FaSMEd

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Improving Learning through Formative Assessment using Technology

University of Nottingham

October 2015

The FaSMeD project

The research focuses on the **use of iPads** in mathematics lessons and how they can be used to facilitate or enhance formative assessment.

The lessons in this phase all involved some use iPads (or laptops) but with different software and mathematical topics.

Research questions

- How do teachers **process** or **present** formative assessment data from students using a range of technologies?

- How do teachers **inform their future teaching** using such data?

Formative assessment

What is the impact from using the technology when:

- Building on student's prior knowledge;
- Identifying and responding to students' conceptual difficulties;
- Using questioning;
- Increasing student collaboration;
- Enabling students to become assessors?

Lesson 1: distance-time graphs

- Two diagnostic questions to start the lesson;
- Use of Showbie to send, receive and display selected student responses;
- Selected student work used to discuss and address misconceptions;
- Peer assessment and discussion based on responses to ‘mirrored’ questions.

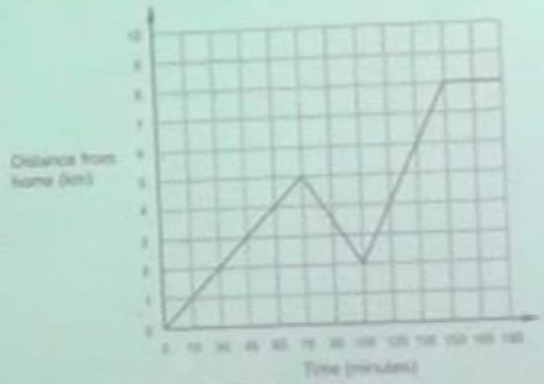
Interpreting a graph

A walk to the shop...

One day John went for a walk to the shop. The graph shows his walk. Describe what may have happened.

A walk to the shop

One day John went for a walk to the shop. The graph below shows his walk. Describe what may have happened.



It took him 1 hour & 15 minutes to walk 5 km. Then he went back 3 km which took him 30 minutes. Then he walked 6km in 1 hour & 15 minutes. He then stopped at 8km for 30 minutes

Drawing a graph

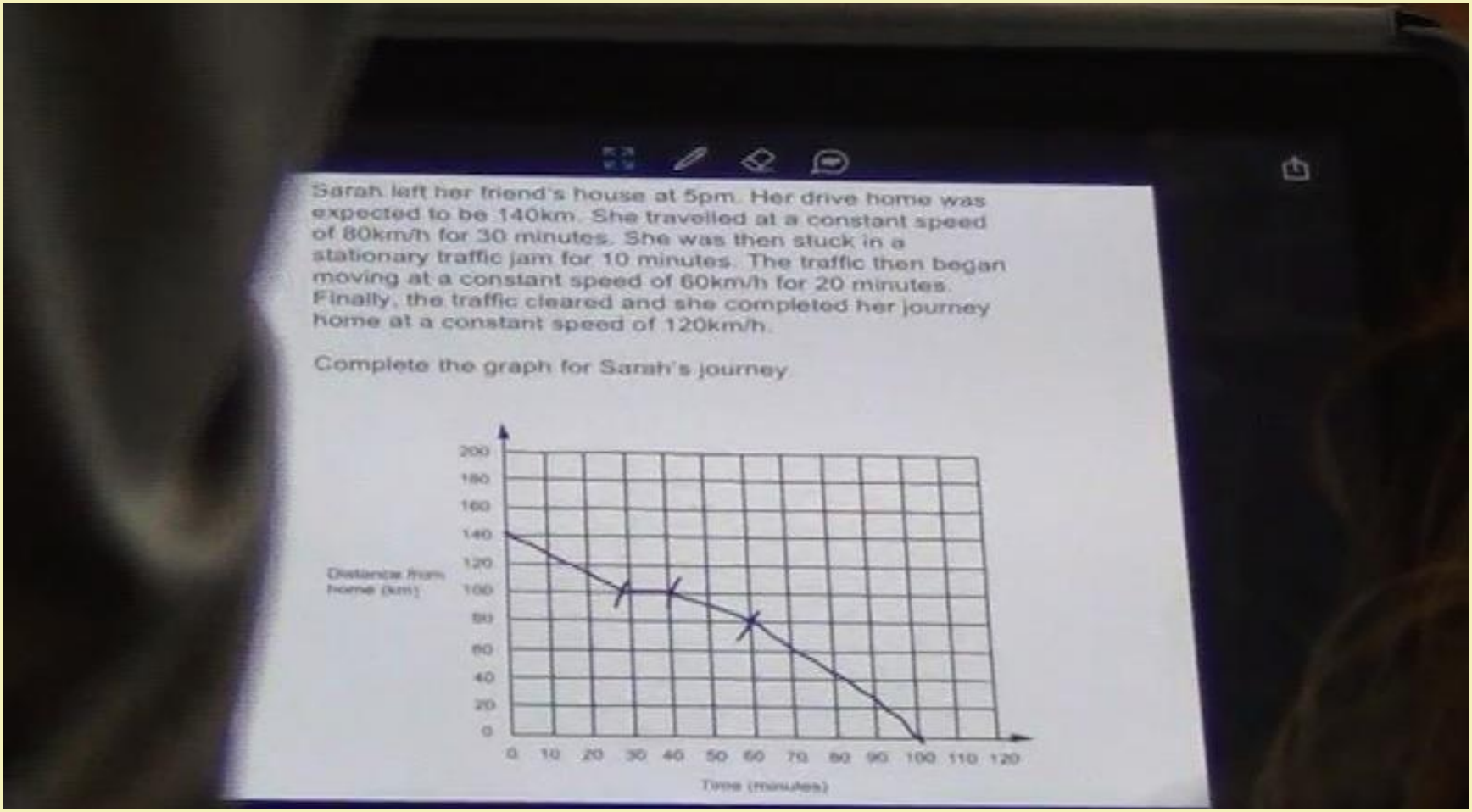
A long drive home

Sarah left her friend's house at 5pm. Her drive home was expected to be 140km. She travelled at a constant speed of 80km/h for 30 minutes. She was then stuck in a stationary traffic jam for 10 minutes. The traffic then began moving at a constant speed of 60km/h for 20 minutes. Finally, the traffic cleared and she completed her journey home at a constant speed of 120km/h.

Complete the graph for Sarah's journey.

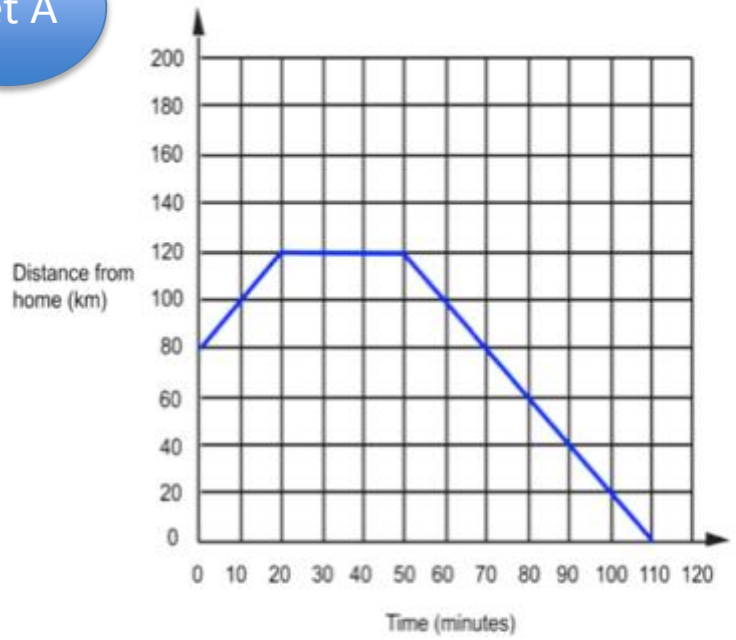
Discussion and decisions

Completing and sharing



Mirrored questions

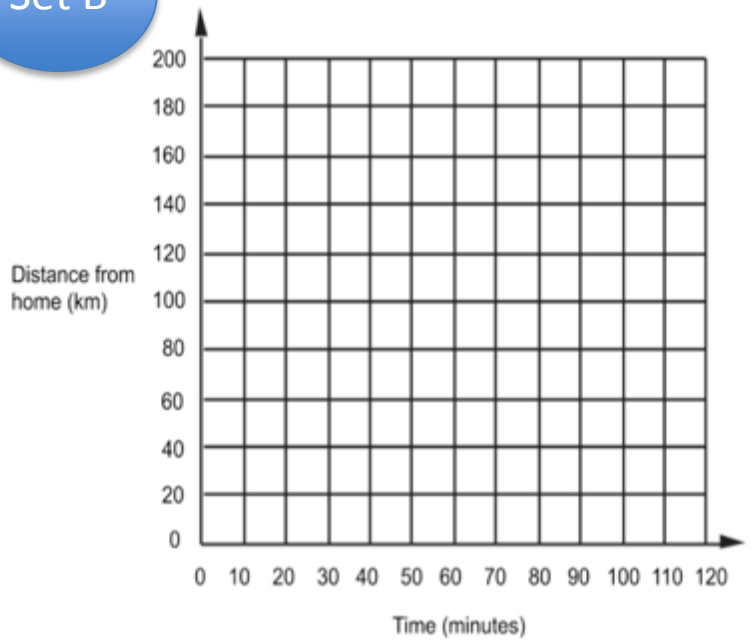
Set A



Complete the story below from the graph.

James is at his friend's house, which is _____ from his house. He travels away from his house to see his Grandma at a _____ speed of _____ km/h for _____ minutes. He stays at his Grandma's house for _____ minutes. He then travels home at a _____ speed of _____ km/h.

Set B



Complete the graph based on the story below.

James is at his friend's house, which is 80km from his house. He travels to away from his house to see his Grandma at a constant speed of 120 km/h for 20 minutes. He stays at his Grandma's house for 30 minutes. He then travels home at a constant speed of 120 km/h.

Peer assessment and discussion

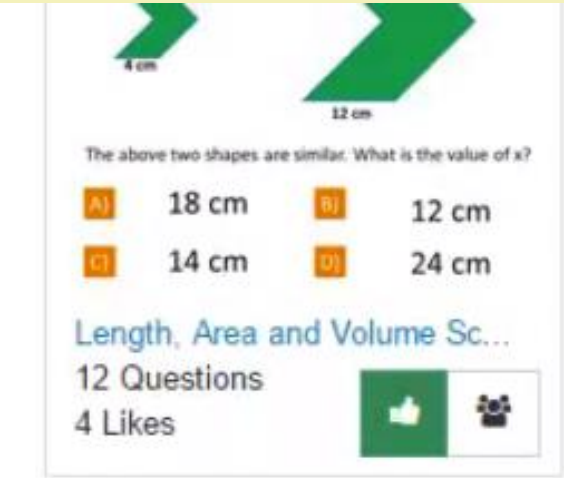
Lesson 2: algebraic expressions

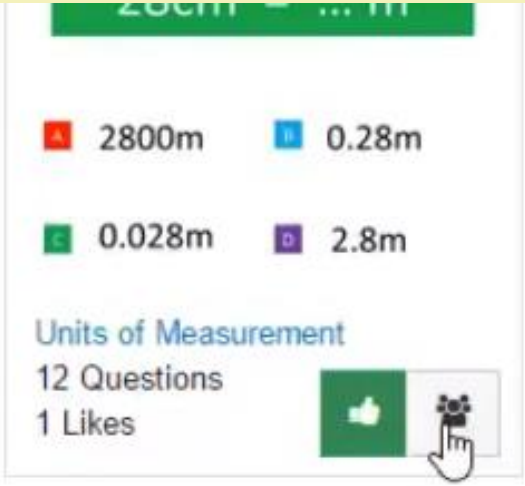
- Diagnostic assessment prior to lesson using diagnosticquestions.com;
- Lesson plan adapted in response to the profile of student responses and reasons given;
- Use of Nearpod to send, receive and display selected student responses;
- Selected student work used to discuss and address misconceptions.

