with one key pedagogical approach.

Experiences of engaging in the consultation

With the consultation running from March 24th to June 30th, a number of participants in the school network highlighted the busy nature of this time of year in schools. In particular, a significant challenge identified was the rollout of standardised tests which took place during the consultation. Some teachers were reluctant to engage with the draft PMC because of imminent standardised tests, while others commented on spending time revising topics, thus limiting time to trial new topics in the draft PMC.

Consultation with children: Executive summary

A four-strand consultation on the Draft Primary Mathematics Curriculum (PMC) was undertaken in the first half of 2022 to gather feedback from educators, parents and guardians, school networks and children. The objective of this research was to gain insights into children's experiences of primary mathematics. Lundy's rights-based Model of Participation (2007) was used to guide and structure the design of participatory methodologies for use with children. Ethics clearance was provided by Mary Immaculate Research Ethics Committee (MIREC) and all information, consent and assent forms sent to the twelve classrooms who volunteered to participate in the research study. Each classroom was visited twice. During the first visit, children were introduced to a member of the research team, the study was described and child-friendly instant cameras were distributed. During the second visit, approximately one month later, the researcher returned to the school with a second researcher and worked with children to gain insights into their experiences of mathematics. Researchers used a toolbox of five child participatory strategies to give voice to children's experiences: (1) Photovoice, (2) Draw and Tell, (3) Student as Journalist (including Vox Pop) (4) Strand Ranking Activity, and (5) Focus Group Interviews.

Following extensive analysis of the data corpus, using grounded theory methods, seven themes emerged.
Theme 1: Children's experiences of collaboration and communication in mathematics
Theme 2: Children's perspectives on teacher roles in the mathematics classroom
Theme 3: Children's experiences of mathematics
Theme 4: Children's experiences of mathematics textbooks
Theme 5: Children's experiences of context in mathematics
Theme 6: Children's experiences of challenge in mathematics
Theme 7: Children's experiences of assessment.

With regard to children's experiences of collaboration and communication when doing mathematics (Theme 1), working with others was referenced by all but one class. Children in the remaining nine classes reported engaging in some form of group work. Across all ten classes, children referred to the social element of group work, the opportunity to work with your friends and the enjoyment associated with collaboration. Regardless of experiences, children expressed a desire for more collaboration. Talking and communicating was viewed as an integral element of group work. Consequently, classes that reported little or no groupwork placed less emphasis on the role of discourse in mathematics. In contrast, many children across four classes specifically referred to the importance of communication in mathematics. For one class, children reported on the centrality of 'maths talk' to their mathematics learning, supporting them to develop conceptual understanding and to solve cognitively challenging activities. Irrespective of the extent of their experiences of communication in mathematics class, all children readily identified its potential benefits and their desire to engage in more.

The consultation also uncovered children's perspectives on teacher roles in the mathematics class (Theme 2). In many classes, the teacher was depicted as a central figure. For example, many children viewed the teacher as 'explainer'. Some children identified the teacher's role as that of 'helper' during times when they required assistance. While descriptions of teacher as 'explainer' and 'helper' were dominant, children in classes that reported engaging in more group work and communication made very little reference to their teacher or the role of the teacher. In these contexts, the teacher's role was de-emphasised, and references to them suggested the teacher as 'facilitator'.

Children's experiences of mathematics (Theme 3) varied. Children who reported a predominantly procedure-focused learning experience generally communicated negative emotions in response to their mathematics experiences. In some of these classes, children viewed getting the 'right answer' as important in mathematics, and in some instances, the sole goal in mathematics. Equally, in some of these classes, children identified 'speed' as being valued and rewarded in mathematics. In contrast, children in some other classes reported positively on regular opportunities to actively engage in meaningful, learner-centred mathematics activities. These included cognitively challenging problem solving and problem posing activities, deeply embedded in rich contexts, with multiple correct solutions. In these classes, children expressed the view that understanding mathematics, and accuracy in mathematics, are more important than speed. Children universally acknowledged favouring more interactive learning opportunities including the use of real world contexts, hands-on experiences and playful mathematical experiences such as maths games. Children in one senior class challenged the perception that reform-based approaches are not relevant for them. They consistently communicated a desire for more variety of engaging learning approaches to promote their interest in and enjoyment of mathematics.

The consultation provided interesting insights into children's experiences of mathematics textbooks (Theme 4) with much variation reported in textbook use. Mention of textbooks often triggered emotive responses. Many children's negative reaction was linked to perceptions that textbook activities were monotonous and tedious. In contrast, a few children across classes reported less disdain for the textbook. Some children were extremely critical of the structure of various textbook series, including book length, limited revision opportunities and the quality of explanations. Despite identifying various issues with mathematics textbooks, many children believed it has a place in their learning and acknowledged the affordances of the textbook series they used, recognising its role when revising. However, children highlighted that the textbooks provided limited learning experiences relative to alternative approaches and objected to its excessive use. Children demonstrated a thirst for mathematics experiences beyond the textbook. One class who had not used textbooks during mathematics class during their current school year communicated a preference for this approach, with justifications including a sense of increased flexibility, better quality learning experiences and increased ownership over their learning.

The data analysis also uncovered children's experiences of context in mathematics (Theme 5). Many children demonstrated a keen awareness of the role of context in mathematics, drawing from the role of mathematics in their pastimes, everyday experiences and in their future professional lives. In general, they placed high value on mathematics strands that had most real-world relevance for them. In contrast, in several classes, children failed to see the relevance of certain areas of mathematics. This was especially evident with reference to Algebra. This deficiency makes a compelling argument for greater use of contexts when teaching these concepts. There was a strong mandate, evident across classes, for more meaningful and context-driven mathematics to be used in schools. In two classes, children spoke excitedly about contexts used to situate the mathematical learning, demonstrating a keen appreciation for the role of mathematics in everyday life.

When exploring children's experiences of challenge in mathematics (Theme 6), it was apparent that many children welcomed challenge in mathematics, recognising the opportunity to learn arising from engaging with challenging activities. For a small number of children, the challenge mathematics provided was the reason they liked mathematics. These children associated challenge with enjoyment and feelings of achievement and success experienced when they completed challenging activities. For the children who had experience of cognitively challenging tasks, they referred to the support provided by working cooperatively with others, sharing solutions and engaging in maths talk. However, children did not want

every activity to be challenging and desired challenges that were within their reach. An important caveat for many children centred on knowing when to expect challenging activities. Children appreciated knowing, in advance, whether an activity would be challenging. Conversely, children did not appreciate underchallenging mathematics, referring to the monotony of completing exercises relating to number operations or procedures-focused tasks.

The child consultation revealed some children's experiences of assessment (Theme 7). Children in four classes detailed their affective response to mathematics testing, that included confusion, anger, frustration, and pride. In contrast, children reported that tests can reward hard work and provide feedback. Children from one class identified mathematics journals as a useful assessment aid. These children also identified a 'traffic light' system as being a useful self-assessment strategy in mathematics class. Contrastingly, the children in another class reported stand-alone assessments with no opportunities for children to review or consult these tests after they were completed or corrected. Children highlighted the importance of teachers connecting with children's current understanding of mathematics to inform their practice.

Conclusion and future directions

Consultation is a cornerstone of NCCA's work in developing curriculum. A key priority for the consultation on the new draft PMC was to elicit educators', parents/guardians' and children's perspectives on the new vision for children's maths learning in primary schools. With a wealth of research to underpin developments to date, feedback gathered over the consultation suggests that the rationale for change needs to be made even more explicit and clear for stakeholders. In addition, the findings suggest that the curriculum would be strengthened with the addition of clear explanations about the core changes arising in terms of children's learning, pedagogy and the role of the teacher in working towards this new vision for mathematics learning in the primary school. Furthermore, the curriculum specification would benefit from a further review to refine and optimise the language register, messages about inclusion, opportunities for linkage; as well as alignment and consistency with other curriculum publications and developments such as *Preparation for Teaching and Learning – Guidance for all Primary and Special Schools (NCCA, 2021)* and the *Primary Curriculum Framework (forthcoming)*.

A key development arising from the first phase of consultation on the curriculum was the addition of mathematical concepts and the development of draft support materials. These additional supports have been largely welcomed as has the potential for the online space to offer greater opportunities for connectivity and ease of navigation of the curriculum. Feedback on curriculum supports suggest that new developments should focus on the provision of examples of children's learning; examples of practical lessons in authentic settings using cognitively challenging tasks and mathematical modelling, and assessment; the development of an online central hub with teacher-generated resources and supports; supports for navigating and planning with the curriculum; as well as more general overviews of different aspects of the curriculum such as the five aspects of mathematical proficiency or promoting inclusion in the primary mathematics classroom.

Despite the prevalence of learning outcomes in primary schools following the publication of the PLC/CTB, data findings from the consultation suggest that there is still a level of uncertainty, apprehension and concern about working with learning outcomes. While this issue emerged more strongly in the questionnaire data, feedback across the consultation strands suggests that further time and support will be needed to enable teachers to engage with and use learning outcomes as intended. Furthermore, the findings suggest the descriptions of learning outcome labels and elements in the draft PMC may need to be reviewed in terms of clarity of meaning and accessibility.

Key insights generated from the school network data strand related to the changes identified by the participating teachers in terms of teaching and learning. Across all strands, issues relating to teacher confidence to adopt and enact these changes were also evident. This report acknowledges the perspectives of teachers that making a meaningful transition to enact the new curriculum will require time and effort by teachers, not only to make cultural and pedagogical changes, but also the mindset shift necessary. In addition to curriculum supports, teachers stressed the importance of in-school and tailored professional development opportunities which allow them to reflect, deliberate and collaborate with other professionals so as to contextualise the curriculum changes for their own settings.

Next steps

The new Primary Mathematics Curriculum specification will be finalised in the coming months. This work will be informed by the consultation findings set out in this report. As part of this, work will focus on a full review of the specification and alignment of the curriculum with the vision, principles and key competencies of the *Primary Curriculum Framework*. These developments will also focus on progressing MST as a curriculum area. It will also be important to employ appropriate communications to highlight the key changes that are introduced in the new curriculum, to both educators and parents; and working with education partners to ensure coherence and consistency across the system. Beyond publication of the specification, attention will then turn to advancement of the primary mathematics toolkit, communications, and continued collaboration with support services and initial education providers.

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Appendix: Written Submissions

Written submissions were authored by the following persons / organisations:

- Byrne, Maire and O'Callaghan, Áine
- Competition and Consumer Protection Commission
- Staff of Dunboyne Junior Primary School, Co. Meath
- Hannafin, Michelle
- Irish National Teachers Organisation (INTO)
- Marino Institute of Education
- Monnelly, Alan
- National Council for Special Education (NCSE)
- National Parents Council
- PACT Team, Department of Computer Science, Maynooth University

Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Individual submission details

Name	Marie Byrne & Áine O Callaghan
Date	31/05/2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes [x] No [ ]

Please provide some brief background information on your organisation (if applicable).

Classroom teachers in an infant school. DEIS band 2.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum.*

The overall rationale and aims of the maths curriculum are sound. We agree that the new maths curriculum needs to foster maths as a subject that is seen everywhere and is for everyone. However, this new curriculum will not be able to support teachers effectively.

We have outlined some concerns below:

1. ***Clear continuity, with visible targets***

We appreciate that general learning outcomes give teachers freedom to pitch topics at the level of their individual classes. However, the new curriculum topic gives little to no guidelines or specific targets for class levels. Specific targets need to be included (For example; what number should we expect the main body of students to able to count to/backwards from/recognise at infant level? What 2D and 3D shapes should a child be able to recognise and discuss in 2nd class?). These do not need to be prescriptive; teachers have always and should always be given the freedom to edit these expectations in line with what they know about their class. However, removing any and all specific targets leaves teachers (in particular newly qualified teachers or teachers new to a class level) guessing as to what they are working towards.

These targets need to be included at the class levels on the curriculum. Having teachers dig through the progression continua at each topic is unfeasible.

In summary we need:

- Specific targets listed for topics such as number, shape and space, fractions etc. A clear 'in general' goal for that class level.
- An explanatory section to reassure teachers that, as usual, these targets are a general idea of what you can expect from the main body of a class. There has always been and will always be flexibility to move these targets should you need to for your specific class

2. ***Playful Learning; mentioned a lot but not supported at all***

The importance of playful learning is key in both the new PLC, and the new maths curriculum. Rightly so. However, our classrooms and teachers are in no way supported to actually engage with playful learning.

We need renewed and sustained training and support in Aistear for ALL members of staff. This has not happened ever, and yet we are expected to use Aistear as a vehicle for so much of our teaching.

It is also impossible to implement playful learning without funding for resources and man power. Aistear is only Aistear with the support of another teacher. We need extra hours and more members of the SE team to propely engage with the new maths curriculum.

In summary we need:

- Funding for Aistear training at whole staff level
- Increase funds for schools specifically for Aistear resources
- Increase the number of SE teachers to support the implementation of Aistear

3. In person training for the new curriculum

We appreciate that Covid stopped in person training for the New Primary Language Curriculum, and webinars were the only suitable option at the time. We have to acknowledge that this is a huge part of the reason we are struggling so much with its implementation (one of many). This can not be repeated for in-service on this new maths curriculum.

We need hands on, in person training. We need people fluent in the new curriculum to demonstrate in person what this curriculum would look like in practice in our schools. Our school is a DEIS band 2 school, with huge socio economic issues and language barriers. We need in person training to flesh out how we adapt the new curriculum to suit our setting. It needs to be whole staff input; working at team levels will not suffice.

Furthermore, it is worth noting that in the online content the junior classes were grossly underrepresented during video examples. Demonstrations were always in older classes; highly organised and rehearsed. There were no examples of playful learning as it happens in an infant room. This cannot be repeated for the maths curriculum.

In summary for this we need:

- In person in-service training; schools closed on those days
- Experts fluent in the language of the new curriculum who can come in and guide us as how to best use the curriculum in our specific school settings
- If there are any video supports/examples/vignettes, infant classes need to be represented more. They can be the hardest lessons to visualise, so their inclusion is an absolute necessity.

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes* [see pages 15 – 24]

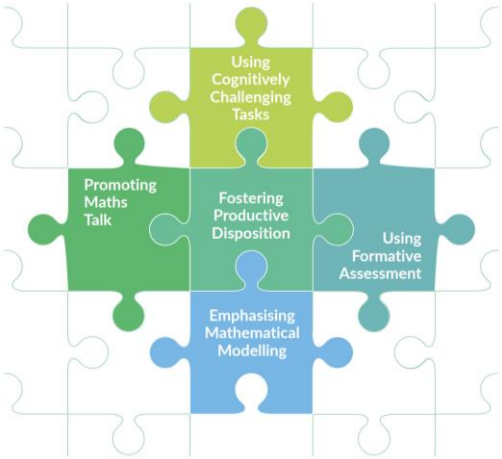
The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

Please give your overall feedback in relation to the curriculum components mentioned above. *Please quote full text of any learning outcome you wish to draw attention to.*

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

Data Protection

The NCCA fully respects your right to privacy. Any personal information which you volunteer to the NCCA will be treated with the highest standards of security and confidentiality, strictly in accordance with the Data Protection Acts. If you require further information related to data protection please visit www.ncca.ie/en/privacy-statement or you can contact the NCCA's Data Protection Officer at dpo@ncca.ie.

Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Organisation submission details

Name	Kate O'Sullivan
Position	Financial Education Manager
Organisation	Competition and Consumer Protection Commission (CCPC)
Date	30/06/2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes [X] No [ ]

Please provide some brief background information on your organisation (if applicable).

The Competition and Consumer Protection Commission ('the CCPC') is the statutory body responsible for promoting compliance with, and enforcing competition and consumer protection law. We strive to improve consumer welfare across the economy by enforcing a wide range of legislative instruments, including product safety legislation.

Our aim is to make markets work better for consumers. To achieve this, we work to influence public debate and policy development, grow public understanding of the importance of open and competitive markets, promote competition and highlight the interests of consumers.

We have a specific statutory role in financial education in *"providing information in relation to financial services, including information in relation to the costs to consumers, and the risks and benefits associated with the provision of those services, and promoting the development of financial education and capability."*[1]

The CCPC fulfils its statutory role in the development of financial education and capability by delivering financial education programmes, conducting research and through the implementation of a three-year Financial Well-being Strategy. The CCPC's financial education programmes include:

- Money skills for life – a workplace financial education programme;
- Money Matters – a programme on personal finance for Junior Cycle teachers and students; and
- Money Counts, which provides resources for the Leaving Cert Applied.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

[1] Section 10(3)(j) of the Competition and Consumer Protection Act 2014.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum.*

The CCPC welcomes the inclusion of specific learning outcomes from junior infants up to 6th class in relation to money in the *Draft Primary Mathematics Curriculum*. It is the CCPC's view that financial education should begin as early as possible in a child's life and continue into adulthood. This allows children to develop the life skills necessary to make financial decisions later in life.

In 2018, the CCPC published the 'Financial Capability and Well-being in Ireland' study which examined levels of financial well-being and financial capability in Ireland[2]. The study found low levels of financial resilience across significant segments of the Irish population and identified the behaviours of 'active saving' and 'not borrowing for daily expenses' as being key to financial well- being. The CCPC Financial Capability and Well-being study also showed a strong relationship between receiving financial education as a child and higher levels of financial well-being as an adult. This finding is further supported by a breadth of international research, guidelines and experiences outlining the long-terms benefits of developing positive financial attitudes and behaviours from early education onwards.

In 2020 the CCPC made a submission to the NCCA on the *Draft Primary Curriculum* supporting the inclusion of financial education on the curriculum[3]. We had identified "Mathematics, Science and Technology Education" and "Wellbeing" curriculum areas as being suitable to include learning outcomes in relation to financial education from junior infants to 6th class. We also highlighted in our submission that financial education is ideally placed to develop the competencies of "being mathematical", "fostering wellbeing", and "being a digital learner", whilst also supporting the principle of inclusive education and diversity. Therefore, we are very heartened to see the inclusion of learning outcomes on money in the *Draft Primary Mathematics Curriculum* at all levels.

[2] A summary report is available here: https://www.ccpc.ie/business/wp-content/uploads/sites/3/2018/12/Financial-capability-2018.pdf. The full report can be found here: https://www.ccpc.ie/business/wp-content/uploads/sites/3/2018/12/Financial-Well-being-in-Ireland-Final-December-2018.pdf

[3] The full submission is available here: https://www.ccpc.ie/business/wp-content/uploads/sites/3/2022/05/2020.12.18-CCPC- response-to-the-NCCA-consultation-on-the-Draft-Primary-Curriculum-Framework.pdf

The CCPC recommends that other elements of money and the way children interact with money are dealt with in the "Wellbeing" curriculum area of the primary curriculum to complement the elements covered under the Draft Primary Maths Curriculum. This would include managing the emotions children may have about money and the risks involved with money. This is particularly important to recognise the diversity of experience of money of many children and to support the principle of inclusive education and diversity. This, alongside the learning outcomes on money in the *Draft Primary Mathematics Curriculum*, would provide a more comprehensive financial education for children.

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.

The CCPC welcomes the rationale for the *Draft Primary Mathematics Curriculum*, particularly 'Mathematics is a tool that helps us to make sense of our world'. It is important that mathematics is connected to the real world and can be applied outside the classroom. Developing financial education through mathematics allows that connection to be made.

Developing financial education through the mathematics curriculum also supports 'Mathematics is everywhere and for everyone', as every child will have to deal with finances and money throughout their lives. The CCPC believes that there is merit in incorporating financial education at all levels of the primary school curriculum and we welcome that money forms part of the key learning outcomes throughout the *Draft Primary Mathematics Curriculum*. The CCPC believes that financial literacy and the ability to critically engage as consumers with financial products are essential life skills meaning that the comprehensive inclusion of financial education across relevant areas of the Primary Curriculum are a necessary part of supporting the Framework to deliver on its vision.

Further to this the CCPC believes that financial education complements the wider focus on literacy and numeracy across the education system in Ireland. In the 'Literacy and Numeracy for Learning and Life' Strategy 2011 – 2020 published by the Department of Education and Skills, it is identified that numeracy is not only the ability to use numbers and to add, subtract, multiply and divide, but also "encompasses the ability to use mathematical understanding and skills to solve problems and meet the demands of day-to-day living in complex social settings"[4]. This was also echoed in the NCCA report on the main findings from parents on the *Draft Primary Curriculum*, where it was noted that parents considered that "this area is very important for children's futures and it should

[4] Department of Education and Skills (2011), Literacy and Numeracy for Learning and Life: The National Strategy to Improve Literacy and Numeracy among Children and Young People 2011 – 2020, see: https://www.education.ie/en/publications/policy- reports/lit_num_strategy_full.pdf

link to the real world"[5].

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes*

[see pages 15 – 24]

The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

[5] National Council for Curriculum and Assessment (2019), Primary Curriculum Review and Redevelopment: Report of main findings from parents on the review and redevelopment of the Primary Curriculum, see: https://ncca.ie/media/4041/parents_focus_group_report1.pdf

Please give your overall feedback in relation to the curriculum components mentioned above.
Please quote full text of any learning outcome you wish to draw attention to.

The CCPC welcomes the inclusion learning outcomes for various age groups in relation to money under the "Measures" strand. We particularly welcome the focus on "appropriately playful learning experiences" of money at junior and senior infants and "appropriately engaging learning experiences thereafter".

The learning outcomes outlined in relation to money are suitable for the *Draft Primary Maths Curriculum*. We would, however, recommend adding digital elements such as the use of cards and online payments as a way of making children familiar with the increasingly digital way consumers interact with money. In the UK Financial Education Planning Framework elements such as credit cards, debit cards and online payments are introduced from the age of seven onwards[6]. The shift to digital banking and digital financial decision making has been accelerated by the COVID-19 crisis. Therefore, the development of digital skills must be seen as a critical part of providing children with the skills to navigate financial decisions in the future. This also supports the "being a digital learner" competency in the *Draft Primary Curriculum Framework*.

