Assessing and Fostering Teamwork: The Behaviour in Teams (BiT) system

Rod Nicolson, Edge Hill University
Sam Farley, University of Sheffield
Our Team

Prof. Rod Nicolson
Department of Psychology
University of Sheffield
Edge Hill University

Dr. Sam Farley
Management School
University of Sheffield

Dr. Daria Hernandez
Dept. Psychology
University of Sheffield

Rose Evison
Consultant
Change Weaving

Prof. Neil Rackham
Author, Consultant & Academic

Prof. Jeremy Dawson
Management School
University of Sheffield
Plan of Talk

Problems for 21st Century Higher Education

Behaviour in Teams

Technology Enhanced Apprenticeship Learning
Problems in 21\textsuperscript{st} Century HE

• The purpose of HE
  – \textit{To give our graduates the opportunity to develop the skills they need to be able to thrive in the 21\textsuperscript{st} century}

• Market Forces / Commodityisation

• Class Sizes

• Logistics

• Competition

• The Dilemma: Knowledge vs Skill

• Fitness for Purpose
The Solution!

1. Take a skill that is central to success post-Uni
2. Find a method of making the components explicit (that is, a language to describe it)
3. Get students to master the skills
   - Knowledge – learning by being told
   - Skill – learning by doing
   - Mastery – learning by teaching
4. Develop a method of validating the skills
5. Develop a system for scaling the learning process
6. Roll it out within the Uni
7. Franchise it for other Unis...
The Behaviour in Teams Project
The Behaviour Analysis (BA) Process

• In the 1970s, Rackham, Honey and Colbert (1971) developed a process called ‘behaviour analysis’ (BA) to improve employees’ interactive skills during training courses.
• Employees would attend training over several days and participate in regular meetings.
• BA involved coding meeting behaviour in real-time, so that delegates could be given behavioural feedback after the meeting that could help them improve the way they behaved in the next meeting.
Behavioural Observation

• A trained observer would code verbal meeting behaviours as they occurred. **After the meeting, they reported the behaviour category figures for each team member.**

• Team members were instructed to **think about the behaviours that had been helping or preventing them from reaching their objectives.**

• They were encouraged to **reflect on their own data and think about which behaviours they should increase/decrease to help the team meet its objectives.**
Learning teamwork in Universities

• Teamwork skills come out consistently in the top 5 requirements of employers for University graduates (Lowden et al., 2008; Council Industry & HE, 2008)
• Almost all University learning and assessment is at the individual (rather than group) level
• Other than enrolling students into teams, *universities often do little to support the development of teamwork skills* (Vik, 2001).
• Although “one might think that simply spending time in a team will lead to the development of teamwork skills” there is no direct evidence to support this (Schaik & O’Brien, 2015, p. 349).
The Behaviour in Teams (BiT) Categories (Rackham et al. 1971)

1. Bringing In
2. Shutting Out
3. Proposing
4. Building
5. Giving Information
6. Seeking Information
7. Supporting People
8. Supporting Ideas
9. Disagreeing
10. Defending / Attacking

Process Initiating Clarifying Reacting
Research Questions

1. Applied
   – Is it actually possible to create a scaleable system capable of providing the necessary large-scale, simultaneous monitoring and feedback process?
   – If so, can this be applied to other aspects of HE?

2. Theoretical
   – What is the impact of receiving feedback on team outcomes (preference for teamwork and performance)?
   – Can ‘structured reflection’ have the same impact as feedback?
Research Context: Achieve More

- Achieve More is a week-long teamwork project which is mandatory for 1\textsuperscript{st} year and 2\textsuperscript{nd} year undergraduate engineering students at the University of Sheffield.
- The students are organised into interdisciplinary teams (of 5-6 students) to research a solution to a real world engineering issue over the course of a week.
- They have daily lectures, workshops and project meetings.
Building the BiT parts

- Tailor the BiT category system to the Achieve More situation
- Develop a real-time app that allows an observer to code the behaviours as they occur in the meeting
- Consider the full learning situation, its logistics, and its politics
- Develop a ‘learn teamwork’ intervention that can be supported in Achieve More via daily 10 minute videos + feedback
- Develop a ‘train the observers’ system with objective success criteria tailored to the intervention
- Recruit and train a cohort of observers
- Develop a real-time cloud storage system for the results
- Develop a real-time individual feedback system for the students
- Develop an ‘offline’ analysis system
- Apply this in the unforgiving real world of Achieve More, with no scope for tuning the system between days
Research Context: Achieve More

• Over 200 teams participate in the Engineering challenges which take place from Monday to Friday (9am until 5pm each day).

• At the end of the week, each team is responsible for producing two deliverables: (1) a report and (2) a presentation. Combined into an overall score.

• At the end of the week, members of each team completed a preference for teamwork measure (Campion, Medsker & Higgs, 1993). Year 1 (alpha = .88) & Year 2 (alpha = .90).
Study Design: Year group 1

• In year group 1, we allocated teams to one of three different conditions
  1. **Control Condition:** \((n = 24 \text{ teams}) = \text{observation}\)
  2. **Reflection Condition:** \((n = 25 \text{ teams}) = \text{observation} + \text{video} + \text{reflection}\)
  3. **Feedback Condition:** \((n = 25 \text{ teams}) = \text{observation} + \text{video} + \text{feedback} + \text{reflection}\)

• Observers watched each of the team’s five meetings over the 5 day week. They coded all 15 behaviours in each session, but feedback was only provided on a specific category per day.
10 Minute Daily Videos

Monday
1. Bringing In
2. Shutting Out

Tuesday
3. Proposing
4. Building

Wednesday
5. Giving Information
6. Seeking Information

Thursday
7. Supporting People
8. Supporting Ideas
9. Disagreeing
10. Defending / Attacking
Feedback Displays

AIR TIME

- **Marie**: 34%
- **Ann**: 6%
- **Hans**: 2%
- **Tom**: 13%
- **Dick**: 45%
Observer Training Procedure

• A three-stage training process was created to train real-time coding to **88 doctoral students**:

  **Stage 1:** a 5-hour **online training programme** that took place using an iPad app.

  **Stage 2:** a **full day face-to-face session** involving lectures on the categories, small group activities and coding practise.

  **Stage 3:** A further **full day of face-to-face session** on giving feedback and ensuring that observers can code reliably.

• At the end of training, **the observer’s mean reliability (Cohen’s Kappa) = .71 (SD = .10).**
Highlights: Year 1

- **Overall Score**
  
  no significant effect of feedback or reflection $F(2, 71) = .432, p > .05$

- **Contribution rate**
  
  Feedback group had greatest change toward even contributions

- **Perceived team contributions**
  
  - Strong correlation ($r=0.51$) between airtime and perceived team contribution
  
  - Much greater change in increase of contributions from Day 1&2 to Day 4 for international students in the Feedback condition

- **Observer Feedback**
  
  The observers found the opportunity to take part extremely motivating, and considered it likely to improve their employability chances
### BiT coding app example

#### Behaviour in Teams Live Coding

<table>
<thead>
<tr>
<th>Category</th>
<th>CaolanG</th>
<th>AidanW</th>
<th>JamesP</th>
<th>AlexanderB</th>
<th>AlhasanM</th>
<th>HeidiM</th>
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<tr>
<td>Proposing Ideas</td>
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<td></td>
<td></td>
<td></td>
<td>PI</td>
</tr>
<tr>
<td>Building</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supporting Ideas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (2)</td>
<td>SI</td>
</tr>
<tr>
<td>Supporting People</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>Disagreeing</td>
<td></td>
<td></td>
<td></td>
<td>1 (8)</td>
<td></td>
<td>D</td>
</tr>
<tr>
<td>Defending-Attacking</td>
<td></td>
<td>1 (0)</td>
<td>1 (1)</td>
<td></td>
<td></td>
<td>D-A</td>
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<tr>
<td>Checking Understanding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CU</td>
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<tr>
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<td></td>
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<td></td>
<td></td>
<td>SPI</td>
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<tr>
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<td></td>
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<td>GPI</td>
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<tr>
<td>Giving Task Info</td>
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<td></td>
<td></td>
<td>GTI</td>
</tr>
<tr>
<td>Shutting out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SO</td>
</tr>
<tr>
<td>Bringing in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BI</td>
</tr>
<tr>
<td>Lightening the Mood</td>
<td></td>
<td></td>
<td></td>
<td>1 (4)</td>
<td></td>
<td>LM</td>
</tr>
<tr>
<td>Pause / Silence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P/S</td>
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<tr>
<td>Undo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>U</td>
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<tr>
<td><strong>Total Time (secs)</strong></td>
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<td>4</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Time (%)</strong></td>
<td>35</td>
<td>17</td>
<td>35</td>
<td>4</td>
<td>0</td>
<td>9</td>
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Enter Participants  Start Coding  Take a Break  Restart Coding  Stop Coding  Store BiT Info