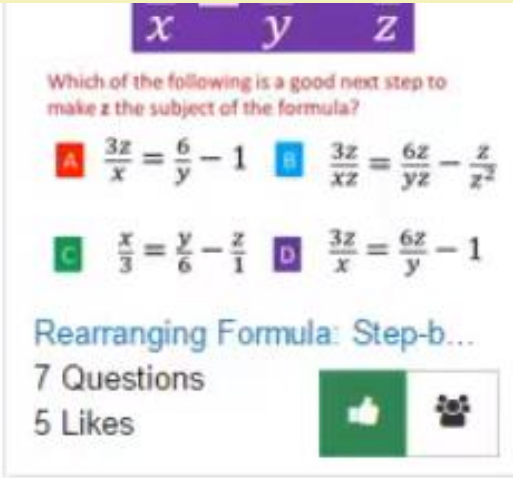
Pre-lesson diagnostic questions

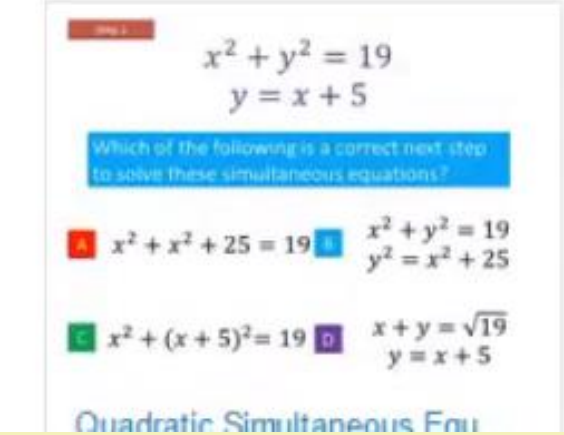
https://www.diagnosticquestions.com

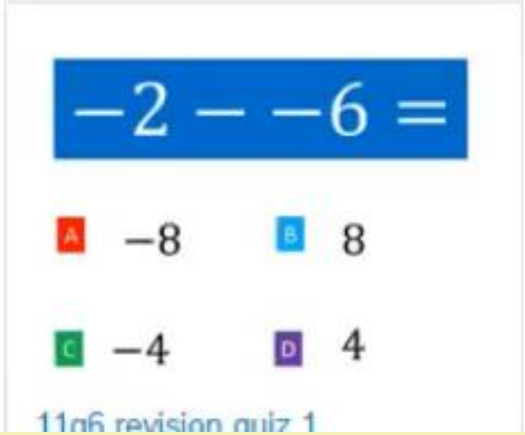
Selection of questions by teacher

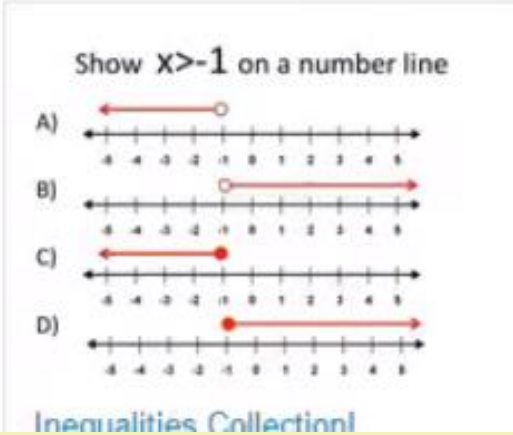












Choices for student

$$-2 - -6 =$$

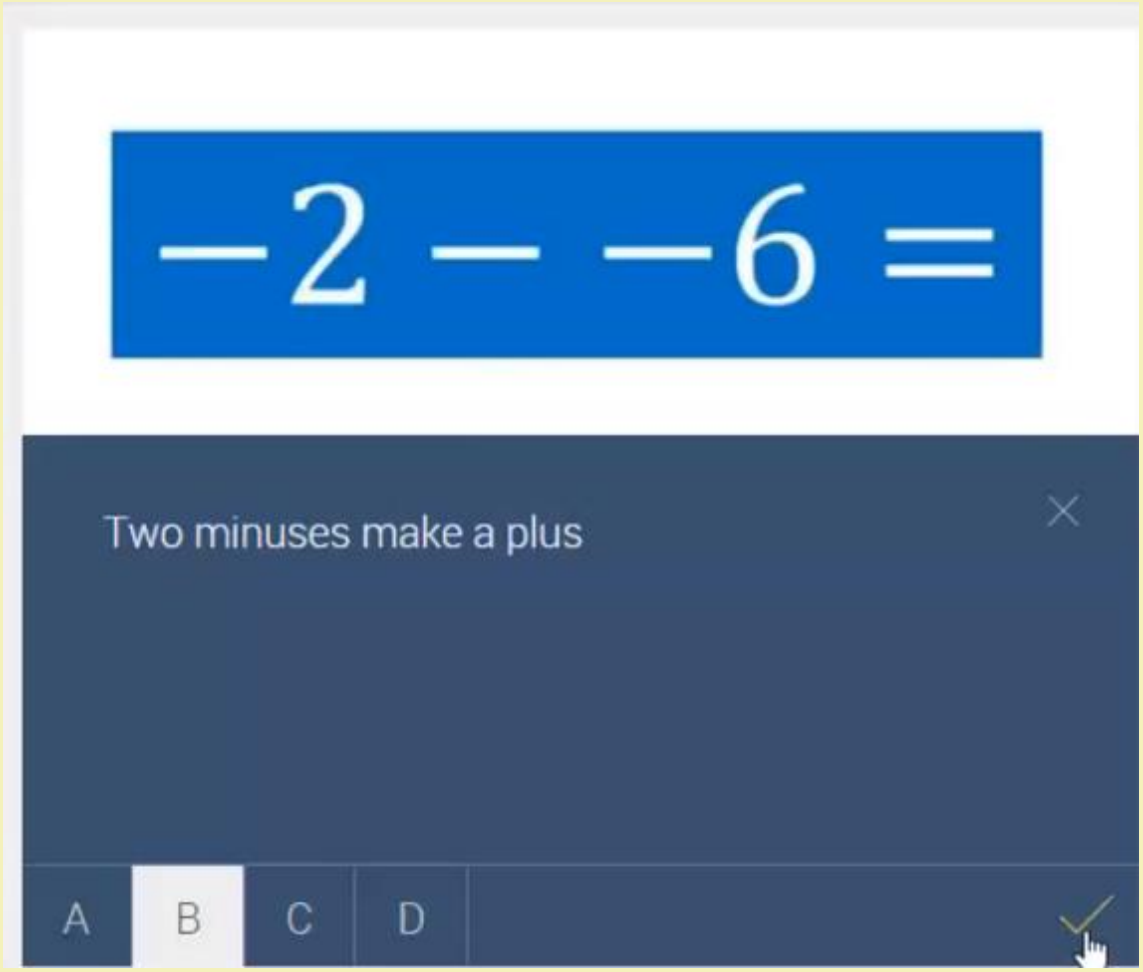
A -8

B 8

C -4

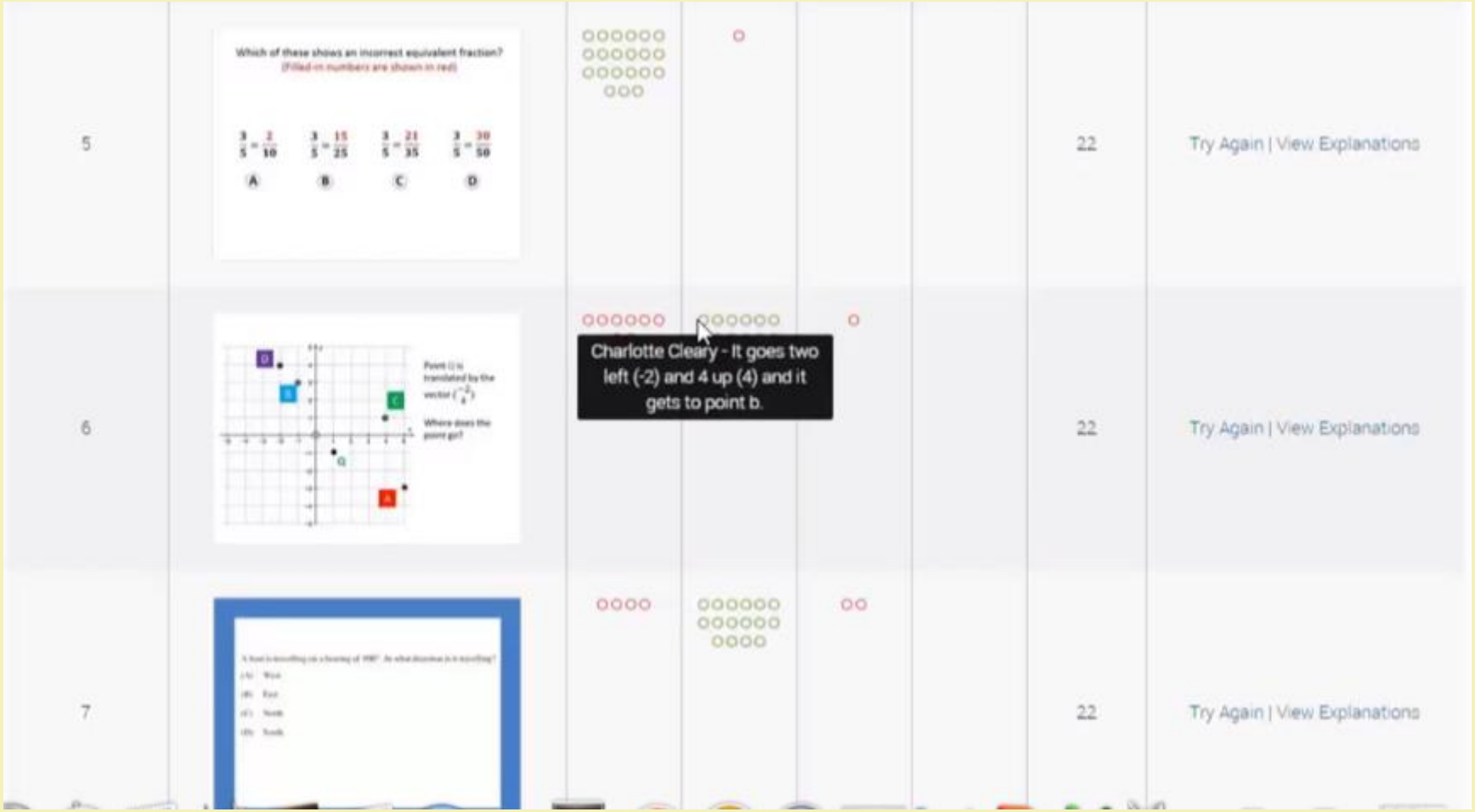
D 4

Student response

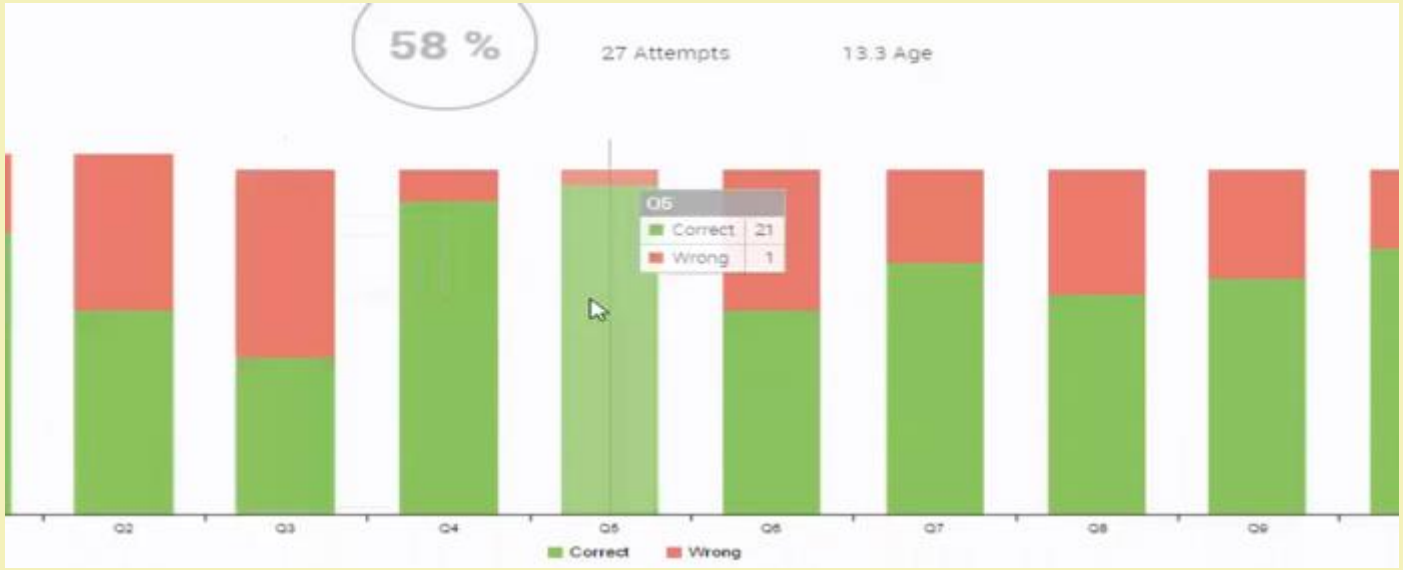


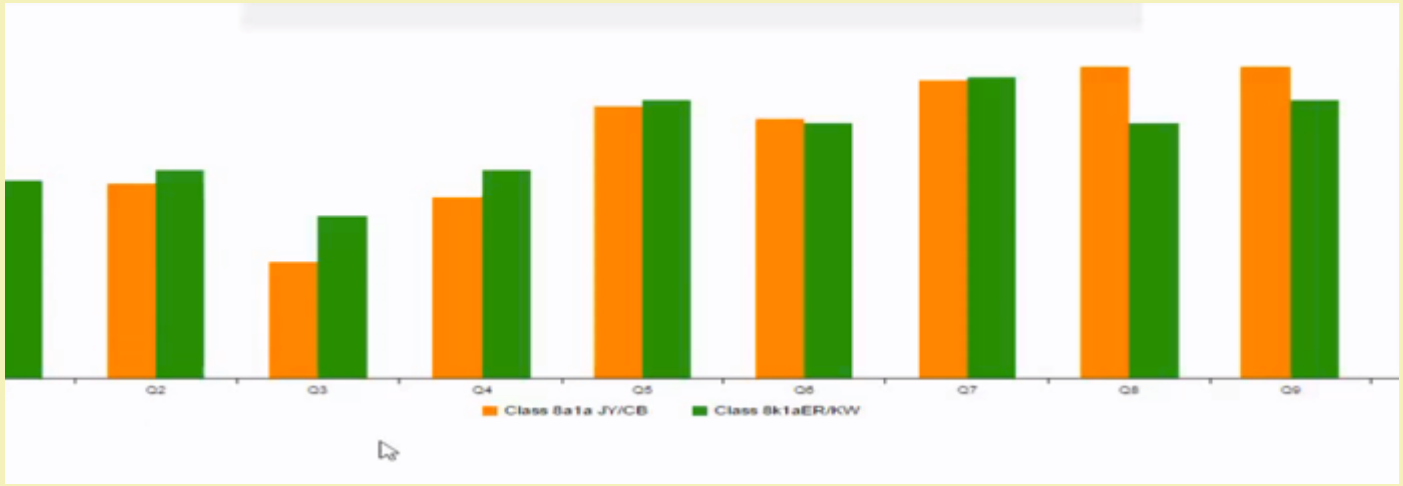
Options for student

Teacher overview



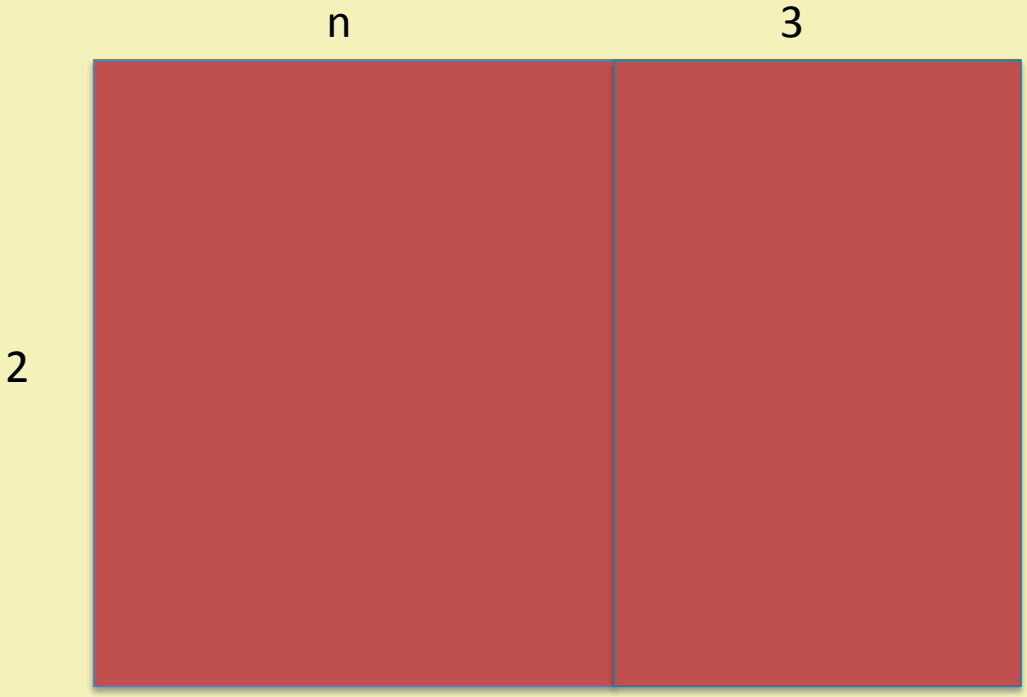
Class profiles





Questions for students

Write down an expression for the area of this shape …

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3


n
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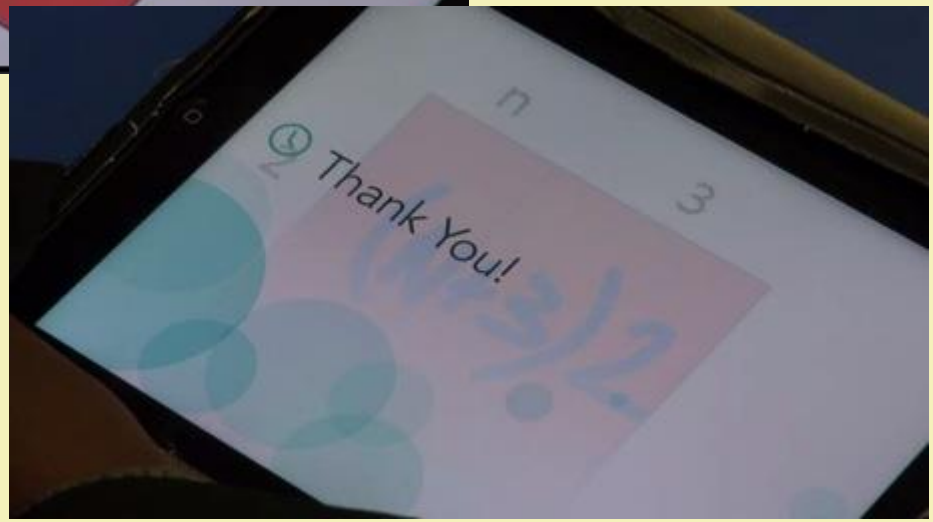
3
(N+3)2


n
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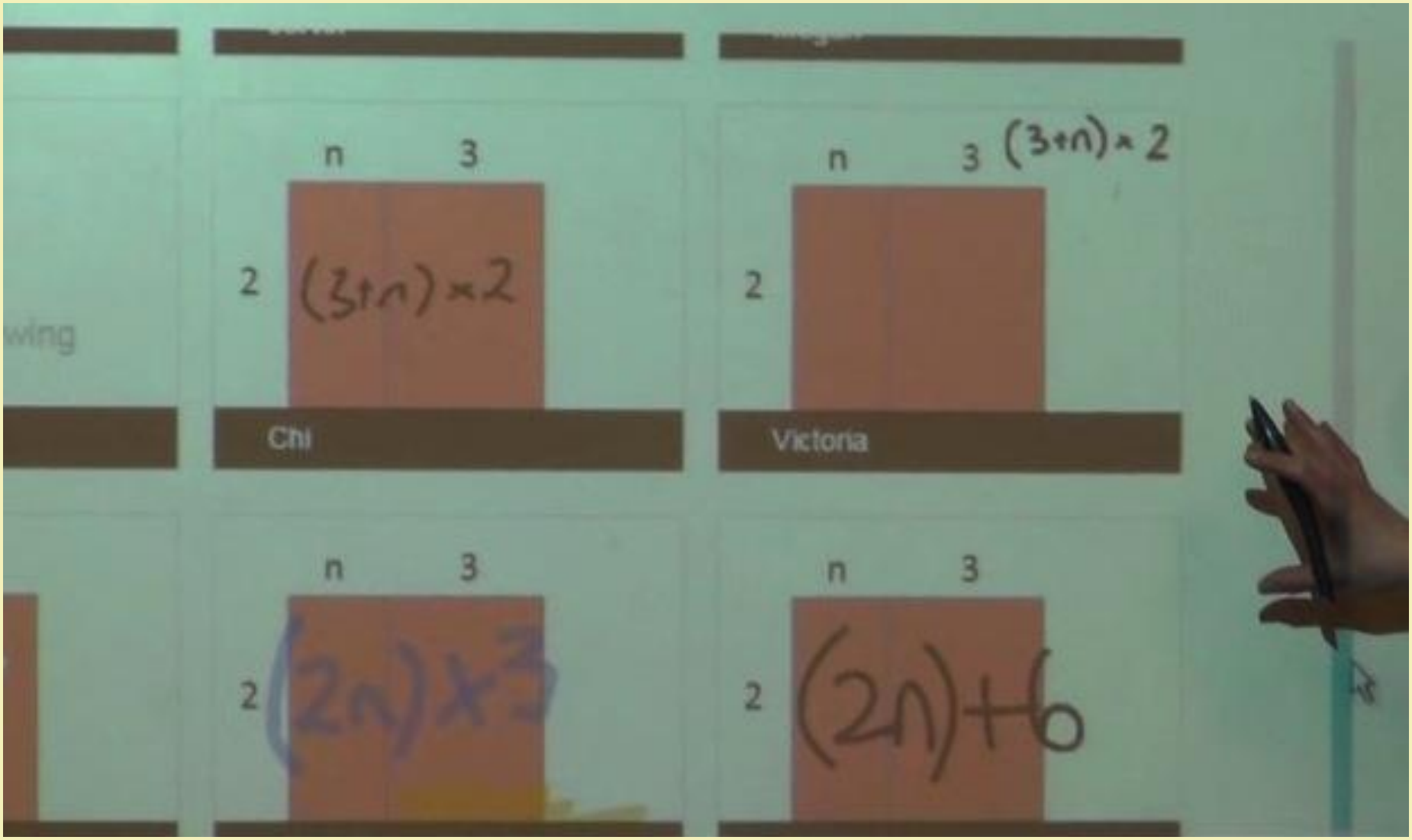
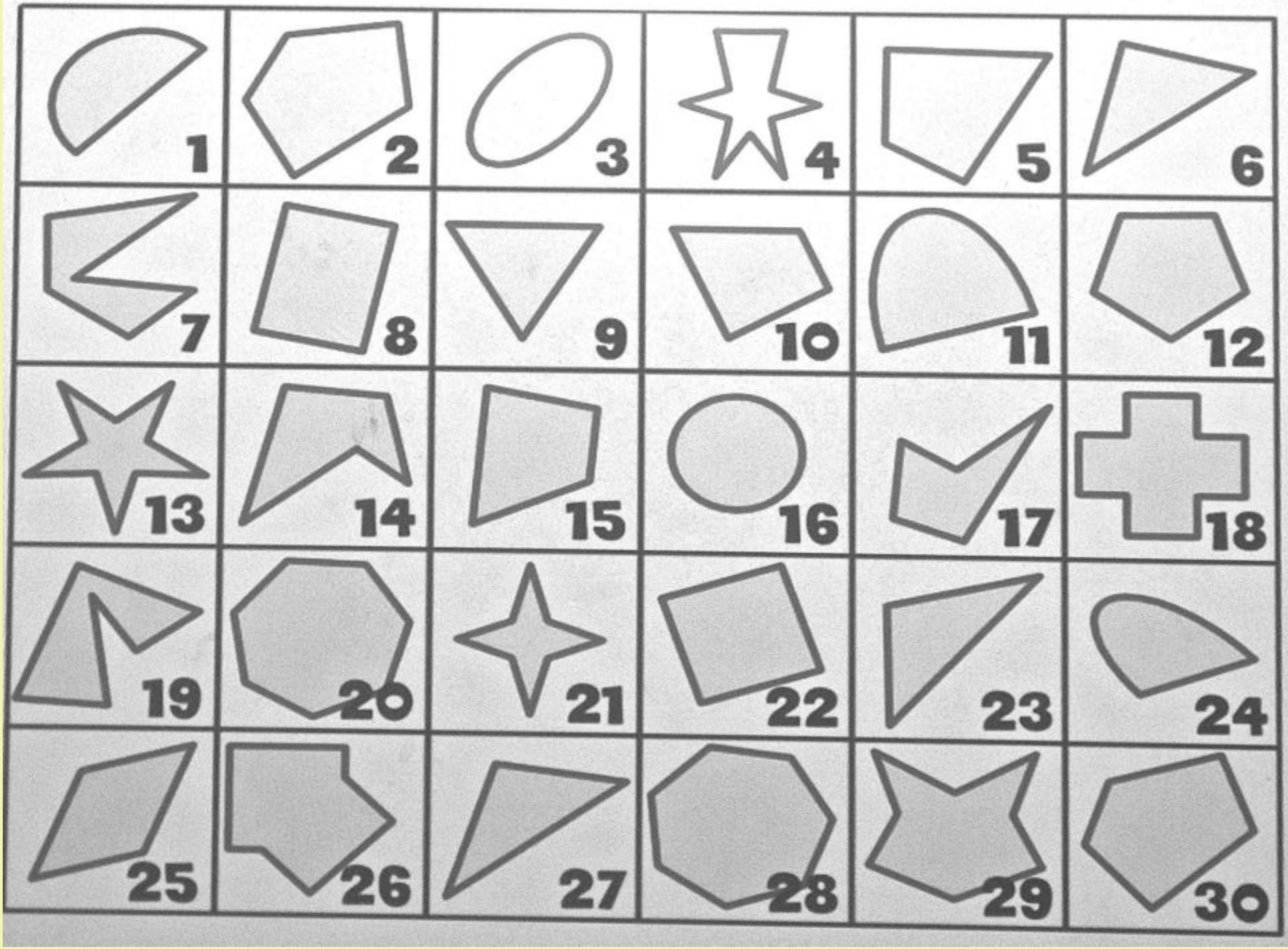
3
Thank You!
(N+3)2