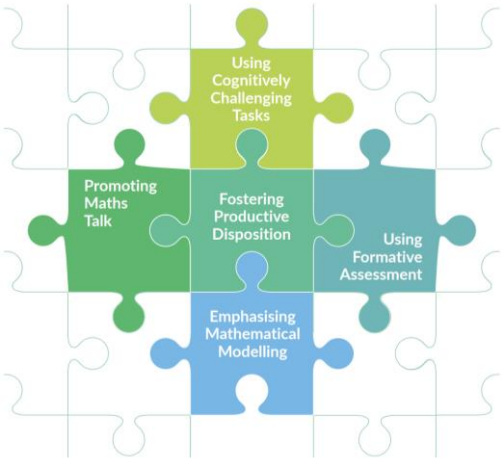
Further to this the CCPC welcomes that one of the learning outcomes under measures focuses on children making financial plans, however we would like to see this extended further to incorporate receipts specifically. In the UK Financial Education Planning Framework keeping receipts forms a key learning outcome for managing your money for children aged between seven and 11 years old. Keeping receipts can help teach children about budgeting and also allows them to better understand the cost of individual items. This would in turn feed into the learning outcome that children would "make informed judgements about transactions and financial plans". To build on this further the CCPC would again like to see an earlier focus on teaching children on needs vs wants. The UK Financial Education Planning Framework incorporates teaching children about needs vs wants from the age of five onwards. This is under the learning outcome in the UK framework of becoming a critical consumer. This should help children achieve the learning outcome in the proposed framework of being able "to recognise the value of money and use euro and cent in a range of meaningful contexts", and also set children up to develop and build on this to develop budgeting skills and habits in 5th and 6th class.

The OECD's International Network on Financial Education (INFE) and the European Commission are currently developing a financial competence framework for children and young people which they plan to launch in early 2023. Competences in relation to digital finance and sustainability are being specifically developed in line with European Commission priorities. OECD INFE are the global leader on financial education best practice, policy and research. We would suggest that once the framework is published that elements of competences related to the primary school age range be considered in terms of the learning outcomes and toolkit.

[6] Young Money, Financial Education Planning Framework 3 – 11 years, see: https://www.young-enterprise.org.uk/wp- content/uploads/2019/01/FINANCIAL-EDUCATION-PLANNING-FRAMEWORK-3-11-ONLINE-2020.pdf

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

The CCPC believes that there are many learning opportunities to develop financial education across the five pedagogical approaches, however in particular the CCPC welcomes the approach of "Promoting Maths Talk" in relation to financial education.

Among the many suggestions for "Promoting Maths Talk" is the concept of "providing suggestions for parents on how to promote and stimulate Maths Talk at home allowing waiting time and time for sustained interaction." The CCPC believes that incorporating financial education into the curriculum could provide a key opportunity for parents to stimulate a discussion around maths and would provide children with a tangible example of how maths forms an everyday part of their lives and builds further on the learning outcomes around money. International research has indicated parents are vitally important in building children's financial literacy[7]. Research conducted in Flanders in Belgium has indicated a positive impact for students in terms of improved financial literacy when their parents were involved. This is particularly true for students who come from a lower socio-economic background. The CCPC supports this approach as it is crucial that the curriculum would try to incorporate that children come from a diverse range of backgrounds where meanings around money can be different. This should be reinforced through the "Wellbeing" curriculum area of the primary curriculum in helping children to deal with any emotions and experiences they might have around money.

The CCPC also believes that it is appropriate to incorporate financial education into "identifying and selecting appropriate situations and problems to generate Maths Talk". Discussion in around basic money concepts like budgeting and understanding the value of money will help children develop their problem-solving skills which is an essential element of the mathematical learning process.

[7] Financial Education in Flanders, see: http://eufin.org/docs/Financial-education-in-Flanders-Belgium.pdf

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

The toolkit could include practical information for teachers on how to teach about money. As mentioned in our submission to the NCCA's consultation on the *Draft Primary Curriculum* in 2020, the CCPC is also committed to providing resources and supports for teachers to be able to teach financial education and to be used in the classroom. This will include detailed, free and open-to-use digital resources on financial education in the classroom, directly linked to learning outcomes from junior infants to 6th class. The CCPC is currently working with the Junior Cycle for Teachers (JCT) Maths team in order to develop financial education resources for junior cycle. We would welcome an opportunity to work with the NCCA and teachers to establish similar successful collaborations at primary level. This would also allow for an improved transition between 6th class and junior cycle in terms of corresponding material linking into curriculum specifications.

International evidence, including OECD guidelines and UK[8], Portuguese and Austrian experiences have demonstrated the importance of supporting and enabling teachers to successfully deliver financial education within the primary curriculum. Teacher confidence needs to be supported, particularly if teachers have not delivered financial education before. Training and support for teachers in teaching financial education should begin in teacher training colleges and universities, and should be continued throughout their career. All training and material should be developed with the input of teachers and take into the account the diversity of schools and of individual children.
The CCPC is committed to supporting and contributing to teacher training on financial education and continuous professional development for teachers at all levels of the educational system. The CCPC recognises the particular importance of training within a transition phase from the old to the new curriculum.

Data Protection

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[8] All Party Parliamentary Group on Financial Education for Young People (2016), Financial Education in Schools: Two Years On – Job Done?, see: APPG-on-Financial-Education-for-Young-People-Final-Report-May-2016.pdf (young- enterprise.org.uk)

Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Organisation submission details

Name	
Position	
Organisation	Dunboyne Junior Primary school
Date	May 2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

YES Yes No

Please provide some brief background information on your organisation (if applicable).
WE are a Junior school with 5 of each class from Junior Infants -2nd class.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum.*

Aspects of the curriculum that remain closely linked to the 1999 Primary Mathematics Curriculum include the strands, learning outcome labels which are similar to the 1999 strand units with some minor changes, and common elements.
It is difficult to Navigate and we feel we need time allocated for inservice to get to grips with it. . Could you have the labels, outcomes, concepts and progression continua for each of the strands together? This would help for planning purposes.

The draft learning outcomes however are quite vague in comparison to the previous curriculum. What is the baseline for each of the class levels in the progression continua? Each child and class will be different but what would the general standard be at each year level.? This will have Implications for standardised testing.
We require more specifications and clear guidance to avoid major discrepancies across schools and/or teachers. The progression continua need to provide a little more detail and clarification on where a standard for specific class levels should be at. Eg At the moment we know Junior infants need to know everything about numbers 1-5, senior Infants 5-10, First class 10-100, 2nd class 100-200.We use this as the Norm .

Support materials are great and would be enjoyable for students while providing for beneficial teaching and learning experiences. However, many tasks, activities and practices would be difficult to implement in many mainstream classrooms with high volumes of students all with varying educational needs and a sole adult in the classroom to implement and manage such ideas.

We feel we need training in implementing this new Curriculum. NQTs have had little or no training in setting up Maths stations for practical maths tasks in classes due to all the time they missed out in College due to Covid. This sort of work is normally done in tutorials in College which they missed out on. Experienced teachers find it difficult to do this active maths without the support of another adult in their class especially in our Junior school setting.

We need extra staff to help with more hands on learning experiences and to facilitate maths talk and to monitor it.

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.
Positive response to both the rationale and aims of the draft curriculum.
Great to see the promotion of 'Maths Talk' and encouragement for students to express their understanding, which will benefit both teachers in their assessment of student learning and support other students in observing alternate strategies. We also agree that the practical Aistear Approach is the best way for young children to grasp the mathematical concepts but how do we facilitate that with young children in a Junior school with big class sizes and a wide range of abilities and also include SEN students? It is impossible for one teacher in a classroom to do all that. We need classroom assistants in every Junior class.

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes* [see pages 15 – 24]

The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

Please give your overall feedback in relation to the curriculum components mentioned above.
Please quote full text of any learning outcome you wish to draw attention to.

Strands: Kept similar to the same as 1999 curriculum, no issues.

Learning Outcome Labels: Correspond well to the former strand units of the 1999 curriculum. Some changes that work well such as grouping length, capacity, area, weight into one label (measuring) as all progress at similar pace.

Elements: Little change, no issues.
Learning Outcomes: Overall response is that there is a serious lack of detail specifying what content needs to be taught at each class level and the learning outcomes are too vague to provide for adequate teaching and learning.
Example: In the former 1999 curriculum for first class; shape and space, there was a clear instruction on which 2D & 3D shapes need to be taught. Associated with these were activities such as constructing shapes, identifying shapes in the environment, combining and partitioning of shapes, as well as clear linkage and integration. Comparing this to the draft curriculum the sole learning outcome for shape would change to 'children should be able to examine, categorise and model 3-D and 2-D shapes.' The lack of clear information about which shapes need to be taught would result in a discrepancy in content taught across schools and/or teachers. This is seen again in the draft Progression Continua of learning outcome label 13 – Space, which does not outline which shapes are required to be taught.

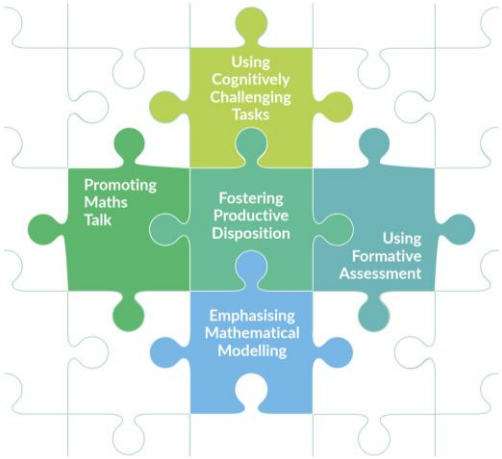
This lack of clarity is seen across many of the new learning outcomes. While the progression continua provide some clarity on the specifics of what content should be taught in some learning outcome labels (For First Class):

- Time: Reading analogue clock in hours and half-hours,
- Fractions: Halves of sets,
- Money: Up to 50c,

The lack of guidance as to where the standard for class levels would be will lead to discrepancies.
It is understandable that students progress at different levels, hence the progression continua, but guidance should still be given as to what the standard for a class level would be, otherwise teachers will need to revert back to the 1999 curriculum for clarity.

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

Overall our school felt very positive about the key pedagogical approaches.
We like that there are suggestions as to how to the teacher could ensure that these pedagogical approaches are active in their classroom.
We felt it would be helpful if examples of cognitively challenging tasks should be provided for each of the essential ideas and concepts.

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

Support materials are great and would be enjoyable for students while providing for beneficial teaching and learning experiences. However, many tasks, activities and practices would be difficult to implement in many mainstream classrooms with high volumes of students all with varying educational needs and a sole adult in the classroom to implement and manage such ideas.

There could be more ideas on integration included.
Time will need to be given to teachers to explore the took kit. We would benefit from Inservice to explore the resources.
Examples of learning experiences for each class level and under each concept would be very helpful.

Data Protection

The NCCA fully respects your right to privacy. Any personal information which you volunteer to the NCCA will be treated with the highest standards of security and confidentiality, strictly in accordance with the Data Protection Acts. If you require further information related to data protection please visit www.ncca.ie/en/privacy-statement or you can contact the NCCA's Data Protection Officer at dpo@ncca.ie.

Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Individual submission details

Name	Michelle Hannafin
Date	25/06/2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes [X] No [ ]

Please provide some brief background information on your organisation (if applicable).

I am a teacher who is very interested in maths education. I have a specific interest in the senior end of the school and have taught in senior classes for the past ten years. I am currently completing an M.Ed in Maynooth University on the topic of maths education. I have spent a considerable amount of time reading about maths education and am coming from an informed perspective. I also have experience in providing CPD for teachers in various subjects. I designed and facilitate an EPV course which is approved by the DES. I am writing a submission as I want the best possible maths curriculum. All suggestions are made in an effort to make the curriculum document more useful for teachers. Please consider all suggestions as an opportunity to reflect.

This submission is written on behalf of myself. However, I also run a business and an Instagram page for primary teachers in Ireland. I surveyed over 2000 teachers on their perspectives on maths education in

the senior primary classroom. In this submission I will also share some of the perspectives of other teachers through the results of this survey where they are relevant.

I would be very happy to be further involved in sharing my opinions by meeting with or speaking to an NCCA representative. It is hard to share all perspectives in a written submission. I am removed from the creation of the draft specification, so I am able to give an unbiased perspective.

I would also like to note that having an open consultation in May and June is poor timing. Teachers are very busy this time of year and have less interest in curriculum development as they are tired and focused on finishing up the year. Term one is the best time to look for teacher perspectives.

Thank you for reading this submission.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum.*

To begin I considered what teachers value in a curriculum document. I have outlined my thoughts below. When you consider the draft curriculum does it meet these targets? If not how can it be changed to support them? I am looking for a practical, useful and useable document.

What am I looking for in a curriculum?

- Concepts and language explained clearly so they are easy to understand.
- A clear outline of progression from junior infants to 6th class.
- Specific learning outcomes.
- Clarity. I want to know what the children 'should' be able to do at the end of a year while understanding that each child will learn at a different pace.
- An awareness that learning is recursive, and skills build year on year.
- Agency. An understanding that teachers will have different approaches and skills and that they will need to adapt the learning to suit the needs of their class. Not every class will be at the same level.
- Different types of learning included. The importance of factual knowledge recognised for senior classes.
- Useful and practical pedagogies that support learning.
- Realistic. Does it affirm and build on current good practice?
- Is it easy to navigate and use?
- Practical. Many teachers find teaching maths difficult. Having specific outcomes/teaching pedagogies that are easy to follow and use will support them.
- Support. What CPD be provided to help teachers upskill?

My overall response is mixed. At the moment the document would not be easily useable by teachers and this should be the key aim. Below I outline some key points below and further expand on them later in the document. I have tried to be very clear as I want the best curriculum possible. My key interest is in the pedagogies chosen. I believe that play-based learning and interactive direct instruction are two key pedagogies that could be included to enhance the curriculum. They are currently the focus of my M.Ed dissertation and I find them very effective pedagogies.

- The rationale is clear and useful.
- The elements of mathematical proficiency are not explained well. Examples and clear definitions are needed.
- The structure in terms of strands is good. I appreciate the suggested changes to measures as many of the topics link well.

- The elements are fine; nothing new.
- Organising learning outcomes in stages is a good idea as they are recursive, however I think a clear explanation that teachers need to teach each strand every year would be helpful. Some teachers will find it confusing. A rationale for the use of stages might also be useful.
- The learning outcomes are very poor. They are too vague. Teachers want to know 'What do I need to teach?' or 'What should the children be able to do?'. This should be evident at a glance from the curriculum. Teachers can then use their agency to teach them in a way that suits their class. In the survey I carried out 41% (813 teachers) of currently practicing teachers are not confident teaching maths in senior primary classrooms. They need to know specifically what to teach, otherwise they will simply rely on the textbook which is not what the NCCA or I want. Similarly, NQT's or teachers teaching a class level for the first time will look for clear guidelines on what to teach in the class.
- Having only five key pedagogical approaches is limited. Where is the role of the teacher? The explanations of each of the approaches is waffly and doesn't give clear examples of how they might be used.

I have spent a considerable amount of time looking at this document. While my views are my own please consider me an informed and interested teacher who wants the best possible curriculum. Thank you for considering my perspectives.

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.

Rationale:

The Rationale is very good. It clearly lays out key thoughts about mathematics and how mathematics is experienced.

Aims:

Firstly, I wish to note that the five aspects of mathematical proficiency are taken from research Adding It Up: Helping Children Learn Mathematics (NRC, 2001). This is perfectly acceptable and these have informed a number of authors and curricula. I agree with the importance of these five elements and that they are interwoven and interdependent.

In the draft curriculum the explanations of each of the aspects of mathematical proficiency are not sufficiently clear and are often confusing. In some cases the explanations are inaccurate and do not reflect the document they were taken from. The first sentence of the paragraph to explain them should be a definition that is easily understood by teachers who are not familiar with the research behind them. Rather than "The curriculum aims to…" the sentences could be started with "Conceptual understanding is…". Most of these are not clear.

The definitions and examples for each of these are provided in Adding it Up (NRC, 2001).

Below I have illustrated one example where the draft curriculum is confusing and inaccurate in terms of the elements of mathematical proficiency.

Here is procedural fluency as defined by the draft curriculum: P. 14.

"Procedural Fluency. The curriculum aims to provide children with opportunities to create their own informal strategies and to integrate new concepts and maths procedures as they build on these strategies. It aims to support children to justify the use of commonly used mathematical procedures and informal strategies, and through this, to strengthen their understanding and skills."

The main aim of procedural fluency is **not** children having opportunities to create informal strategies and to integrate new concepts. This definition is confusing and impractical. I do agree that children should be able to create informal strategies and use them, however this is not the essence of procedural fluency. In the second sentence the curriculum says children should justify the use of procedures. Again, while this is a critically important maths skill, it is not procedural fluency. There are further sentences to describe it but in my opinion the first two sentences should clearly explain the concept. The definition

of procedural fluency in Adding it Up (NRC, 2001) which is where the aspects of mathematical proficiency are taken from for our curriculum is:

Procedural fluency refers to knowledge of procedures, knowledge of when and how to use them appropriately, and skill in performing them flexibly, accurately, and efficiently.

This definition is much clearer. It does not need to be changed for our curriculum, especially when the changes not only alter the meaning of the term but also are confusing. Procedural fluency is children's ability to use procedures with skill and knowing when and how to use them. I believe the authors should revisit the original explanation and use it. By all means add to the explanation but it is important to ensure that the meaning is retained. The two definitions shared above do not have the same meaning.

In my opinion procedural fluency as being able to use procedures flexibly, accurately and efficiently is essential. At the senior end of the school this automaticity greatly aids conceptual understanding and children's ability to be creative in mathematics. Children need to achieve automaticity in single digit addition, subtraction, multiplication and division. This should also be emphasised in the curriculum. "The automatic retrieval of basic math facts is critical to solving complex problems because complex problems have simpler problems embedded in them" (Willingham, 2009). Children need to fluently be able to solve simple problems to keep their working memory free to solve more difficult problems. In my own classroom this is apparent when teaching a range of topics such as fractions and long multiplication. If a child cannot multiply by 7,8 or 9 the sum 98 x78 is almost impossible for them as it takes them too long to do the simple multiplication and is too hard to retain the procedure. This concept is also reinforced by Kirschner et al. (2006), "we are skilful in an area because our long-term memory contains huge amounts of information concerning the area. That information permits us to quickly recognise the characteristics of a situation and indicates to use, often unconsciously, what to do and when to do it." It is important to consider how human cognitive architecture is organised. (Sweller – cognitive load theory) when considering how children learn. An emphasis should be placed on the importance of learning and retaining basic facts in the four operations.

By changing the definition of procedural fluency to 'children use their own informal strategies' the concept has become unclear. While sometimes children can use their own strategies there is also an importance to learning basic mathematical procedures and skills. Having good factual and procedural knowledge allows children to build their conceptual understanding.

This is one example of how the definitions in the curriculum are unclear and do not retain their original meaning. I would highly recommend revisiting each of the original definitions in the Adding It Up document (NRC, 2001) and checking that the meaning is clear in our curriculum. This is not the only example I could have chosen. I did not have time to go through each of the explanations in this detail.

The speech bubbles from different parties do not add much to the explanations and are generally unnecessary. Consider adding the definitions of each to the glossary of terms at the end of the document.

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes* [see pages 15 – 24]

The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

Please give your overall feedback in relation to the curriculum components mentioned above.
Please quote full text of any learning outcome you wish to draw attention to.

The five strands are clear and useful.

The elements are also fine. Is there a place in the curriculum for the types of mathematical learning? Learning mathematics requires three types of knowledge: factual, procedural and conceptual (Willingham, 2009). Children need to learn factual knowledge which in turn supports their procedural and conceptual understanding.

Learning outcomes:

The learning outcomes across the draft curriculum are vague and unhelpful. Is there a need to have both learning outcomes and progression criteria? Teachers will have to refer to both the curriculum and the toolkit to do their planning. Are the outcomes necessary? Could teachers plan using the progression criteria instead? The learning outcomes should help teachers plan what to teach and currently they are difficult to use. Teachers would find planning much easier with one set to work from. The progression criteria are far more useful as they outline what the children should be able to do.

In the PLC the milestones were not a success. They are cumbersome and when the need to include them in planning was dropped they were no longer widely used by teachers. The concept is useful but if they are not practical they will not be used. This was evidenced in the roll out of the PLC. I would highly recommend either making specific learning outcomes or having only the progression criteria. Ideally,

they should both be in the curriculum document. The progression criteria are what teachers will need to use as the outcomes are too vague. Therefore, they should be central to the curriculum document.

Teachers do not like the PLC. They find it confusing, difficult to use and overwhelming. It would be far more beneficial to have specific learning outcomes in the curriculum. Teachers can still have agency and flexibility across the stages and address the needs of their class. Having specific outcomes does not reduce teacher agency. Teachers will be able to explain that their class need to work on the specific outcomes for a class below or above the level they are teaching to. I do this frequently; this year in time my 4th class were originally working to the 2nd class curriculum in the strand unit of time. I used my agency to teach the concepts my class needed to learn. By the end of the year most children were meeting the 4th class curriculum objectives. Having specific objectives does not prevent teachers from being flexible and autonomous.

I realise that the format is highly unlikely to change at this point. However, clear examples of how to use the curriculum to plan with both the outcomes and progression criteria should be central to showing teachers how to use the maths curriculum. In the PLC this caused a lot of confusion. It would be preferrable not to repeat this experience!

Time: Draft Curriculum P. 21

I want to outline some of the questions I had when only using the outcomes across the four stages. The progression criteria do answer most of these which shows that they will be needed in the curriculum, not as an aside.

Time	*Through appropriately playful learning experiences children should be able* to develop a sense of time and its purpose.	*Through appropriately engaging learning experiences children should be able* to understand how time is measured, expressed and represented. Through appropriately engaging learning experiences children should be able to explore equivalent expressions of time.	*Through appropriately engaging learning experiences children should be able* to compare, approximate and measure time using appropriate units of measurement. Through appropriately engaging learning experiences children should be able to identify the relationship between different units and representations of time.	*Through appropriately engaging learning experiences children should be able* to solve and pose practical tasks and problems involving the interpretation and calculation of time.

- Jr/Sr Infants: **A sense of time.** Is this in years/weeks/day/night? Is there any introduction to the clock?
- 1st /2nd class: **Children should be able to understand how time is measured, expressed and represented.** What units are they using to measure? Hourly intervals? Half hour intervals? 15 min intervals? **Equivalent expressions of time**. Is this comparing digital and analogue time? What expressions of time? Hours? Minutes?
- 3rd/ 4th class: **to compare, approximate and measure time using appropriate units of measurement.** What units of measurement? 15 min intervals? 5 min intervals? 1 min intervals? Compare to what? **Identify the relationship between different units and representations of time.** What units? What representations? Fractions? Decimals? Analogue/digital?
- 5th / 6th class: **solve and pose practical tasks and problems involving the interpretation and calculation of time.** What time skills should the children be able to do? Can all children read the clock? What practical tasks and problems? What skills will these include? What is interpretation of time? What is calculation of time?

As discussed above this example shows that the outcomes are vague and illustrates the questions teachers might have when they go to the curriculum to see what they are to teach in relation to time for their class.

In this section I have highlighted key sentences from P.18 of the draft curriculum where the rationale and use of learning outcomes is described. After each sentence from the curriculum my thoughts are shared in bold.

"Learning Outcomes, when shared with children, can support them to hold clear expectations and to be active agents in their own learning." **The outcomes are unshareable as they are not specific to what children are learning. I agree that sharing learning outcomes is a highly effective strategy. However, there are no shareable outcomes in the curriculum. Teachers will have to decide themselves on the outcome and rewrite them to share them with the children. While sharing the learning outcome is an excellent strategy the outcomes in the curriculum are not suitable for this purpose.**

"Learning Outcomes allow for teacher agency and flexibility in exercising professional judgement and decision-making around planning, teaching and assessment for individual contexts." **Teachers already exercise their agency and flexibility by adapting learning to suit their own class. They do this with the current specific learning objectives. The outcomes don't need to be vague for teachers to be agentic.**

In the document (P. 18) the three sentences below are what learning outcomes help teachers to do:

1. "Prepare for, teach and reflect on their use of appropriate methods for teaching and learning mathematical ideas." **The outcomes are so vague that they are not helpful. For each outcome I have to try and figure out what I am meant to teach. I will need to refer to the progression toolkit as well as the curriculum document. I do not find the outcomes helpful to prepare, teach or reflect as they are too broad.**

2. "Focus the use of assessment to gather evidence of children's learning and understanding, thereby enabling teachers to adapt their teaching and respond appropriately to children's learning." **The outcomes do not do this. They are not clear so there is nothing to assess against. Teachers already assess the children and adapt their teaching to respond to children's learning. This can be done with specific outcomes.**

3. "Provide focused feedback to children and parents/ guardians." **How can extremely vague outcomes help teachers provide focused feedback to children or parents?**

Please reconsider having specific learning outcomes. It is possible to allow for agency and flexibility with specific outcomes. Specific outcomes are useful and practical for teachers. The progression criteria are more specific however teachers who are new to a class level or an NQT may find it challenging to establish where their class are as there are no guidelines on what is expected to be achieved in each class. If

continuing to use the outcomes as they are please consider putting the progression criteria in the curriculum document also.

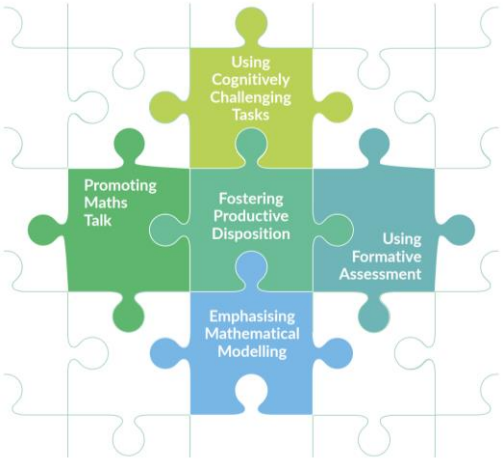
Please consider:

- **Are the outcomes presented in a way that teachers can easily navigate and use them?**
- **Could the progression criteria be used instead of learning outcomes in planning as they are more useful for teachers?**
- **Should teachers have to interpret every sentence of the learning outcomes?**

Many teachers already lack confidence in teaching maths. A curriculum that is vague will not help them to teach. The curriculum should be a document that can be referred to daily. It should be clear and easy to navigate. Originally, I did not see the progression criteria as they were in a separate document.

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

Firstly, I question is what other pedagogical approaches were considered? While it mentions that these are not an "exhaustive nor hierarchical" list I cannot find other approaches mentioned in either the curriculum or the reports published. I have read many of the research reports underpinning the curriculum.

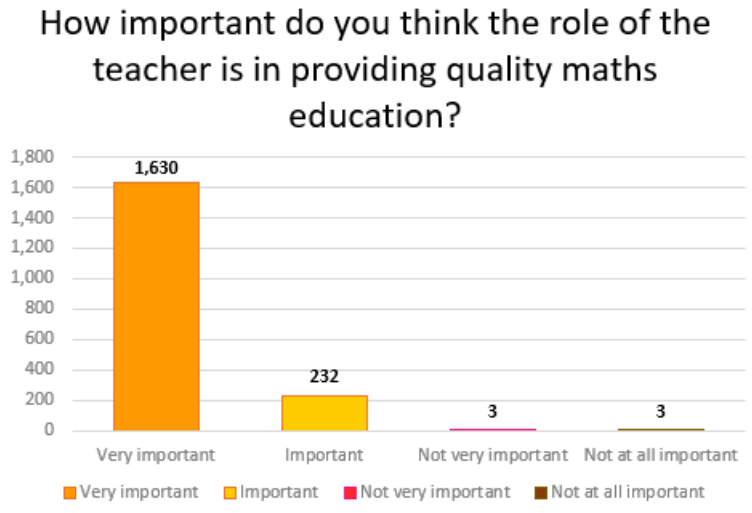
While I think these five approaches are important I believe there is a serious oversight in not including both the role of the teacher and play-based learning as key pedagogical approaches. I believe that these could underpin many of the approaches mentioned as the five key approaches.

The teacher plays an essential role in maths education. The teacher will foster the productive disposition, facilitate maths talk and develop the cognitively challenging tasks based on the needs of the child.

Moreover, the teacher leads the learning. They activate prior knowledge, find out the level of the children, teach the concepts, check for understanding, design active learning experiences and assess the learning. I believe that the teacher should be central to the curriculum.

I feel that 'interactive direct instruction' is a key pedagogical approach used in my classroom and in many classrooms around Ireland. In this form of direct instruction children are actively involved in the learning process. The children have an opportunity to engage in dialogue, ask and answer questions, talk with a partner, work on mini whiteboards, show different ways to solve a problem. The children are not sitting and passively listening. They are actively involved in their learning. The teacher models examples, asks questions and involves the children in talk. I have found this to be a highly effective teaching strategy in the senior classes. Hattie (2017) defines direct instruction as intentional, well-planned, and student-centred guided approach to teaching. It is not an archaic or didactic method of teaching maths but is positive, child-centred and active.

I asked teachers how important they felt the role of the teacher was in providing maths education. 99.7% of teachers voted for very important or important. 1852 teachers felt the teacher had an important role. In comparison only 6 teachers voted for not very important or important, representing 0.3% of those who answered. It is clear that the currently practicing teachers of Ireland value the role of the teacher. Suggestions on how the teacher can lead learning in an interactive and interesting way would be a very beneficial approach. Teachers would be able to take these suggestions on board as it would not be very far removed from their current practice.



(Hannafin, 2022)

The pedagogical approaches are not complete. The role of the teacher needs to be outlined. If this curriculum is for the teacher it should explain what the teacher can do in order to use these approaches.

It is disappointing to see play-based learning only in junior and senior infants. I believe play-based learning should be a key pedagogy in our new curriculum. There is a place for play in the senior primary classroom. Play provides motivation for learning and certainly helps to foster a positive disposition. I use play-based learning on a daily basis in my senior classroom. The children love to learn through games and playful

learning. Here are a few quotes from children in my class this year. I asked them about their experience of using games during maths in the classroom.

- "Learning maths through games is awesome." (4th class child, 2022)
- "The games made learning fun for me." (4th class child, 2022)
- "When we do a game first it helps me understand what we are actually doing." (4th class child, 2022)
- "Today during maths I felt great because it was fun and I understood everything very clearly." (4th class child, 2022)

The children love a playful learning approach. It encourages math talk and allowed me to create cognitively challenging tasks. Play is how children learn and it should be valued. It is important to have an understanding of what play is as a methodology. It is a wide spectrum that encompasses many types of play. While free play is not a highly effective teaching strategy many other types of play are effective to help children reach an explicit learning goal. In the senior classroom using guided play, games and playful instruction is a way to enthuse and motivate children to learn.

FIGURE 1 | Play conceptualized as a spectrum captures playful experiences that differ along a continuum in terms of initiation and direction of the experience and whether or not there is a learning goal.

(Zosh et al., 2018)

Thinking about play as a spectrum enables us to retain a play essence where children experience joy and have agency in their play contexts while also recognizing that play may take many different forms and serve many different functions (Zosh et al., 2018). Play can be used as a teaching strategy in the senior primary classroom. Play supports learning. "Play can be joyful, iterative, socially interactive, meaningful and actively engaging. Play increases children's motivation. It helps connect children's knowledge, experiences and interests. Because play supports learning, it should have an important role in school" (Mardell et al., 2021:1).

Active, engaged, meaningful, social, iterative and joyful are characteristics that individually and collectively appear in a number of scientific articles that highlight processes involved in optimal learning. These same characteristics coalesce in play. Thus, playful learning – and in particular guided play – should confer real learning advantages for academic and social outcomes (Zosh et al, 2018).
Again, the teacher has a key role in setting up playful learning experiences that help children achieve specific learning objectives.

I believe that the role of the teacher in the form of interactive direct instruction and play-based learning are two key pedagogies that should be included in our new curriculum.

- The teacher has a key role in many of the pedagogies already suggested. However, the role of the teacher is not mentioned in any of them. The curriculum is for the teacher and the teacher plays a key role in organising the learning and supporting the children in their learning.

- Interactive direct instruction when combined with play is a highly effective teaching strategy.
- Play is motivating and engaging for children.
- These pedagogies are easy to use and implement. Children's learning can be extended on and they can be cognitively challenged through the development of games and activities that help them reach a learning target.
- Both play and interactive direct instruction are child-centred approaches that are based on the theory of how children learn in maths. They underpin many of the key pedagogies already included.

We should not be asking our children to discover the curriculum. This is not an efficient or helpful way for children to learn. Children need to be taught problem solving skills before attempting to solve problems. This also needs to be outlined as many of the pedagogies mentioned are problem-solving type pedagogies. Children should be actively engaged in learning, however the teacher has a key role in creating the learning experiences.

Using playful learning and direct instruction in mathematics are the focus of my M.Ed studies in Maynooth University. I would be happy to share more information on either of these strategies and I passionately believe are highly effective ways to teach maths. Moreover, they are practical and child-centred. Please consider adding these pedagogies to the curriculum.

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

I am looking forward to seeing the support materials and examples of children's learning. These sound like they will be very useful and practical for teachers. I think they will be very welcome and will provide much needed support for teachers.

The progression criteria are far more useful and useable for teachers than the learning outcomes which are generally confusing. These need to be in the same document. I know there was confusion with the PLC initially, but I think in maths the progression criteria are absolutely necessary, so teachers know specifically what to teach. These need to be available to teachers in an easily accessible format. The online PLC is time consuming to navigate. Please consider having a document with both the outcomes and progression criteria in them or combining them.

Is the current organisation the best way to present the information? Are the vague learning outcomes across four stages needed? Can teachers plan with the progression criteria rather than outcomes? In maths teachers need specific goals to teach towards.

Additional supports:

- In-person seminars should be provided as support when the new curriculum is rolled out. Ideally a number of them over a number of years. Webinars are hard to engage with.
- Meetings in clusters of local/ similar size schools would be very beneficial as best practice could be shared.
- CPD on how to teach maths effectively is needed. Teaching maths an entirely separate skill to doing maths oneself. Findings from the survey I carried out show that over 1000 teachers felt their teacher training did not provide them with adequate skills to teach maths in a senior primary classroom. This represented 77% of total respondents.
- Practical examples of mathematical modelling and math talk in action are needed in the curriculum. Teachers need to know what that will look like.
- Funding is needed to buy maths equipment. Use of concrete resources is very poor in senior classes and teachers rely heavily on the textbook. Teachers need access to resources and many schools have no budget for maths equipment.
- Class size impacts teachers' ability to teach maths. Differentiation is much easier to achieve in a class of 18 than a class of 32. Many of the dialogic approaches such as math talk and mathematical modelling will be very difficult to use in larger overcrowded classrooms. Despite the reduction in class size over recent years we continue to have some of the largest classes in Europe. This will impact teachers' ability to use some of the approaches.
- Team teaching; could schools be trained in how to team teach for maths?

Data Protection

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Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Organisation submission details

Name	Máirín Ní Chéileachair
Position	Director of Education, Research and Learning
Organisation	Irish National Teachers' Organisation
Date	07/09/2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes √ No

Introduction

The Irish National Teachers' Organisation (INTO), as the largest teacher union in Ireland, welcomes the opportunity to respond to the draft specification of the *Primary Mathematics Curriculum (PMC*) for junior infants to sixth class. Since the publication of the1999 Primary School Curriculum, the INTO has been involved in ongoing engagement with members to seek feedback on the opportunities presented and challenges posed by that curriculum. The findings of an INTO survey of teachers and school leaders on mathematics in 2004 highlighted some of the constraints of the 1999 mathematics curriculum including a lack of resourcing and content overload (INTO, 2005). Feedback from members as part of this survey also suggested that there was a large emphasis on the use of textbooks.

Similar findings emerged from a later survey on numeracy which was conducted by INTO to help inform the organisation's Consultative Conference on Education in November 2013 which was

based on the theme of *Numeracy in the Primary School*. The majority of respondents called for a skills-based curriculum that was both challenging and relevant and one that incorporated increased use of ICT (INTO, 2014). At the 2015 Education Conference on *Primary School Curriculum: Have Your Say* a number of challenges were identified including curriculum overload; lack of time; over-emphasis on standardised testing and accommodating the needs of children with SEN and EAL (INTO, 2017). An initial submission on the *Draft Specification of the Primary Mathematics Curriculum (PMC) for Junior Infants to Second Class* was produced by INTO in March 2018 following engagement with members throughout the country.

Considering the significance of the teacher's voice in policy, the INTO supports the partnership approach to curriculum development. Teachers appreciate the opportunity to engage in consultation to ensure that their views and concerns regarding the draft specification are captured. In order to inform its position, the INTO organised a number of consultation focus groups with members. Three face-to-face focus groups were held in different parts of the country as well as two online focus groups. A number of INTO branches as well as individual members also provided feedback. Much valuable information was gathered from members during this consultation process despite the short time frame allowed and the scheduling of the consultation during an extremely busy final term of the school year. Concerns were also expressed by members regarding the limited time allowed to schools to engage with the draft curriculum documents having just emerged from the very challenging pandemic period.

Main Findings

Curriculum Content and Structure

Learning outcomes & Progression Continua

Similar to views expressed by teachers regarding the initial draft of the PMC in 2018, participants in INTO's consultation described the Learning Outcomes as being vague and lacking in detail. The broad and non-specific nature of the learning outcomes will place an additional burden on teachers as they attempt to interpret and develop ethereal learning outcomes into meaningful classroom practice. The vague and highly non-prescriptive nature of the learning outcomes poses a particular difficulty for newly qualified teachers (NQTs) and other inexperienced teachers who will find the new curriculum difficult to navigate and 'flesh out' for a particular class level in the absence of broader teaching experience. There is a widespread belief expressed by INTO members that the learning outcomes in their current form pose a significant risk of creating an even greater reliance on textbooks and accompanying planning templates provided by educational publishers.

The *Mathematical Concepts* in the Primary Mathematics Toolkit (PMT) are a welcome inclusion, and these are viewed as useful signposts to teachers in planning teaching and learning and translating the learning outcomes into practice but further and more detailed development of this would be viewed as helpful by teachers.

Teachers are also concerned about the move away from specific content being assigned to each class level as in the current mathematics curriculum. This lack of certainty makes it difficult for teachers to start planning with a new class as, in the absence of defined learning outcomes for specific classes, it is not immediately clear what exact content would have been covered by previous teachers during the first half of a particular 'stage.' This places much greater importance on the whole school plan to define what content should be covered at each class level as well as clear communication between teachers of different classes. The INTO highlights the importance of providing opportunities for school staffs to work together and plan collaboratively to ensure consistency and also calls for the development of Guidance on Whole School Planning to complement *Preparation for Teaching and Learning – Guidance for all Primary and Special Schools (NCCA, 2021)*

Teachers feel very strongly that absolute clarity and consistency regarding the content to be covered are very important and the draft curriculum provides neither. Many teachers expressed the view that the nature of mathematics is such that it demands a structured, incremental approach rather than some other subjects such as History or Geography which have traditionally been presented as a 'menu curriculum' with a large degree of choice and autonomy afforded to schools and individual teachers. Pupils must develop a clear understanding of foundational mathematical concepts before they can progress and engage in problem solving. It is important that pupils feel confident and competent in using basic mathematical skills as they will form the cornerstone of future learning in the area of STEM. As such, there should be no ambiguity around what content is to be covered at which class level otherwise some aspects of the curriculum could be overlooked. This would have a significant impact on pupils' mathematical development leaving them unable to engage with later aspects of the curriculum having potentially missed out on foundational learning.

Some respondents felt that the provision of learning outcomes across stages rather than for specific class levels would not be a significant challenge given that teachers are already differentiating within their classes based on current curriculum objectives. In schools with multi-class settings this will not be a new concept. However, teachers continue to report an uncertainty regarding the function and purpose of the Progression Continua. Many teachers indicated that their experience of using progression continua through their engagement with the Primary Language Curriculum (PLC) to date has not helped to clarify this, with some members describing them as "unclear" with little evidence of natural progression along the continuum. There is also a perception among teachers that there is a large amount of 'hidden content' within the progression continua with little obvious connection to the accompanying learning outcomes.

Teachers expressed unease at the extent and nature of the changes being proposed in the draft PMC. This curriculum signals significant pedagogical and cultural change not least regarding the move to a learning outcomes-based curriculum. Unfortunately, teachers' experiences of learning outcomes in implementing the PLC over recent years have not been positive. INTO members consistently report a high level of dissatisfaction with the PLC. It is seen as having added significant complexity to their planning and preparation without any discernible positive impact on teaching and learning. Teachers are frustrated by its cumbersome, text laden layout and the absence of clearly defined content for each class level. Further research is required on the meanings, understandings and interpretations of learning outcomes in curriculum, particularly, for young children in junior in primary schools. It remains to be seen whether a learning outcomes approach will be appropriate to the Irish primary context.

Language

During the previous consultation process in 2018, teachers raised concerns regarding the inaccessible and unfamiliar nature of the language used throughout the curriculum documents. Unfortunately, these concerns are echoed by teachers in response to this latest draft of the curriculum. In particular, the terms used to describe the five key pedagogical practices in Chapter 6 of the curriculum document are seen as overly complex and verbose. Members feel that the language used in the progression continua could also be more precise and succinct to avoid any possible misconceptions. The concerns about language point to a need for more careful consideration of language use and of the relevance of such language to the lived reality of practicing teachers. There is also a need to provide opportunities for teachers to engage in meaningful professional development in regard to recent curricular and pedagogical developments.

The language used to explain the various aspects of the curriculum may also cause confusion as it does not reflect the language used in the PLC. In the Language Curriculum the term 'element' describes essential language learning, and each element has a set of learning outcomes (NCCA, 2015, p 30). Conversely, in the PMC the term 'elements' refers to mathematical processes/skills, and each learning outcome label has a set of learning outcomes (NCCA, 2018, p. 28). Teachers questioned why the more appropriate and familiar term 'mathematical skills' was not retained and used in place of the newly adopted term 'elements' thereby avoiding any confusion or mixed messaging between the maths and language curricula.

In addition to this, teachers felt that within the content of the curriculum there should be a much greater emphasis on the importance and centrality of mathematical language. The importance of mathematical language is not adequately reflected in the curriculum documents currently. Teachers

wish to see specific content relating to mathematical language incorporated into the curriculum. Teachers referred to the helpful appendices contained in the teacher guidelines for the 1999 curriculum and require similar resources and supports for the PMC such as a glossary of mathematical terms relevant to the content. The glossary in the current draft of the PMC is for interpreting the curriculum rather than as a teaching resource. Teachers also referred to the overview of symbols, notation, and terminology relevant to each class level which was included with the 1999 maths curriculum as a helpful feature which they wish to see replicated.

Play

Teachers broadly welcome the increased emphasis on play-based learning experiences and playful pedagogy for all primary school classes in the draft curriculum. Teachers recognise the value of such approaches in facilitating discovery-based, child-centred learning and to foster positive dispositions towards mathematics. Teachers again however expressed reservations about the lack of adequate training and professional development for *Aistear* which was never adequately funded or resourced to be fully implemented and embedded in all schools. The INTO recommends that professional development for all teachers on play-based pedagogy should take place either prior to the introduction of the PMC or as an integral part of the implementation process.

In addition to this, significantly increased funding is required for schools to purchase and develop the necessary resources and supports to enable play-based approaches for example to purchase concrete materials to move away from textbooks and fully embrace play-based pedagogy. INTO has long highlighted the inadequate funding provided to primary and special schools in Ireland which leaves them unable to provide much needed resources and equipment to enhance children's learning experiences.

General Issues

The *Draft Primary Curriculum Framework* proposes the grouping of Mathematics with Science, Technology and Engineering; teachers emphasise the importance of ensuring that sufficient, distinct time is allocated to Mathematics due to the crucial importance of the development of foundational numeracy and maths skills in the early years of primary school.

Teachers expressed the view that more foregrounding of calculator use in senior classes is necessary. This would be particularly helpful for students experiencing difficulty with number facts and operations who could engage more meaningfully with other mathematical concepts if released from such difficulties by calculator use.

Teachers welcome their acknowledgement as 'agentic professionals' in this draft PMC and in the *Draft Primary Curriculum Framework*. It would be preferable however if the curriculum sought to allow teacher agency in how to teach specified content rather than agency in choosing what to teach which is how this draft curriculum is perceived currently by teachers.

Resources

During the consultation focus groups, teachers were asked to identify essential resources and supports required for successful implementation of the curriculum. Despite their misgivings regarding learning

outcomes and other aspects of the curriculum content, teachers generally felt that the concepts and ideas behind the new curriculum are good and well-intentioned but are not practical for implementation in the current conditions of Irish schools and classrooms – most notably class size, lack of appropriate resources especially for hands-on practical activities and not enough time to give to hands-on learning activities in an overloaded school day are seen as significant barriers to implementation.

The capacity of this curriculum to address the challenges and shortcomings of the 1999 curriculum is entirely dependent on appropriate funding, resources and supports being made available to schools. Teachers prioritised the following supports as essential for successful implementation of the PMC:

- Sufficient time allowed for high quality CPD (with the majority being face to face), planning and collaboration

Sustained support available to all schools within a much shorter timeframe than has been the experience heretofore

- Support service personnel modelling and demonstrating the curriculum in action in individual classrooms to make it real and meaningful for teachers
- Support should be available locally, making greater use of local education centres, PDST associates and facilitators. Availability of such personnel would give schools a more accessible and local contact point for support
- Use of teacher supply panels to release teachers from their class to engage with support services and collaborate with colleagues in exploring and implementing the curriculum – each school to be allowed an allocation of hours based on school size (Similar to CLASS hours)
- More staff in schools to facilitate greater use of team teaching and collaborative approaches

Curriculum Rollout & CPD

Teachers articulated very clear views on the requirement for high quality and fit-for-purpose CPD to launch and rollout the new curriculum. Key demands in this regard include:

- CPD must not be delivered by solely online means, the majority must be face to face.
- Timely face-to-face inputs provided to all schools and teachers.
- Teachers require time and space for collaboration and engagement with colleagues in both their own and other schools. School based planning days must be a feature of CPD and Sustained Support for a number of years to facilitate the embedding of the new curriculum.

