

# What is Numeracy?

How one interprets or understands numeracy has far reaching implications as it dictates what needs to be known in order to be considered numerate; how the concepts and skills should be effectively taught and assessed and the type of training needed in order to be able to teach numeracy effectively (Condelli, 2006). As such, in this white paper the authors will seek to provide a comprehensive overview of what the term numeracy means and how the definition of this key concept has evolved over the years. However, it is first worth noting some challenges relating to people's understanding of numeracy that can hinder the effective teaching and learning of the concept to all learners from young children to adults.

One of the most difficult challenges facing the effective teaching and learning of numeracy at any stage of education is the lack of a standardised definition of what the concept of numeracy actually means. While numeracy is an internationally recognised word, Frejd and Geiger (2017) outline how there are many different interpretations and definitions of the term and as such, many researchers agree that there is “...*little agreement on what constitutes numeracy*” (Condelli, 2006: 1). Rather, the concept of numeracy is still very much contested (Coben, 2003). The following are three reasons proposed in the literature to explain why numeracy is not well understood:

1. There are a plethora of comparable/related terms, for example , numeracy, quantitative literacy, mathematical literacy, functional mathematics etc., used to describe the concept of numeracy (Gal et al., 2020) with the term used tending to depend on the country/jurisdiction in question (O'Meara et al., 2024).
2. There is a lack of an equivalent term for numeracy in some countries (Gal et al., 2020).
3. The conceptualisation of numeracy can differ depending on the age demographics of the people it is applying to, i.e. children vs adults (Gal et al., 2020).

In the face of such challenges and due to the far reaching consequences of poor levels of understanding of the term numeracy this white paper is seeking to provide an overview of the evolution of the definition of the term numeracy and will conclude by offering a broad definition that could be adopted internationally to describe this concept which is so critical for meaningful civic engagement in the 21<sup>st</sup> century (Goos et al., 2023).

The term numeracy was first introduced in the UK in the Crowther report in 1959. In this report, the word numerate was introduced as a means of offering a word that was a mirror image of literate but which encapsulated the skills needed to think quantitatively (Ministry of Education, 1959). First defining numeracy in this way has had many lasting consequences, most notably in the way that numeracy has often been subsumed within literacy due to the early parallels drawn between the two (Condelli, 2006). As such, in the intervening years it has been important for researchers to elaborate on the concept and offer more in-depth definitions of the term. Following the Crowther report, the Cockcroft report was the next major research output which sought to elaborate on the meaning of the term numeracy. According to Carpentieri, Litster and Frumkin (2009) the Cockcroft Committee focus was on identifying the



mathematical requirements needed by adults in higher education, the workplace and life in general and as such their definition of numeracy drew strong parallels between numeracy and mathematics. In this report the Cockcroft Committee ascertained that numeracy had two key attributes 'The first of these is an 'at-homeness' with numbers and an ability to make use of mathematical skills which enables an individual to cope with the practical mathematical demands of his everyday life'. The second attribute is the ability to 'have some appreciation and understanding of information which is presented in mathematical terms, for instance in graphs, charts or tables' (Cockcroft, 1982: 11). This definition certainly offered a broader conceptualisation of numeracy and began to recognise the importance of context when considering numeracy. However, it was not without its shortcomings. In particular, by establishing a strong connection between numeracy and basic mathematical skills the complex and intricate nature of numeracy was somewhat lost. This, according to Gal (2016) and Madison and Steen (2008), has resulted in numeracy sometimes being referred to as a skill that is learned primarily in the early years of school, and relates solely to simple arithmetic skills. This was the next challenge that needed to be overcome in relation to the conceptualisation of numeracy.

While researchers such as Gal et al. (2005) outline how many struggle to agree on how numeracy and mathematics differ some academics have attempted to explain the key differences between these two terms. These attempts have subsequently led to broader conceptualisations of numeracy in more recent years. Johnston (1995: 34) was one of the first in the field to acknowledge the strong ties but also the unique differences between mathematics and numeracy and summarised these similarities and differences succinctly when she stated:

*"To be numerate is more than being able to manipulate numbers, or even being able to succeed in school or university mathematics. Numeracy is a critical awareness, which builds bridges between mathematics and the real world, with all its diversity. [...] in this sense ... there is no particular level of mathematics associated with it: it is as important for an engineer to be numerate as it is for a primary school child, a parent, a car driver or gardener. The different contexts will require different mathematics to be activated and engaged in."*

