Insights about a Student’s Mathematical Knowledge and Any Misconceptions

Kasey demonstrated some excellent techniques for mentally representing fractions and decimals. On more than one occasion, Kasey discussed that she would be thinking about the problem, “like a pizza” and would mentally visualise the different sized slices of pizza depending on the denominator. She demonstrated a sound understanding of the underpinning concepts of fractions, although failed to recognise fractions by name when faced with a visual representation that demonstrated more than one fraction on the “pizza”. In question 1. a.), Kasey came to the conclusion that part B of the pie is one fifth. “There are five parts, but I’m not sure because they all have to be the same size”. Kasey demonstrated a misconception that if a pizza or pie is divided into unequal parts, we can count the parts and that will be the denominator. She knew this answer was incorrect when faced with the second half of this question, but couldn’t resolve her answer. Further, Kasey demonstrated insights into her mathematical knowledge when faced with question 9. a)., she recognised that the denominator is the same and thus utilised the information provided by the numerators to result at the correct answer.

Kasey demonstrated some insights when connecting fractions, decimals and percentages. In question 14, she could easily identify the fraction and the percentage, although struggled when asked to represent the same value in another fraction and when asked for the decimal form, gave an answer of 0.6 (six tenths), rather than 0.06 (six hundredths). From this, it can be concluded that Kasey does not have a firm understanding of place value.

Throughout the interview, Kasey utilised the tool of benchmarking numerous times. In question 9. c)., Kasey recognised that 5/8 is more than one half, when she converted to a common denominator, “It’s larger than a half, because a half would be 4/8”. Further, she demonstrated this understanding in question 9. d)., where she knew 2/4 is one half and 4/2
is four halves. During question 10. a), upon giving the correct answer, she noted that she was, “looking at what it is closest to”. Later in this question when faced with the syringe number line, Kasey incorrectly gave an answer of 34mls. Although she understood the measure, she failed to notice the ‘1’ and ‘2’ that were marked onto the syringe and incorrectly assumed that each tick on the line was representative of 1ml.

It is clear from Kasey’s responses throughout the interview that she has developed a whole number misconception. On multiple occasions she states that the bigger number had to be the one with less digits, “The one with less numbers is larger”. A possible reason for shorter-is-larger thinking is that Kasey is attempting to interpret decimal notation in terms of the more familiar number notation. Further, the student demonstrated a limited decimal number knowledge, when she disregarded the decimal point entirely and only compared the number directly follow the decimal point, “3 is closer to one than 653 (when comparing 0.3 and 0.653)"
Critical Evaluation Usefulness of the Fraction and Decimals (Rational Number) Interview Strategy For Gaining Knowledge About A Student’s Current Mathematical Knowledge

The Fraction and Decimals (Rational Number) Interview serves as a valuable tool in assisting educators to identify the weaknesses in their students’ mathematical conceptual understanding of fractions and decimals. From this, educators are able to tailor specific pedagogy to assist children to gain competence in areas where they may have been unsuccessful during the interview. Although the interview is effective in determining the possible gaps in a child’s conceptual thinking, the information that comes from this should be utilised in collaboration with other assessment tasks and observations that have been gleaned and noted by the classroom teacher, on a more ongoing basis. This more comprehensive overview of a child’s conceptual understanding should then act as the springboard for action in mathematics teaching and learning.

A broader range of evidence of understanding would be significantly increase the benefits of the educator assisting each individual’s personal development. Further, this in-depth assessment and observation (as an addition to information provided in the interview) would discount for any personal, social or emotional difficulties that the individual may be faced with on the given day of the interview.

To achieve the strongest understanding of Kasey’s mathematical knowledge, gentle questioning techniques were utilised throughout the interview to understand how she arrived at her answer, to be able to accurately assess for misconceptions. Questions and statements (such as, “Can you guide me through your thinking there?” or “Think out loud for me” followed by extensive notes) proved extremely helpful in gleaning a deep insight into Kasey’s conceptual knowledge.

Although the interview assists in recognising gaps in understanding, it is also clear that students are able to result at the correct answer whilst applying misconceptions that they have acquired about fractions and decimals. In Kasey’s interview she successfully answered the first half of question 15, even though her thinking was incorrect. This demonstrates that questioning throughout the interview is paramount.

Further, the circumstances through which the interview was undertaken were
particularly challenging for Kasey. The student had no previous relationship with the interviewer and, although the ice breaker challenge assisted slightly, the student felt that she was being “judged” and as a result was anxious throughout the course of the interview.

Kasey related question 17 (Pod Tunes or New Tunes) to her personal experiences with iTunes and, as a result, was unable to conjecture about the mathematics involved in the task, “Songs are usually more than a dollar, so that’s a good deal”. This question could perhaps be restructured to something students are not so familiar with.

Towards the end of the interview, the student was demonstrating signs of fatigue and was lacking in motivation. It was clear that Kasey was tired and therefore was not presenting her strongest conceptual thinking. This could be owing to a number of reasons.

In summary, the interview paints a relatively accurate picture of mathematical insights and misconceptions, when facilitated in conjunction with questioning techniques and these insights and misconceptions are backed up by classroom assessment and observations. For optimal results, the interview should be conducted by someone that the students knows or has a relationship with.

Please see attached Record Sheet.