While online webinars are seen as useful for optional CPD and the development of teacher's own interests, teachers do not see them as being effective or appropriate for CPD required to advance national priorities or the facilitation of curriculum reform due to the limited engagement they allow. Reforms of the scale being proposed require engagement and buy-in from all teachers and this cannot be engendered by online webinars alone. Teachers, in the main, did not find online approaches utilised for the PLC a positive experience. The current model of online webinars for CPD as utilised for the rollout of the PLC is not effective for teachers and therefore, they demand that CPD for the redeveloped Maths Curriculum be provided in a format similar to that of the 1999 Curriculum i.e.

planned school closures to give teachers the time, space and opportunity to engage with and reflect on the curriculum content and the wider changes in pedagogy and practice.

Teachers' views and experiences of online CPD as identified by our focus groups have many commonalities with international research (Lander, Lewis, Nahavandi, Amsbury & Barnett, 2020) on teachers' perspectives on and experiences of online professional development. The translation of content into practice is a particular challenge, not unique to CPD delivered by online methods, but potentially exacerbated by decontextualised and generic online approaches which take no account of the nuance of individual school contexts The limitations of online approaches in facilitating interaction and collaboration between teachers have also been identified as a significant disadvantage. This was highlighted by teachers in our focus groups who require more time and space to engage and collaborate with colleagues in their own and other schools to explore and develop understandings of curricular and pedagogical change.

In general, webinars for the PLC were deemed by teachers to be of poor quality and unhelpful. They are perceived as regurgitating the content of the curriculum book. Teachers want and need practical and concrete supports – something that illustrates what the curriculum looks like in practice in a real classroom context. Where online engagement is required, ideally a full day school closure should be sanctioned as teachers have not found the half-day closures effective. It is difficult to focus on the content when coming directly from the classroom, possibly dealing with issues which emerged in school that day, children left in school who were not collected, etc. Teachers also highlighted poor communication of the rationale behind the PLC and of the move to a learning outcomes-based curriculum with many teachers reporting continued uncertainty of what this means for their classroom practice.

Teachers conveyed an unequivocal demand for clear guidance, direction, and practical supports in developing fit-for-purpose whole school, yearly/termly and short-term plans for maths to take account of the PMC. Worked examples of planning documents for a variety of different contexts are seen as essential. Teachers cite negative experiences of attempting to navigate the planning involved in implementing the PLC and feel that more support in this regard is very important for PMC. Teachers expressed disappointment and frustration with a lack of adequate support from PDST in planning for and implementing the PLC and fear that schools will again be left to their own devices to implement and embed the PMC with every school having to 'reinvent the wheel.'

Principal teachers who participated in the consultation process identified a requirement for specific briefing/training for principals ahead of a wider roll out to the general teacher population – this tailored support would ensure that principals are informed and aware of the context and content of new curriculum and can help to prepare their school communities for the curriculum in conjunction with PDST and other supports.

Conclusion

Having considered the draft curriculum specification, and engaged with members the INTO makes the following recommendations regarding the content and implementation of the PMC:

- The learning outcomes and associated mathematical concepts should be reviewed and further developed as necessary to provide certainty and clear guidance to teachers enabling them to plan focused, appropriate, and enriching learning experiences for all children.
- Language used throughout the curriculum documents should be reviewed and revised in the interests of clarity, accessibility, and relevance to practising teachers.
- Specific curriculum content and resource materials must be developed to reflect the centrality of mathematical language and to promote a coherent approach to mathematical language across all classes.
- High quality, timely, and in-person initial CPD must be provided to all schools and teachers prior to the implementation of the curriculum together with ongoing and accessible sustained support. The majority of this support must be of a face to face nature
- School based planning days must be provided to schools for a number of years to allow schools the time and space to embed new curricula and new practices and pedagogies.
- Guidance on Whole School Planning to complement *Preparation for Teaching and Learning – Guidance for all Primary and Special Schools (NCCA, 2021)* must be developed to facilitate schools in planning for a new Mathematics Curriculum and the subsequent roll out of the Primary Curriculum Framework.

A learning outcomes approach creates a significant shift in curriculum culture which will require investment and support for teachers to enable them to develop a curriculum that meets the needs of their individual contexts. Any curriculum process model which relies on teacher judgement is far more demanding on teachers and thus far more challenging to implement in practice (Stenhouse, 1975). Therefore, the INTO reiterates that teachers need more time, support, and professional development opportunities to allow them to engage with this new approach to curriculum.

In conclusion, the INTO reiterates that the wider issues of class size, resourcing, time and sustained CPD must be addressed to ensure effective implementation of any new curriculum.

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Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Organisation submission details

Name	Marino Institute of Education Response prepared by: Dr. Seán Delaney Dr. Maja Haals Brosnan Breed Murphy Dr. Bridget Flanagan
Position	Registrar Head of Department for Arts, Maths, PE and Early Childhood Education Assistant lecturer in Mathematics Education Part-time lecturer in Mathematics Education
Organisation	Marino Institute of Education
Date	29/06/2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes ✓ No

Please provide some brief background information on your organisation (if applicable).

Marino Institute of Education (MIE) welcomes the opportunity to respond to the National Council for Curriculum and Assessment on the Draft Primary Mathematics Curriculum. MIE is an autonomous, charitable higher education institute, under the co-trusteeship of the Congregation of Christian Brothers European Province and Trinity College Dublin, the University of Dublin. MIE is a teaching, learning and research community with involvement in teacher education dating back to 1905 when the Christian Brothers' Educational Research and Resource Training Centre was established and this centre was subsequently recognised as a Teacher Training College in 1929. The undergraduate programmes offered in MIE include the Bachelor of Education, the Baitsiléir san Oideachas Trí Mheán na Gaeilge, the Bachelor of Science in Early Childhood Education and the Bachelor of Science in Education Studies while postgraduate programmes include the Professional Master of Education (Primary) and the Master in Education Studies (Primary Mathematics Education). Additional programmes offered by MIE include the Migrant Teacher Bridging Programme and Continuing Professional Development programmes for teachers.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum*.

The development of the Draft Primary Mathematics Curriculum which is underpinned by theoretical and philosophical beliefs and aims to develop the mathematical proficiency of children in primary school is welcome. A shift in key pedagogical practices to include a focus on fostering productive disposition and the use of cognitively challenging tasks is considered a positive development. Flexible, open-ended learning outcomes provide opportunities for teachers to exercise their agency and offers opportunities for teachers to design instruction that matches the needs of children in their class. However, the open-ended learning outcomes reduce specificity and therefore provide less guidance and direction for teachers than the previous curriculum. Areas which we feel warrant further attention in the Draft Primary Mathematics Curriculum include inclusion, differentiation, play and engagement.

The curriculum notes the benefits of five key pedagogical practices for their potential to foster an inclusive learning environment and culture. The extent to which social and cultural contexts can significantly impact on children's mathematical development is relevant in the context of guiding mathematics education. A section highlighting issues of inclusion and the value of culturally responsive mathematics pedagogy within the curriculum is desirable, as Irish primary schools are characterised by increasing ethnic, linguistic and cultural diversity.

Greater reference to differentiation would strengthen the curriculum, emphasising the importance of designing learner-centred mathematics instruction. This could be achieved by adopting the principles of Universal Design for Learning in the teaching of all curriculum strands.

'Playful learning experiences' are mentioned repeatedly in the learning outcomes for children at Stage 1. A statement on the value of play in the curriculum would add to the document. Play can also effectively facilitate the development of conceptual understanding of mathematical ideas with children in Stage 2, Stage 3 and Stage 4, such as when learning about measures, data, chance and probability.

Student engagement is a multifaceted idea involving behavioural engagement, cognitive engagement and emotional engagement which presents significant benefits for learners of mathematics. Engagement will be discussed in further detail in the context of the rationale and aims of the curriculum.

Finally, in 1999 the curriculum designers laid out the curriculum objectives for mathematics – uniquely – class level by class level. The departure from the 1999 approach to the current one of setting out more open-ended learning outcomes at four different stages is likely to create an exigency for a range of classroom supports, especially in the form of mathematics representations and tasks, for teachers. Has thought been given to the supports that will be

provided to classroom teachers for teaching mathematics in this way? In addition, because textbook publishers play a role in creating resources which are frequently used by teachers and children, has consideration been given to explicitly communicating the rationale for the more open ended learning outcomes with textbook publishers so that resources and textbooks can reflect the different develop rates at which children progress and the diversity of needs which exist in classrooms? This requirement is further magnified for teachers in multi-grade classrooms.

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.

The rationale for the Draft Primary Mathematics Curriculum clearly sets out the context of children's learning of mathematics and the importance of mathematics in their lives. We welcome the continued emphasis on the development of positive dispositions, which also feature in the Aistear Framework. Some evidence from forthcoming research points to how children in Ireland tend to either be very positively disposed or very negatively disposed towards mathematics, highlighting the importance of promoting a positive disposition among all children towards mathematics. Encouraging children to develop their perseverance and resilience link directly with the importance of supporting children to engage in productive struggle when developing problem-solving skills (Schoenfeld, 2018).

We welcome the selection of mathematical proficiency as the overall aim of the curriculum. The interdependence and interwoven nature of conceptual understanding, procedural fluency, adaptive reasoning, strategic competence and productive disposition as aspects of mathematical proficiency are clearly explained and visually presented in the infographic. We encourage the curriculum development team to consider extending the aspect of productive disposition to emphasise student engagement. Student engagement is a multidimensional construct consisting of behavioural engagement, cognitive engagement and emotional engagement which results in a deeper student relationship with mathematics (Fredricks et al., 2004). Encouraging meta-cognition and reflective practices regarding engagement with mathematics can positively contribute to enhanced levels of mathematical knowledge (Ingram, 2013). Promoting an awareness of student engagement would place an emphasis on supporting children to monitor themselves as learners of mathematics, develop meta-awareness among children of challenge and struggle in learning mathematics and the value of both, and help them appreciate the connection between challenge and learning.

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes* [see pages 15 – 24]

The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

Please give your overall feedback in relation to the curriculum components mentioned above. *Please quote full text of any learning outcome you wish to draw attention to.*

Overall, we are supportive of the curriculum structure, built around five strands and four elements. In this submission, feedback relating to the curriculum components focuses mainly on learning outcomes, followed by a brief reference to elements.

Although flexible, open-ended learning outcomes offer potential benefits with regard to facilitating teachers to exercise their agency and supporting teachers to design instruction that meet the needs of a diverse range learners, the Draft Primary Mathematics Curriculum may not provide sufficient structure for all teachers, particularly those who are inexperienced, with regard to guidance on what mathematical content needs to be taught. Specific skills, concepts and learning trajectories associated with each strand are clearly and coherently set out in the Primary Mathematics Toolkit and greater cross-referencing of these developmental trajectories in the Draft Primary Mathematics Curriculum may support teachers who need guidance. Without providing clarity regarding mathematical concepts and skills within the curriculum document, some teachers, particularly those who are inexperienced may find themselves relying primarily on textbooks for guidance, resulting in textbooks becoming a de facto syllabus and therefore potentially reducing opportunities for using mathematical knowledge in the real contexts in which it is useful.

Within the learning outcomes, we suggest placing the frequently used phrases 'Through appropriately playful learning experiences children should be able to:' and 'Through appropriately engaging learning experiences children should be able to:' at the beginning of each column in order to avoid unnecessary repetition in the learning outcomes within the columns. Also, the soft-copy version of the document would be more user-friendly if the pages in landscape orientation were rotated in the original document prior to upload on the internet.

With reference to the learning outcomes for Stage 1 of the Measures Strand, the absence of reference to language development is considered an oversight. Furthermore, consistent references to the development of

ordering, comparing and matching skills in Stage 1 of the Measures strand is recommended, due to the importance of these skills for the later development of number concepts.

The learning outcome related to Transformation at Stage 1 would benefit from greater clarity, to illustrate if this learning outcome is intended to apply to 2-D and 3-D shapes, or 3-D shapes only, and to highlight what a child in Stage 1 should understand following learning about transformations. Using terms such as polygons and polyhedrons (and non-polygons and non-polyhedrons) instead of 2-D and 3-D shapes may help reduce some confusion around classifying shapes. With reference to the idea of transformations at Stage 2, the understanding of a line is that it extends in both directions indefinitely, and therefore the idea of a dilated line has the potential to be imprecise and/or misunderstood.

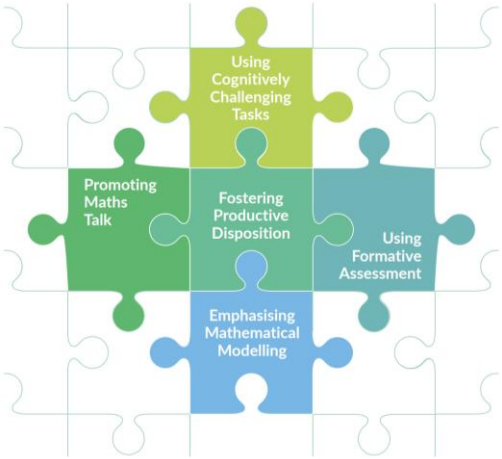
Transformation	*Through appropriately playful learning experiences children should be able* to explore the effects of shape movements.	*Through appropriately engaging learning experiences children should be able* to understand that shapes and lines can be reflected, rotated, dilated and translated.	*Through appropriately engaging learning experiences children should be able* to model and explain the effects of transformations on shapes and lines.	*Through appropriately engaging learning experiences children should be able* to perform and devise a range of steps involving transformations.

The inclusion of a series of concepts for exploration at each stage sets out the key ideas which relate to each learning outcome label. These are useful to teachers as they plan instruction. At times, simpler explanations would suffice. The concepts of multiplication and division provided do not extend to the scaling structure of multiplication and the ratio structure of division, which are typically used by children in the senior classes in real life scenarios.

While the use of technology is encouraged within the curriculum in the context of maths talk and mathematical modelling, coding also offers opportunities to enhance children's problem-solving skills and mathematical proficiency. In the interest of grammatical correctness and to avoid ambiguity, it is recommended to change the element label 'Applying and Problem-solving' to 'Applying Mathematics and Problem-Solving' or simply 'Problem-Solving'. Similarly, the meaning of the word 'apply' is unclear in relation to 'problem-solving situations' in the following statement; 'Children should investigate, develop, select, apply, interpret, model and compare a variety of problem-solving situations and strategies as they explore mathematics and deepen their mathematical understanding'.

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

We strongly support the use of the five key pedagogical approaches outlined in the Draft Primary Mathematics Curriculum. We are particularly pleased to see the inclusion of the use of cognitively challenging tasks and the emphasis on fostering productive disposition. In order to maximise the potential learning from using cognitively challenging tasks, we feel it is necessary to specifically make children aware of their meta-practices, not only valuing struggle and normalising mistakes as steps towards deeper understanding but also as mechanisms to monitor their own developments as learners, analysing the effectiveness of thinking strategies etc. Also, the term 'task', which is frequently used in the document, has a rather specific definition in that a task involves three elements. Tasks focus attention on the products students are required to formulate, the operations needed in the process of generating the product and the resources available to students (Doyle, 1983). The curriculum would benefit from clarification of this rich meaning of the idea of a task.

The section of the curriculum document which explains each of the five pedagogical approaches, suggests possible ways of incorporating them into mathematics teaching and outlines their benefits is informative and useful. It may be helpful if the online version of the curriculum includes links to videos of teachers and children in classrooms showcasing how these practices can be practically implemented i.e. what math talks/cognitively challenging tasks /mathematical modelling look like at various stages, such as what maths talk may look like with children at the beginning of Stage 3, and what maths talk looks a few weeks later after a teacher has consistently encouraged children to speak about the approaches they are using.

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

In terms of supporting teachers to plan their instruction and to effectively sequence the concepts and skills which children will learn, the progression continua offer significant support and are a strong aspect of the toolkit.

The supports outlined for creating rich environments and the introduction to maths talk are particularly effective in that they provide both background information and practical examples to illustrate how they may be implemented in the context of primary mathematics teaching and learning.

The Draft Primary Mathematics Toolkit and the Draft Primary Mathematics Curriculum make repeated references to 'appropriately playful learning experiences' for children at Stage 1 and 'appropriately engaging learning experiences' for children at Stage 2, Stage 3 and Stage 4. The documents would benefit from an explanation of what is meant by the terms 'appropriately playful learning experiences' and 'appropriately engaging learning experiences' which includes some of the characteristics of each.

It is important to recognise that maths talk is useful for children at all stages of primary school and in addition to the support materials currently developed for stages 1 and 2, further support materials for those teaching children in stages 3 and 4 would support teachers teaching more complex mathematical concepts.

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Data Protection

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Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Individual submission details

Name	Alan Monnelly
Date	16/07/2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes ☐

Please provide some brief background information on your organisation (if applicable).

Degree in Electrical Engineering at UCD (1965).

12 years Industrial experience in Europe, UK. and Ireland. Writer on the ISCIP Project with Trinity College/Dublin VEC Curriculum Development Unit (while teaching at Ballyfermot Vocational School) and obtaining an H Dip in Ed. from UCD (1977).

M.Litt. Trinity (1999). "Thinking Children and Mathema6cs: Methods to enhance mathema6cal pedagogy".

Member of the Steering Committee of the Project Mathematics programme and member of the subsequent Teacher Trainers Team (while teaching mathematics and physics at Newpark Comprehensive School & head of Transition Year.)

Three years in the UK at the Anglo-European School (Essex) teaching GCSE O and A-Level in Mathematics and Physics but also (more interestingly!) the same subjects for the French Baccalaureate.

Member of Transition Year Teacher Training cohort for Mathematics.

One of the team of five writers for the Alternate Leaving Cert (LCA) in Shannon Curriculum Development Unit. (Mathematics and Science/technology) and subsequent teacher trainer.

Two years as a Tutor in mathematics with the OU, while still at Newpark Comprehensive School.

These years of experience in industry, teaching and Curriculum Development (mainly at second level), have given me a deep insight into what style of pedagogics is needed in order to improve *all* young pupils' *understanding* of mathematics. During my own teaching practice I believe I have shown how this might be done.

The Draft Primary Mathematics Curriculum as presented is a realistic basis upon which to build such an understanding.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum*.

In my opinion the Draft Curriculum is one of the best child-centred pedagogical programmes I have ever read. Throughout the text there is a consistent the strong theme of teaching young people to think more deeply about their own 'thinking'. The subject is mathematics but the teaching practices promoted could apply to many other school subject and ought to become the template for Second level. The aim of creating a society of citizens well-disposed to mathematics is most welcome, at the moment many citizens seem to see the subject as a 'Weapon of Math Destruction'.

The New Vision is brave and I know will be well received but introducing more *practical activities* might incur extra expense; and I wonder if this might choke-off some positive endeavours?

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Experiences in school mathematics ought to help children see that mathematics (for many that just means numbers!) is a part of their lives and those experiences should help pupils realise that from the time they rise to the time they sleep, 'numbers' have *measured, pictured* and *dictated their* day.

Is there an idea in The Aims of a moving away from the textbook dictating the nature of mathematics and a moving to a series of richer activities based on pupils surveying the world around them? If so this should make mathematics more to real(?) for children and might, perhaps, stop the them being influenced by the so frequently heard cry of, "I never understood maths and hated it". I am not dismissing the usefulness of a textbook use but having it more as a useful resource for reading / learning and generating questions.

"Maths proficiency building on what they already know". True of course, but what exactly do they already "know' or more importantly understand?. Mathematical lessons are meant to stimulate curiosity, intrigue and fun (!), and hence develop a bank of knowledge and *understanding* that children can then bring to bear on problems. When children to *realise* that they have this bank of knowledge their self-worth will improve along with their confidence.

In the Draft an important proposal is made namely to *interweave* (integrating?) the basic skills and operations used in mathematics. To move away from the compartmentalisation of arithmetic/ geometry/ algebra; enabling pupils broaden their thinking and use both sides of their brain! However, I would encourage *very early* use be made of the instruments hidden in the *oft forgotten geometry* box. They can become powerful aids in modelling (explaining) so many mathematical concepts visually /physically/ and thence mentally.

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes* [see pages 15 – 24]

The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

Please give your overall feedback in relation to the curriculum components mentioned above.
Please quote full text of any learning outcome you wish to draw attention to.

As with previous sections of the Draft this presentation is clear and comprehensive. The Five Strands and associated Elements spell out the desired teaching practices. Pupils should be made aware of both these graphics; given suitable interpretations and explanation of the thinking behind them. Their acceptance of such a structure and underlying philosophy will enhance the positive disposition that the Draft wishes to achieve.

The graphic is clever but I am wondering if the 'degree measure' for each Strand has some specific message? Eg., Space and Shape 180 .. ….Algebra 360. Does this imply that algebra is the ultimate goal, or that it is the basis upon which all school is maths is based?

Maybe it is I bias but I believe that the concepts generated in Space and Shape (ie. geometrical methods) should, in most cases, be used as the investigative technique. Their use can help to explain both visually (and mechanically) mathematical ideas. While researching for my M. Lit. I found (and since also designed) models for all the concepts that underly school mathematics. For a pupil to have solved a problem using a model that they have made/created, encourages their analytical thinking and helps to improve the pupil's confidence. Also the model can be taken home to answer the parental question, "what did you do in school today"!

I seem to be worried about the priority listing of the Strands (perhaps wrongly). Data and Choice are topics that pupils can appreciate easily. I would include Permutations as a study; bringing in Order, Priority, Status, Permutations and Combinations. Such aspects feature in Sport and Music, - topics that children might not readily associate with math lessons.

Measure and Number have an all presence in all mathematical practices; but the operations on numbers can be confusing for pupils. The order of priority, from easier to difficult seems to be - addition, division, subtraction and multiplication. A startling 'game' that might focus on the priority of operation is to compare the results of simple sums done on a scientific calculator and a non-scientific one.

Pupils should make their own addition/multiplication squares and delve into the patterns that can be seen in the array. They make the squared boxes using the set squares and the 'sliding parallel' method.

