EDMA310/360 Mathematics unit planner **Sarah Collins**

Unit Overview

Unit title:
An Introduction to Decimal Fractions

Content maths area:
Decimal Fractions

Grade/year level:
Grade 5 and AusVELS level: Year 5

Learning Focus (ideas extrapolated from AusVELS):
Content Strand: Number and Algebra
Sub-strand: Decimals
Proficiency strands:
Understanding includes making connections between representations of numbers, using fractions to represent probabilities, comparing and ordering fractions and decimals and representing them in various ways.
Reasoning includes investigating strategies to perform calculations efficiently, continuing patterns involving fractions and decimals.

Rationale:
It is necessary for students to learn the mathematical content area of Decimal Fractions, since decimal notation is an important part of basic numeracy. Fractions, decimal fractions, and percentages all interconnect as they are different ways of representing numbers, which also uses multiplicative processes (Moody, 2008). Decimal Fractions is the most commonly used mathematical content in real-life contexts, such as money and measurement.

Assumed prior knowledge of students:
It is assumed that students' prior knowledge for Decimal Fractions includes an understanding of whole number, place value, and fractions (Wright 2004). By a Year 5 level, students would have experienced investigating equivalent fractions, skip counting in fractions (by quarters, halves, and thirds), as well as locate and represent these on a number line. Also students have recognised that the place value system can be extended to tenths and hundredths. Students make connections between fractions and decimal notation (AusVELS, 2014).

Grouping strategies to support learning:
Students will be grouped in pairs or small groups as this naturally encourages students to collaboratively discuss and solve a problem, while explaining their reasoning (Irwin, 2001).
These groups will be organised as mixed ability, as this provides a support base for students to openly discuss ideas and solve conceptual problems in various different ways, while using questions, representing ideas, and making connections as a group (Boaler, 2008).

Overview of assessment:
Formative and self assessment strategies will be used throughout the Unit Planner, such as journal writing, anecdotal notes, checklists, and observations (Van de Walle, 2013). Each individual student will keep a journal and write any struggles, understandings, and/or questions to show their progress and conceptual understanding of decimal fractions. These assessment strategies are formed around tasks that require the learner to compare, order, and benchmark decimal fractions to further their understanding of the relative size of decimals (Roche, 2005).

References:

AusVELS. (2014). *Mathematics.* The Australian Curriculum in Victoria. Retrieved: http://ausvels.vcaa.vic.edu.au

Boaler, J. (2008). *Promoting 'relational equity' and high mathematics achievement through an innovative mixed-ability approach.* British Educational Research Journal, Vol. 34, No. 2, pp. 167-194. Retrieved: http://www.tandfonline.com/doi/pdf/10.1080/01411920701532145

Irwin. (2001). *Journal for research in mathematics education*. Vol. 32, No. 4, pp. 399-420. Retrieved: http://www.jstor.org/stable/749701

Moody, B. (2008). *Connecting the point: Investigation into student learning about decimal numbers*. University of Waikato: New Zealand. Retrieved: http://leo.acu.edu.au/pluginfile.php/985732/mod_folder/content/0/Moody%2C%20B.%20%282008%29.%20Connecting%20the%20point_Investigation%20into%20student%20learning%20about%20decimal%20numbers.%20.pdf?forcedownload=1

Roche, A. (2005). *Longer is larger—or is it?* Australian Primary Mathematics Classroom, 10(3), 11–16. Retrieved: http://search.informit.com.au/fullText;dn=199049752974381;res=IELHSS

Van W., Karp, K., & Bay-Williams, J. M. (2013). Elementary and middle school mathematics: Teaching developmentally (8th ed.). Boston: Pearson.

Wright, V. (2004). *Decimals: Getting the point.* The University of Waikato. Retrieved: Wright, V.(2004) Decimals_Getting the point.pdf

MATHEMATICS UNIT PLANNER

Topic: Introduction to Decimal Fractions	**Year Level: 5**	**Term: 2**	**Week: 1-5**	**Date:**

Key mathematical understandings
(2-4 understandings only; written as statements believed to be true about the mathematical idea/topic):

- Place-value system is fundamental to understanding decimal fractions
- Fractional language is important to link concepts and representations.
- Relative size of decimal fractions allows comparing and ordering of decimals.
- Multiplicative thinking connects knowledge of fractions and division to understand that decimals are not a new number but another representation of fractions.

Key AusVELS Focus / Standard (taken directly from AusVELS documents):

Content strand(s): *Number and Algebra*

Sub-strand(s): Decimal Fractions

Level descriptions:

- Compare and order common unit fractions and locate and represent them on a number line (ACMNA102)
- Recognise that the place value system can be extended beyond hundredths (ACMNA104)
- Compare, order and represent decimals (ACMNA105)

Proficiency strand(s): *Understanding* *Fluency* *Problem Solving* *Reasoning*

• Understanding includes making connections between representations of numbers, using fractions to represent probabilities, comparing and ordering fractions and decimals and representing them in various ways.

• Reasoning includes investigating strategies to perform calculations efficiently, continuing patterns involving fractions and decimals

Key skills to develop and practise **(including strategies, ways of working mathematically, language goals, etc.) (4-5 key skills only):**

- Fractional Language
- Bench marking
- Multiplicative thinking
- Comparing relative size of decimals

Key equipment / resources:

- Decimats
- Dice
- Decipipes
- Decimal cards
- Spinner

Key vocabulary **(be specific and include definitions of key words appropriate to use with students)**

- Fractional Language
- Tenths: this is immediately to the right of the decimal point.
- Hundredths: is two places to the right of the decimal place.
- Thousandths: is three places to the right of the decimal place
- Decimal point
- Smaller than, greater than, equivalent

Possible misconceptions (list of misconceptions related to the mathematical idea/topic that students might develop):	**Key probing questions** (focus questions that will be used to develop understanding to be used during the sequence of lessons; 3 – 5 probing questions):	**Links to other contexts** (if applicable, e.g., inquiry unit focus, current events, literature, etc.):
• Whole number thinking • Longer is larger • Shorter is larger • Zero means 'nothing' • Reciprocal thinking • Negative thinking	• What is the role of the zero in decimal fractions? • How do know which decimal is larger? • Where is the tenths, hundredths, and thousandths? • What strategies can we use to compare decimals?	• Decimals in real life context: • Rulers- Measurement • Money • Statistics • Probability

Learning strategies/ skills							
Analysing Checking Classifying Co-operating Considering options Designing Elaborating	Estimating Explaining Generalising Hypothesising Inferring Interpreting Justifying	Listening Locating information Making choices Note taking Observing Ordering events Organising	Performing Persuading Planning Predicting Presenting Providing feedback Questioning	Reading Recognising bias Reflecting Reporting Responding Restating Revising	Seeing patterns Selecting information Self-assessing Sharing ideas Summarising Synthesising	Testing Viewing Visually representing Working independently Working to a timetable	

MATHEMATICAL FOCUS (what you want the children to come to understand as a result of this lesson – *short, succinct statement*)	**'TUNING IN'** **(WHOLE CLASS FOCUS)** (a short, sharp task relating to the focus of the lesson; sets the scene/ context for what students do in the independent aspect. e.g., It may be a problem posed, spider diagram, an open-ended question, game, or reading a story)	**'INVESTIGATIONS SESSION'** **(INDEPENDENT LEARNING)** (extended opportunity for students to work in pairs, small groups or individually. Time for teacher to probe children's thinking or work with a small group for part of the time and to also conduct roving conferences)	**'REFLECTION & MAKING CONNECTIONS SESSION'** **(WHOLE CLASS FOCUS)** (focused teacher questions and summary to draw out the mathematics and assist children to make links. NB. This may occur at particular points during a lesson. Use of spotlight, strategy, gallery walk, etc.)	**ADAPTATIONS** - Enabling prompt (to allow those experiencing difficulty to engage in active experiences related to the initial goal task) - Extending prompt (questions that extend students' thinking on the initial task)	**ASSESSMENT STRATEGIES** (should relate to objective. Includes what the teacher will listen for, observe, note or analyse; what evidence of learning will be collected and what criteria will be used to analyse the evidence)
Session 1 • Students will be able to identify which decimal is larger, using decimals with one decimal place (tenths).	**Walk about quiz** Ragged decimal cards will be displayed around the room. Compare these decimal fractions together. For example; which is larger 4.100, 4.2, 3.15? Which decimal fraction is in between 3.2 and 4.6? Discuss the tenths, hundredths, and thousandths.	**Fish Bowl** Model activity for students. *Can you show me which is larger?* **Spinner and Decimals** (Appendix 1) In groups of 3, students flip decimal cards and use the spinner to justify which is larger, closer to one, closer to one half, or closer to zero (benchmarking). Adaption of *Spin to Win*: (Downton, 2014).	**Whole Class Discussion** Discuss any misconceptions: *What does the zero represent in the tenths place?*	**Enabling prompt:** Use benchmarking strategy to compare a small group of decimal fractions on flash cards. Use three decimal cards, where one is one half (0.5) *What is one half represented as a decimal?* *Which decimal is larger than 0.5?* **Extending prompt:** Using the decimal cards, order from smallest to largest and justify their choices.	Teacher will record **anecdotal notes** for 3 groups focussing on: 1. Language used 2. Ability to identify the larger decimal 3. How they reason their choice.