Class discussion



Lesson 3: Tessellation

- Students discuss common shapes and their properties with the teacher;
- Students make predictions of shapes that will tessellate;
- Students use the “Tessellation creator” app to test their predictions;
- Students explore tessellations of two or more shapes;
- Students view, assess and comment on work by their peers.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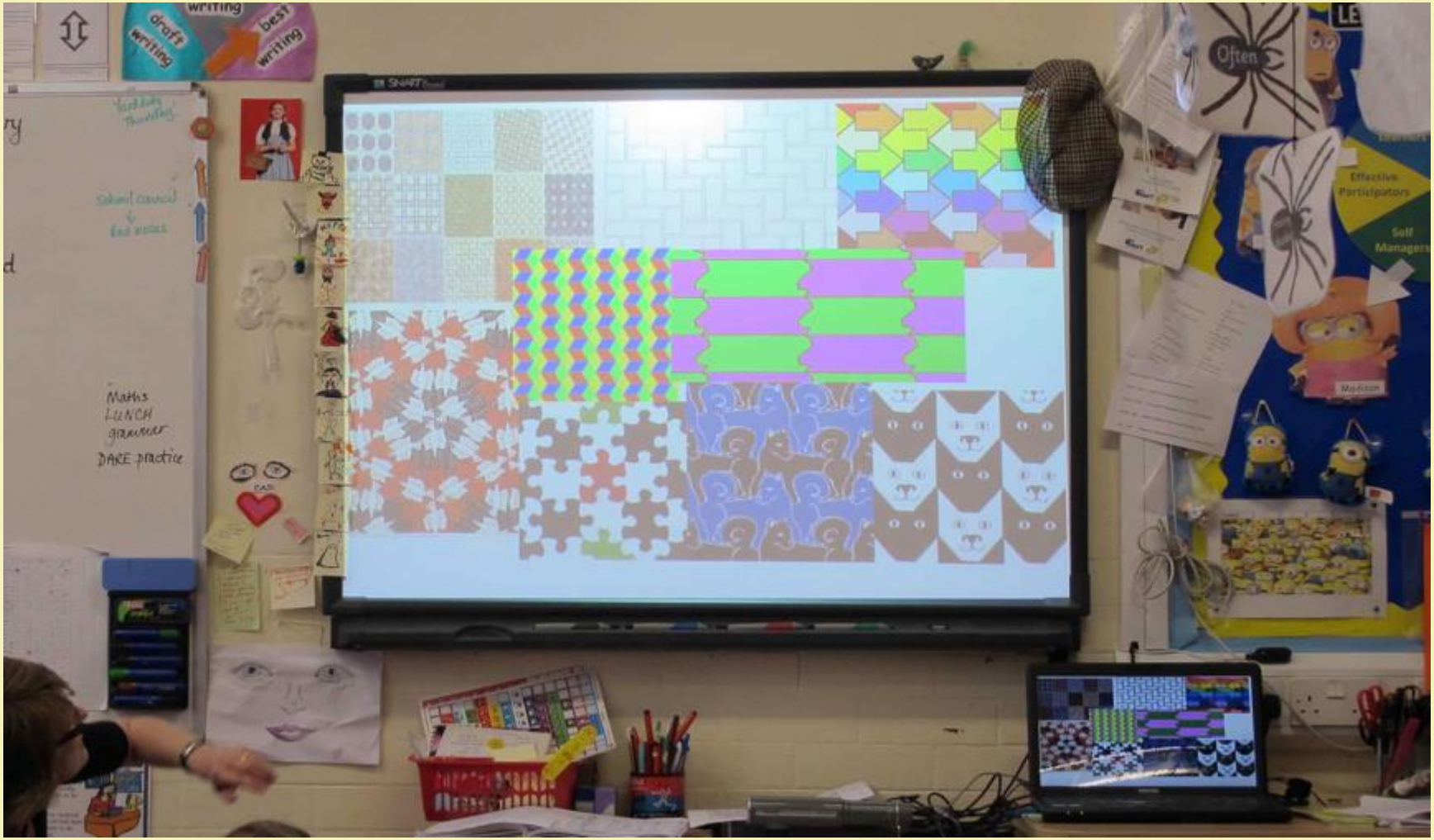
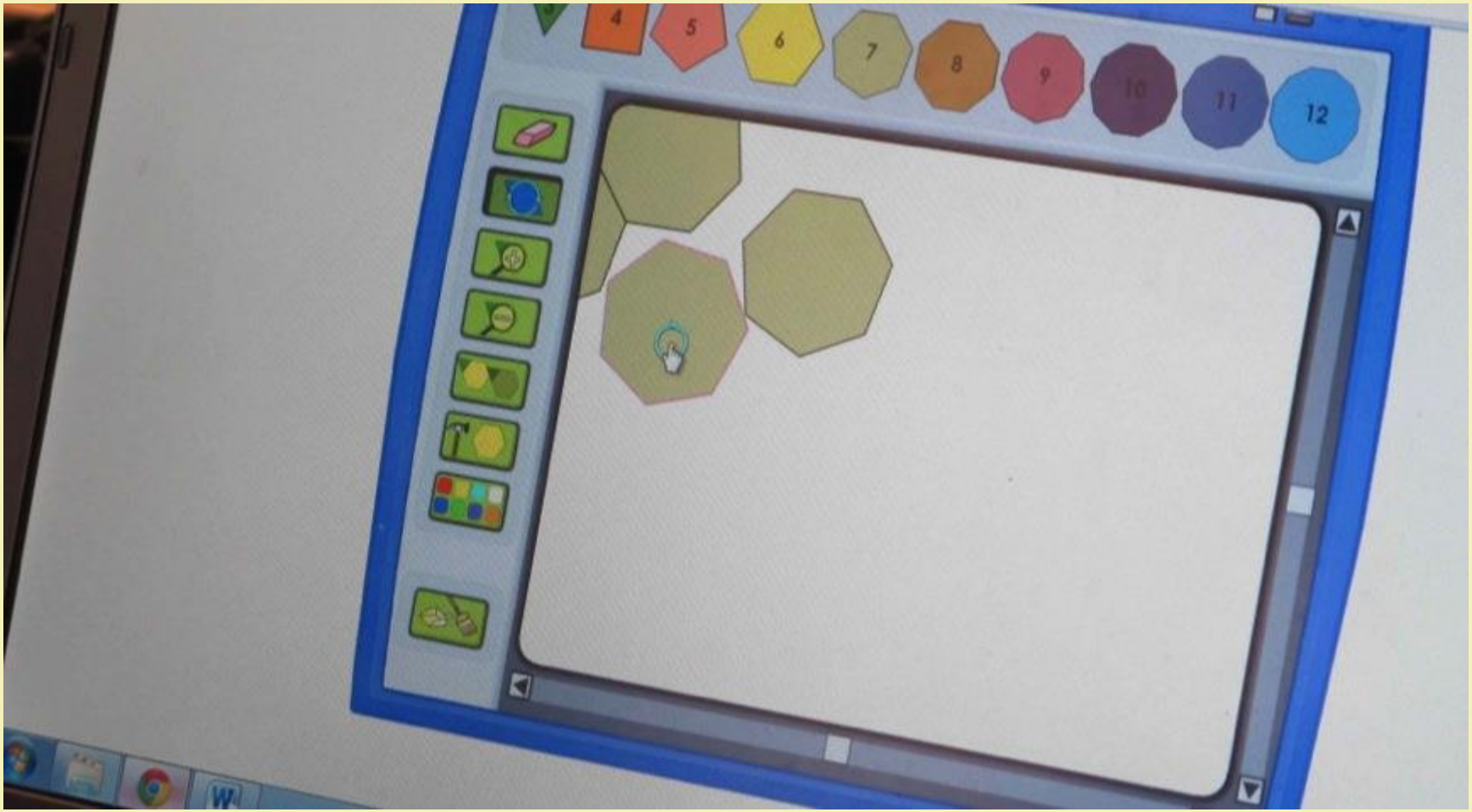
Discussing tessellation