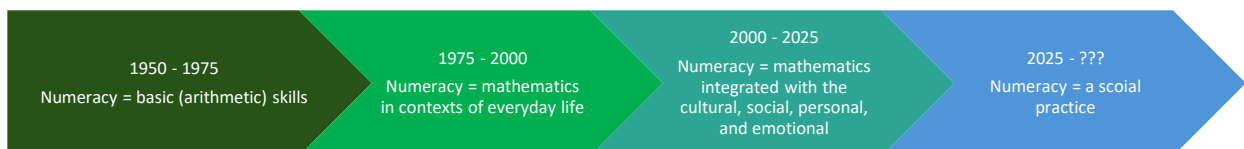
This definition again highlighted the important role of context when considering numeracy and also outlined how numeracy enables us to utilize mathematical knowledge and skills to solve real world problems. The distinction between numeracy and mathematics was also considered by Steen (2001: 17-18). She eloquently elaborated on the key differences between mathematics and numeracy when she stated:

*"Mathematics climbs the ladder of abstraction to see, from sufficient height, common patterns in seemingly different things. Abstraction is what gives mathematics its power; it is what enables methods derived from one context to be applied in others. But abstraction is not the focus of numeracy. Instead, numeracy clings to specifics, marshalling all relevant aspects of setting and context to reach conclusions."*



Similar to the work of Johnston (1995), Steen (2001) recognizes that there is a link between mathematics and numeracy but while abstraction is at the heart of mathematics context is what is central to the concept of numeracy. These distinctions paved the way for numeracy to be considered as a multi-faceted concept that required a range of different mathematical concepts and skills to be integrated into cultural, social, personal and emotional contexts. Subsequent conceptualisations of numeracy were cognizant of this and in more recent years research has acknowledged that, akin to literacy, it is impossible to fully understand numeracy without considering the contexts in which it is embedded (SOLAS, 2021; Hoyles et al., 2002; Reder & Bynner, 2008; Street, Baker, & Tomlin, 2005). One such conceptualization of numeracy was proposed by Goos et al. (2019). They sought to offer a definition of numeracy that reflected the nature of knowledge, work and technology in the 21<sup>st</sup> century. While the Cockroft report outlined how two attributes were central to numeracy Goos et al. (2019) outline how there are four core dimensions associated with the concept. The first of these four core dimensions was contexts reflecting the need for contexts to be at the heart of numeracy. The remaining three dimensions of numeracy as they saw it were the application of mathematical knowledge, thus recognizing the undeniable link between numeracy and mathematics; the use of tools whether they are physical, digital or representational; and the promotion of positive dispositions. The final aspect of the definition for numeracy proposed by Goos et al. (2019) saw all of these dimensions embedded in a fifth dimension. This fifth dimension was labelled *critical orientation*. According to Goos et al. (2019) it is this dimension that requires individuals to demonstrate a capacity to select and use appropriate mathematical knowledge and skills in different contexts and to interpret and critically analyse results, thus enabling the individual to transition smoothly from the real world to the mathematical world and back again. This definition of numeracy, with its five core dimensions, shifts the focus of numeracy to the social manifestations and consequences of numeracy in home, work and community settings. It also recognizes the higher order skills necessary in order to be considered numerate, thus moving away from the idea of numeracy being a basic skill that can be developed in the early years of schooling. In essence, this definition presents numeracy as a social practice, as it “challenges the privileging of academic forms of numeracy over other forms that are embedded in people’s daily lives.” (SOLAS, 2021: 19).

This white paper has sought to describe the evolution of term numeracy/numerate since it was first introduced in 1959. In Figure X we attempt to summarise this evolution.



**Figure X. The evolution of numeracy**

Initially numeracy was viewed as synonymous with basic arithmetic and/or mathematics but this was soon considered too narrow a conceptualisation. Subsequent definitions began to present numeracy as a form of functional mathematics where numeracy was seen to involve the application of basic mathematical knowledge and skills in particular contexts. However,



problems persisted due to the connection to basic skills and failure to acknowledge the higher order skills required to be considered numerate. According to Condelli (2006: 59) the next stage of the evolution of numeracy was the view that numeracy was an “*integrative skill, incorporating mathematics, communication, cultural, social, emotional, and personal aspects of individuals in context.*” Finally, in more recent years numeracy has been conceptualised as a social practice. According to Oughton (2018) this conceptualisation of numeracy recognises that the construct is needed to enable people to have meaningful social interactions at home, in the workplace or in the community. This contemporary view of numeracy also recognises that some forms of numeracy are more visible and influential than others (NALA, 2012) and Oughton (2018) further elaborates on this when he ascertains that this perception challenges the privileging of academic forms of numeracy. As such, this conceptualisation of numeracy allows adult numeracy to be held in higher regard but, as with numeracy in general, advancements will only be made in this regard when there is a better understanding of what adult numeracy is. This will be the focus of the second white paper in this series.

## THE CONCEPTUALISATION OF NUMERACY IN NIP PARTNER COUNTRIES

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This material was produced in the Erasmusplus project **Numeracy in Practice**, projectnumber 2021-1-NL01-KA220-ADU-000 026 292. In this project, 11 partners in 11 countries worked together in designing, evaluating and improving the materials. All materials can be found on the website ([www.cenf.eu](http://www.cenf.eu)).



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