

Supporting inclusive practice when teaching Time

Learning Outcomes associated with Time

- Stage 1:** Through appropriately playful learning experiences children should be able to develop a sense of time and its purpose.
- Stage 2:** 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.
- Stage 3:** 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.
- Stage 4:** Through appropriately engaging learning experiences children should be able to solve and pose practical tasks and problems involving the interpretation and calculation of time.

Introduction

Time, a Learning Outcome Label in the Measures strand of the Primary Mathematics Curriculum is a core mathematical skill for all children. It is an essential life skill which will support them to understand and manage their daily life activities and enable them to engage independently in society. Time is a complex skill and a difficult concept for some children to learn. This is due in part to the fact that it can be neither seen nor felt. The wide range of measurement options ranging from minutes, days, weeks and months to years by tools using analogue, digital and calendar formats further complicates the learning process. Maximising the potential of each child will be achieved through a teaching programme which is informed by assessment and delivered using evidence-based pedagogical approaches.

Tips for Teachers

Some children's understanding of time will be centred solely on their **individual everyday life situations**; while others will develop a **broader in-depth concept of time**.

Building the foundations for learning time

Telling the time requires a **complex skill set**. Children need to **understand the concept of the passing of time and to acquire the skills for measuring time** (including analogue and digital clocks). They need to learn that time has two attributes that can be measured – **the time an event took place** and the **length of its duration**.

Foundational Skills for Telling the Time

Identify numerals to 12

Count in 1s to 12

Count in 5s to 60

Conceptual understanding of $\frac{1}{4}$ and $\frac{1}{2}$

A firm understanding of elapsed time is a critical early step in acquiring time skills. Some basic number skills are required before children are ready to learn how to tell the time (Refer to Foundational Skills). Proficiency in counting on also provides a base for calculating time problems. Teaching the units of measurement e.g. seconds, minutes, hours, days etc. is an important aspect of developing a conceptual understanding of time. The active involvement of children in timing short events and in creating visuals of events of similar duration is an effective means of learning these concepts.

1 minute	10 minutes	One hour
Brush my hair	Drive to school	Swimming lesson
Put on my shoes	Circle Time	Football training

Digital and analogue clocks

Telling the time digitally is a **core life skill**. Children generally find it easier to become proficient in telling the time in this manner. However, telling the time on a digital clock may not equate with a conceptual understanding of time. The **analogue clock** has the advantage of providing visual images of elapsed time to illustrate the relationship between minutes and hours and is therefore a **highly recommended teaching tool** for teaching the **concept of time** and for **solving time problems**. The teaching sequence begins with the analogue clock. Using a one-handed clock (hour hand only) is a means of providing additional support for some children. Making the associations explicit between the digital and analogue clock from the earliest stages supports children's learning. While most children will learn how to tell the time in analogue and digital format simultaneously, others may benefit from being taught understanding and proficiency in one format initially. **(Butterworth & Yeo, 2007)**



Establishing a baseline of children's understanding

Given the **complexities of teaching and learning time**, a **critical first step** lies in the **identification of children's baseline knowledge** of the **pre-requisite number** and **time** skills. This will support the understanding of their existing knowledge and identify their baseline of foundational skills before introducing new concepts and skills. Working within a continuum of assessment framework, class teachers and special education teachers (SETs) use complementary assessment approaches ranging from informal assessments such as their professional judgement and children's self-assessment to formal, planned assessment measures.

Teachers will develop their initial understandings of children's baseline knowledge intuitively. Informed by children's learning experiences to date and by their interaction with time related activities in their daily life experiences, teachers will begin to form their professional judgement of children's baseline skills. They may find it useful to document their anecdotal observations systematically as a first step in the teaching and learning process.