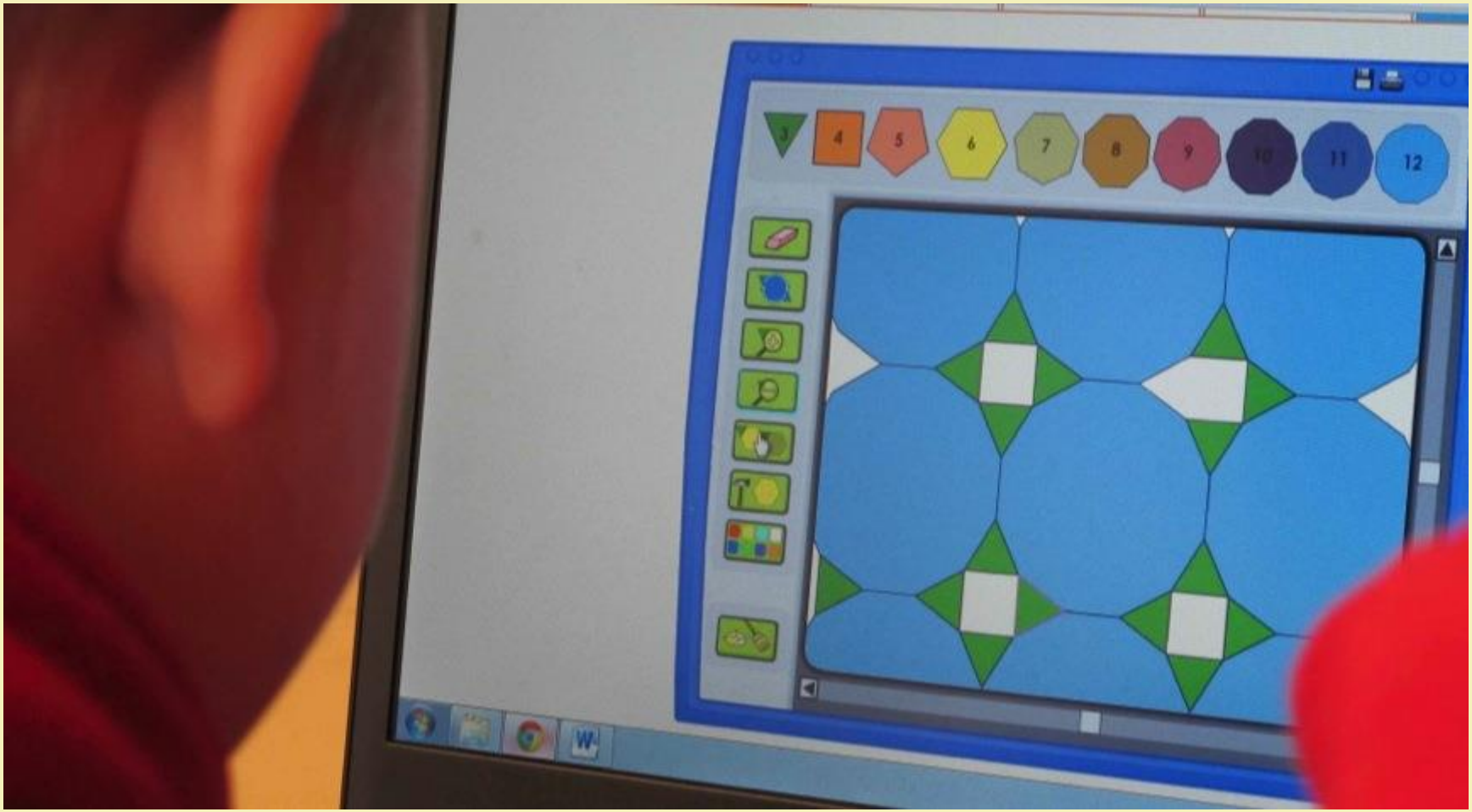


Making predictions

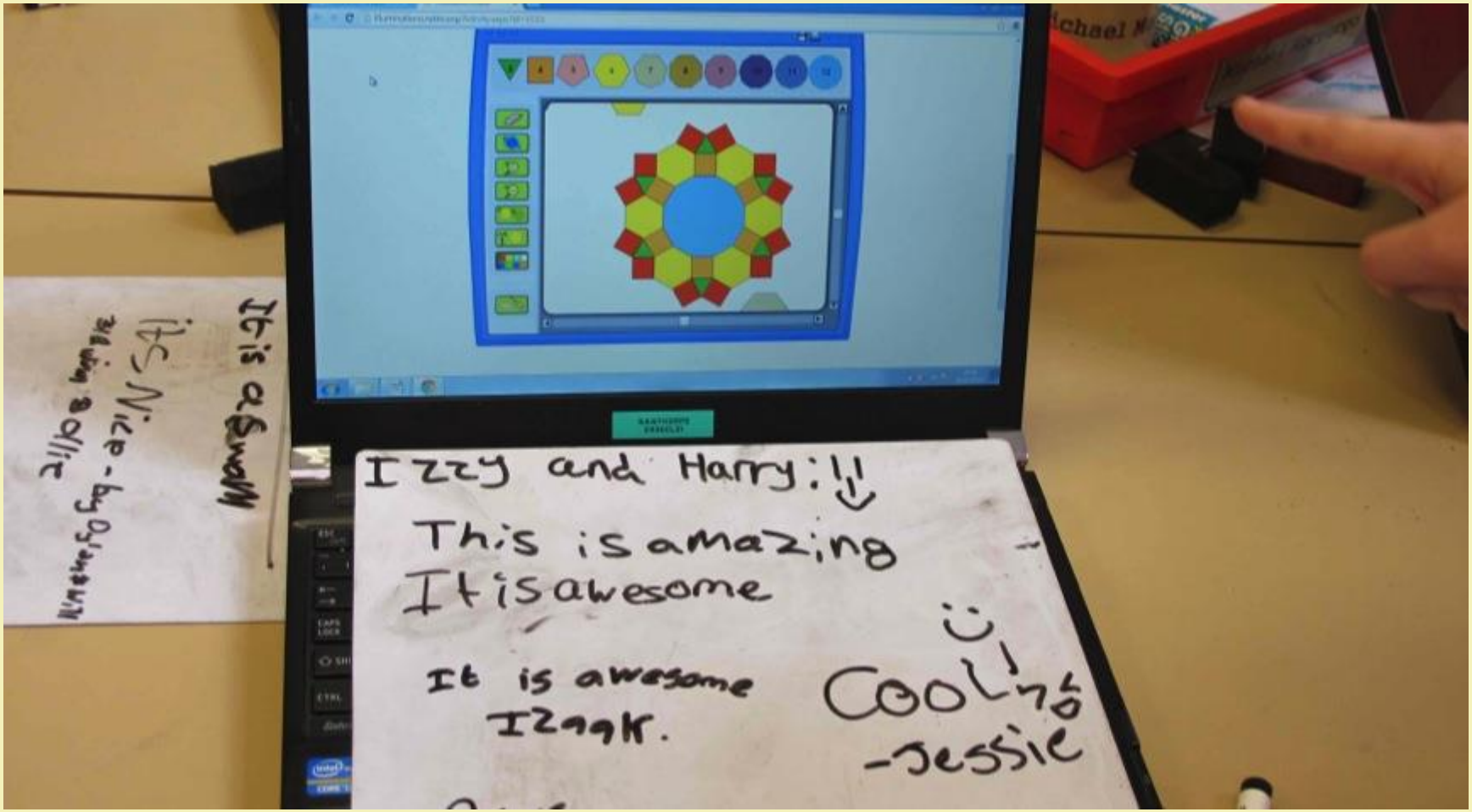
Testing the predictions



Exploring further

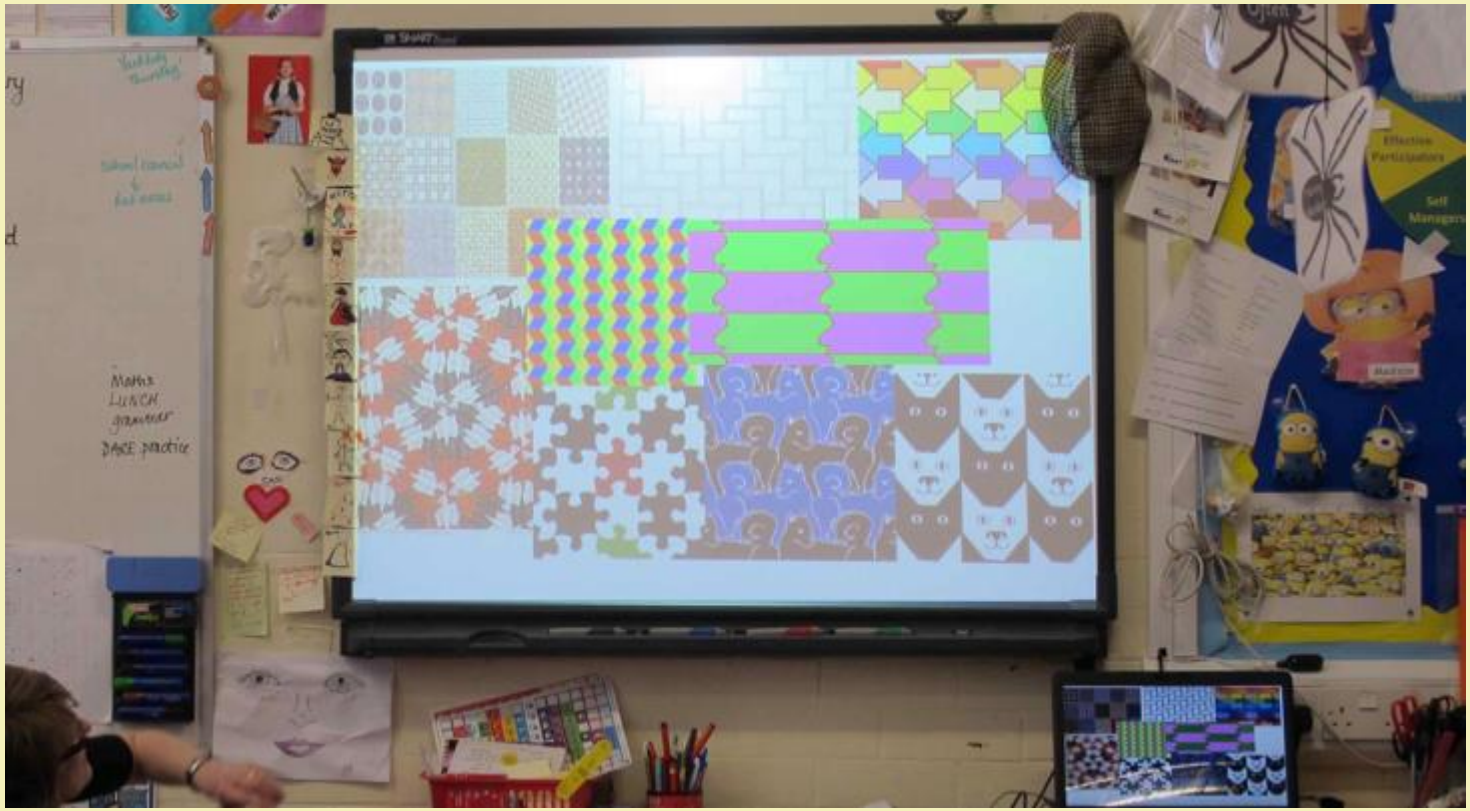


Peer assessment



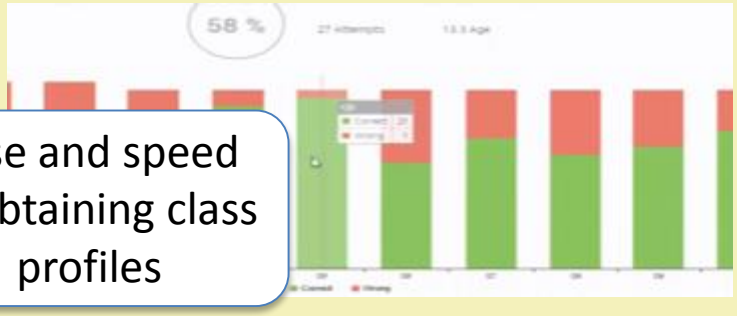
The role of technology (1)

A direct replacement for paper-based methods of formative assessment?



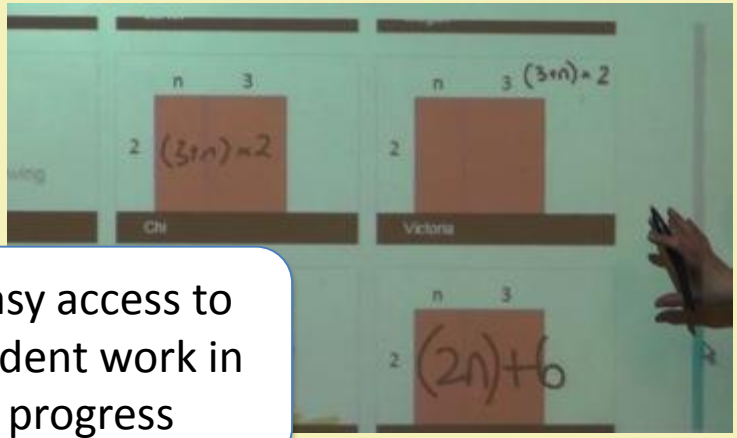
The role of technology (2)

A replacement with the same function but additional benefits?

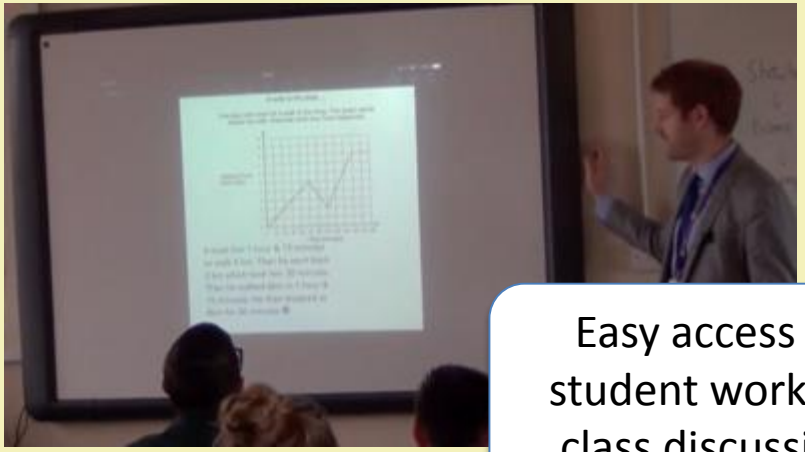


Ease and speed of obtaining class profiles

Less time drawing so more time for student discussion



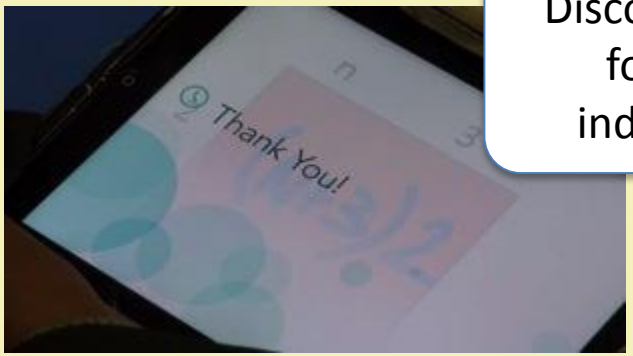
Easy access to student work in progress



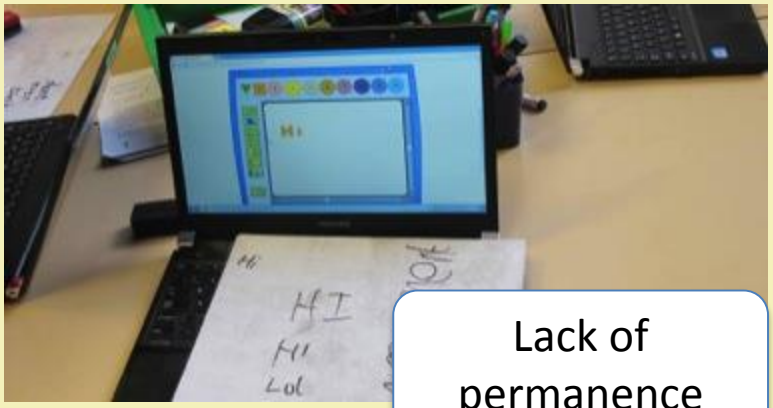
Easy access to student work for class discussion

