Cognitively Guided Instruction (CGI) Problem Types

With Cognitively Guided Instruction (CGI), problem solving is the focus, and there are important distinctions among different types of problems that are reflected in the ways that children think about and solve them based on the types of action or relationships described in the problems (Carpenter, et. al., 2006). Classifying problems as shown in the table below can build a deeper understanding of each of the operations. In addition, the structure of the problem type provides a way to identify the relative difficulty of various problems.

Mathematics Problem Types

Joining Problems (Action)

(Result Unknown)	(Change Unknown)	(Start Unknown)
Ann had 6 pencils. Juan gave her 8 more pencils. How many pencils does Ann have all together?	*Ann had 8 pencils. Juan gave her some more pencils. Now she has 14 pencils. How many pencils did Juan give Ann?*	*Ann had some pencils. Juan gave her 8 more pencils. Now she has 14 pencils. How many pencils did Ann have to start with?*
6 + 8 = ☐	***8 + ☐ = 14***	***☐ + 8 = 14***

Separating Problems (Action)

(Result Unknown)	(Change Unknown)	(Start Unknown)
Ann had 14 goldfish. He gave 8 goldfish to his friend, Juan. How many goldfish does Ann have now?	*Ann has 14 goldfish. He gave some goldfish to Juan. Now he has 8 goldfish. How many goldfish did he give to Juan?*	*Ann had some goldfish. He gave 8 goldfish to Juan. Now he has 6 goldfish. How many goldfish did Ann have to start with?*
14 – 8 = ☐	***14 – ☐ = 8***	***☐ – 8 = 6***

Part-Part-Whole Problems (No Action)

(Whole Unknown)	(Part Unknown)	(Both Parts Unknown)
Ann has 7 blue cap erasers and 8 pink cap erasers. How many cap erasers does Ann have?	*Ann has 15 cap erasers. 8 are pink and the rest are blue. How many blue cap erasers does she have?*	*Ann has 15 cap erasers. Some are pink and some are blue. How many could be pink and how many could be blue?*
7 + 8 = ☐	***15 – 8 = ☐ OR 8 + ☐ = 15***	***☐ + ☐ = 15***

Compare Problems (No Action)

(Difference Unknown)	(Quantity Unknown)	(Referent Unknown)
Ann has 12 marbles. Juan has 7 marbles. How many more marbles does Ann have than Juan?	*Ann has 5 marbles. Juan has 7 more than Ann. How many marbles does Juan have?*	*Juan has 12 marbles. He has 5 more than Ann. How many marbles does Ann have?*
12 – 7 = ☐ OR 7 + ☐ = 12	***5 + 7 = ☐***	***12 – 5 = ☐ OR 5 + ☐ = 12***

Groups

(Multiplication)	(Measurement Division)	(Partitive Division)
Ann has 3 packages of gummies. Each package contains 8 gummies. How many gummies does Ann have?	Ann *has 24 gummies. There are 8 gummies in each bag. How many bags of gummies does she have?*	*Ann has 3 bags of gummies with the same number of gummies in each bag. Altogether, she has 24 gummies. How many gummies are in each bag?*
3 x 8 = ☐	***24 ÷ 8 = ☐***	***24 ÷ 3 = ☐***