

Thinking About the Thinking of Others

Can students improve their performance on multiple choice questions by using both inhibitory control and cognitive flexibility in looking at possible responses?

Introduction

Student diagnostic testing such as NAPLAN and PAT-M often asks students to answer a range of multiple choice questions. However when students do not know the answer to the question immediately they often choose a response at random. This gives little insight into whether the student understands the task or not. This research was designed to give students a different way to approach multiple choice questions by considering the thinking that would be required to generate each response. It is hoped that by analyzing each response and thinking about whether they agree with it they will be more likely to select the correct answer to the task.

Method

The Question

$2(a + 3b)$ is the same as:

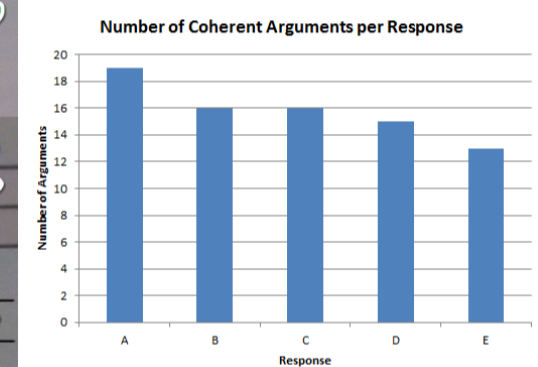
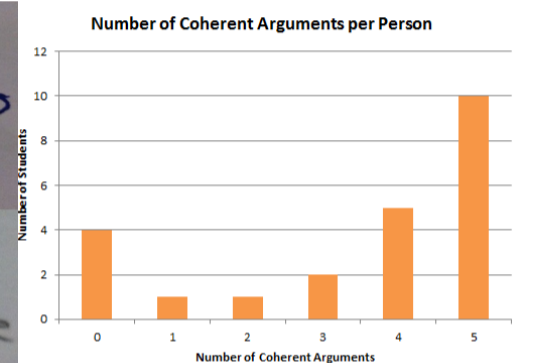
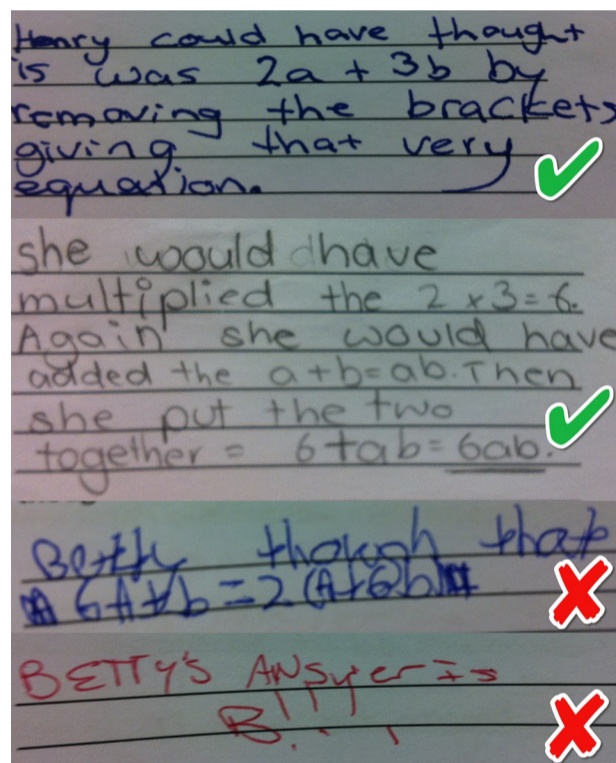
- A $5ab$
- B $6ab$
- C $a + 6b$
- D $2a + 3b$
- E $2a + 6b$

Students were given a PAT-M question that they had done earlier in the year (shown opposite) and for each of the responses were asked "John thought that A was the correct answer to this question. How might have he thought about the problem". This was asked for each of the 5 possible responses. Students were asked to justify how each person got that possible answer and were then asked to determine who they thought was correct.

Observations

The following is some observations from this task

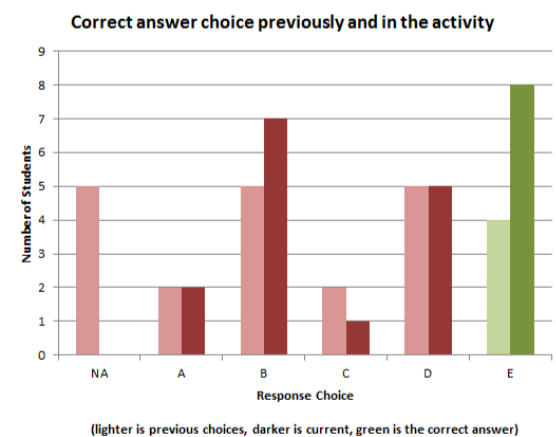
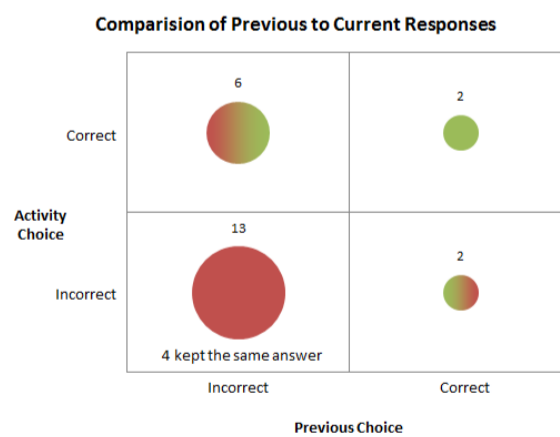
- Students responses to this task were, for the most part, quite coherent in talking about the mathematics. Two thirds of the students were able to provide either four or five clear, coherent arguments for how that person thought about the question (shown by ticks).
- There were very few people who were not able to give even one coherent argument. For those with none, responses were similar to those shown by crosses.
- The question with the least coherent responses was the correct answer, some just did not know how someone could think about that answer, they found no link to the question.
- Almost everybody chose to represent their responses in words rather than symbolically.
- Most of the responses that the students gave also corresponded closely to what ACER thought would be the incorrect thinking.
- Students were much more confident with the answer that they chose.



Results

The following represent the results of the analysis of the responses both pre and post activity.

- The number of correct responses to the question doubled from the testing in term 3.
- Only 6 of 23 students chose the same response as they did in term 3, 2 of these chose the same correct response, 4 chose the same incorrect answer.
- 4 previously chose incorrectly and now chose correctly, 2 chose correctly this time having not sat the test in term 3.
- 9 people swapped from one incorrect answer to another and 2 changed from the correct answer to an incorrect one.



Discussion

In looking at the responses to this task it was surprising to see such high numbers of coherent arguments to each of the given responses. In thinking about the research initially it was thought that students would find it difficult to see the problem in any other way other than their own. Students showed a high level of cognitive flexibility in generating these arguments however for some the challenge of thinking from another person's point of view was too demanding.

It is clear in looking at the responses to this question that students have a range of misconceptions present in their thinking about the distributive law and collecting like terms. Overall student confidence with their answers made it clear that some of these misconceptions are strongly held.

It was interesting to see that such small numbers of students stuck with their original responses (they were not aware of what they picked last time). This indicates a element of guessing in the previous completion of this question.

Overall this task did show that students were much more willing to stop and think about the task (inhibitory control) and were able to think flexibly about the possible answers. This did lead to a higher level of achievement on the question. However the time taken for students to complete this task (about 30 mins) would be time prohibitive in timed diagnostic tests such as NAPLAN and PAT-M. Frequent practice of this type of task may lead to increased speed in sorting correct from incorrect responses.