Algebra seems to be the big 'never understood' part of school mathematics. The introduction of symbolic patterns can be quietly introduced when modelling for a variable, or a change of, design.

Teachers should collect a bank of fun games and diagrammatic resources that mimic algebraic methods. The whole topic of algebra and its usefulness will become clearer to learners and promote much use of the Draft's four Elements!

The Learning Outcome charts very clear and easy to understand.

Among all the excellent pedagogics in the Draft the real highlight for me is the Element graphic. If children begin to understand what is happening, what and why they are doing particular work (?) positive results will follow - whether it is maths or any of their other subjects. Learners should learn how they are learning!

Communications: Fun comparing social language with the special vocabulary used in maths. Meaningful group discussions and talking with their teachers. (The rhombus is a favourite strange creature (?)?

Understanding and Connecting: Facts and figures are the diet of maths and many pupils know that they, know (sort of) but also know that they do not understand . They must learn to gather and link other related ideas and facts in order to build a bank of knowledge for solving problems. I oden wonder wen reading books on 'How to solve problems' that ask the problem solver to 'recall already known facts' - the work now suggested in the Draft is the very way to build such 'Previous Knowledge.

Reasoning: For many defining what the problem is, is the problem. Other subject areas might be introduced as examples of how to approach matters; word puzzles, logical problems, visual tricks and so on.

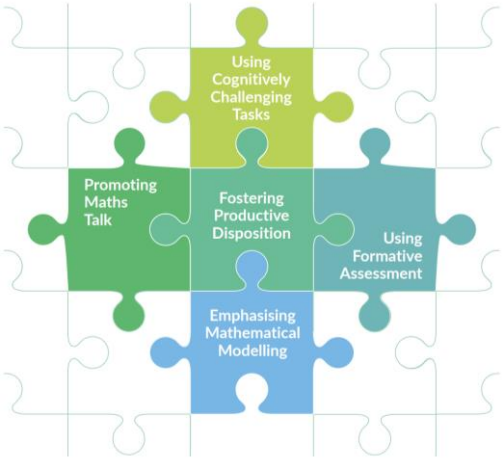
Applying and Solving Problems: Pupils must learn to read and realise what the problem is. An abundance of material is available for all sorts of problem that can be used in class and also at home. For many math problems a drawing or a model will help to children to see what is being asked. There are many paperback books with sensible (and non-sensible) problems and puzzles that will provide plenty of practice. It is perhaps in this area that emphasis on how the process is so important in solving problems - yet pupils should feel the satisfaction on proving the correct result.

The section on Learning Outcomes: Very clear. I like the phrase "appropriate engaging". Appropriate to children's intellectual, of course, but always extending gently the presentations to be a little more sophisticated?

Is Algebra listed first for some reason? Excuse my paranoia!

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.

THIS SECTION SHOULD BE READ AND RE-READ BY TEACHERS (AND THOSE WHO DESIGN AND PRODUCE EDUCATIONAL MATERIAL.

I, and many others will applaud this is a New Vision for Primary mathematics. Although the pedagogy here is for younger children the educational philosophy is applicable to much older children and, in fact should become the template for Second level, (and Third!).

Its power/strength of this Draft Curriculum is in its overall objective of teaching / helping young people to think clearly and confidently. If followed correctly the Draft proposals will result in children having a very *positive* experience of mathematics; no more 'I hate maths', and, as with so much of Primary education, be helpful in their adult life.

A great leap forward will be achieved if pupils can become comfortable with '*maths* talk' and extend such talk into the symbolic language of maths. Using techniques of '*modeling*' will allow the learner to see the structure of the problem. '*Cognitive tasks*' will present much fun into thinking and unraveling problems, (good for showing them at home too!). '*Formative assessment*' means teacher and pupil will measure progress. Finally the pupil will become a person with a *''productive disposition'*.

Teachers should be constantly aware of the Five Interconnected practices in their classroom work. If done so it will mean that means that mathematical concepts can be '*gently*' introduced to very young children and then, by a way I call the *Spiral Effect*, be re-introduced in at more sophisticated level as the pupils move up the year groups.

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

One concern: Is my worry about the possible lack of, or difficulty obtaining materials for much of the envisaged practical a valid concern?

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Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Organisation submission details

Name	Madeline Hickey
Position	Specialist Lead – Policy and Practice
Organisation	National Council for Special Education (NCSE)
Date	30th June 2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes

Please provide some brief background information on your organisation (if applicable).

The NCSE aspires to a society where children and adults with special educational needs receive an education that enables them achieve their potential. We promote a continuum of educational provision which is inclusive and responsive, and provides an appropriate education for children and adults with special educational needs. We provide supports to schools; advice to educators, parents and guardians; research into special education; provide policy advice to the Minister for Education and Skills to improve education services for students with special educational needs.

Research advises that students with additional needs are well supported with only 1% in special classes and 1% in special schools. 25% of the education budget is now invested in supporting special education.

- 1 in every 4/5 teacher posts supports special education
- Over 19,000 special needs assistants are in place

- Assistive technology, specialist furniture/equipment and adapted school buildings are provided
- A special school transport system is in place
- A school inclusion model is being piloted which will provide
  - In-school therapy (occupational and speech & language and behaviour) service to improve school capacity
  - A national school nursing scheme
  - A national SNA training course
  - Enhanced NCSE support teams
  - Enhanced NEPS provision.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum.*

- Recognition and acknowledgement of the **unique learning journey and needs of each child**
- Promotion of **teacher agency**, autonomy, flexibility, professional judgement and teacher knowledge in their own school contexts
- Some **links to the terminology** of the PLC and Aistear e.g. Strands, Elements, Stages, Learning Outcomes, appropriately playful / appropriately engaging Learning Experiences.
- A **reference is made to align** the *Draft Primary Maths Curriculum* to the recent interagency publication, *Preparation for Teaching and Learning: Guidance for all Primary and Special Schools.*

Areas to Consider:

- To support the proposed **alignment of the *Draft Primary Maths Curriculum*** to the recent interagency publication, ***Preparation for Teaching and Learning: Guidance for all Primary and Special Schools***, consideration could be given to highlighting the connections explicitly and elaborating on the key messages of the Guidance document to demonstrate the connections to the *Draft Primary Maths Curriculum*.
- **Replication of the layout and structure** of the Primary Language Curriculum. Teachers accessing this curriculum should have immediate familiarity due to their knowledge of the PLC. This alignment could be at chapter title and graphics level. Consideration should be given to presenting the Maths Concepts in Chapter 10 of the Draft PMC and the Language Concepts of Chapter 10 of the PLC in a similar and familiar structure. The PLC is presented through Elements across Strands, while Maths is presented through Learning Outcomes across Stages.
- **Reference** should be made to the ***Primary Curriculum Framework*** and, in particular, the development of the **Key Competency of 'Being Mathematical' and its associated attributes**. This should be included and aligned with the aims and rationale of the *Draft Primary Maths Curriculum*.
- Emphasising the inclusive nature, design and development of the *Draft Primary Maths Curriculum*, as an inclusive curriculum for all children in all primary and special school contexts. **The term Inclusion and Diversity** is used in the *Primary Curriculum Framework* and therefore this should transfer to the terminology of the Draft PMC.
- Consideration should be given to Including the ***Additional Support Pathways*** in the *Draft Primary Maths Toolkit*
- Recommend removing all **references to the term 'planning'** in the following Support Material https://ncca.ie/media/5466/7-preparation-for-teaching-and-learning-in-primary-mathematics.pdf
- The Progression Continua should be considered when **creating Examples of Children's Mathematical Learning and in the Support Materials**. This would be very important for teachers in special schools and special classes.
- The term ***'progression milestones'*** appears to be interpreted differently in the Draft PMC. Considering the PLC, it could cause confusion for teachers, in particular, special class teachers who will most likely use the Progression Continua.
- A deeper **examination of the language used in the Progression Continua** is needed to ensure that it is inclusive for all learners. For example, use of the terms 'recites', 'counts', 'describes', 'explains' and 'justifies' may look different for individual learners.
- Consideration should be given to **developing Support Materials for all children in all school contexts**. Drawing on the expertise of the NCSE Primary Curriculum team and the Visiting

Teachers for the Blind/Visually Impaired' and Deaf/Hard of Hearing, support materials could be developed collaboratively to support teachers in all school contexts.

- To promote engagement from teachers working in primary and special schools, it would be important to consider **alignment of all Curricula**. For example, to highlight how the Draft PMC through its Strands, Elements and Learning Outcomes has been developed to align to the *Junior Cycle specification for Maths*, the *Aistear framework* and the *Primary Curriculum Framework*. The alignment could be demonstrated through an infographic.

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.
Areas to consider:

- Chapter 3 of the Draft PMC (Aims) is generic and links with the thinking of the *Preparation for Teaching and Learning Guidance* document by first looking at the child (child-centred). The Draft PMC introduces mathematical proficiencies. Consideration should be given to presenting this through three headings: children and their lives, children's connections with others and children's mathematical thinking and development.
- Consideration should be given to enhancing Figure 5 (p. 9) developing a link to Mathematics and the information that is conveyed.
- The rationale could include reference to how the Draft PMC through its Strands, Elements and Learning Outcomes has been developed to align to the Junior Cycle specification for Maths. The alignment could be illustrated through an infographic.
- Consideration should be given to address the diverse needs of all learners. For example, on p.10 '*Primary mathematics education should provide children with opportunities to engage with deep, meaningful and challenging mathematics in educational settings, including social and familial settings. Such engagement will result in children co-constructing knowledge and skills as they interact and collaborate to solve complex and real problems'.*
- Recommend inserting 'supported by using a number of tools such as numbers' on p.14. '*Children should detect mathematical relationships … using a number of tools such as numbers, concrete materials, manipulatives, symbols, words or graphics."*
- Research from Butterworth could be added to the Aims section of the Draft PMC, particularly in relation to children's innate sense of number. See Butterworth (1999) *What Counts: How every brain is hardwired for Maths* and https://www.mathematicalbrain.com/

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes* [see pages 15 – 24]

The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

Please give your overall feedback in relation to the curriculum components mentioned above.
Please quote full text of any learning outcome you wish to draw attention to.

- Recognition and acknowledgement of the unique learning journey and needs of each child.
- Promotion of teacher agency, autonomy, flexibility, professional judgement and teacher knowledge in their own school contexts.
- Some links to the terminology of the PLC and Aistear Framework e.g. Strands, Elements, Stages, Learning Outcomes, playful and engaging Learning Experiences.

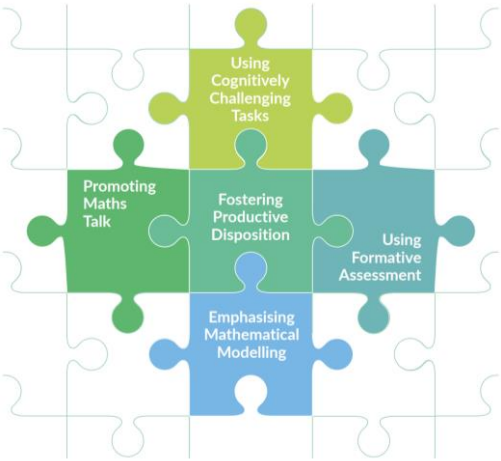
Areas to Consider:

- Replication of the layout and structure of the Primary Language Curriculum. Teachers accessing this curriculum should have immediate familiarity due to their knowledge of the PLC. Consider renaming Chapter 4 as 'Strands and Elements'. Consider renaming 'Maths Elements' to 'Elements' as demonstrated in the PLC. Alternatively consider renaming 'Strands' to 'Maths Strands'.
- A single graphic could be used to represent both the strands and the elements.
- *Figure 7: Representing the Five Strands* (p.15) is somewhat confusing, in terms of the colours used for each strand and their interconnectedness. They are listed alphabetically rather than by stages of development. Is there a hierarchical aspect to the strands? Should the infographic demonstrate this? Is there a significance to the starting point of each of the coloured lines? Should the Strand of Number be the starting part for all Strands and built upon, as it is a fundamental Maths concept underpinning all Strands?
- The Elements appear to describe overarching key mathematical skills. Should the LO labels be organised under the four Elements similar to the PLC? The Elements appear only in the Progression Continua in the Maths Toolkit, and do not appear to be aligned to the LO labels. Are the Elements a compulsory part of the curriculum or are they identified as an optional part of the Toolkit?
- The Mathematical Elements could be renamed 'Elements'. The graphic suggests an anticlockwise approach to the Elements (large and small arrows). Is this significant? Is there a hierarchical aspect to the four Elements, should certain mathematical Elements be completed first?
- The Elements are introduced on p.17 before the LOs. However, unlike the PLC, these Elements are not incorporated until the Progression Continua level.
- Why was the term 'label' added to 'Learning Outcome Labels'? Could this be included in the descriptive paragraph instead, so that the title is 'Learning Outcomes' (similar to the PLC)?
- Chapter 5 should include a graphic that provides an 'Overview of the Learning Outcomes' including LOs, Strands and Elements. (Similar to p.19 of the PLC).
- The descriptor of each Learning Outcome (Chapter 5) appears to be very broad in nature. Could reference be made to the Progression Continua here as a useful tool for teaching and learning?
- A playful and engaging approach to Maths teaching and learning needs to be encouraged at all stages (1 to 4). Emphasis should also be placed on the stage of development, rather than the class level.

- Where there are blank gaps appearing in the Learning Outcomes, does this indicate/imply that there are no expectations to work on particular LOs at particular stages? For example:
    - Strand: Algebra - LO: Expressions and Equations – Blank for Stage 1
    - Strand: Data and Chance – LO: Chance – Blank for Stages 1 and 2
    - Strand: Number – LO: Uses of Number – Blank for Stages 2, 3 and 4
    - Strand Number – LO: Numeration & Counting – Blank for Stages 3 and 4
    - What is the expectation for a child who has not grasped all a Learning Outcome, i.e. entering first class and not having a clear understanding of Number
- Following the subsequent development of 'early a' following the first draft of the PLC, it is important to consider how 'blank' spaces in the overview of LOs will be received by teachers. Ann explanation should be offered to explain the rationale for this.
- Should the Maths curriculum include a definition of 'data' in the main text or Glossary, similar to the definition of 'text' in the PLC i.e. all examples/forms of data.

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

- To assist teachers in bringing the curriculum to life, examples of children's learning and support materials can be found in the toolkit.
- Through the five pedagogical practices, an emphasis has been placed on the process rather than the product.
- An aim of the pedagogical practices is to 'allow for children to learn and develop at a pace and level of challenge that is individual to their needs and interests….'
- Bringing Mathematics outside the classroom and in the home environment is emphasised.
- There is a strong emphasis on developing meaningful dispositions for children.

Areas to Consider:

- Consideration could be given to recognise the Preparation for Teaching and *Learning Guidance*, with particular reference to the three pillars and the visible preparation, which informs the curriculum in practice.
- At the beginning of the document on p.25, it suggests that there are five key pedagogical practices. However at the end of the section, it states that 'it is important to note that this list of

pedagogical practices is neither exhaustive nor hierarchical. Consideration could be given to state this from the beginning.

- Most of the suggested pedagogical practices are very high functioning and need elaboration and differentiation for learners with SEN.
- Although interconnectivity it outlined as being a feature of the listed pedagogical practices it is however open to confusion. In some cases there is an overlap of a key pedagogical practice with the suggestions to develop the practice. For example: 'Cognitively Challenging Tasks' is identified as a pedagogical approach and can be referred to as 'low-threshold, high ceiling tasks' yet low threshold, high ceiling tasks are suggested as part of developing productive dispositions.
- On p.26 it states that 'learning experiences can be found in the progression continua'. Is this message consistent with the PLC?
- To keep in line with the PLC, consideration could be given to define 'dispositions' on p.27.
- The opening section outlines that the pedagogical practices are not hierarchical or linear. However, the message of p.32 suggests that Maths Talk, Maths modelling and productive dispositions lead to cognitively challenging tasks.
- Consideration could be given to include the NCCA Continuum of Assessment to assist teachers in understanding the connections with the Draft PMC.
- Significant consideration needs to be given to the function and role of the Progression Continua in the Draft PMC to ensure that it delivers the same message as the PLC. For example, 'The Progression Continua, found in the Primary Maths toolkit, may be a useful tool for teachers in planning for formative assessment in the classroom'. The Progression Continua in the PLC are not designed to be used in terms of formative assessment.

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

The Primary Mathematics Toolkit Chapter 7 (p.38):

- Chapter 7 of the Draft PMC book is titled 'The Primary Mathematics Toolkit'. However, it highlights an overview of the toolkit. Teachers may misinterpret that this is the entire toolkit.
- In the first paragraph, the language could be considered misleading and somewhat confusing. For example, *'The four components of the toolkit are described in the following section…"* Simpler language to consider might be 'the components of the toolkit are…'
- In the fourth paragraph, the following could be inserted. 'While the progression continua suggest one typical learning journey in Maths …'

Mathematical Concepts:

- Consideration should be given to moving the Mathematical concepts solely to the toolkit as a support material.
- Consideration should be given to presenting the Maths Concepts in Chapter 10 of the Draft PMC and the Language Concepts in Chapter 10 of the PLC in a similar and familiar structure. The PLC is presented through Elements and across Strands, while Maths is presented through Learning Outcomes and across stages. Could the rationale be stated to help teachers to see the connection?

- Are all of the Mathematical Concepts considered as concepts? Some might be categorised as: practical examples/helpful hints/descriptors/glossary/Maths facts. Would the language of Maths ideas/facts/statements be more accurate than Maths concepts?
- By introducing Mathematical Concepts as 'essential', are they considered compulsory? In the PLC, the information in the Curriculum book is considered compulsory and the toolkit is considered optional.
- Table 2 on p. 4 of the toolkit refers to an 'overview of mathematical concepts in the Primary Maths Curriculum'. However, this is not what is shown in the table. The table is an index showing where to find the concepts.
- Example of readability and language used that is may be cumbersome for teachers. See quote from p.39, *'There are 15 progression continua tables, one for each of the LO labels. Each continuum describes the learning journey across 11 progression milestones (a-k). Progression Milestones describe learning in terms of mathematical content and processes. In progression continua, mathematical processes are categorised as 4 key elements – understanding and connecting, communicating, reasoning, applying and Problem solving.'*

Progression Continua:

- The use of the term 'Milestones': Unlike the PLC, in the Draft PMC, the progression steps within each Progression Continua are called 'Progression Milestones a-k'. Consideration should be given to referring to these as progression continuum/continua or progression steps in line with the PLC
- The use of the term 'Milestones': In the PLC, Milestones are a collective summary of the Learning Outcomes across each Strand. Since the roll out of the PLC for Stages 1 – 4 (2019), the progression milestones are not emphasised over the progression continua.
- There are a very large number of progression continua arising from having one for every Element under every Learning Outcome. This is not the case in PLC. Is there a hierarchical rationale for this?
- Many of the words used at steps 'a' of the progression continua use language from the Additional Support Pathways including 'attends' and 'responds' etc. This may render use of the pathways difficult/ confusing. The word 'engages' may be more beneficial to use. Alternatively, if using the language of the Additional Support Pathways such as 'attend, respond' etc, consideration should also be made to include 'experiencing' to acknowledge the learning at that earliest stage.
- Progression Continua: a significant number of the Progression Continua start at 'e' or even 'g'. Consideration needs to be given to some of the following questions.
    - Unless it is clarified that some children will not be expected to work on this LO, it will cause confusion among teachers of children. There needs to be clear instruction around this.
    - What would a teacher of a child with significant needs do in 5th class? (For example, the child might be accessing the curriculum at 'a' – but this is not available). Guidance for teachers around whether this LO applies to every child is needed. Consideration needs to be given to ensure that the Draft PMC is a curriculum for all.
    - Other examples: chance (f/g), variables expressions and equations (e). We must ensure that all children access all of the LOs of the Draft PMC.
- Could a list of prerequisite skills and foundational skills be included in the blank sections of the Progression Continua? Is this the function of the mathematical concepts?
- The Progression Continua for Number only goes as far as milestone (d). This suggests that 'a-d' is sufficient for all Junior and Senior Infant children. What is suggested for the teacher to aid differentiation for exceptionally able children in the Infant class? Similar challenges may arise for teachers of exceptionally able children in first class around the area of numeration and counting, which stops at 'g'.

- The toolkit does make reference to the words 'additional needs', 'special educational needs' or 'inclusion'. Could we encourage use of the term 'all' children/learners.
- The word 'recite' in the progression continua e.g. (Algebra 1 – Patterns, rules and relationships). '*Recites number word sequences forwards and backwards to 10'.* The word 'recites' could cause confusion for teachers, therefore consideration needs to be given to an inclusive definition of what 'recites' looks like for children in all school contexts. Guidance around this suggestion could be taken from how 'text, implements and surfaces' are defined in the PLC. Possible inclusion of such terms should be considered for the Glossary. Other examples include terms such as describe, discuss, justify etc…

Support Materials

- Consideration should be given to including the *Additional Support Pathways* in the *Draft Primary Maths Toolkit*
- Consideration should be given to developing support materials for all children in all school contexts. Drawing on the expertise of the NCSE Primary Curriculum team and the Visiting Teachers for the Blind/Visually Impaired and the Deaf/Hard of Hearing, support materials could be developed collaboratively to support teachers in all school contexts.
- P.21: '*While the Progression Continua suggest a typical learning journey in mathematics throughout primary school, teachers should exercise professional judgement when making decisions as to the learning experiences which are most appropriate for the children in their classroom.'* Theses Support Materials should assist teachers in making professional judgements in creating engaging meaningful and inclusive learning experiences for all children in their classrooms.

Examples of Children's Learning:

- Overall is it difficult to imagine what activities would engage children in learning at the earliest levels of 'a', 'b' and 'c' particularly for some strands and learning outcomes. The PLC does not yet provide support for teachers of children with the highest level of need in the support material. If this is similar for the Maths curriculum, it may be too difficult for teachers to engage with in such contexts.
- Consideration should be given to addressing the concrete – pictorial – abstract representations of children's learning to provide an inclusive approach to Learning Outcomes and Learning Experiences.

Data Protection

The NCCA fully respects your right to privacy. Any personal information which you volunteer to the NCCA will be treated with the highest standards of security and confidentiality, strictly in accordance with the Data Protection Acts. If you require further information related to data protection please visit www.ncca.ie/en/privacy-statement or you can contact the NCCA's Data Protection Officer at dpo@ncca.ie.

Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Organisation submission details

Name	Áine Lynch
Position	CEO
Organisation	National Parents Council
Date	30th September 2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes [x] No [ ]

Please provide some brief background information on your organisation (if applicable).