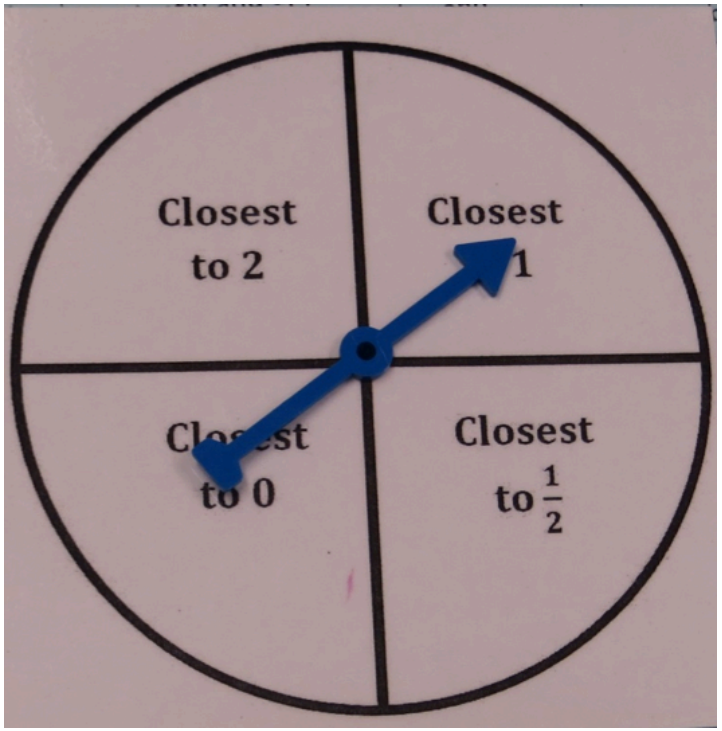
Session 2 • Students will be able to identify decimals in between two decimal fractions with 2 decimal places (tenths and hundredths).	**Fruit Shoot Interactive Game** (Appendix 2) Whole class plays Fruit Shoot to compare decimals; larger/smaller/ same as.	**Spinner and Decimals** Students in pairs, use the decimal cards and spinner to justify which is closer to one, closer to one half, and closer to zero. Students then find and reason 3 decimal fractions that are in between the two decimal cards that they flipped. (Appendix 2)	**Whole Class Discussion** What effect does zero have on the tenths and hundredths place? Is 1.2 and 1.20 the same decimal fraction?	**Enabling prompt:** Using pegs labelled with decimal fractions of tenths and hundredths. Students order smallest to largest, using benchmarking skills. **Extending prompt:** Students use a ruler to measure various objects around the room to identify and record the tenths and hundredths.	Teacher explores students' perceptions of decimal fractions through their **journal writing**. Focus on: 1. Any misconceptions 2. Understandings of tenths and hundredths 3. Fractional language
Session 3 • Students will identify tenths, hundredths, and thousandths as a symbol and as a representation.	**Receipt strip activity** Mark the strip on the floor with 1 at one end and 3 at the other. Students write a decimal fraction on a sticky note and then place their number on the strip. **Fish bowl** *Does this number belong on the strip? Why/why not?* *Compare decimals together. For example, is 2.1 and 2.10 the same, larger, or smaller? Why do you say that?* As a class, reorder decimals on the strip from smallest to largest.	**Demonstrate Decimat activity.** How are tenths, hundredths, and thousandths represented on a decimat? **Decimat and Cards** (Appendix 3) In groups of three, students will flip cards and shade in their individual decimat. Whoever has the largest decimal fraction wins. *How do you know which is larger?* Students will use fractional language e.g. 8.3 = Eight and three tenths. (Adaption of Decimat game Roche, 2010)	**Whole Class Discussion** What happens if we add zeros to these decimal fractions? 0.180, 0.108, 0.018 *Which one is bigger? What effect does the zero have on each of these decimal fractions?*	**Enabling prompt:** Teacher leads a small group of students and identifies tenths, hundredths, and thousandths on the decimat. Together, represent decimals of two decimal places on the decimat. **Extending prompt:** How many different ways can you represent the decimal fraction on the decimat?	Teacher uses sticky notes to **observe** students understandings of tenths, hundredths, and thousandths. Identify: 1. Connection between symbol and representation. 2. Fractional language used 3. What reasons were given?

