Final Probation Report

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May 21, 2014

1 Introduction

This document aims to evidence my accomplishments during the probationary period of my lectureship:

- Section 2 will discuss my participation in PCUTL. Due to the volume my module 3 submission, I will keep this section brief.
- Section 3 will not only list my publications and grant income but also discuss my future plans for research.
- Section 4 will demonstrate my contribution to innovation and engagement as well as a detailing my administrative responsibilities.
- Section 5 will demonstrate my competency with the Teaching and Research grade 7 profile.

2 Teaching

2.1 PCUTL

I started PCUTL (HMT007) in [FIND DATE HERE] and completed the 3rd module on [FIND DATE HERE]. I fully engaged with this process obtaining my certificate with distinction.

My module 3 portfolio is attached but due to the page count of that submission (FIND PAGE COUNT) is summarised below:

- Rigorous statistical analysis of a student survey investigating student perceptions of formative assessment. A manuscript is in preparation to submit to a pedagogical journal.
- Detailed review and critique of active learning techniques including Inquiry Based Learning and Flipped Classrooms;
- Reflection within my subject area on the defining properties of a modern mathematician which should include not only entrepreneurial skills but also programming skills;
- Rigorous and justified implementation of a new module (MA1003) taught using an innovative and modern pedagogy (a flipped classroom delivered to a class of 160 students);
- Peer review by multiple Cardiff University colleagues, international peers and engagement with higher education academy.

The following summarises my present teaching philosophy which is a direct result of the PCUTL process:

> Aim to provide learning opportunities to students in a constructivist framework, using technology to enhance a scaffolded active student centred experience.

It might be of interest to note that recent research (appearing after I completed PCUTL) has in fact shown the evidence for better student learning in active learning pedagogies as opposed to a classic lecture based approach [1].

2.2 Teaching

As well as going through the PCUTL process I have been involved in various other teaching activities as summarised in Table 1.

Course Title	Credits	Level	Involvement
Computing for Mathematics	20	First Year BSc.	Designed, Lead and Delivered
OR 2	10	Final Year BSc.	Designed and Delivered half of course
OR Methods	12	MSc.	Designed and Delivered 4/11 of course
Advanced Statistical Packages	10	MSc.	Designed, Lead and Delivered
Introduction to Object Oriented Programming	NA	MSc.	Designed, Lead and Delivered 2 day hackathon
Introduction to LaTeX	NA	BSc. and MMath	Designed, Lead and Delivered half day course

Table 1: Summary of involvement in taught courses

Most of the above courses are designed to be delivered in a student centred approach which is a direct implication of my growth as an educator through the PCUTL process.

This teaching has taken a large quantity of time in terms of preparation, the exact amount of time is difficult at this stage to approximate but the above corresponds to a mean of approximately 7 hours of contact time a week.

Future teaching plans involve the creation of an extra curricular 2 hour weekly session. During this students will be able to further explore aspect of programming applied to mathematics: Code Club.

2.3 Research Students

Throughout my tenure as a lecturer I have been heavily involved in the supervision of research students as various levels:

- BSc. Final Year Students ();
- MMath Final Year Student ();
- Summer Research Students ();
- PhD Students ().

This aspect of teaching is something I am particular fond of and hope to continue. In particular I hope to further enhance the involvement of undergraduates in research.

3 Research and Scholarship

My research interests lie in the fields of Game Theory and Queueing Theory applied to Healthcare. During my probationary period I have published X manuscripts in leading journals with one paper being returned to REF 2013.

3.1 Publications

A full list of my publications is given below. Of the X papers x of those were published during my lectureship.

Accepted/Published:

Gillard J, Knight VA, Williams J and Wilson R. (2014). **Staffing Levels of a Maths Support Centre.** (Accepted subject to revisions in Interfaces)

Knight VA and Harper PR. (2013). **Selfish routing in public services.** European Journal of Operational Research. 230 (1) 122-132

Knight VA and Gillard J. (2013). **Using Singular Spectrum Analysis to Obtain Staffing Level Requirements in Healthcare.** Journal of the Operational Research Society

Shone R, Knight VA and Williams JE. **Comparing Observable and Unobservable Queues.** European Journal of Operational Research

Knight VA, Harper PR and Smith L. (2012) **Ambulance Allocation for Maximal Survival with Heterogeneous Outcome Measures.** OMEGA - The International Journal of Management Science. 40 (6) 918–926

Baboolal K, Griffiths J, Knight VA, Nelson AV, Voake C and Williams JE. (2012). **How Efficient can an Emergency Unit be? A Perfect World Model.** Emergency Medicine Journal. 10.1136/emermed-2011-200101

Harper PR, Knight VA and Marshall A. (2012). **Discrete Conditional Phase-Type Models Utilising Classification Trees: Application to Modelling Health Service Capacities.** European Journal of Operational Research. 219 (3) 522–530