National Parents Council Primary

NPC submission to the National Council for Curriculum and Assessment on Parents Feedback to the Draft Primary Maths Curriculum

Supporting Parents
Supporting Children

National Parents Council Primary (NPC) is the representative organisation for parents of children in primary or early education. NPC was established as a charitable organisation in 1985, under the programme for Government, as the representative organisation for parents of children attending primary school. It received statutory recognition in the Education Act 1998.

NPC Vision

NPC want to see an Ireland where every child has the opportunity to reach their full potential.

NPC Mission

NPC exists to ensure that all parents are supported and empowered to become effective partners in their children's education. NPC will work to increase the capacity and capability of the primary education sector, to achieve true partnership and deliver better outcomes for all children.

NPC's Key Activities are:

Representing the parents' voice in primary education
Advocacy
Building participation
Service delivery

NPC Service Delivery

NPC services are aimed at empowering parents so that they can support their children in all aspects of education.

Helpline
The NPC helpline is a national confidential service for parents. The helpline staff listen and give information and support to parents to help them make the best possible decisions for and with their children.

Training and Development
The NPC Training and Development programme is a national programme of training, development and support for parents. The purpose is to empower parents to play an active part in their child's education at every level.

Website
The NPC's website www.npc.ie aims to provide parents with information regarding primary education. The site also allows parents an opportunity to give NPC their views regarding primary education issues.

Introduction

The NCCA have developed a draft of the Primary Maths Curriculum and we, the National Parents Council wanted to know what parents thought of it, and what their general opinions are around the topic learning Maths. The Survey ran for just a short period of time, over the course of a weekend and the response rate was very positive with a total of 868 surveys completed. Parents had the opportunity to highlight what they find important about maths learning for their children, as well as being able share what they feel is working well and highlighting what they would like to change. Furthermore, Parents were encouraged to ask their children to fill out a similar survey which was adapted for children.

The vast majority of parents who filled out this survey have a child in primary school at 92% of the total. The other eight percent is made up of families with a child in preschool, secondary school, a special school or they have more than one child at different stages of education.

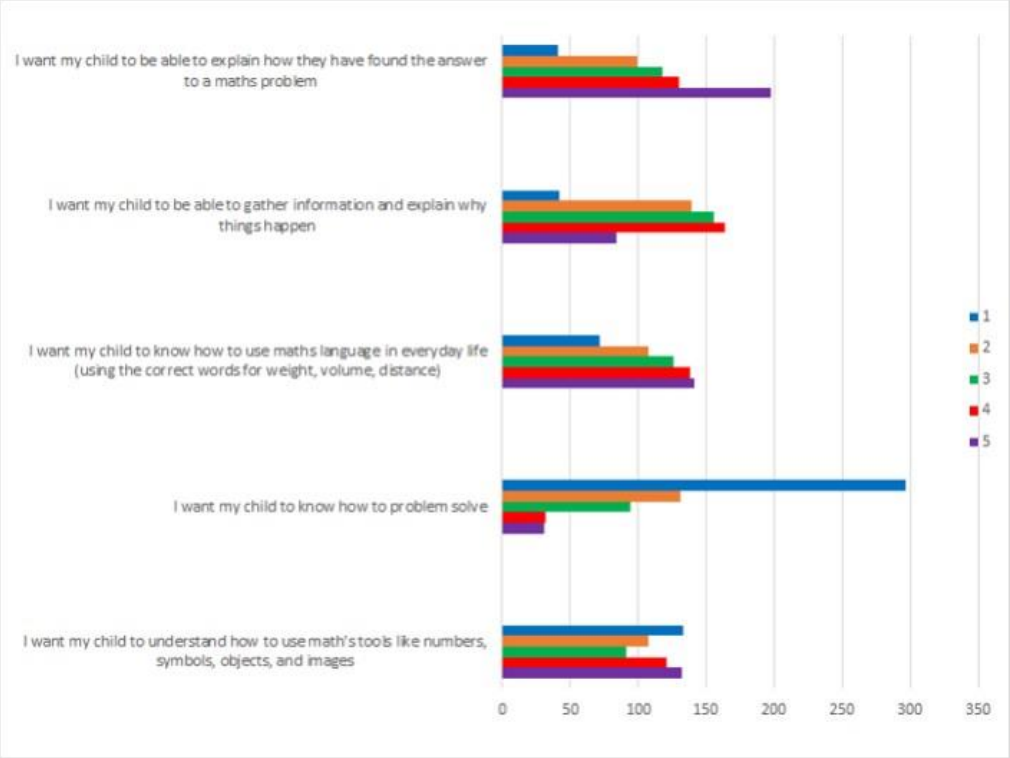
73% of children are in a single grade class making it the most common answer; 19% are in a mixed grade class; 7% attend a Gaelscoil; just less than 1% are in a special class; and barely 1% attend a special school.

Parents views of what is important about learning Maths

A total of 585 parents ranked five statements in order of importance. Knowing how to problem solve was selected as most important by 27% of parents. 20% chose how to use maths tools such as numbers, symbols, objects, and images as their second most important statement. Gathering information and being able to explain why things happen, using and understanding maths language, and being able to explain how they have found the answer to a problem made up the remaining 53% of parent's choices.

The graph below illustrates that an almost equal amount of parents ranked "I want my child to understand how to use maths tools like numbers symbols, objects and images" as their number 1 choice as those who ranked it as their number 5 choice, indicating that parents are divided on the importance of that particular skill. There also appears to be mixed views on the importance of using maths language in everyday life, with similar numbers of parents ranking this as their 2^{nd}, 3^{rd}, 4^{th} and 5^{th} most important skills.

The graph below clearly represents an obvious distinction on parents' views regarding the level of importance relating to children being able to explain how an answer to a maths problem has been found and, for parents who want their child to know how to problem solve with most parents assigning rank 1 or 2 to the skill of problem-solving and most parents ranking being able to explain how they got the answer as 4 or 5 in terms of importance.



We asked parents to rank the following four statements on a scale of 1-4;

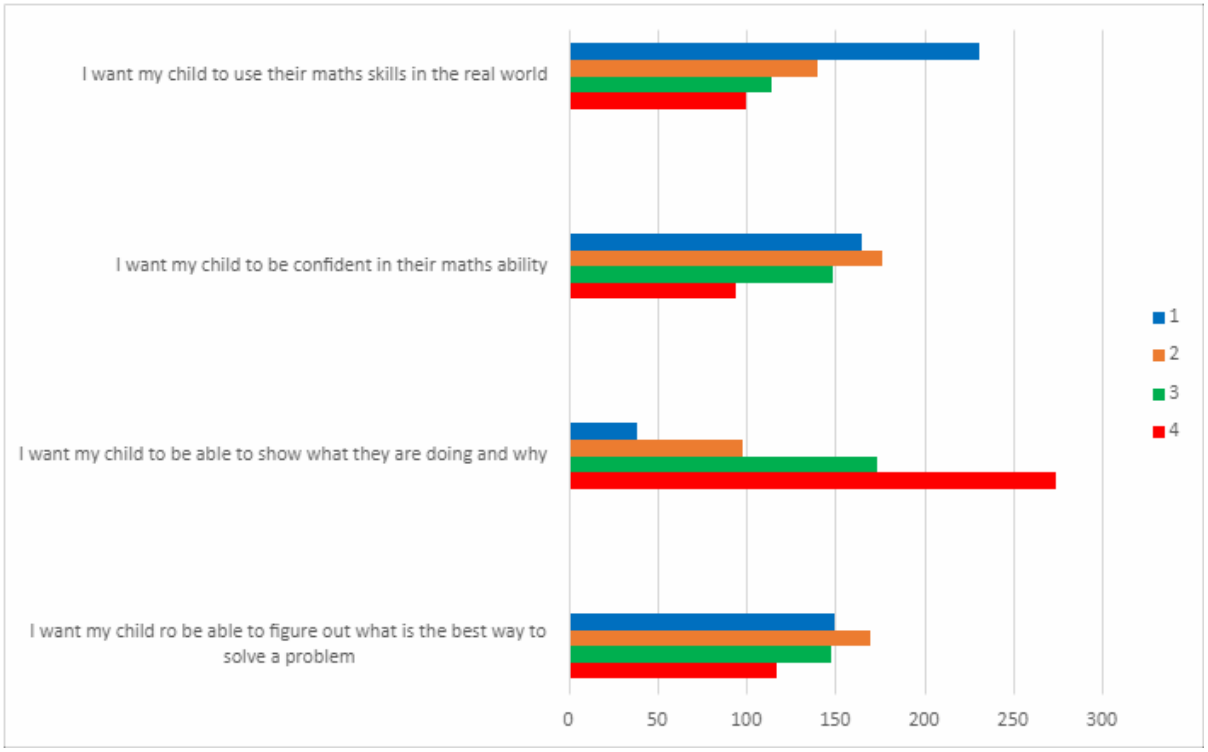
"I want my child to use their maths skills in the real world", "I want my child to be confident in the maths ability",
"I want my child to be able to show what they are doing and why", and,

"I want my child to be able to figure out the best way to solve a problem".

Most parents (29%) selected that being able to use maths in the real world as number 1. Being confident in their maths ability was chosen by 27% of parents as the overall second most important statement.

For the third statement, most parents ranked it at either 3 or 4, this shows that the majority of parent's are more focussed on their children using maths outside of school, being confident, and understanding the best way to solve a problem, and are less concerned about their child being able to show what they are doing and why in comparison.

The graph below clearly illustrates the almost equal statistics across the ranking scale for the fourth statement; so although 150 parents ranked this statement as number 1, 117 ranked it as number 4; both of these are substantial numbers of responses.



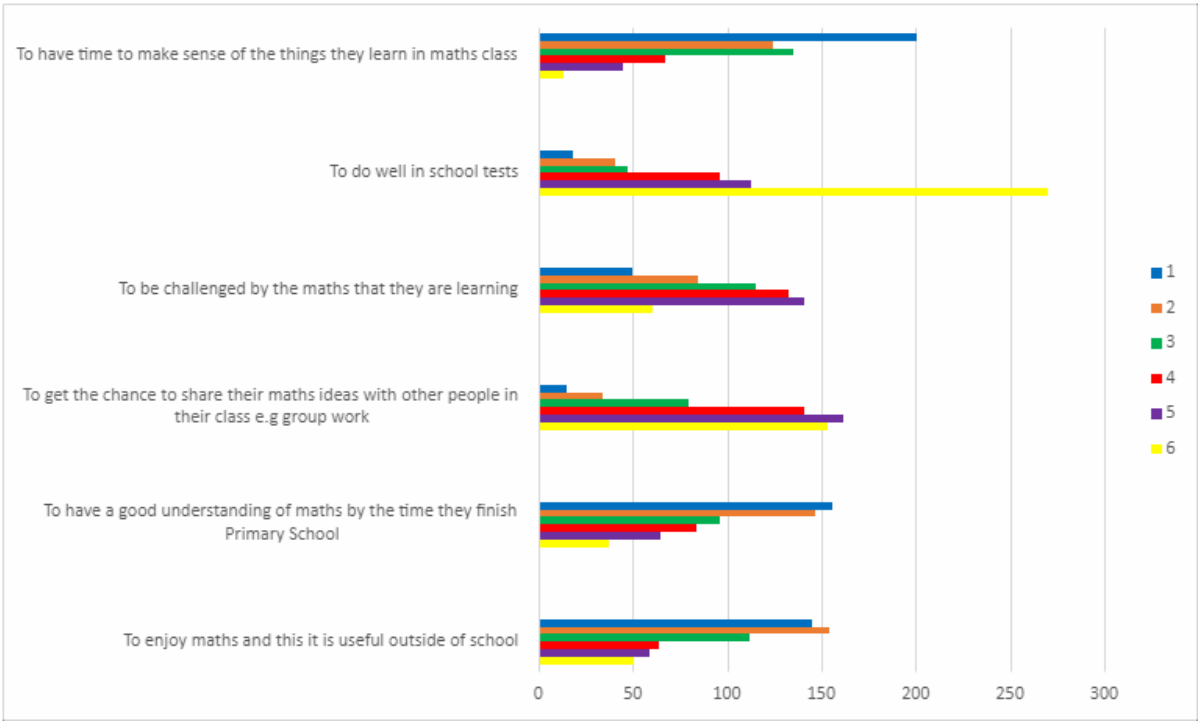
What Parents Feel Children Need in Order to Succeed in Maths Education

Parents responses highlight that children having the necessary time to make sense of what they learn in maths class most important as 34% selected this as number 1 on the Likert scale.

Doing well in school tests was ranked lowest on the scale as 46% of parents ranked it at number 6 and only 10% ranked it at number 1 and, being challenged by the learning was most commonly chosen as between 3 and 5 on the scale.

Children having opportunities to engage in group work and share their learning was ranked on the latter end of the Likert scale with nearly 80% of the parents ranking it between 3 and 6. Similarly, this was reflected in the children's survey for Likert scale responses; however when it came to asking the children what way they would like to learn maths, group work was a common suggestion. Therefore, it is something that appears to be valued but less so on a comparative scale.

To have a good understanding of maths by the time children finish primary school was rated as number 1 by 27%, and number 2 by 25% of parents. These high rankings show that 52% of parents consider this statement as very important. Similarly, 51% ranked enjoying maths and finding it useful outside of school between 1 and 2 on the Likert scale.



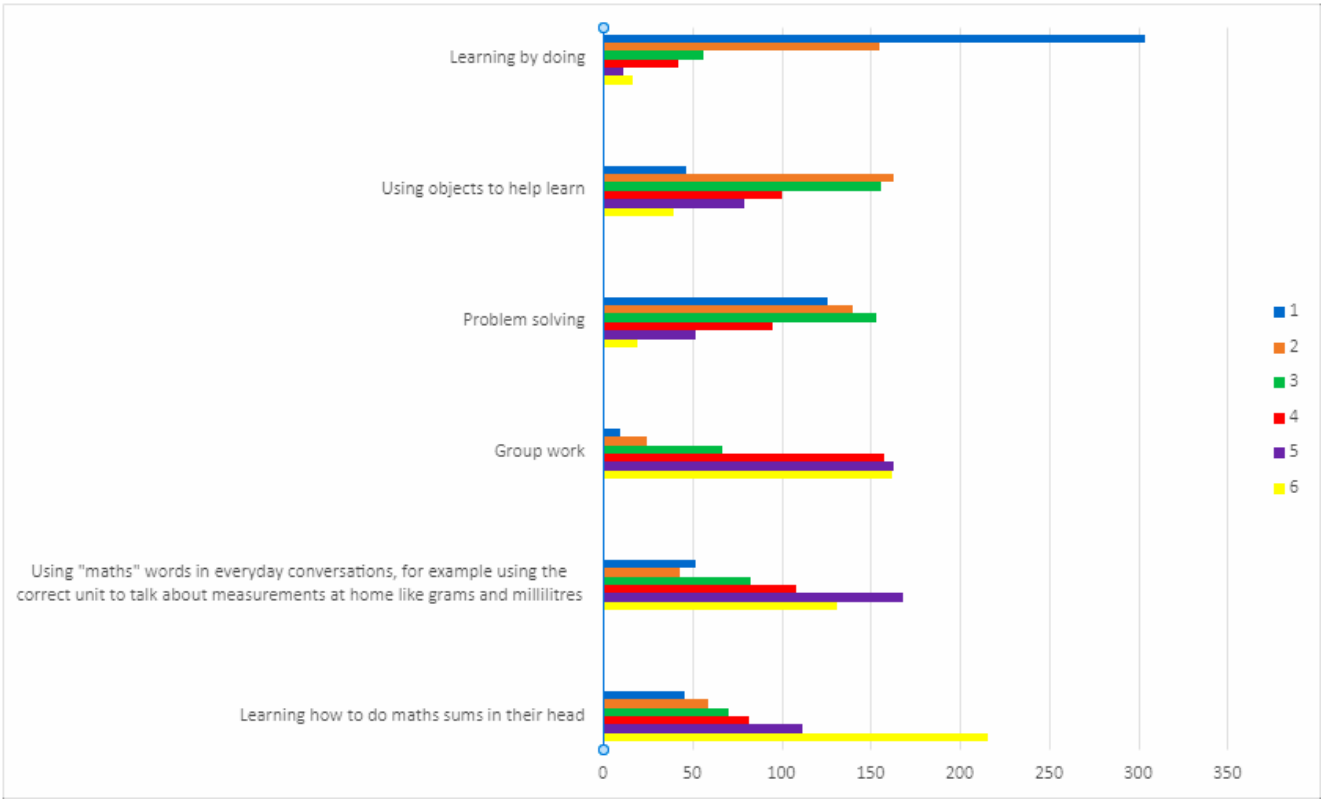
Parents Responses on how Children Learn Best

The graph below shows that "Learning by doing" was the most commonly ranked statement at number 1 on the Likert scale as nearly 80% of parents ranked it at 2 or above and less than 3% voted it at number 6.

Children learning how to do maths sums in their head was the most common statement to be ranked at number 6 on the scale by 37% of all parents. 8 percent of parents voted this as number 1 on the scale and 30% ranked it between 1 and 3 (175 parents).

Using objects to help children learn was ranked in the middle, mostly between 2 and 4 on the Likert scale and group work was more toward the latter end of the scale with the majority of parents selecting between 3 and 6.

The data for this question is best represented in the graph below.



What Parents Feel Could be Removed for Children's Maths Learning

Parents expressed their concern for the level of maths that is being taught, many feel their children are not being challenged enough and they particularly highlighted that having more opportunities to progress in the early school years would be good. However, parents also noted that the maths questions that are literacy dense are over complicated for many children, and for children with dyslexia the riddle-type of questions are very confusing. It was a common response from parents that learning tables off by heart is a memory game and unnecessary and that mental maths takes away from children being able to figure out the problem; while some children find it very easy others find it very difficult.

Parent's Relationships with Maths

Positively, 73% of parents responded that they like maths and feel able to help their child with maths. The next highest statistic was that 12% of parents do not like maths but that feel able to help their child. Another 9% like maths but do not feel able to help their child and 5% do not like maths but do feel able to help their child.

Though most parents are able to help their child with maths, almost 15% of parents say they feel unable to help their child with their maths learning at home.

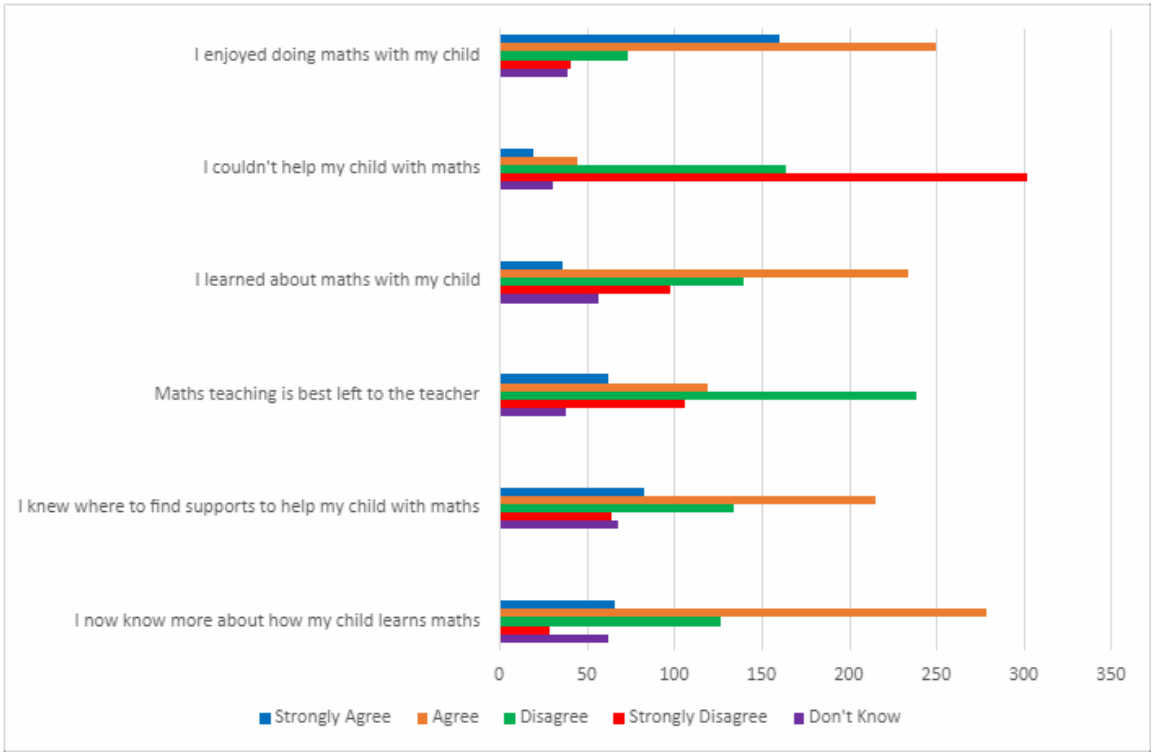
Parent's Experiences of the Covid-19 School Closures

Throughout the Covid-19 school closures, parents and children were faced with some changes in their children's learning at home. More than half (54%), responded that they could help their child with maths during the school closures. Interestingly this is a much lower statistic than the 73% of parents who highlighted that their relationship with maths was good and feel able to help their child.

There was a 3% response from parents who strongly agreed that they could not help their children with maths during the Covid-19 school closures, and a further 8% who agreed to this statement. That is 64 families who struggled with maths learning at home during this period and a further 35% did not know where to find supports.

73% of parents either strongly agreed or agreed that they enjoyed doing maths with their child throughout the school closure and 61% highlighted that they now know more about how their child learns maths.

The Majority of parents (61%) responded that they do not feel that the teaching of maths should be left to the teacher whereas 32% do. In the children's survey there were contrasting statistics as 52% of children feel their teacher is better at teaching maths.