Session 4 • Students will justify and reason to make the largest decimal fraction possible using only tenths, hundredths, and thousandths.	**Scooter Quest Interactive Game** (Appendix 4) Whole Class activity focusses on various decimals fractions. *Which number is in the tenth/hundredth/thousandth place?*	**Model Decimat Activity** Using fractional language, which number should go in the tenths, hundredths, and thousandths, to make the largest number? **Decimat and Dice** (Appendix 4) In groups of 3, students roll 3 dice and make the largest decimal fraction using tenths, hundredths, and thousandths. For example: Roll 2, 6, 1 can make 0.621 Students then colour in the decimat to represent this decimal fraction.	**Whole Class Discussion** What strategies can we use when when comparing decimal fractions? E.g. Look at the tenths column first of each decimal fraction to see which is larger/smaller.	**Enabling prompt:** Students use paper folding to create their own decimat to understand tenths, hundredths, and thousandths. **Extending prompt:** How many different ways can you represent the decimal fraction on the decimat? Use a ten-sided dice (0-9) to increase the range of numbers.	Teacher uses **checklist**, do students understand place value: 1. Where are tenths, hundredths, and thousandths in a decimal fraction? 2. Reason as to why their decimal fraction is the largest.
Session 5 • Students will connect the symbol, oral, and, representation of decimal fractions using the place value system.	**Decimal Bingo** (Appendix 5) Using the Decimal Bingo activity sheet, students colour in the number the teacher calls using fractional language e.g. 7.43 = Seven and forty-three hundredths.	**Decipipes and Dice** (Appendix 5) In groups of 3, students roll 3 dice to make the largest decimal fraction using tenths, hundredths, and thousandths. Similarly to the Decimat and Dice activity, students create the largest decimal and represent this with decipipes.	**Whole Class Discussion** Students in a circle with notebooks. Teacher rolls the three dice. Students write the largest possible decimal fraction. Share ideas. Write various different ways to express the largest number. For example: 0.375 can be: Three hundred and seventy-five thousandths Thirty-seven hundredths and five thousandths Three tenths, seven hundredths, and five thousandths.	**Enabling prompt:** Students use decimal cards and hundred square to compare the sizes of decimal fractions. *Where is the tenths, hundredths and thousandths column?* **Extending prompt:** Students write down various ways to express the decimal fraction, as seen in whole class discussion.	Teacher uses **anecdotal notes** and students' **journal writing** to evaluate how well students understand place value in decimal notation. 1. Do students use fractional language? 2. Understand the link between tenths, hundredths, and thousandths. 3. Do students correctly represent the decimal fraction using decipipes? 4. Can students identify which decimal is larger?

Appendices

Appendix 1- Session 1

Spinner (Downton, 2014)

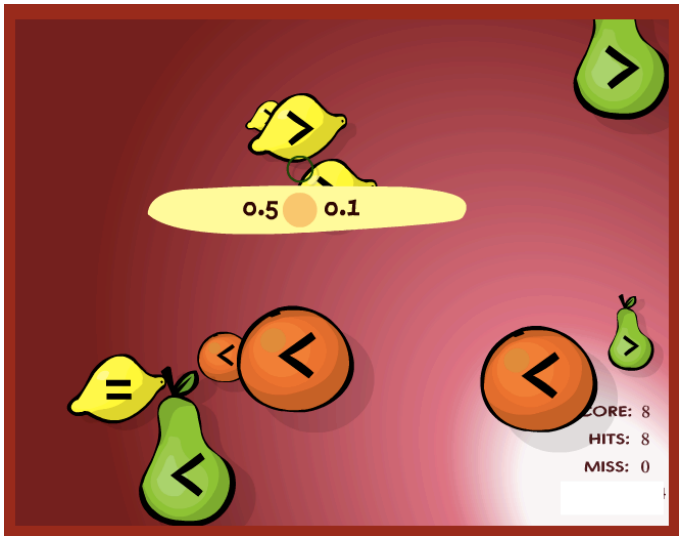


0	0.1	0.2
0.3	0.4	0.5
0.6	0.7	0.8

http://www.teacherspayteachers.com/Product/GOLF-Card-game-for-decimal-comparisions-Tenths-286150

