Faculty of Education

Assessment Task Cover Sheet

Unit Co-ord./Lecturer	Helen Chick	**OFFICE USE ONLY** Assessment received:
Tutor:(if applicable)		
Student ID	078395	
Student Name	Emma Salisbury	
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Assessment Task Title/Number	Assessment Task 1 : Children's understanding of decimals	
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Signed E.Salisbury Date 18/08/2015

*By submitting this assessment task and cover sheet electronically, in whatever form, you are deemed to have made the declaration set out above.

Assessor's feedback:

Assessor: ***Helen Chick***

Section A

A1 - Maya

Maya is a female student in year seven and is 13 years old. From her answers to question one, she would be classed as an *Apparent Expert*. Her responses to question one were all correct; however she did spend a long time to reach these answers when compared with Rylie. When interviewing Maya on her responses to question one and responses to other questions, she found it difficult to explain her reasoning and indicated that some answers were 'guesses'. From this interview, Maya's answers suggest that she may be a *money thinker*. While she does not have the misconceptions on *smaller is larger* or *longer is larger,* and her results suggest *apparent expert* behaviour, however some of her answers and being unable to explain why she got the correct answer would suggest she is a *money thinker*. While Maya correctly answered question 13, usually used to draw out money thinkers, she reasoned that while they were very close the first option was a tiny bit larger, concluding that 23.451 was larger than 23.45. However Maya's answers to question two, provide substantial evidence that Maya is not confident with her understanding of decimals particularly when it came to longer decimals. Her constant self-corrections and then her inability to provide a decimal closer than her closest answer, shows that she does not have a firm grip in regard to the density of decimals. Also, when asked to circle her closest answer, her answer for part c and d, Maya chose the number that was less than the original. For example part c the original number was 0.631 and the closest was 0.630, however in her list of options she also recorded 0.632. This shows, that while her answer was correct she was unable to see that these two numbers were the same distance from the original, which suggests that she lacks a concrete understanding of place value. This is further shown in question three in the response to writing 15 numbers between 4.2 and 4.3. Her list included 4.21 and 4.210 as different numbers and in question five, she reasoned that 0.8 was bigger than 0.80 even though she had reasoned correctly later on that 2.0 was the same as 2. This further adds to the suggestion that while Maya has an understanding of decimals, she often guesses, quite often these guesses are correct, but in these cases she cannot explain her reasoning and with appropriate teaching students such as Maya are the most likely to become experts (Steinle & Stacey, 2004b)

A2 – Rylie

Rylie is a female student in year seven and is 13 years old. From her answers to question one, Rylie would be classed as an *Apparent Expert.* However in contrast to Maya, Rylie had a significant understanding of decimals, and was able to provide sound and coherent reasoning to her selections. After completing question one, Rylie got all parts correct and was able to explain in her interview why each was the case. From question one; Rylie would be classed as an apparent expert using task-expert thinking. From the remainder of the interview, Rylie further proved her understanding of decimals. In question two, she was able to demonstrate a real flexibility with the numbers by choosing her closest response then finding a way to make it closer. For example the closest number to 4.2 Rylie chose out of her answers was 4.19, however when asked to write an even closer number she simply added a 5 in the hundreds place value position. This shows a solid understanding of place value and also a confidence in her own understandings of decimals, knowing that her first answer was correct and modifying this with adding another decimal place. The only unusual answer provided by Rylie was her last answer in question three to name 15 numbers between 4.2 and 4.3, which was 4.19. However her thought process explained in her interview of adding the numbers 1-9 after 4.2 and then 1-9 after 4.21 shows that she fully comprehends place value for decimals. When asked about 4.19, she stated that it was a mistake and she meant to write 4.219, which highlights her understanding as she was able to correct an error in her own answer. From the whole interview, Rylie was shown to be an *Apparent Expert* with a sound knowledge of wholes, fractions and decimals (Nesher & Peled, 1986).

A3 – Alicia (Supplied Data)

Alicia is a female student aged 14 years. From her answers to question one, Alicia has the *shorter is larger* misconception when it comes to her decimal understanding, in particular Alicia has the *Denominator focussed thinking* misconception (Condon & Hilton, 1999). Alicia understands the first question, for example, 3.7 as three and seven tenths and understands 3.54 as three and 54 hundredths, however because she believes that tenths and bigger than hundreds, she does not understand the relationship between how many parts of the whole and the size of the parts. So in this example she would get the question correct, however in question seven she sees 0.72 as seventy two hundredths which must be smaller than 0.4 which she would interpret as four tenths. The general pattern with denominator focused thinking is that the longer number after the decimal place means the smaller the pieces, and students with this misconception will often see the shorter number as the largest (Steinle & Stacey, 1998) . However, if all the decimals for comparison were of equal lengths, Alicia would get all questions correct, so by using decimals of varying length or 'ragged' decimals, teachers are able to uncover misconceptions such as Alicia's (Steinle & Stacey, 1998).

