**Making Connections to the Standard Multiplication Algorithm**

**NC.4.NBT.5**

This document is intended to demonstrate the importance of using concrete, pictorial, and place value knowledge interchangeably before moving to the more abstract and procedural multiplication algorithm. The color coding helps one to see that the same products will be repeated in each model and show their interconnectedness.

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| **Area/Array Model**  Students begin breaking numbers up concretely based on their foundation of base 10 concepts and their number sense from third grade. Students can use base 10 manipulatives or draw the model on graph paper. This representation helps students see that multiplying two numbers will create a rectangular array.  **Example:** 9 x 15 = ?  For this model, students draw a rectangle or use grid paper to make a 9 by 15 array. To make multiplication easier, the 15 is decomposed by place to be 10 + 5. Next, the10 is multiplied by 9 and then the 5 is multiplied by 9. This method is a model for the distributive property.    9 x (10 + 5) or (9 x 10) + (9 x 5)  90 + 45 = 135 | **Open Area/Array Model**  The open area or open array model is the next step in multiplying 2 and 3 digits. It will lead students to a better understanding of the connection between the distributive property and the standard algorithm.    **Example:** 32 x 25 = ?  For this model, the student draws a rectangle (array) without using the grid to show each square. The two factors are broken by place: 32 becomes 30 + 2 and 25 becomes 20 + 5. Next, multiply across the array (multiply the 20 x 30 and the 20 x 2, then multiply the 5 x 30 and then the 5 x 2). Add all products together for the answer.  30 2   |  |  | | --- | --- | | 600 (20 x 30)  20  5 | 40 (20 x 2) | | 150 (5 x 30) | 10 (5 x 2) |   600 + 150 + 40 + 10 = 800 |
| **Partial Products**  This method is like the array model, but an array is not drawn. Simply decompose the numbers by place and multiply. Then add each partial product for the total. Students may begin with the ones place or the tens place (commutative property).  Begin with ones Begin with tens  32 32  x25 x25  10 (5x2) 600 (30x20)  150 (5x30) 150 (30x5)  40 (20x2) 40 (20x2)  + 600 (20x30) + 10 (2x5)  800 800 | **Standard Algorithm**  After students gain a conceptual understanding of multiplication involving arrays with equal rows and columns, students can move towards procedural fluency with the standard algorithm. When students have a strong background in area models and partial products, they have a better understanding of where these products come from and don’t make as many simple errors or mistakes.  32  x25  160 (5x2) + (5x30)  640 (20x2) + (20x30)  800 |