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BiT observer training app example
## BiT feedback app example 1

### Data for 7A Day 1&2&3&4&5

<table>
<thead>
<tr>
<th>Name</th>
<th>Disagreeings (%)</th>
<th>Seeking Info (%)</th>
<th>Giving Info (%)</th>
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</thead>
<tbody>
<tr>
<td>BenjaminJ</td>
<td>18</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>EssaA</td>
<td>0</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>EvanW</td>
<td>7</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>Kei_CelineP</td>
<td>14</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>MarkW</td>
<td>25</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>OliverW</td>
<td>36</td>
<td>20</td>
<td>23</td>
</tr>
</tbody>
</table>

### Data for 7A Day 1&2&3&4&5

<table>
<thead>
<tr>
<th>Name</th>
<th>Shutting Out (%)</th>
<th>Bringing in (%)</th>
<th>Lightening Mood (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BenjaminJ</td>
<td>22</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>EssaA</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EvanW</td>
<td>17</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Kei_CelineP</td>
<td>11</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>MarkW</td>
<td>8</td>
<td>7</td>
<td>16</td>
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<tr>
<td>OliverW</td>
<td>40</td>
<td>60</td>
<td>43</td>
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</tbody>
</table>
BiT feedback app example 2

Report Page 2 for group 35A: Day 1

Bringing in vs Shutting Out Day1

<table>
<thead>
<tr>
<th>Names</th>
<th>Bringing in</th>
<th>Shutting Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>MathewT</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>UsamaW</td>
<td>0</td>
<td>1</td>
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<tr>
<td>MojtabaD</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EstherH</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cheuk_LamL</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Student Feedback

• “I think that they all went well- I actually learnt quite a few new skills.”

• “I felt that these reflection sessions were well worked, the information was useful and will make my teamwork more effective in the future.”

• “they were good in the sense they didn't intrude or disturb us from the actual task and were insightful by showing us the stats that we had for each behaviour that we would otherwise not notice”

• “Having feedback at the end of the day is very useful for the next day. I have realised that I am poor at judging my own behaviour and the observers charts show me how I really behave.”

• “I think the sessions are very detailed and easy to understand.”

• “they r perfect”
Conclusions on BiT outcomes

• Not surprisingly, the effect of the feedback on the overall score was not significant.

• There were, however, significant effects on many of the key variables – telling students about ‘Bringing In’ and ‘Shutting Out’ led to significant changes (improvements!) in later teamwork, and the information also led to greater participation (and hence more even contribution overall) for the international students.

• There are many ways that the effectiveness of the feedback can be improved, especially in terms of its timing and its integration with the other activities. We also need to think how to code looking up information on Google! We will be trying these next year.

• Logistically, it was a triumph – 100 ipads, 80 observers, 160 groups over 5 days, less than 3% data failure, over 10,400 hours of group interaction captured!
Wider Implications
Major Study: 1350 in Year 1 and in Year 2. Aims:

(i) To design a **scaleable** intervention that is self-propagating – ipad-based

(ii) Provide valuable **explicit learning** for students and demonstrators

(iii) Provide a unique **differentiator** for the University of Sheffield

(iv) January-Feb 2017 - entire first and second year Engineering undergraduates, and over 100 trained observers. Recorded 10,450 person-hours of data within 2 weeks, with immediate individual feedback to each group
The Solution to the Problems in HE!? 

1. Take a skill that is central to success post-Uni
2. Find a method of making the components explicit (that is, a language to describe it)
3. Get students to master the skills
   - Knowledge – learning by being told
   - Skill – learning by doing
   - Mastery – learning by teaching
4. Develop a method of validating the skills
5. Develop a system for scaling the learning process
6. Roll it out within the Uni
7. Franchise it for other Unis...

1. Teamwork
2. BiT categories
   - Students
   - Observers
   - BiT team!
3. BiT training
4. Apps and iPads
5. In Sheffield...
The future

• We have introduced a hybrid system, where we are creating TEL (Technology Enhanced Learning) through the use of sophisticated ipad-based resources
• This does not ‘dumb down’ the contribution from the academics, but actually allows them to use their higher level skills
• We have produced a system where students can learn skills (and validate them) working in their own time, thereby getting round the 1 hour per week problem (and the feedback problem)
• This could form the basis of a skill learning ‘apprenticeship’ model for HE, where we take the crucial outcome skills for each discipline and produce a Technology Enhanced system to foster effective learning (and testing)
• This would indeed transform the landscape of Higher Education!

Thank you for listening