Knight VA and Harper PR. (2012). **Modelling Emergency Medical Services with Phase Type Distributions.** Health Systems. 1 53-68

Fetta A, Harper PR, Knight VA, Williams JW and Vieira I. (2011). **On the Peter Principle: An Agent Based Investigation into the Consequential Effects of Social Networks and Behavioural Factors.** Physica A: Statistical Mechanics and its Applications. 10.1016/j.physa.2011.12.053

Williams J, Gillard J, Harper PR and Knight VA (2011). **Forecasting Welsh Ambulance Demand using Singular Spectrum Analysis.** Journal of the Operational Research Society. 10.1057/jors.2011.160

Griffiths J, Knight VA and Komenda I. (2011). **Bed Management in a Critical Care Unit.** IMA Journal of Management Mathematics. 10.1093/imaman/dpr028

Knight VA, Williams JE and Reynolds I. (2011).**Modelling Patient Choice in Healthcare Systems: Development and Application of a Discrete Event Simulation with Agent-Based Functionality.** Journal of Simulation. 10.1057/jos.2011.21

Harper PR, Kleinman ER, Gallagher JE and Knight VA. (2011). **Cost-Effective Workforce Planning: Optimising the Dental Team Skill-Mix for England.** Journal of Enterprise Information Management (Accepted)

Williams J, Gillard J, Harper PR and Knight VA. (2010). **Forecasting Welsh Ambulance Demand using Singular Spectrum Analysis.** (In Proceedings of the XXXVI International ORAHS Conference)

Behrend RE and Knight VA. (2008). **Higher Spin Alternating Sign Matrices**. Electronic Journal of Combinatorics. 14(1): R83, 38pp.

Submitted:

Knight VA., Komenda I and Griffiths J. **Measuring the Price of Anarchy in Critical Care Unit Interactions.** (Submitted to OMEGA)

In Preparation:

Knight VA. **On a Polytope Containing the Transportation Polytope.** (In preparation to submit to the Journal of the Operational Research Society)

Young J and Knight VA. **Understanding the effect of selfish behaviour in a series of two queues.** (In preparation to submit to The Journal of Simulation)

Books (Conference Proceedings):

Harper PR, Knight VA, Vieira I and Williams JW. (2011) Operational Research Informing National Health Policy. Cardiff University. ISBN: 978-0-9569158-0-1

3.2 Grant Funding

Further to my publication portfolio I have had success in garnering funding as shown below:

Cardiff & Vale University Health Board
Operational Research Modelling to Support Cardiff and Vale UHB
£371,427 *2013-2018*

EPSRC
Identifying and modelling victim, business regulatory and malware behaviours in a changing cyberthreat landscape
£101,659 *2013-2016*

Aneurin Bevan Health Board
Creation of a Mathematical/OR Modelling Unit to Support the Aneurin Bevan Health Board
£319,944 *2013-2015*

ESRC
Hate speech? Understanding the modelling of social media identity formation and behaviour through the Cardiff Online Social Media Observatory (COSMOS)
£7,015 *2013-2016*

Health Foundation and Cardiff & Vale University Health Board
Estimating quality improvement and cost reduction for the patient and local health economy of transferring ENT/audiology services into a community setting
£61,237 *2013-2014*

LANCS (EPSRC)
Post-Doctoral Training Scheme Grant: Investigating the Effects of Individual Behaviour on Hierarchical queueing Systems
£5,000 *2012*

Cardiff University CUROP Award
Developing and Evaluating Mathematical Teaching Resources through Open Source Software
£2,200 *2012*

LANCS (EPSRC)
Post-Doctoral Training Scheme Grant: Choice and Healthcare Investigation Project
£2,500 *2010-2011*

Cardiff University CUROP Award
Patient Choice: A Discrete Event Simulation
£2,500 *2010*

3.3 Future Plans

- *Some more papers which involve theoretical understanding of hybrid behaviour in queues.*
- *First Grant;*
- *Investigate potential for Fellowships;*
- *Further international relationships.*

4 Contribution to Innovation and Engagement

4.1 Innovation and Engagement

- *School visits*
- *ORiS*
- *University visits*
- *Social media: (Twitter, G+, YouTube, Blog)*
- *Media*
- *HMC2 and Jenny.*
- *Open Source Software contributions.*

4.2 Administration

- *Research committee;*
- *IT committee;*
- *General administration.*

5 Additional Requirements

6 Conclusion

References

[1] *S. Freeman, S. L. Eddy, M. McDonough, M. K. Smith, N. Okoroafor, H. Jordt, and M. P. Wenderoth. Active learning increases student performance in science, engineering, and mathematics.* Proceedings of the National Academy of Sciences, *May 2014.*