The role of technology (3)

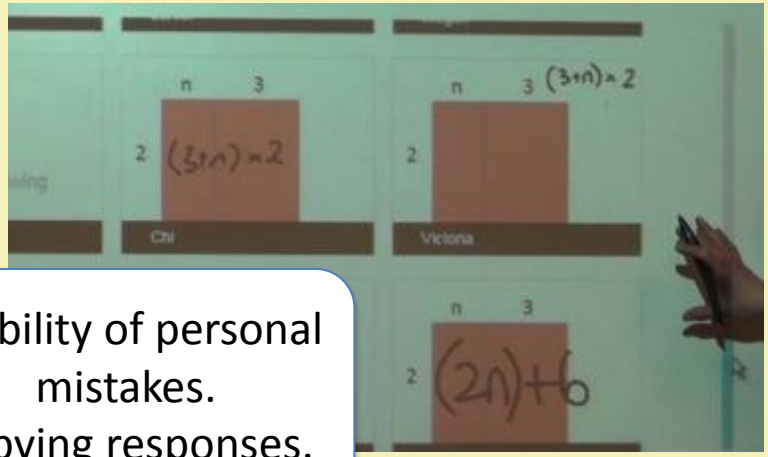
A replacement with the same function but some disadvantages?



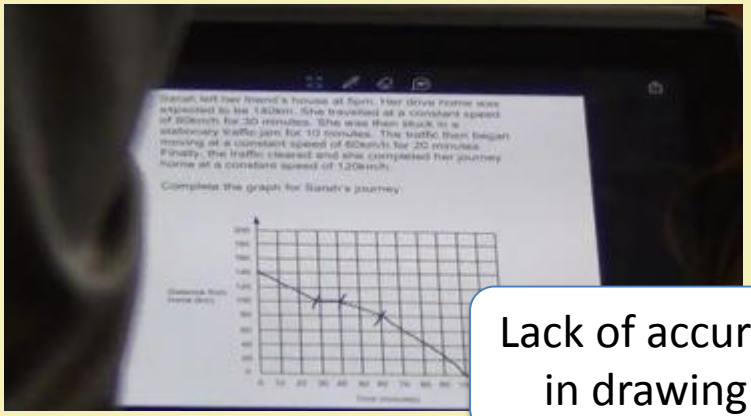
Discontinuity for the individual



Lack of permanence



Visibility of personal mistakes.
Copying responses.

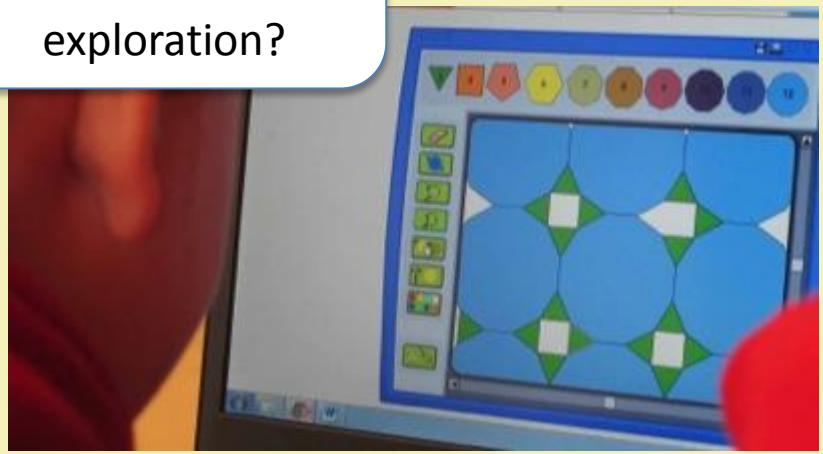


Lack of accuracy in drawing

The role of technology (4)

A tool that significantly changes the process of formative assessment?

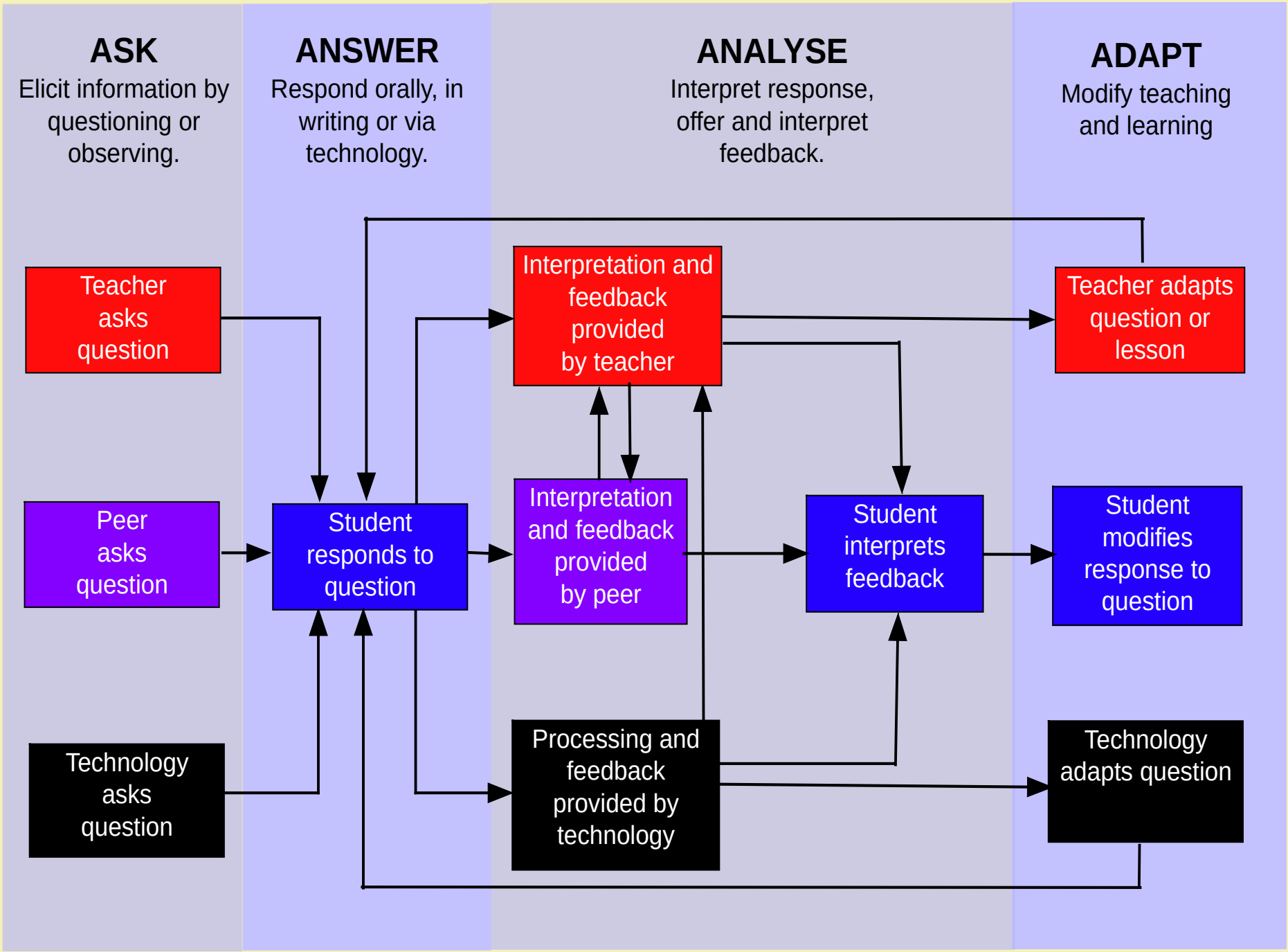
Presenting new questions and areas for exploration?



Changing the nature of peer assessment and discussion?

Functionality of technology in formative assessment

- Sending and sharing
- Processing and analysing
- Providing an interactive environment


ASK
Elicit information by questioning or observing.
ANSWER
Respond orally, in writing or via technology.
ANALYSE
Interpret response, offer and interpret feedback.
ADAPT
Modify teaching and learning
Teacher asks question
Peer asks question
Technology asks question
Student responds to question
Interpretation and feedback provided by teacher
Interpretation and feedback provided by peer
Processing and feedback provided by technology
Student interprets feedback
Teacher adapts question or lesson
Student modifies response to question
Technology adapts question