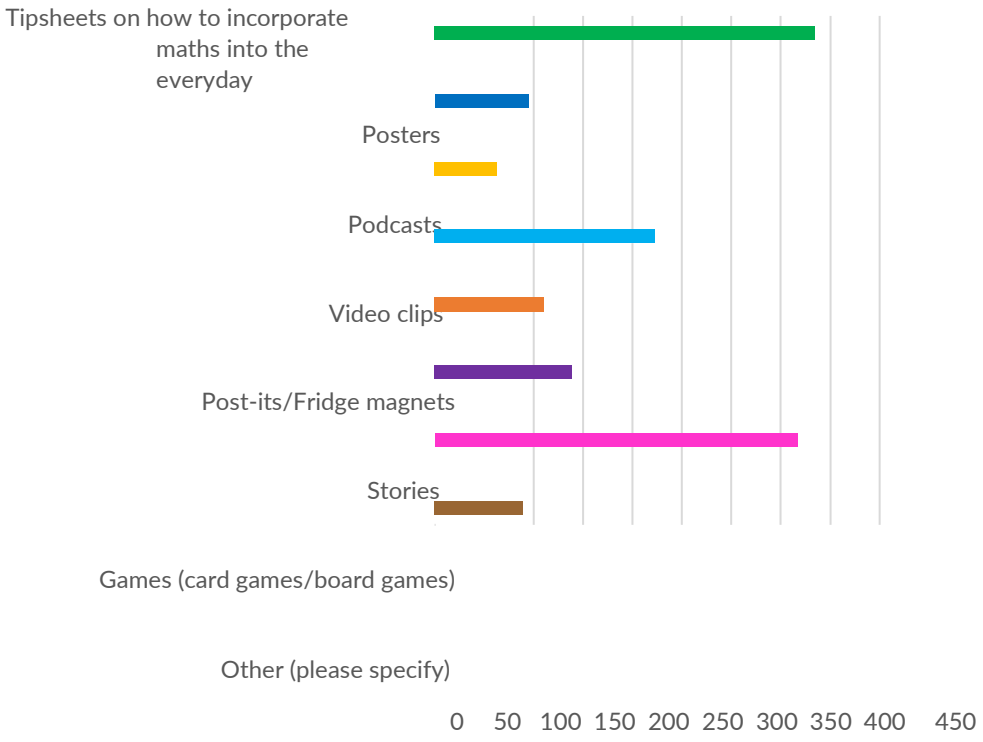


Parent's Feedback on the Supports Needed to Help Children's Maths Learning at home

The graph below clearly illustrates that parent's most preferred supports would be tip-sheets on incorporating maths in the everyday, and games. Posters, video-clips and stories were also highlighted as beneficial.

Parents who had other suggestions for supports commented that having specific supports for individual children's needs would be helpful, such as to support children who did not find their in-school maths challenging, or those who found it too challenging.

A very common concern was of the way maths is taught in schools now differs from how parents learnt it and therefore challenges learning at home. Parents recommended that the areas and topic which are taught in school each month is discussed with parents, that teachers upload videos to the school website or onto the homework application, or that there are in- school tutorials for parents to help their children learn maths.



Parents' Additional Comments on the Draft Primary Mathematics Curriculum

The general consensus from parents' additional comments is that the curriculum is over- simplified, and Ireland should look to other countries' approaches to maths education. Some parents resort to teaching their own versions of maths at home, while others hire tutors for primary school aged children.

There were recommendations to use more maths language, Aistear for older age groups, and

incorporating maths more into the real world. Parents also noted the curriculum needs to support children with learning difficulties and disabilities and that teachers need to be trained how to effectively teach the curriculum to all children.

Children at different stages of learning was an issue for parents, some noting their child is gifted and that they do not have the appropriate support, and others noting their child needs more help to stay on par with peers. Furthermore, many parents noted that they are not familiar with the curriculum and would like more information on it.

Primary (NPC) submission to the National Council for Curriculum and Assessment (NCCA)

Children's Feedback to the Draft Primary Maths Curriculum

Supporting Parents
Supporting Children

Introduction

The NCCA have developed a draft of the Primary Maths Curriculum and we, the National Parents Council wanted to know what children thought of it, and what their general opinions are around learning about Maths. The Survey ran for a short period of time, over the course of a weekend and the response rate was very positive with a total of 196 surveys completed.

Children had the opportunity to share their opinions on their own maths education, what they do and do not enjoy about mathematics, what they find most important about maths, and their experiences from the school closures due to Covid-19.
Of the 196 children who responded, 99% are attending either a primary school or a Gaelscoil. Two of the respondents selected the 'other' category and both stated they are attending preschool.

The respondents involved children from a range of different classes from junior infants to sixth class. Two children noted that they are due to start preschool in September 2022, one finished sixth class in June 2022, and three noted that they are commencing sixth class in September 2022.

While finding out some more about the type of classes children are learning within, 70% highlighted that they have only one grade in their classroom, while 26% have more than one. However, three of the five children who selected 'other' have two or more grades in their classroom and the final two also attend Additional Needs Support (ASN). One of the children attend a special class and one attends a special school.

Children's Feedback on how they feel about Maths

In asking the children how they personally feel about maths there was a positive response by the majority as 54% highlighted that they like maths and that they are good at maths and 16% noted they do like maths but that they find it difficult.

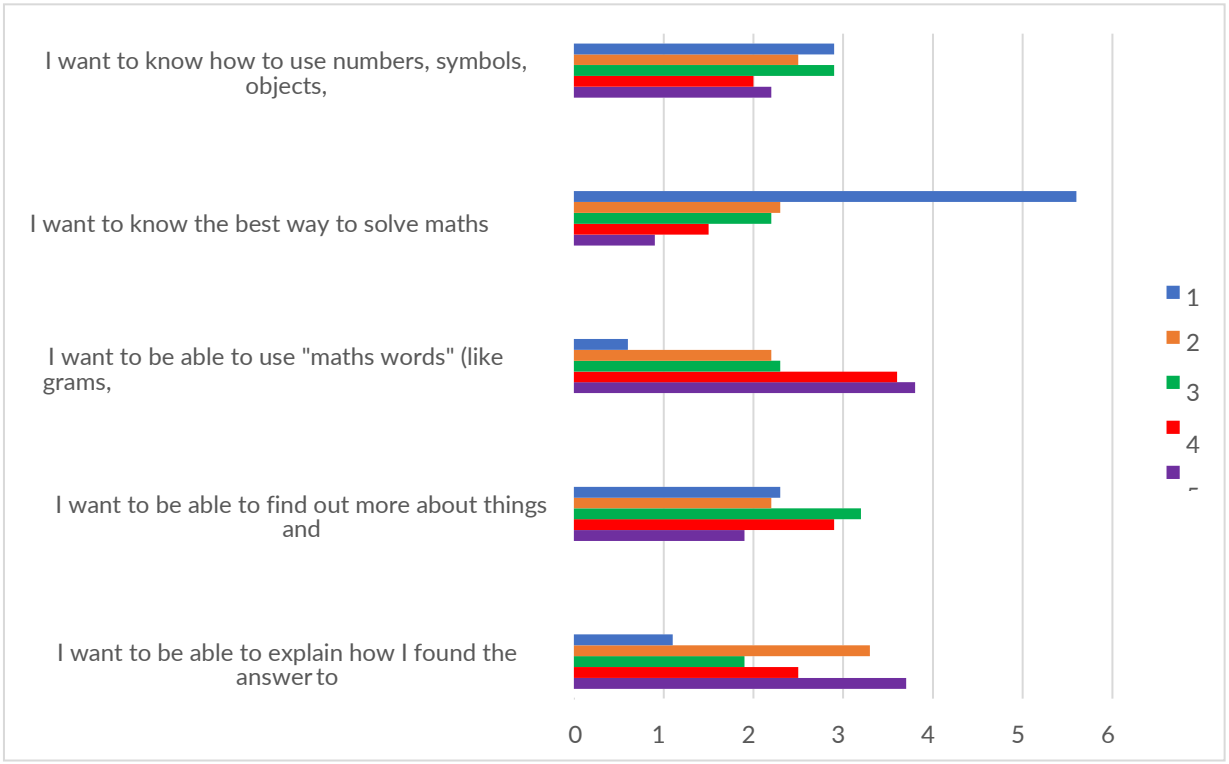
However, in contrast there were 37 children who selected that they do not like maths, 22 of them stated that though they do not like maths, they are good at it and the remaining 15 do not like it but also find it hard.

What Children find Important about Maths

The graph below illustrates that the most common option that children ranked as number 1 on the Likert scale is that they want to know the best way to solve problem. 45% of children chose this as number one and over 80% ranked it between 1 and 3. Reflecting on [question 4 of] the parents surveys, the idea of knowing the best way to problem solve was not as highly regarded in comparison to other options.

Maths language was ranked on the latter end of the scale at either 4 or 5 by 59% of children. Being able to explain how to find the answers to maths problems had mixed scores, 33% ranked it at number2 but 37% ranked it number 5 on the scale.

The graph illustrates the almost even rankings between 1 and 5 for children wanting to know how to use maths tools (numbers, symbols, etc.); 43% ranked it at either 1 or 2 and 34% ranking at 4 or 5. There was a similar pattern in children's responses to being able to find out more about things and explaining why they happen in a maths context, the favoured response however was the middle of the scale as over a quarter of children selected number 3.



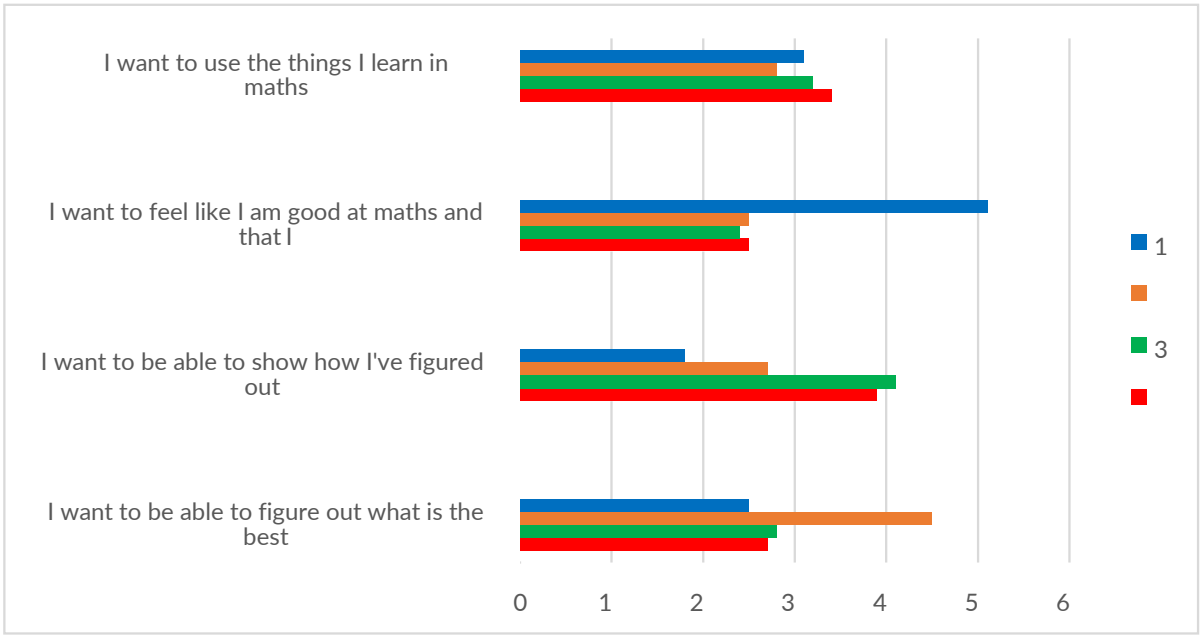
What children want from their Maths Education

Children's responses to the statements shown on the graph below clearly illustrates that children feeling they are good at maths and enjoying it is a number one priority for 41% of them.

Showing how they figure out maths problems is of less importance to them as 64% ranked it as either third or fourth on their scale of importance.

Wanting to be able to transfer skills learnt in maths class to situations outside of school had very mixed responses; between 22% and 27% of children responded at each level on the Likert scale.

Lastly, being able to figure out the best way to problem solve was ranked favourably at number 2 on the scale, however in terms of percentages, 56% ranked it at or above 2, and 44% ranked it at or below 3.



The graph below shows that children's most common priority is having time to make sense of what they learn as 74% ranked this statement between 1-3. This is echoed in the parent survey results as over 55% ranked it highly on the Likert scale. Wanting to do well in school tests was also ranked as highly important as 41% of children ranked it between 1 and 2.

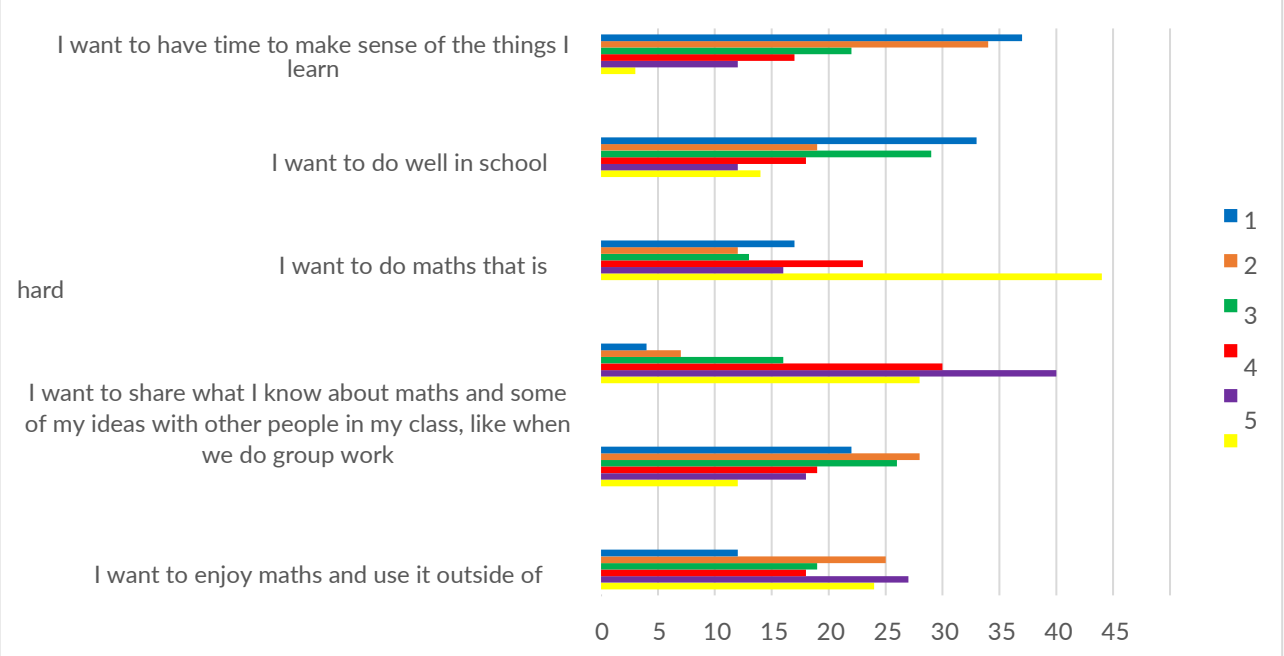
Wanting to do maths that is hard was the least favoured statement and was ranked bottom

of the scale by 35% of children. However, 14% chose this as number 1 on the scale, thus 17 children out of the 125 that responded to this question do want to challenge their maths

ability.

Group work was also commonly ranked on the lower end of the Likert scale with 78% of children ranking it between 3 and 6. Understanding maths by the end of primary school was mostly ranked in the middle of the scale as 58% of children selected between 2 and 4.

Wanting to enjoy maths outside of school was commonly selected at the lower end of the scale as 51% ranked it at either 5 or 6. However, 30% ranked it at either 1 or 2 and the remainder ranked it at 3 or 4.

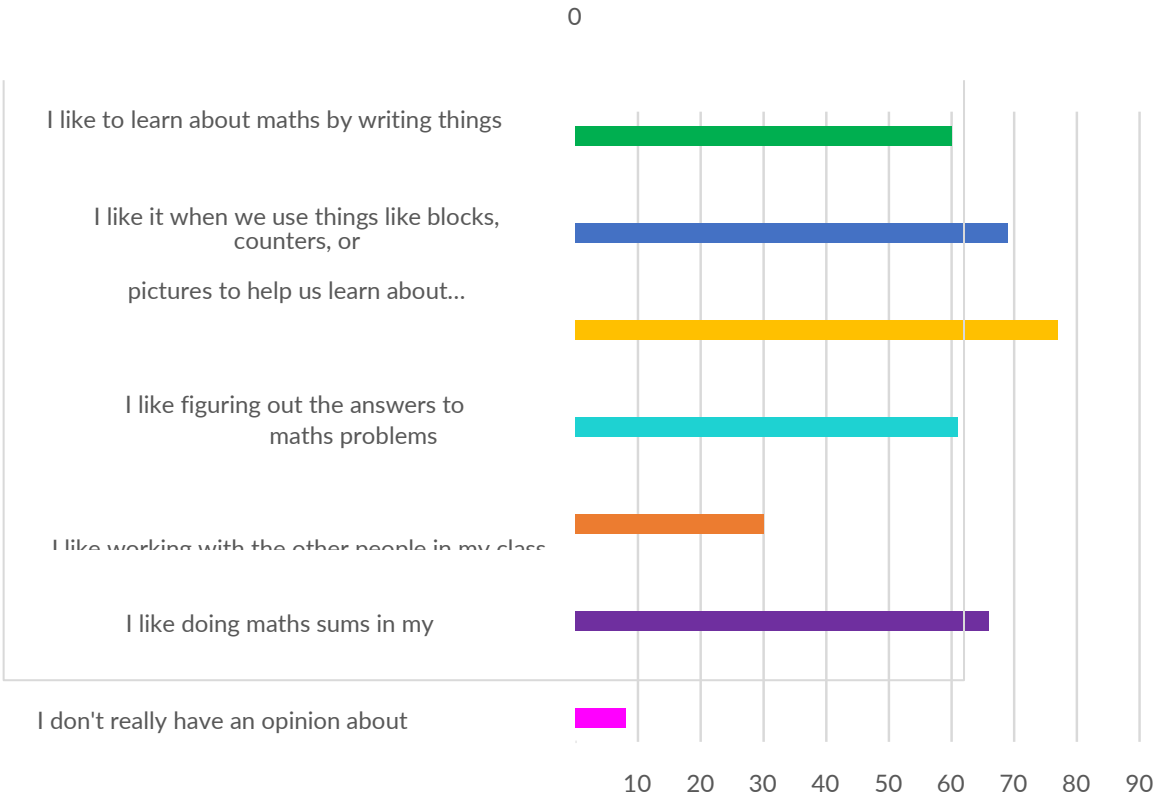


What Children Enjoy Learning about in Maths

This was a multiple-choice question which has allowed children to show the variety of ways in which they like to learn about maths. Figuring out answers to maths problems was the overall preferred learning method as it was selected by 62% of children. Using objects such as counters and blocks was second favourite and was closely followed by children selecting that they like doing sums in their heads.

49% of children selected that they enjoy doing group work. Interestingly, in previous questions where children were asked to rank statements, group work did not appear as a favourite approach to learning; however, in comparison, this statistic shows that although it may not be their favourite method they do still enjoy group work as an approach to learning maths.

Using maths language outside of maths class as a learning support was selected by 24% of children and 6% did not have an opinion along with the 71 children who skipped by this question.



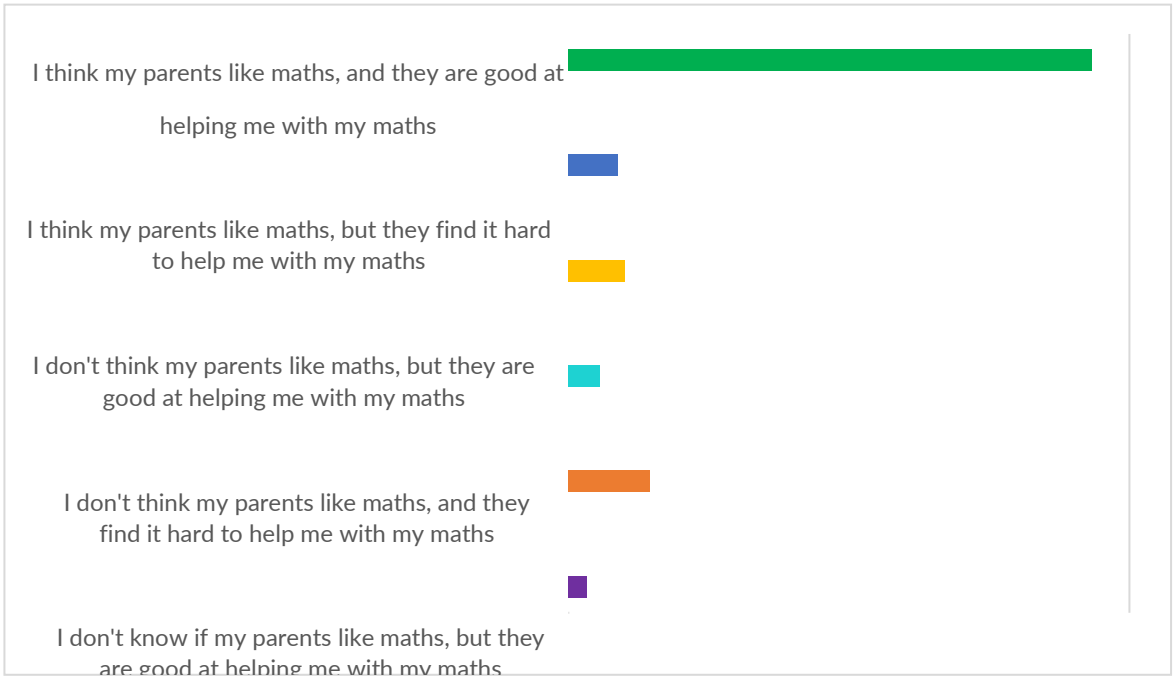
Children's Feedback on the Maths they Would Like to have Replaced

Problem solving, fractions, and written problems were the most frequent topics that children highlighted that they would like to remove from the maths curriculum. Furthermore, "time" was referred to often however it is unclear if the frequency of it being mentioned was in the context of needing more time to understand and practice maths or if it was in relation to the concept of time as a maths topic; however, there were instances where both have been specified by other children for this question.

Children's Responses for if their Parents Enjoy Maths and/or can Help them with their Maths

Referring to the graph below, it is clear that the majority (67%) of children answered that they think their parents do like maths are good at helping the children with their maths. The next highest statistic is that 11% of children do not know if their parents like maths but they can help the children with their maths work. 7% chose that they do not think their parents like math but that they are good at helping the children with their maths. Therefore, the three highest statistics all indicate that children do feel that their parents can help them with their maths work.

Parents liking maths but finding it hard to help, parents not liking maths and finding it difficult to help, and children unsure if their parents like maths but feeling their parents find it hard to help were less common selections, however a combined total of 16 children have parents who find it difficult to help them with their maths work.



