Responsive Teaching: Cognitive Science and Formative Assessment in Practice

SOK - Friday, 29th November, 2019

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- What’s the problem and what does a solution look like?
- How can we plan effectively and efficiently?
- How can we respond to student understanding effectively?
- Conclusions and next steps
Endemic problems

1) So much to teach, such short units
2) So much to teach, such short lessons
3) How do students know what good work looks like?

1) How did students do?
2) What are students thinking?
3) How can I help all students improve?

“Unlike statistical optimization procedures, heuristics do not try to optimize (i.e., find the best solution), but rather satisfice (i.e., find a good-enough solution).”

Gigerenzer, 2008
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Wegwarth, Gaissmaier and Gigerenzer, 2009
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### Key terms
1. Chancellor: Head of government
2. Coalition: Government with two or more parties sharing power
3. Enabling Act: Law giving Hitler power to make laws without Reichstag approval
4. Führer: The combination of chancellor and president
5. President: Head of state
6. Reichstag: The German national parliament
7. SA: Organisation of Nazi supporters, 2 million members by late 1933.
8. SS: Hitler’s elite bodyguard
9. Führer: The combination of chancellor and president
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### Key people
1. Paul von Hindenburg: President, First World War general and hero
2. Franz von Papen: Right-wing member of the Centre Party
3. Ernst Röhm: Leader of the SA
4. Kurt von Schleicher: Right-wing politician, former general, not a Nazi
5. Hindenburg: Died, leading opponents arrested including von Schleicher.
6. Hitler: Elected chancellor, curbs the power of the SA, Röhm is killed, leading opponents arrested including von Schleicher.

### Key factors
1. Unemployment: 8 million unemployed people felt let down by the government.
2. Propaganda: The Nazis offered appealing messages through powerful propaganda. Hitler was an effective speaker.
3. Fear of Communism: Unemployment and anger increased votes for the Communists: this scared many middle-class voters.
4. Uncommitted democrats: Hindenburg and many right-wing non-Nazis were not committed to democracy and underestimated Hitler.
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6. Uncommitted democrats: Hindenburg and many right-wing non-Nazis were not committed to democracy and underestimated Hitler.
7. Unemployment: 8 million unemployed people felt let down by the government.

### The Nazi rise to power and seize of control

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1929</td>
<td>Wall Street Crash in America leads to a depression and 6 million unemployed in Germany; Nazi messages seem more relevant.</td>
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<tr>
<td>1930</td>
<td>Election: Nazis win 18.3% of votes, second largest party in Reichstag. Weak centre-right governments are supported by Hindenburg.</td>
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<tr>
<td>1930</td>
<td>Election: Nazis gain 18.3% of votes but no government is formed.</td>
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<tr>
<td>1932</td>
<td>Apr</td>
<td>Hindenburg wins again, Hitler comes second.</td>
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<tr>
<td>1932</td>
<td>Nov</td>
<td>Election: Nazi vote falls to 33.1%, Communist vote increases; Kurt von Schleicher appointed chancellor but can't gain support.</td>
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<tr>
<td>1933</td>
<td>Jan</td>
<td>Von Papen convinces Hindenburg to appoint Hitler chancellor as part of a coalition government which will limit Nazi power.</td>
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<tr>
<td>1933</td>
<td>Feb</td>
<td>The Reichstag Fire; Reichstag Fire Decree restricts civil liberties.</td>
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<tr>
<td>1933</td>
<td>Mar</td>
<td>Election: Extensive intimidation by Nazis; Nazis win 44% of votes, ban the Communist Party, pass the Enabling Act.</td>
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<tr>
<td>1933</td>
<td>May</td>
<td>Trade unions are banned.</td>
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<tr>
<td>1933</td>
<td>Jun</td>
<td>All other political parties are banned.</td>
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<tr>
<td>1934</td>
<td>Jun</td>
<td>Night of the Long Knives: Hitler curbs the power of the SA, Röhm is killed, leading opponents arrested including von Schleicher.</td>
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<tr>
<td>1934</td>
<td>Aug</td>
<td>Hindenburg dies, Hitler becomes Führer. Armed forces swear a personal oath of loyalty to Hitler.</td>
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</tbody>
</table>
Misconceptions

Horizon knowledge

1, 2, 3 → + → x
Knowledge structures

- Revolution
  - Russia
  - France
  - Industrial

Decision rule #1

Plan the key points in a unit in advance
- Knowledge
- Representations (to explain key ideas)
- Misconceptions
- Horizon knowledge (prior knowledge and future topics)
- Knowledge structures

Don’t worry (so much) about lesson planning
Endemic problems

1) So much to teach, such short units
2) So much to teach, such short lessons
3) How do students know what good work looks like?

