Algebraic patterns and expressions

Examples of pupils’ work
Examples are from

- **Investigation 1, Q. 1A** "Sketch any of the three figures in the Pattern Player"
- **Investigation 1, Q. 1C** "Describe the pattern..."
- **Investigation 1, Q. 1 F G H** "Copy your expression for total..."
- **Investigation 2, Q. 1 A B** "Describe the pattern's structure and predict the expression for the total number of lights."
- **Investigation 2, Q.1 D E** "Explain how the numbers and variables in your pattern are related to the lights in the pattern"
"Sketch any of the three figures in the Pattern Player" (Inv 1, Q1A)

Discuss the responses...
- The three pupils are seeing the pattern very differently – how would you support them to ‘see’ what is needed to recreate it accurately?
"Describe the pattern..." (Inv 1, 1C)

- What language are the pupils using?
- What language might support pupils to better describe the pattern’s structure?
"Copy your expression for total..." (Inv 1, Q.1 F G H)

f) Select the name of your variable and drag the slider that appears to check if your pattern grows as expected.

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Variable name: [ ]
Variable value: [ ]
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g) Copy your Expression for Total.
```
3 \times 6 = 18
```

h) In your expression:
   i) What does the number represent?
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3 \text{ means lights in block}
6 \text{ means how many times the pattern is in the sequence}
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   ii) Which part is the variable and what does it represent?
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6 (\text{above}) \text{ is how many patterns there are.}
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- How is pupils’ appreciation of an algebraic variable developing?
- How would you use the software to support further discussion?
Describe the pattern's structure and predict the expression for the total number of lights.” (Inv 4, Q1 A B)

1) a) Describe the pattern's structure in words or pictures and how it is different from other patterns you have seen. It might help if you think about the starting pattern and how it grows. (You may wish to use the Step Forward and Step Back to help).

   It is different from other patterns we've seen because it is an odd shape and also has two different colors.

b) Predict: What do you think the expression to give you the total number of lights (for any pattern of this type) will be?

   There's gonna be two different expressions but the total number of lights is addition of both expressions.

1) a) Describe the pattern's structure in words or pictures and how it is different from other patterns you have seen. It might help if you think about the starting pattern and how it grows. (You may wish to use the Step Forward and Step Back to help).

   The pattern structure is different because it has two colours.

b) Predict: What do you think the expression to give you the total number of lights (for any pattern of this type) will be?

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1) a) Describe the pattern's structure in words or pictures and how it is different from other patterns you have seen. It might help if you think about the starting pattern and how it grows. (You may wish to use the Step Forward and Step Back to help).

   3 orange light surrounded with green lights.

b) Predict: What do you think the expression to give you the total number of lights (for any pattern of this type) will be?

   8 x number of rows

• What are the pupils noticing?
"Explain how the numbers and variables in your pattern are related to the lights in the pattern" (Inv 1, Q1D)

d) Check: Was your prediction correct? [The lights in the Pattern Player would be correctly coloured]. If not, modify your expression.

\[ \text{Yes} \]

e) Explain: How the numbers and variables in your expression are related to the lights in the pattern.

\[ \text{They're linked} \]

- How will you use the software to enable pupils to respond to this challenging question?