Children's Perspectives on Maths Learning during the Covid-19 School Closures

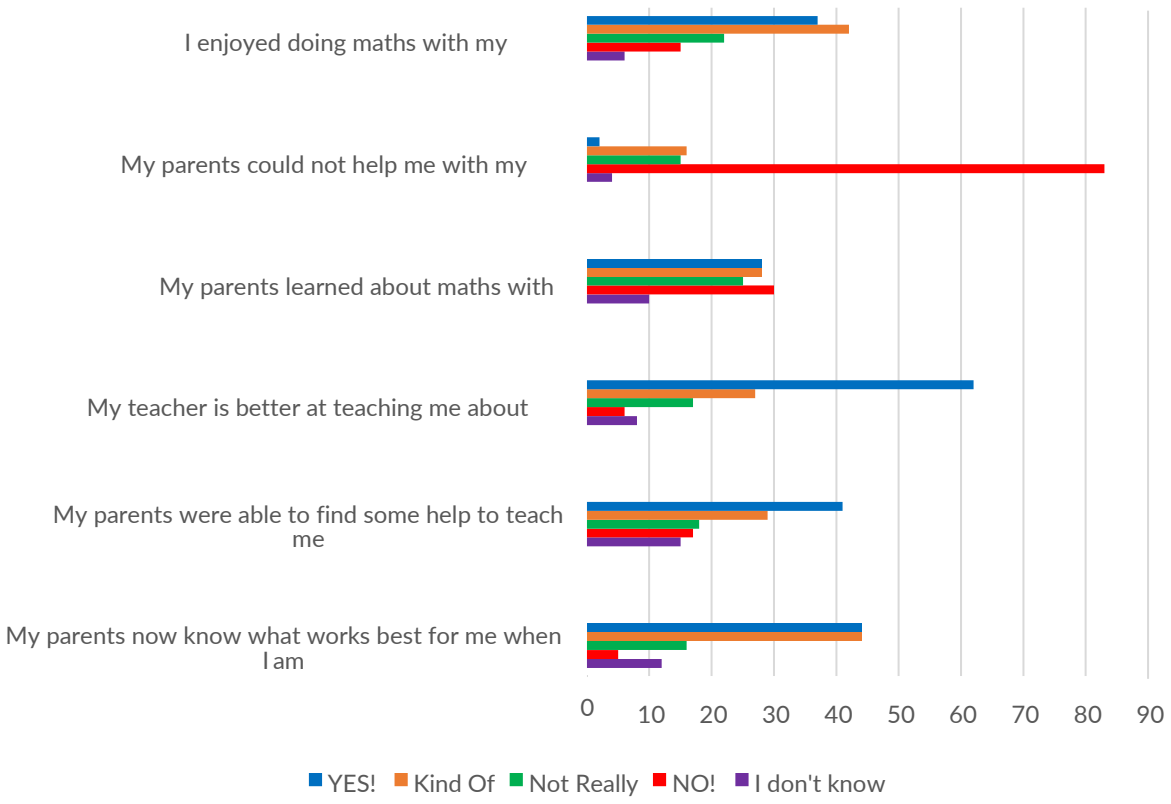
Positively, the data shows that most children felt their parents could help them with their maths, however there were still children who felt their parents could not help them. These statistics concern the period when schools were closed which means that if those children's parents did not have access to what they required to support their child, then the child had limited support for their maths learning at home during this time.

An interesting statistic is that 52% of children suggested that their teacher is better at teaching them about maths; however, only 11% of parents chose this answer in the parent survey. 73% of children selected "yes" or "kind-of" to the statement that their parents now know more about how they learn maths and 65% noted that they enjoyed doing maths with their parents.

65 children noted that their parents learned maths with them, this is potentially a link to parents who commented in the parent survey that the way their children learn maths is different to how the parents themselves had learnt it when they were in school.

Furthermore, 29% of children indicated that their parents did not know where to find the supports they needed to help their children with maths.

Please refer to the graph below for further details of this analysis.



Children's Responses to Various Types of At-Home Maths Learning Supports

The graph below clearly illustrates that children would prefer to have games to help their parents best support their maths learning and furthermore, 43% also recognised that it would be helpful if their parents had tips on how to support maths learning in the everyday context.

In order of preference based on the children's responses, having video clips, fridge magnets, story books, posters, and podcasts would all be very helpful supports to have available.
However, 17% of children selected that they do not want any of these supports at home and 12% selected that they would like something else at home.

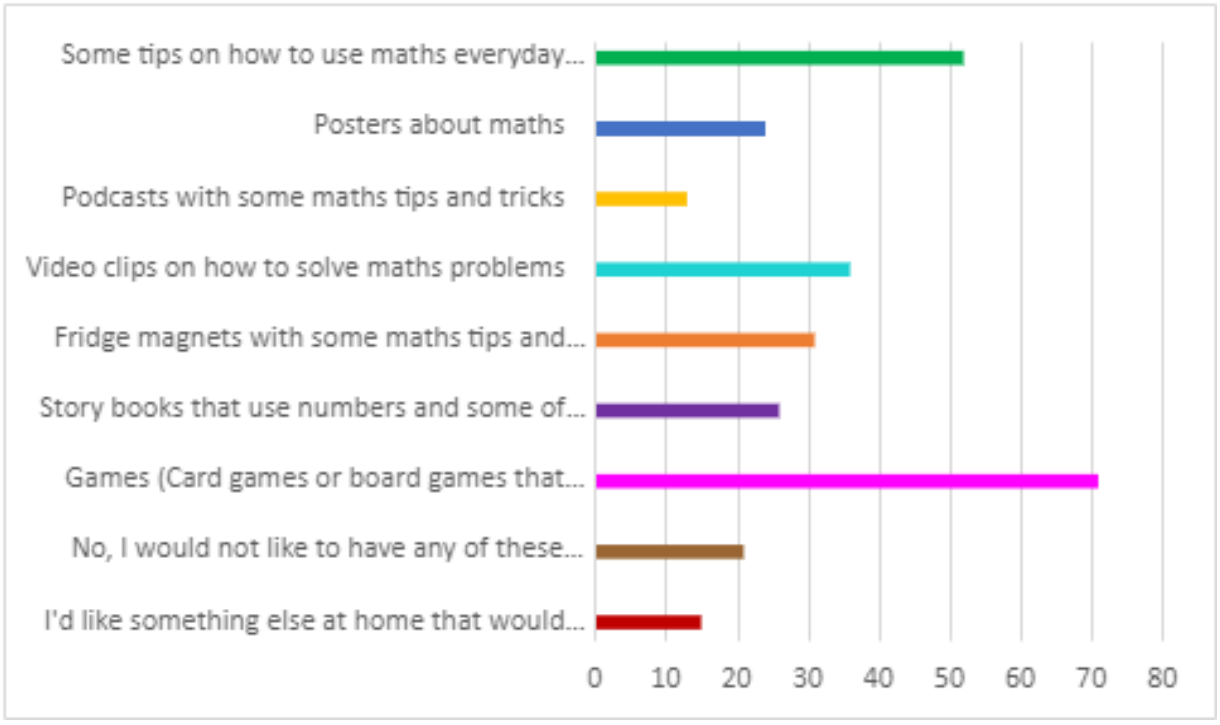
In terms of other supports, children left comments that they would like resources such as a blackboard, whiteboard, abacus, paper, something that "is not incredibly boring", quizzes, apps, computer games, and a tutor.

Children's Additional Comments on How they Believe their Maths Learning Should Look

Group work and making maths learning fun dominated the children's responses to what they think maths learning should look like.

Other comments were to have shorter maths lessons, less tests, and removing reading questions.

Maths learning was referred to as being too easy and it was suggested that it should be possible to progress depending on ability rather than whole class progression.



Draft Primary Mathematics Curriculum

Written submission template for organisations, groups and individuals responding to the *Draft Primary Mathematics Curriculum*

This template is intended to support you (and your colleagues/organisation) in developing a written submission in response to the *Draft Primary Mathematics Curriculum*. Please e-mail your completed submission to pmc.submissions@ncca.ie

Organisation submission details

Name	PACT team
Position	
Organisation	Maynooth University, Department of Computer Science
Date	30th June 2022

The NCCA will publish written submissions received during the consultation. The submissions will include the author's/contributor's name/organisation. Do you consent to this submission being posted online?

Yes ✓ No

Please provide some brief background information on your organisation (if applicable).

PACT team - Programming, Algorithms, Computational Thinking (Maynooth University).

The PACT team at Maynooth University Department of Computer Science develops computer science resources and supports for teachers at both primary and secondary school level. All our workshops, school visits, and materials are available free of charge. Teachers do not need any prior knowledge of computer science to attend our teacher CPD workshops. We specialise in computational thinking, using our resources to increase students' problem-solving skillsets and their engagement in STEM subjects. Our "unplugged" teaching materials are adapted from our involvement as the national representatives developing tasks for the International Bebras Computational Thinking Challenge, through the Irish Computer Society's National Bebras Challenge. Our teacher training and school visit programme is currently funded by Science Foundation Ireland Discover Programme (InSPECT and CoCoA projects) and Maynooth University. Since 2012, our PACT team has directly engaged with over 500 teachers and 25,000 students.

The remainder of the template includes two sections. Section 1 invites your overall comments and observations on the *Draft Primary Mathematics Curriculum*. Section 2 is structured to align with main sections of the draft curriculum.

Section 1

Please outline your overall response to the *Draft Primary Mathematics Curriculum*.

In the *Draft Primary Mathematics Curriculum* there is only one mention of computational thinking: on p. 17 under Element 4: Applying and Problem Solving.

This contrasts with the "*Draft Primary Curriculum Framework"* document which was available for consultation until February 2022, and which explicitly referenced demands to include computational thinking (CT) in the primary curriculum. We strongly support this inclusion of CT, as we believe computational skills are essential skills for children to acquire for their future studies and careers. We would like to see this highlighted also in the primary mathematics curriculum.

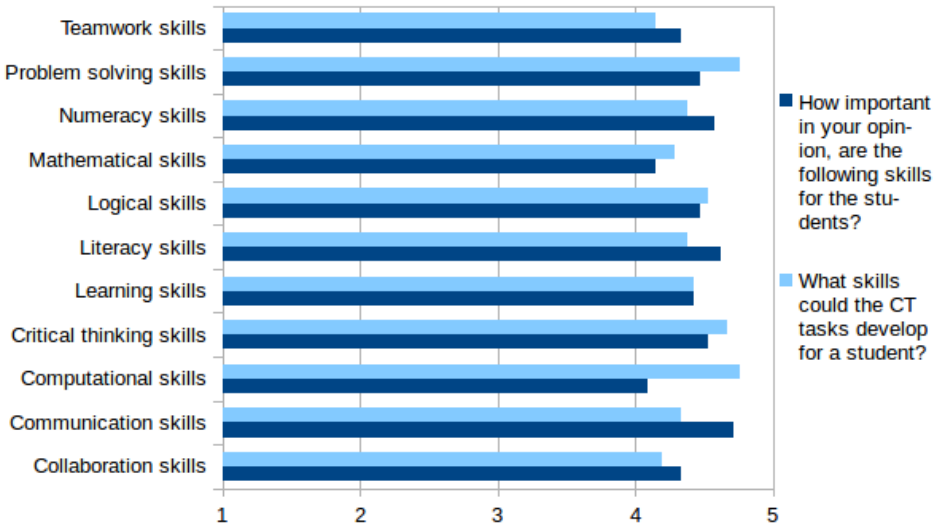
Our suggestion is that computational thinking would be included in a more prominent way, at least to a similar extent as it was in the NCCA's previous (2017) mathematics draft specification. The importance of computational thinking and coding was highlighted several times in the previous draft document *"Primary Mathematics Curriculum DRAFT SPECIFICATION JUNIOR INFANTS TO SECOND CLASS" (2017).* We illustrate this with the following examples from the 2017 document:

- a whole section on page 12: "How does the new Primary Mathematics Curriculum support computational, creative and flexible thinking skills and coding?"
- page 29 Element 4: Applying and Problem Solving
- Appendix I, page 71: "*In July 2016, the Minister wrote to the NCCA requesting that, in the context of the Council's work on primary mathematics, particular consideration would be given to ensuring that every child has an opportunity to develop the computational, and flexible and creative thinking skills that are the basis of computer science and coding."* and *" In light of the audit findings and findings more generally about overload and competing priorities in the current curriculum, the Council recommended that the how, where and when decisions about coding as an integral part of the primary curriculum should be made during, and as part of, the wider review of the primary curriculum in 2017 and 2018, since this review will determine decisions about the purpose, structure, stages, time allocations, and content of a redeveloped curriculum. In the meantime, we can embed the basis of coding—computational thinking, and flexible and creative thinking skills—in the new curriculum specification for mathematics currently under development."*

It is important to note that computational thinking is a wider problem-solving skill set that is distinct from coding. While the skills developed are an aid to coding, they can be taught in a school setting without need of extensive training for teachers. The tasks are unplugged, meaning that they can be delivered in the classroom without computer equipment that schools are often lacking. Computational thinking activities allow all learners to participate.

Including computational thinking in the primary mathematics curriculum would make the transition from primary to secondary school easier. Although all of our CT materials target key CT and computer science (CS) concepts, they also teach other curriculum-relevant skills as shown through feedback from teachers who have been working with us in our CT workshops. In teachers' opinions, solving CT tasks improve the following skills in students: teamwork, collaboration,

communication, mathematical, numeracy, literacy, learning, logical, critical thinking, problem solving, and computational skills. These are the skills that received a rating from "very" to "extremely" to the question of how much a particular skill could be developed by students using CT tasks (scale: 1-not at all, 2-slightly, 3-moderately, 4-very, 5-extremely). All these skills were also considered "very" to "extremely" important skills for the students to have, in teachers' opinions.



The draft curriculum should further promote the development of computational thinking skills, strengthening the link to the Framework for Junior Cycle key skills of Managing Information and Thinking and Being Numerate. In addition, computational thinking also links with the Aistear's focus on play, tactile problem solving, and the Aistear theme of Exploring and Thinking.

For Ireland to continue improving its attainment levels in international assessments such as PISA and TIMSS, recognising the importance of problem solving and computational thinking in the Primary Curriculum Framework is essential. The mathematics component of the PISA tests now explicitly incorporates computational thinking, and PISA national representatives are currently discussing including computational thinking as a separate line item for country ranking.

We have found that unplugged computational thinking activities our team has offered to teachers have been a very successfully taken up in primary and secondary schools, supporting teachers in facilitating Cognitively Challenging Tasks in the classroom in the ways suggested on page 32 of the draft curriculum. Examples of our materials include a computational thinking obstacle course which encourages collaboration and activity based problem solving, a computational thinking workbook (https://pact.cs.nuim.ie/pages/workbooks.html) for primary school students, as well as seasonal tasks which link to key dates and activities in the school calendar.

Specific locations where it would be appropriate to mention computational thinking

The current draft primary mathematics curriculum specification refers to problem solving in several places that are effectively computational thinking, but do not refer to computational thinking. These places would be specific opportunities to clarify what is proposed by using the term "computational thinking" that is already in widespread use. For example:

- *Procedural Fluency p. 14: "The curriculum aims to provide children with opportunities to create their own informal strategies and to integrate new concepts and maths procedures as they build on these strategies. It aims to support children to justify the use of commonly used mathematical procedures and informal strategies, and through this, to strengthen their understanding and skills."*

  The field of computational thinking defines and explains many of these specific strategies, and could be mentioned as an example to allow teachers to understand exactly what specific strategies are being referred to here.
- *Procedural Fluency p. 14: "Children should be encouraged to apply procedures accurately, efficiently and flexibly; to transfer procedures to different problems and contexts; to build or modify procedures from other procedures; and to recognise when one strategy or procedure is more appropriate to apply than another."*

  The procedures referred to here is a broader set than the long division, long multiplication, etc., textbook procedures, however, it is not made clear. In fact, this paragraph contains several descriptions of concepts central to computational thinking, and formalised in computational thinking, without referring to computational thinking. For example, the specification could refer to algorithms as an example of the procedures referred to here. Further, the computational thinking concept of generalisation is exactly the concept of transferring procedures to different problems and contexts. It does not have any other name in the field of mathematics/computer science, so its correct name could be used here.
- *Applying and Problem Solving p. 17: "Children should investigate, develop, select, apply, interpret, model and compare a variety of problem-solving situations and strategies as they explore mathematics and deepen their mathematical understanding. They should apply their mathematical knowledge and skills in flexible, efficient and creative ways to solve problems, conduct investigations and develop their computational thinking."*

  It is positive that computational thinking is mentioned in this paragraph, but the paragraph is ambiguous. For example, what exactly is meant by *"variety of problem- solving situations and strategies"* -- we know what this means in the field of computational thinking, so the authors should state they mean computational thinking strategies, or else give examples from mathematics that are not computational thinking.
- p. 32: The section *"Suggestions for the provision of Cognitively Challenging Tasks"* has several suggestions that would be facilitated with unplugged computational thinking puzzles and activities, if the authors wished to include concrete examples for teachers.
- p. 34: The section *"Suggestions for promoting Maths Talk"* could include a mention of unplugged computational thinking puzzles. The maths talk mentioned here is a standard feature of teams of pupils tackling computational thinking puzzles (e.g. Bebras tasks) and ending with a whole-class discussion of the strategies used.

Section 2

Rationale and Aims [see pages 9 – 14]

The rationale for the *Draft Primary Mathematics Curriculum* addresses the importance of mathematics in children's lives, while the over-arching aim of the draft curriculum is the development of mathematical proficiency.

Please give your overall feedback in relation to the Rationale and Aims.

We are very pleased to see aspects of computational thinking included in the Aims section of the draft in the *Adaptive Reasoning* in page 13 (e.g. logical thought, reflection, explanation, and justification) and the *Strategic Competence* in page 14 (*solving problems in variety of ways, first understanding the problem or situation and its key features, and then framing or representing the problem*). However, it would be good to also use the actual term *computational thinking skills* in the description.

The section below was included in the Introduction of the *"Primary Mathematics Curriculum DRAFT SPECIFICATION JUNIOR INFANTS TO SECOND CLASS" (2017).*
We would like to see an
equivalent section in the new Draft Primary Mathematics Curriculum because it highlights the importance of computational thinking:

> ***"How does the new Primary Mathematics Curriculum support computational, creative and***
> ***flexible thinking skills and coding?***
> *There has been much public interest in the question of the place of coding in the primary curriculum and of the relationship between the wide range of coding initiatives currently in primary schools and the curriculum, particularly the mathematics curriculum. Following a request from the Minister in July 2016, NCCA undertook to clarify, tease out and explain, through its planned development of a new mathematics curriculum, the relationship between coding and mathematics at this level of children's education.*
> *Essentially, primary mathematics lays some of the foundations of coding through its emphasis on computational, creative and flexible thinking skills. Mathematical experiences and activities designed to develop these skills involve children solving complex problems, in which they are encouraged to break the problem down into steps, analyse the parts of the problem, prioritise relevant information and drawing on existing understandings, reason their ideas and evaluate their solution.*

Curriculum structure - *Strands, Learning Outcome Labels, Elements and Learning Outcomes* [see pages 15 – 24]

The *Draft Primary Mathematics Curriculum* is structured according to five Strands: Algebra; Data and Chance; Measures; Number; Shape and Space. Attached to these Strands are 15 Learning Outcome Labels, which contain Learning Outcomes for each stage.

Mathematical processes are categorised into four Elements: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving.

Our feedback from teachers indicates that the inclusion of computational thinking in the primary mathematics curriculum will develop the four elements of the Primary Mathematics Curriculum: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving. This has been highlighted in our previous work where skills such as teamwork, collaboration, communication, mathematical, numeracy, literacy, learning, logical, critical thinking, problem solving, and computational skills were identified as those developed by our CT materials (see section 1 of this document).

Please give your overall feedback in relation to the curriculum components mentioned above.
Please quote full text of any learning outcome you wish to draw attention to.

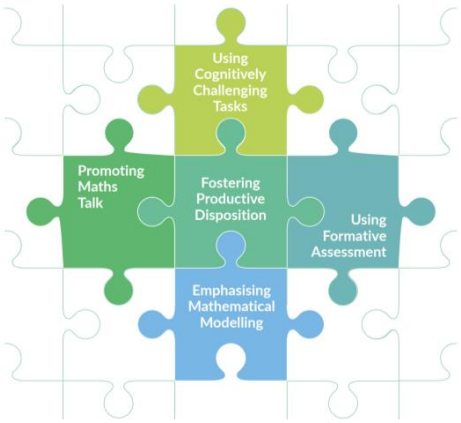
We are very pleased to see computational thinking mentioned as part of one of the four elements in *Curriculum Elements* (Element 4: *Applying and Problem Solving*, page 17).

However, the importance of computational thinking is not mentioned as it had been in previous NCCA documents concerning mathematics "Primary Mathematics Curriculum Draft Specification Junior Infants to Second Class" (2017) and "Primary Curriculum Framework" (available for consultation until February 2022).

Our feedback from teachers indicates that the inclusion of computational thinking in the primary mathematics curriculum will develop the four elements of the Primary Mathematics Curriculum: Understanding and Connecting; Communicating; Reasoning; Applying and Problem solving. This has been highlighted in our previous work where skills such as teamwork, collaboration, communication, mathematical, numeracy, literacy, learning, logical, critical thinking, problem solving, and computational skills were identified as those developed by our CT materials (see section 1 of this document).

The Primary Mathematics Curriculum in Practice [see pages 25 – 37]

The *Draft Primary Mathematics Curriculum* proposes five key pedagogical approaches which underpin and embody a new vision for children's learning in terms of teachers' everyday practice.



Please give your overall feedback in relation to these key pedagogical approaches.

We are supportive of the five key pedagogical practices, especially the section of *Using Cognitively Challenging Tasks* (page 31). Computational thinking tasks are a good example of this type of cognitively challenging task.

We suggest following added bullet point to the list of "*Through engaging with and experiencing Cognitively Challenging Tasks, children*" on page 31.

- will build their computational thinking skills

The sections on *Fostering Productive Disposition*, *Promoting Maths Talk*, and *Emphasising Mathematical Modelling* reflect our views of what is important from a computational thinking perspective.

Primary Mathematics Toolkit

The Primary Mathematics Toolkit will contain four components: Mathematical Concepts, Progression Continua, Support Materials and Examples of Children's Learning. For consultation, the *Draft Overview of the Primary Mathematics Toolkit* contains Mathematical Concepts, Progression Continua and 11 Support Materials.

Please give your overall feedback in relation to the supports outlined and suggestions on additional supports.

We are ideally placed to provide support materials for Cognitively Challenging Tasks. We have a workbook already designed and printed, along with supporting teacher materials, for 3rd- 6th class. Professional printed copies (20,000 copies, funded by Science Foundation Ireland's Discover Programme grant no. 18/DP/5887) are currently being distributed (free) to partner primary schools nationwide. We also have a computational thinking workbook for 1st – 2nd class in preparation. The workbook is available electronically (for free) at https://pact.cs.nuim.ie/pages/workbooks.html.

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