The *Time Assessment Pack* available at <https://pdst.ie/primary/stem/mathematics/measures> is a useful criterion-based assessment. Comprised of two sections, the *whole class assessment* is suitable for use by class teachers. The *individual assessments* are particularly useful for children who are at the early stages of their learning trajectory or for those struggling to acquire foundational concepts and skills. Generally undertaken by a SET or a special class teacher, the individual assessment evaluates skill level at three stages – concrete, pictorial/representational and abstract (See Concrete/Representational/Abstract Framework

below). Informal assessment tools such as teacher observation and teacher designed tasks will generate the necessary data to complete the whole class and individual assessments.

Monitoring learning progress

Ongoing **assessment of progress** is **essential** to **inform future teaching** and learning. Keeping a tight link between assessment of progress and teaching interventions on target skills is especially important for children who find it difficult to acquire the conceptual and procedural aspects of time. Teachers' professional judgement based on their observations plays an important role in this process. **Quick and frequent checks** using a template to aid recording are useful for monitoring progress.

Asking the child to explain their thinking and solution (sometimes with a focus on an error – diagnostic interview) is a simple and quick way to obtain diagnostic information. It may also be useful to keep a record of error analysis data. The diagnostic process, initiated by the class teacher and supported by the special education teacher will lead to increased outcomes for children who have difficulties with time.

Evidenced-based pedagogical strategies for teaching time

Evidence-based pedagogical strategies support the teaching of time to all children. Teacher demonstration, guided practice and independent practice are key features of effective pedagogies when teaching mathematics. Providing frequent opportunities for children to actively engage and respond to mathematical activities and incorporating constructive feedback into lessons are also essential elements of the teaching and learning process.

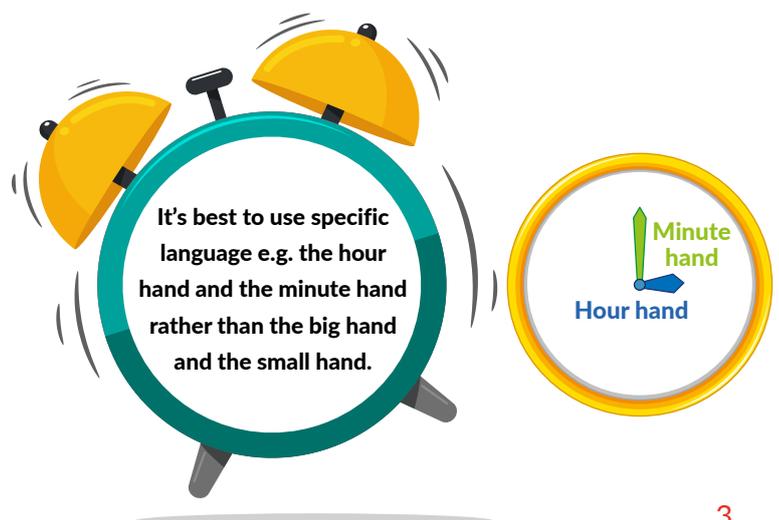
Meaningful contexts for learning

Activity	Start Time	Finish Time	How long did it take?
	7.50	8.00	10 minutes
	8.15	8.30	15 minutes

Children's personal experiences are central to developing their conceptual understanding of time. Using these experiences in school and at home will enable children to begin to sequence familiar events in their lives e.g. *I brush my teeth after breakfast and before I go to school.* Comparing the duration of daily experiences of differing durations will support the development of the concept of elapsed time.

Mathematical language

Teaching the **language of time** gives children a verbal tool to support their **conceptual development**. It is therefore **an essential component of teaching and learning** for time related skills. Children learn best when their teachers use the specific language associated with the concept. Maths language should be clearly explained in meaningful contexts, such as those outlined in the previous section.



Visual representations or images of the language are helpful for many children. These could be on display in classrooms (Maths Word Wall) and/or documented in the children's individual Maths Journals (define and visualise/represent key language and procedures). Use the language on a regular basis in everyday and practice-based contexts at home and in school. It is best to communicate with parents in order to ensure a consistent approach to maths language in home and school settings.

