Introduction

The focus for this unit of work is chance (probability). The intention of this paper is to provide teachers with insights into the nature of probability, and provide guidance for creating productive learning experiences for their students (Way, 2008). It addresses the key ideas and teaching points involved with chance and describes how probability thinking develops (Way, 2008). Children bring with them to school an innate sense of chance, however, realistic concepts about chance require substantial development before students are able to make formal predictions about future events (Watson & Kelly, 2002). Students require formal experiences with the language and vocabulary of chance in order to successfully describe the likelihood of an event occurring (Way, 2008). Essentially, in order to enable students to reason with probability, they need to experience a range of concepts practised in different contexts.

Literature review

Way (2008), describes probability as “the quantification of chances, and requires the recognition of randomness and the application of proportional thinking” (p.1). Randomness involves understanding that the outcome of a particular event is unpredictable and cannot be determined before the event has occurred. Jones, Longrall, Thornton & Mogill (1999) suggest an understanding of chance develops intuitively. Whilst recognizing that this idea is important, it is imperative that children’s understanding of chance is supported with instruction and explicit teaching in the primary school years (Jones et al., 1999).

Children bring to school an innate sense of chance. In the early years, student’s probabilistic thinking skills are developed through informal judgments and experiments with data collection that are based on experiences (NCTM, 2000). Students begin to explore sample size and compare result using appropriate mathematical vocabulary. At this level of thinking, it is important to expose students to the relevant vocabulary related to chance (Frykholm, 2001). Frykholm (2001) asserts this idea by encouraging students to describe the possibility of events as “certain, impossible, likely, or unlikely” (p.113). It is important to expose children to informal experiences where the entire sample space is obvious, such as activities with spinners, to demonstrate all possible outcomes in a sample space (Way, 2008). Sample space represents the entire set of all potential outcomes (Way, 2008). Watson and Kelly (2002) suggest that teachers should be confident in moving students in the younger years to a higher level of thinking by providing them with concrete examples, demonstrations and activities with chance to allow children to make interpretations from representations.
In the mid primary years, students apply their knowledge of fractions to explain, compare and predict the probability of an event occurring. Students are challenged to order the probability of events occurring using oral, written and numerical language. For example, when flipping a coin, the likelihood of tossing a head or tail is fair, equal or halve. Through experimental tasks, students are challenged to develop an understanding about the sample size and its relevance to the parent distribution of a population (Way, 2008). Middle school students are also required to form and assess inferences about a collection of data (ACARA, 2013).

In the late primary years, students' understanding of proportional reasoning results in the development of the ability to quantify chance through appropriate data representations, such as lattice or tree diagrams and organised lists (Ben-Zvi, Aridor, Makar, & Bakker, 2011). Students are heavily engaged with analysing sample space through problem-solving activities involving experimentation, data collection and interpretation. Students' understanding of chance demonstrates clearly articulated solutions with convincing arguments (Way, 2008).

In a classroom environment, there presents a need for social, experimental and theoretical probability learning experiences to be explicitly planned. These three approaches provide students with a varied context in which to recognise and view the meaning of chance (Jones, 1999). Social probability is subjective; it involves the formal assessment and close scrutiny of the likelihood of everyday events (Watson & Kelly, 2002). Theoretical probability involves using the complete knowledge of a sample space to calculate the expected probability of each outcome. For example, the chances of tossing a tail using an unbiased coin remains one half no matter the event that occurred previously. Experimental probability involves conducting trials and recording data to make estimates about chance with confidence (Way, 2008).

Aspinwall and Tarr (2002) suggest that in order to successfully construct inferences, students must understand that larger sets of data (or sample size) form more accurate inferences, and smaller sample sizes are unlikely to be truly representative of the parent distribution. Sample size plays a vital role in making accurate predictions about the likelihood of an event occurring, if students are able to recognize the importance of sample size, a connection between data and chance is demonstrated (Aspinwall and Tarr, 2002). Students must also recognize that chance has no memory, the result of a previous experiment has no impact on the outcome of the next (Way, 2008). Unfair games allow teachers to correct misconceptions about sample size and demonstrate the vital role it plays in the making judgements based on probability and chance (Aspinwall and Tarr, 2002).

Essentially, inferences made before the data has been collected are often drawn from personal experience and are therefore unreliable. Comparatively, inferences drawn after the data had been collected are supported because they are based on evidence and are more reliable (Ben-Zvi et al., 2011).
Zan, Brown, Evans & Hannula (2006) concluded from their research that people's attitudes towards mathematics plays a vital role in their learning. Teachers should use games and activities to improve student’s attitudes and motivation towards the usefulness of chance as an area of study.

Pulos and Sneider (1994) explain that games must have “an enjoyable activity with goals, rules, and educational objectives” (p.24). Teachers must provide students with meaningful contexts to explore the ideas of probability. To ensure quality learning occurs at all levels, teachers must explore connections between concepts, other mathematical areas and the approaches to teaching and understanding probability (Way, 2008).

Critique of the Curriculum

It is important to recognise that the content strand probability (chance), is formally introduced to students at level one. The AusVELS curriculum recognises that in the early years of primary school, students have access to mathematical knowledge relevant to their lives such as the intuitive sense of chance that children bring with them to school (VCAA, 2013). By focusing on such knowledge, students are provided with the educational opportunities to construct realistic concepts of chance through informal explorations with probability (VCAA, 2013). The intuitive nature of chance is further supported with instruction and explicit teaching of the key ideas and understandings related to chance (Jones, Longrall, Thornton & Mogill, 1999). The exploration with chance in the early years provides a meaningful background to which formal ideas are later developed that critically evaluate the probability of an event occurring (VCAA, 2013). In levels 3-6 students make meaningful and purposeful predictions to creatively and efficiently evaluate chance and data concepts (VCAA, 2013). Students are exposed to activities, trials, games and experiments with sound educational objectives to explore the concept of chance (VCAA, 2013). The curriculum also recognizes the importance of developing the appropriate language related to chance to provide students with the ability to make informed assessments about the likelihood of an event occurring (Frykohlm, 2001). Essentially, the achievement stands provide measurable descriptions about what children should be able to do at specific levels, not what children need to understand (VCAA, 2013). This information provides teachers with the main aspects of content they are expected to cover and challenges teachers to construct an engaging curriculum that fosters creativity and supports the development of deep relational understandings in all curriculum areas (VCAA, 2013).

Conclusion

This paper provides teachers with an overview of the curriculum area of chance. It is important to recognise that it supports teachers in engaging students with chance by creating meaningful and productive learning experiences. The literature review provides teachers with information related to current research and important implications for teaching the curriculum area of chance. The focus of lessons are on the exploration of chance through informal experiences which
provide students in grade three with a background to which formal ideas can then be later developed. They encourage students to become confident learners in the area of chance through “inquiry and active participation in challenging and engaging experiences” (VCAA, 2013, P.2).
References:


