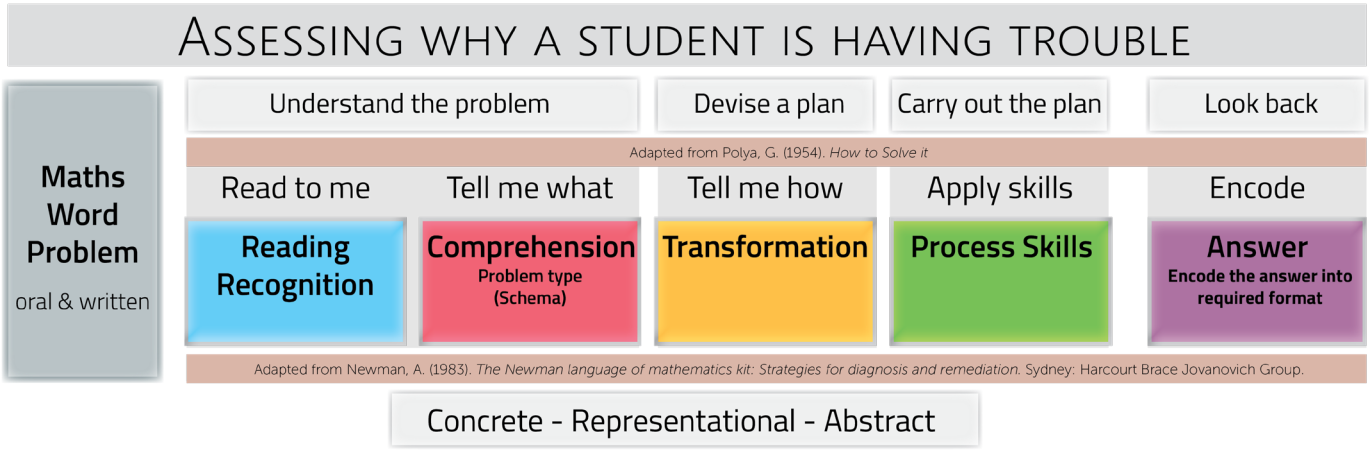
Newman Analysis



Reading mathematics text and understanding what it means are two different elements of solving a word question in mathematics. Consider the use of the word 'more' in the following word problems.

- Michelle had 4 pencils and was given 3 more. How many does she now have?
- Michelle has 8 pencils and I have 5 pencils, how many more pencils does Michelle have?

In the first example the implication is to add. Many students reading the word 'more' in the second example will automatically add the 8 and 5 and provide an answer of 13. In fact subtracting 5 from 8 will provide the correct answer of three. These problems help to illustrate that strategies such as the 'key word' strategy can sometimes backfire when solving mathematics word questions.

In order to comprehend and mathematics word question students will require:

- a good mathematical vocabulary and
- an understanding the underlying structure of the way mathematics word questions are written.

Swan advises, "We now have considerable research evidence to suggest that to understand a mathematical concept it is better to work through a few well chosen problems, than to work through lists of exercises. These problems must embody key concepts and be discussed and tackled in depth …" (p, 60). (See The Structure of World Problems).

Pinpointing the problem

A Newman (1983) five-point error analysis may be used to help pinpoint where students experience difficulty in solving word problems so that targeted support can be provided. Newman's questions are listed below:

1. **Reading:** Please read the question to me. If you don't know a word, leave it out.
2. **Comprehension:** Tell me what the question is asking you to do.
3. **Transformation:** Tell me how you are going to find the answer.
4. **Process skills:** Show me what to do to get the answer. Tell me what you are doing as you work.
5. **Encoding:** Now write down the answer to the question.

In the model shown Polya's Problem Solving Strategies have been linked to a Newman Analysis to help pinpoint where a student is experiencing difficulty solving a word problem.

Reading

When reading text in mathematics a student needs to recognise words and symbols and sometimes refer to graphs, tables and diagrams. Many strategies employed in the teaching of reading may be applied to reading mathematics word questions. It should be noted that mathematics word questions tend to be dense and provided few contextual clues

Comprehension

To comprehend what is being read the student must know some specific mathematical vocabulary and be able to distinguish how a word is being used in the context.

Transformation

Students can use a variety of tools to transform the information found in a word question into a number sentence. Drawing a diagram such as a 'bar diagram' is an example of one such tool.

Process Skills

Some students will make a careless error or lack the process skills to determine the answer. Many interventions occur at this phase despite evidence to suggest that many students do not pass beyond the comprehension phase.

Encoding

This involve students writing the answer in an acceptable form, using appropriate units, placing the decimal point at the appropriate place and so on.

Conclusion

Newman Analysis is and ideal starting point for teachers and schools to use to assess what is the main cause of students failing to solve word questions. This information may then be used to focus an intervention strategy to deal with the issue. For a detailed explanation of the use of Newman Analysis, see https://www.mav.vic.edu.au/files/conferences/2009/08White.pdf

References

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