Decision rule #2

Cut everything from the lesson except one, academic purpose

1) How did students do?
2) What are students thinking?
3) How can I help (all) students improve?

Don’t try to achieve multiple academic goals
Don’t try to achieve non-academic goals
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What was the Renaissance like?

Historical aim: To understand chronology - what life was like in the past
Success Criteria: BY THE END OF THIS LESSON YOU WILL:
be able to describe the ______
be able to explain what made it different to ______
be able to use this to predict ____ developments

PURPOSE
Moving forward to the next big time period

Learning Habits
Noticing, Reasoning, Flow

What are we learning? How can we succeed? Why?
Do your best.

Write an elegant and insightful response.
Worked example
\[ \frac{2}{5} + \frac{1}{4} = \]

Your turn
\[ \frac{2}{3} + \frac{1}{5} = \]

Ericsson and Pool, 2016
Sadler, 1989

Barton, 2018
Decision rule #3
If you want students to do something, show them a good one and a bad one first and let them compare.

Don’t worry about copying

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Poor Proxies for Learning
(Easily observed, but not really about learning)

1. Students are busy: lots of work is done (especially written work)
2. Students are engaged, interested, motivated
3. Students are getting attention: feedback, explanations
4. Classroom is ordered, calm, under control
5. Curriculum has been 'covered' (i.e., presented to students in some form)
6. (At least some) students have supplied correct answers (whether or not they really understood them or could reproduce them independently)

Coe, 2013
Objective:
Students can add two fractions with shared, and with different, denominators.

Exit ticket:
1) $\frac{2}{7} + \frac{3}{7} =$
2) $\frac{4}{5} + \frac{3}{5} =$
3) $\frac{1}{5} + \frac{2}{6} =$
4) $\frac{2}{3} + \frac{3}{4} =$

Objective:
Students can explain what made Greek civilisation unique.

Exit ticket:
*What made Greek civilisation unique?*
Decision rule #4
Check what every student understood at the end of every lesson.

Don’t:
• Rely on substitutes
• Assume it will stick
• Feel you have to mark it
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1) How did students do?

2) **What are students thinking?**
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Among patients who died in intensive care, doctors who were “completely certain” of their diagnosis...

...were wrong 40% of the time.

Kahneman, 2011
Which of these campaigns was Martin Luther King involved in?

a) The March on Washington
b) The American Civil War
c) Barack Obama's presidential campaign

Which of these campaigns was Martin Luther King involved in?

a) The March on Washington
b) The Freedom Riders Campaign
c) Lunch counter sit-ins.
I am putting on my green skirt.

1. Je vends ma jupe verte.
2. Je suis en train d’enfiler ma chemise verte.
3. Je mets ma jupe verte.

Select the missing word

Le _______

1. femme
2. garçon
3. garson
4. fille
5. garçon
Which of these is correct?

A. Its on its way.
B. It’s on its way.
C. Its on it’s way.
D. It’s on it’s way.

In which of these right-angled triangles is \(a^2 + b^2 = c^2\)?

A.  
B.  
C.  
D.  
E.  
F.  

William
At the end of Act I, Scene 2, which of these is true?

a) The Montagues and the Capulets are enemies.
b) Romeo is in love with Juliet.
c) The Capulets have invited Romeo to their party.
 Decision rule #5

Put a hinge question in your lesson after you introduce the key idea

Don’t worry about this until you’re using exit tickets every lesson.

Wylie and William, 2007
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What do we need before we give feedback?

- Curriculum
- Goal
- Model
- Worthwhile task
- Feedback

Decision rule #6

Give less feedback, get students to do more with it.

Don’t worry about what/how much you’re writing. Worry about how much they’re improving.
What’s the problem and what does a solution look like?

How can we plan effectively and efficiently?

How can we respond to student understanding effectively?

Conclusions and next steps

Responsive teaching =

What do I want students to know/do? (guidance from cognitive science)

What did students understand? (guidance from formative assessment)

What do I do next?
Six decision rules

1) Plan the key points of the unit in advance (knowledge, representations, misconceptions, horizon knowledge)
2) Cut everything from the lesson except a single, academic purpose
3) If you want students to do something, show them a good one and a bad one first and let them compare.
4) Always check what everyone understood at the end of every lesson.
5) Put a hinge question in your lesson after you introduce the key idea
6) Give less feedback, get students to do more with it.

Responsiveness =

Understanding
Validation
Care/support

Reis, 2007
Dank u wel!

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