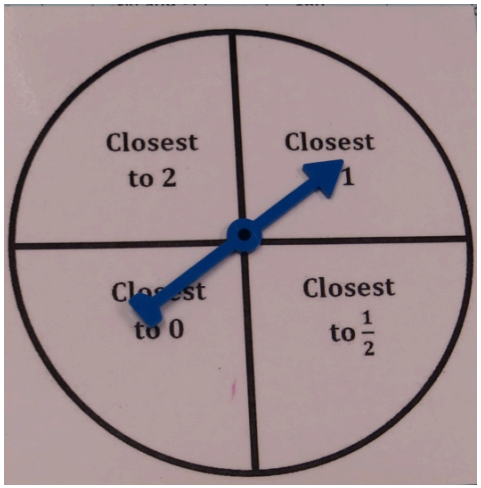
Appendix 2- Session 2

Fruit Shoot- Interactive Game



http://www.sheppardsoftware.com/mathgames/decimals/CompareDecimals.htm

Spinner (Downton, 2014)



0.1	0.2	0.3	0.4
0.5	0.6	0.7	0.8
0.9	0.11	0.12	0.15
0.16	0.21	0.23	0.24
0.28	0.34	0.35	0.37
0.41	0.45	0.47	0.49
0.51	0.54	0.55	0.57

http://www.teacherspayteachers.com/Product/Decimal-Fraction-Matching-Cards-260023

Appendix 3- Session 3

Decimats (Roche, 2010)

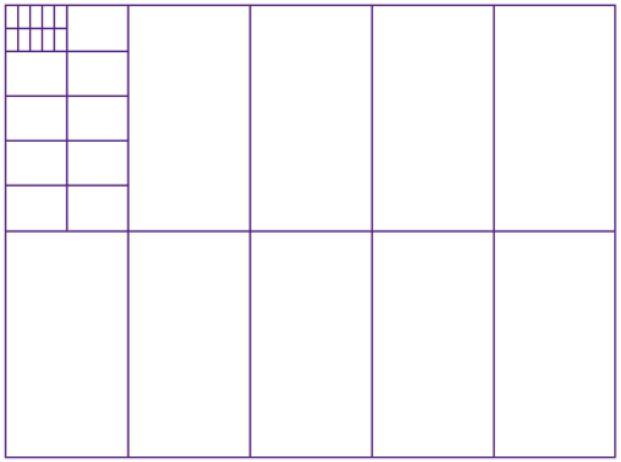


Figure 2. A blank Decimat.

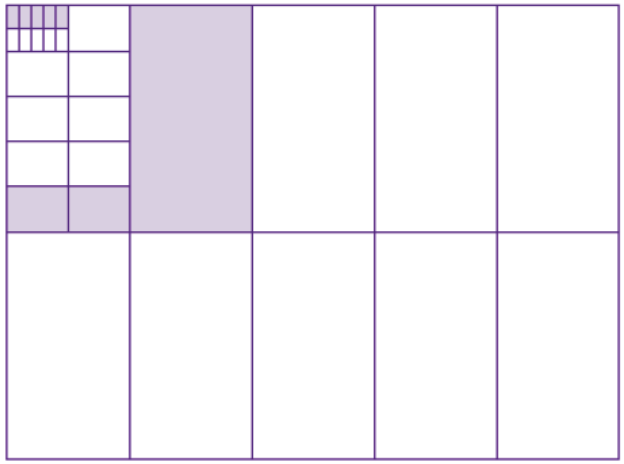


Figure 3. A shaded Decimat (showing 0.125).