Section B:

From the interviews I conducted, Maya would require additional help to completely master this topic, evidence suggests that no matter what misconception student possess, that majority of students can achieve expert level providing that the missing link in their understanding is uncovered (Steinle & Stacey, 2004a). Maya's answers to interview questions showed that while she had a decent grasp of decimals, her understanding does need improvement. Also while she got a lot of her answers correct, she admitted in the interview that she did not know why and was unable to provide reasons behind her guesses. Maya belongs to a very important classification of decimal understanding. Without this unique test, as Maya got a lot right, she may go unnoticed and teachers may believe that she has the same comprehension of decimals and Rylie.

To help students improve their understanding of decimals the teacher must first uncover all misconceptions the student in question may have (Stacey, 2005). The key to helping students understanding is to know your student. While Maya got many questions correct, she often lacked reasoning for these answers. To completely assess where her understanding is lacking the use of questioning and examples is required. For example by asking a student for a number close to 0.625 they may say 0.620 which would be correct. By asking for another example that is even closer, however, and another and another, this can not only highlight areas of incomplete understanding but also help improve the students decimal place value and decimal density, leading to the realisation that there are an infinite amount of decimals close to 0.625 (Stacey, 2005).

After establishing the exact extend of Maya's decimal understanding, the next step to improving this understanding would be to develop a common language within the class. Many students, including Maya often struggle to explain their reasoning because they are not confident with the terms that are used by teachers and other students. A 'class meeting' to decide which words to use and their meaning, can alleviate a lot of the guess work in answering the questions set forth by the teacher and also build confidence in the student's ability to explain why they reached a particular answer. By having the student explain their reasoning to another student or to the teacher, that student will often discover mistakes in their own work. By developing a common language students can explain their answers to another student and those students will be able to understand each other as they are now 'speaking the same language'.

This is particularly helpful for students with confidence issues. By having to explain to a peer, this process removes a lot of the anxiety and shame that comes from getting a question wrong in front of the class.

One activity to improve decimal understanding is through the use of games in the maths classroom (Condon & Hilton, 1999). Games are an important tool for teachers of mathematics as they provide a break and a fun alternative from the textbook focused learning typical of the high school maths class (Lee, Luchini, Michael, Norris & Soloway, 2004). Often students do not realise, at first, that the fun game they are playing is directly related to the topic and aimed at improving understanding. Games also provide an incentive and motivation for learning (Randel, Morris, Wetzel & Whitehall, 1992). Often with the introduction of games, students want to get better at the game and improve each time they play. By using games in maths classes students will often provide their own motivation and will practice and try and further their own understandings and ability in order to get better at the game.

One such activity involves cards. Cards are very useful in teaching decimals and also provide a prop which is a particularly helpful tool for visual learners. This activity involves students in small groups being dealt four playing cards, after the face cards have been removed from the pack, and a card with a decimal point at the front of all answers. Students are then asked using these cards what is the smallest number possible that they can make and then what is the largest number they can make. Students can also be given the same sets of numbers in card form and then asked a series of questions similar to question three on the interview. For example, by giving students the decimal point and a 6, 7 8 and 9 number card, the maths teacher may then ask how many numbers the student could make between 6 and 9. This not only allows the teacher to diagnose any misconceptions when it comes to decimals but by making it a fun competition between class mates, the students will provide their own motivation to get better at the game for next time it is played.

Mixed ability groups work particularly well in the maths classroom, and for this activity particularly, by allowing students to take on a teaching role within the group for less gifted students (Pazos, Micari & Light, 2010). No matter what the ability of the students within the group they can all gain something from this classroom organisation. The stronger students within the group can further cement their knowledge by having to explain to less able students (Condon & Hilton, 1999) and the students of average ability or misconceptions, for example the case study of Maya, will be able to gain immensely from this type of organisation. Maya, who is not a confident decimal student, will be able to improve her reasoning by learning from more gifted students within the group. Also by having to attempt to teach students whose abilities that are beneath her own, she will be able to identify errors in her answers and improve her own understanding.

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