Home / school linkage

Incorporating informal references to time throughout the day, both at home and in school on a daily basis is an effective way of learning about time and increasing achievement for all children. When teachers and parents describe the time of an event, children become aware of various times in their daily lives – *We went swimming yesterday, Tuesday is P.E. day, it's Tom's birthday tomorrow.* Incorporating the time of the event and/or its duration marks a development of this step – *we eat our lunch at 1 o'clock, we have ten minutes to play at Small Break etc.* In this way, children begin to make associations with specific times and begin to make meaning of these times and events.



Playing **maths games** at home and in school provide fun and engaging opportunities to learn the language of time and to use time skills in daily life – using games relevant to the current learning outcomes is particularly effective. Reading stories about time to children is another very practical way of teaching the concept of time.

Visual supports

Using **visual schedules** to depict the class timetable for a day or for an individual class gives a visual image to the passage of time. **Visual timers** such as sand timers and digital timers (with visual features) for specific time periods e.g. a five-minute activity aids a deeper understanding of elapsed time. **Visual Arts activities** such as a comic strip or the life cycle of a butterfly, can be used to visualise the passing of time learned in subjects such as Social, Environmental and Scientific Education.

Time-themed books can enhance learning by providing a context for a time related skill, can support understanding and generalisation and may also increase children's interest in the topic. Reading or listening to a story about time is an excellent first step when teaching the concept. Children should have access to time-themed books during independent reading time and should also be facilitated to take these books home for home reading. Examples of suitable books include – *Just a Second, A Second is a Hiccup, Me Counting Time, What's the time, Mr. Wolf? The Bad-Tempered Ladybird, The Tortoise and the Hare, The Very Hungry Caterpillar.* Children with more advanced time skills would enjoy stories featuring, for example, historical timelines, the history of telling the time and lifecycles (butterfly, an old oak tree, autobiographies).

Telling the time

Use multiple representations in the context of the **Concrete, Representational, Abstract** framework (CRA) to teach the procedural skill of **telling the time**. Use a real clock (analogue) to introduce the clock face (Concrete stage). Follow this with a drawing/pictures of a clock face or online teaching clocks (Representational/Pictorial stage). Using numerals only is the final stage in the teaching sequence (Abstract stage).

Concrete Representational Abstract (CRA) Framework

Teaching sequence 



Concrete = Use a real clock



Representational = A drawing of a clock

6.15

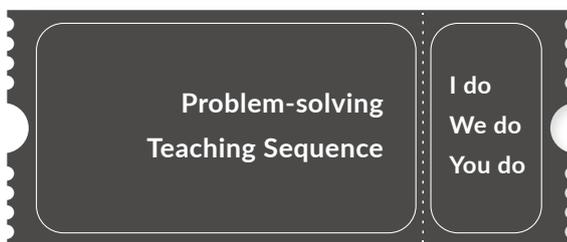
Abstract = Numerals only

Intervention sequence 

To ensure access to learning for all, each of the three stages may be used simultaneously. Keeping in mind that the abstract level is the goal of learning, it may be useful for many children to experience learning at the concrete and representational levels simultaneously. For others, it may be useful to experience a reverse learning sequence. For example, a child experiencing difficulty at the abstract stage may benefit from visuals or representations of the clock face. Using a real clock (analogue) (concrete stage) will provide further support and aid a deeper understanding of this difficult skill. In this digital age, replacing the concrete stage with a **virtual clock** (online, app, IWB) is a realistic option and worthy of consideration in teaching and learning intervention

Using timelines

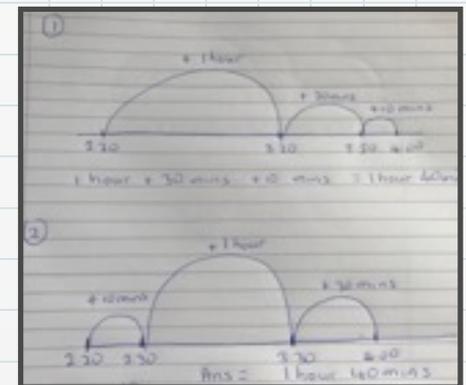
Applying their knowledge of number lines to **timelines** is a useful **visual problem-solving strategy** for **elapsed time problems**. A key feature of this approach is that it allows children to visualise and document their solutions in a visual manner.