0.68	31.5	24.2
2.534	3.751	3.51
1.89	24.3	4.018
3.4	2.7	0.608
0.6592	1.5	2.24
2.3378	3.8	2.34
1.89	2.323	4.0
3.45	2.71	2.330

Decimal Cards (tenths, hundredths, thousandths)
http://joyin6th.blogspot.com.au/2011/09/same-materials-different-activities.html

Appendix 4- Session 4

Decimat Activity (Roche, 2010)

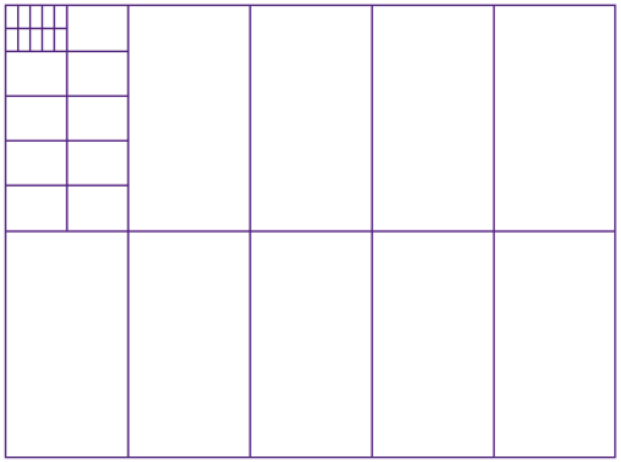


Figure 2. A blank Decimat.

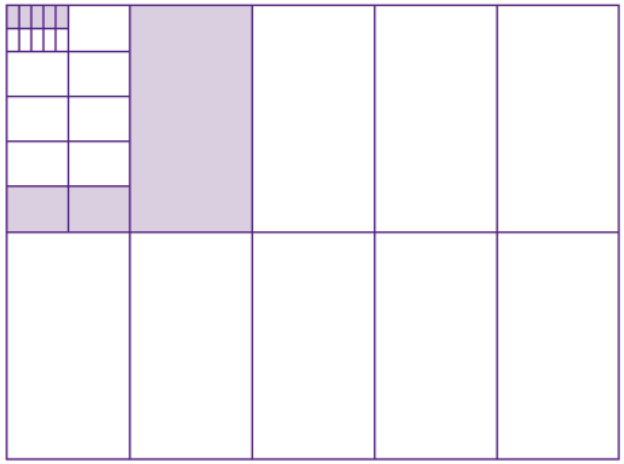


Figure 3. A shaded Decimat (showing 0.125).

Scooter Quest- Interactive Activity
http://www.sheppardsoftware.com/mathgames/decimals/scooterQuestDecimal.htm

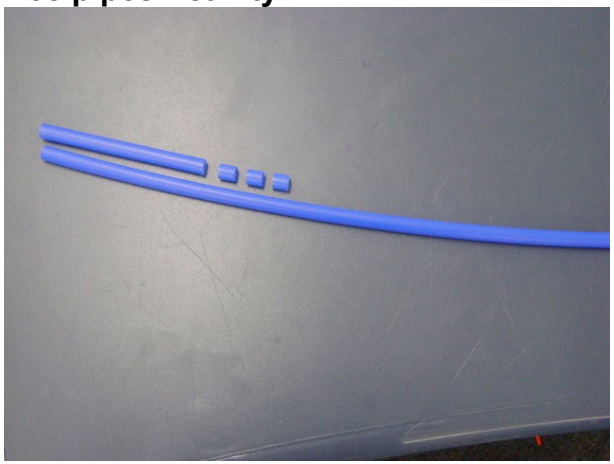
Appendix 5- Session 5

Decimal Bingo

http://www.greatmathsteachingideas.com/wp-content/uploads/2012/10/Untitled.png

7.86	8.434	9.1	9.563
8.9	9.58	10.356	10.7
8.203	10.43	8.7	10.3
9.001	8.373	10.256	8.623

Decipipes Activity



http://saxonslearningblog.blogspot.com.au

References

Downton, A. (2014). *EDMA310/360- Tutorial 5 Slides: Planning a unit of work.* Accessed: 19 October 2014. Retrieved: http://leo.acu.edu.au/mod/resource/view.php?id=722523

Roche, A. (2010). *Decimats: Helping students to make sense of decimal place value.* Australian Primary Mathematics Classroom. Vol. 15 (2). Retrieved: http://files.eric.ed.gov/fulltext/EJ891799.pdf