PhD Supervision: Mapping the Cognitive Change of Students and Their Supervisors

Dr. Camille B. Kandiko, Dr. Ian M. Kinchin & Dr. David B. Hay

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Outline of presentation

• Background and framework
• Research questions
• Initial findings of three student-supervisor maps (A, B, C)
• Conclusions
Overview of the study

This project uses concept mapping and interview techniques to track changes in knowledge and understanding among students and their supervisors in the course of full-time research towards a PhD

This on-going work measures both cognitive change in the specific subjects that are the topic for research and in the understanding of the process of PhD level research and supervision
Background

- PhD is gateway qualification
- Evidence of original and innovative contributions to knowledge
- Economic significance
- High drop-out rates a concern for universities and governments
Background

- General neglect for the support and development of research skills (Roberts Report, HM Treasury, 2002)
- Lack of a research-led pedagogy for dissertation supervision
- Importance of change and the support for change in the course of research (Salmon, 1992)
Framework of the study

• Concept mapping
  • Tool for indentifying knowledge and understanding
• Use concept mapping in the development of university teaching practice
• Measuring the quality of cognitive change through mapping
• Use concept mapping to track cognitive change in time
• Use concept mapping to describe processes of supervision and learning
Concept mapping to identify knowledge and understanding

Three basic knowledge structures
• Chain ~ Rote learning
• Spoke ~ The emergence of ‘learning readiness’
• Network ~ Expertise (Hay & Kinchin, 2006)
Research questions

- Ask students and supervisors to create maps (separately) of the two following areas:
  - Topic – looking at the academic area under investigation within the PhD
  - Process – looking at the conceptions held of the research process and of the PhD as an entity
Cognitive change

- Measuring change of knowledge and understanding over time (Hay, 2007)
Supervisor A

1. Foundation
2. Endothelial Dysfunction
3. Cellular Emphasis
4. Pre-term pregnancy
5. Cord
6. Foetal endothelial cells
7. In vitro (cell culture)
8. Normal pregnancy

FOCUS
Preeclampsia Vascular Dysfunction

Translational Research (clinical end point)

Raising calcium (2 min action)

Activating kinases (2 min action)

Factors

Enzymatic eNOS (2-5 min) (Western blotting) (8A)

Products (NO) (30 sec to 15 min) (qRT-PCR) (learning)

Sources of reactive O species (5-30 min) (lucigenin) (learning)

Mitochondria (mitoSOX) (cytochrome culture) (8B)

Effects of different O levels (glove technique) (8C)

Protein levels (8-24 hours) (Western blotting) (8A)

mRNA levels (2-6 hours) (qRT-PCR) (learning)

Trained others (8D)

Factors

To introduce

Isolated and cultured

looking at

Cell from

compare

to ‘rescue’ dysfunctional

regulation of

by

measure by

can influence

by

identify
Student A

HUVEC (foetal)

Normal

Preeclampsia

Looking at

NO Production

Cofactors/Substrates: L-arginine transport BH4 DDAH ADMA

eNOS Regulation (acute)

How influence of

Interactions between NO (done) and ROS (mitoSOX) (working on)

Regulatory Proteins HSP90 (done) Kinases: Akt ERK1/2 (working on)
Initial Findings A

• In topic maps (A), student and supervisor differ on scope of PhD
  • Supervisor sees lab studies as way to answer larger questions
  • Student focuses on lab techniques and methodologies
Supervisor Map B

This relationship is central (B1)

- Working with PhD Student towards Thesis
- Techniques
- Literature
- "Transferable skills"
- Communications skills
- Publications
- Enthusiasm
- Academically qualified
- Teamwork

- Competent

- 3-3.5 years
- "Final" (D1)
Student Map B

Supervisor

What a PhD is?

To give direction (initially)

Independent project integrated into the research group I am in. To enable my development as an independent research scientist

To give direction (eventually)

Act as mentor, and assess strengths and weaknesses (of student)

Assess strengths and weaknesses (of student)

Two-way

Since 9 month upgrade:
- Balancing workload
- Assess strengths and weaknesses
- More focused
- Learn to write for audience
- Give more structured time to plan PhD
- Schedule time to work with supervisor

Scientific writing/Presentation

Teaching others

Understanding the literature

ME (Student)

Developing the role as giving

Integrate projects and research interests

Provide group with "bigger picture"

Feedback on progress

Setting up methods/ knowing how to put together good experiments

Independent thinking

Transferable skills- for what I do next
Initial Findings B

• Supervisor
  • focuses on relationship between student and supervisor with a focus on the end goal (thesis)
  • highlights characteristics of student

• Student
  • notes actions for both self and supervisor
  • mentions dynamic nature of the student-supervisor relationship
Initial Findings Pair C

**Supervisor Map**

- Presentation skills
- Management of frustrations
- Fun, exciting, enjoy, engaged
- Experience in supervision of younger students
- Transferable skills
- Writing
- PhD
  - Involves
  - Overall aim
    - To become independent scientist
  - Prepare to be independent scientist
  - Understand the literature and come up with testable hypothesis
  - Design an experiment to test hypothesis
  - Evaluate results of experiment critically
  - Relate it back to the literature and generate new hypotheses
  - Continuous process
  - A piece of original research
  - An expert in a specific field
  - An expert in the literature
- Continuous process

**Student Map**

- Work
- Study
- PhD is
  - Learn about the international scientific community
  - Learn to work with different people
  - Learn in depth a certain part of a subject
  - Learn to communicate scientific knowledge
  - Aim
  - Publish
  - But to publish you have to be
  - Responsibility
  - Patient
  - Hard working
  - Deal with frustration

- Continuous process
- A piece of original research
- An expert in a specific field
- An expert in the literature
- Continuous process
Initial Findings C

• The supervisor map (C) concentrates on acts of doing and being, whereas the student map (C) focuses on learning and acquiring traits and characteristics

  • The supervisor’s map details the scientific process of discovery (through hypothesis testing)

  • The student’s map centres on publishing, the eventual outcome, but does not indicate the exact path to get there
Conclusions

• A: Differentiation of scope between student and supervisor

• B:
  • Supervisor sees a) characteristics, b) relationship, c) actions, d) output
  • Student highlights a dynamic process

• C: Process versus outcomes
Conclusions

• This unique approach to assessing PhD supervision may allow for analysis of the role of ‘expert’ and ‘novice’ status in cognitive change
  • Role of expert and novice may change
• Act of mapping appears to surface underlying thoughts about PhD process and supervision
• Mapping and interview techniques surface the highly unique and personal nature of the student-supervisor relationship
• On-going studies in biological health sciences, dentistry, psychiatry, English, and physics
References


Questions?

Contact information:

Camille B. Kandiko
King’s Learning Institute
King’s College London, UK
camille.kandiko@kcl.ac.uk

Thank you!