Similar to teaching other problem-solving strategies, teachers should introduce the **timeline** using an explicit pedagogical approach. In this case, the 'I do, We do, You do' teaching sequence may be useful.

The film **Finding Nemo** starts at 2.20. It is over at 4.00. How long does it last?

- 1 hour
- 30 minutes
- 10 minutes
- 1 hour 40 minutes



This is achieved through teacher modelling and verbalisation of their thinking processes (think-aloud) to provide an explanation and rationale for each step of the process (**I do**). Having observed several similar problems, children can be given the opportunity to complete similar problems in pairs or in small groups (**We do**).

Allow children the flexibility to use different bridging options when using timelines initially (refer to Finding Nemo image). They will become more sophisticated in this task as they progress in their thinking. The final step of the teaching sequence requires children to undertake timeline problems independently (**You do**).

Class Management Strategy

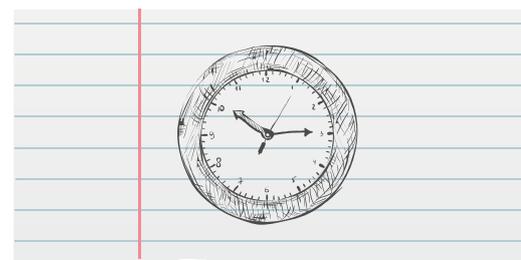
Encouraging children to verbalise each step of the problem-solving process can help overcome impulsive behaviours, lead to longer engagement and increase achievement.

It can be helpful for children to have opportunities for open discussions where they provide a rationale for their choice. In addition, they will gain from opportunities to discuss timeline solution choices other than their own. Critical to the success of the **timeline** teaching sequence is engaging children in interactive feedback throughout the process.



Multiple approaches to teaching and learning

Applying the Universal Design for Learning (UDL) pedagogical strategy when teaching Time allows for the meaningful inclusion of all learners. Each step of the teaching and learning process must facilitate the participation and successful progress of all. Adopting the Concrete, Representational, Abstract (CRA) framework to assessment as outlined in the *Individual Assessment* section of the [PDST Measures Manual Time Assessment Pack \(PDST\)](#) provides access to baseline knowledge for children who may struggle with assessment in abstract format only. Using the CRA approach to teaching *Telling the Time* facilitates access to learning on a concrete, visual and abstract level. This can be achieved by using real and/or teaching clocks and/or images of clocks when teaching abstract time skills and concepts. Some children will gain additional benefit if the clock images are identical or similar to the real teaching clocks used in the teaching and learning process. While some children will benefit from using teacher directed supports, others will gain from using supports of their choice when engaging in tasks and activities on time.



Working with children in **small groups** or on a **one to one** basis, as well as increasing feedback are useful approaches to providing additional support to some children.

Using technology

Technology use is a valuable means of enhancing teaching in maths and is particularly suited to aid the development of procedural skills for children requiring additional teaching support in Time. Using technology, teachers can either develop their own activities or source them online. Relevant activities include sequencing everyday events; ordering days of the week, months, seasons; telling the time; matching analogue and digital times; converting analogue to digital time; accessing cinema listings, bus and train

timetables in real time contexts etc. The interactive teaching clocks at the following sites are helpful teaching resources for both home and school. For examples, see <https://www.topmarks.co.uk/time/teaching-clock>; <https://www.mathsisfun.com/time-clocks-analog-digital.html>

Conclusion

Children vary in terms of their ability to acquire the conceptual understanding and procedural skills associated with time. While many children will acquire the skills, the ability to manage time may be the focus for some children. In this context, children learn the concept of time broadly and learn to use environmental and/or verbal cues and sequences to manage time and events in their daily lives. Pedagogical approaches to time should ensure successful outcomes for each child.

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Resources

<https://www.topmarks.co.uk/time/teaching-clock>

<https://www.mathsisfun.com/time-clocks-analog-digital.html>