



Institute of Technology

Ciência sem Fronteiras / Science Without Borders

Postgraduate Project Template

Institution:	IT Blanchardstown
Title of Postgraduate Opportunity: (include level of study)	The Cognitive Demands of Learning to Program in Java: An Empirical Study of Novice Programmers MSc/PhD
PI Name & Contact Details:	Dr. Larry McNutt Head of School of Informatics and Engineering Email: larry.mcnutt@itb.ie Tel: 353+1+8851080
Department/School:	Informatics and Engineering
Research Centre /Group:	Software Engineering Research Group
Research Centre/Group website:	
<p>Brief Summary of PI research / research group /centre activity</p> <p>Larry McNutt BSc (Hons), HDipEd, M.Ed(Hons), EdD, FICS, is currently Head of School of Informatics and Engineering at the Institute of Technology Blanchardstown, Dublin, which he joined at its establishment in 1999. Prior to joining ITB, Larry was Senior Lecturer in the Institute of Technology Tallaght, Dublin and spent a number of years as an academic staff member at Southern Cross University Australia. He has also lectured at Dublin City University, Capella University in the US and at the Letterkenny Institute of Technology in Ireland. A Fellow of the Irish Computer Society, his research interests and publications include distance education, educational technology, instructional design and computer science education.</p> <p>Recent publications include:</p> <p>Conference proceedings:</p> <p>McNutt L. (2010), <i>"Examining the Field of Educational Technology: A Bourdieuan Perspective"</i>. In Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2010 (pp. 1374-1383). Chesapeake, VA: AACE</p> <p>Book Chapters:</p> <p>McNutt L. (2010). Educational Technology, Innovation and Habitus: What is the connection? In R. Donnelly, & J. Harvey and K. O'Rourke (Eds.), Critical Design and Effective Tools for E-Learning in Higher</p>	

Education: Theory into Practice (pp. 72-91). IGI Global, ISBN13: 9781615208791.

McNutt L & Murphy D. (2011). Sharing innovative practice/manging diversity. In N. Fitzpatrick & J. Harvey (Eds.), **Designing Together:Effective strategies for creating a collaborative curriculum to support academic development** (pp. 76-81). Published on behalf of the LIN Accredited Professional Development Working Group. Available from <http://arrow.dit.ie/>

Brief Description of Masters or PhD Project

The cognitive processes involved in computer programming represent a topic which has interested researchers over the past 30 years. As a result a significant bank of research literature exists covering the many aspects of what has been termed the "psychology of programming". However this work appears to have made little impact on existing undergraduate information systems or computer science teaching resources. It is well recognised that the provision of an effective learning environment is dependant on a number of critical elements including (i) previous experience (ii) the nature of the task (iii) the material employed and (iv) the context in which the task (learning) occurs. Examining and analysing the learning environment in an attempt to identify the "critical success factors" to be addressed in enabling the novice programmer to succeed is a daunting task. All educators however, need to continually assess the information generated and upgrade teaching approaches as necessary.

This project will investigate that if such information was incorporated as part of the subject matter in programming courses what impact would it have on novice programmer success. This study will also explore the key predictors for success in the programming domain.

Main Research Question(s):

To investigate the cognitive demands of learning to program in Java and to measure the effectiveness of a preparatory "learning to learn" course on the success of novice programmers. The key questions to be addressed by the study include:

Research Questions:

- What are the cognitive demands of learning to program?
- What is the relationship between memory, learning style and motivation on a novice programmers success
- What is the impact of a "learning to learn" course on the success of novice programmers
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The main areas to be investigated by this project are:

Models of Programming Expertise	Identifying the tasks involved in programming from the perspectives of novice and expert programmers
The Cognitive Demands of Programming	The underlying knowledge bases that novice programmers need to acquire.
Instructional Strategies to Facilitate Learning to Program	Current findings on didactic approaches that facilitate learning to program

Key Attributes of Project for Brazilian Postgraduate Students

This project provides an opportunity to engage in research into the cognitive demands of computer programming which is an area of increasing importance to educators and industry. Some of the main motivating factors for carrying out research in this area include (i) identifying productive programmers (ii) identifying employees who might best profit from additional training and (iii) exploring the relationship between programming abilities and other cognitive reasoning processes.

Name and contact details for project queries, if different from PI named above:

As above

Please indicate graduate disciplines which are eligible for application:

The recruited graduate should be from a Computer Science/Business Information Systems/Information Technology/Psychology degree course. Their degree should have been awarded with a minimum of a 2nd class honours, some relevant work experience would be desirable.

The recruited graduate should also have demonstrated an interest in programming, learning theory and cognitive science.

Alignment with Science Without Borders Priority Areas:

Please indicate the specific programme priority area under which the proposed postgraduate project fits – choose only one (tick box)

Engineering and other technological areas	
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	
Health and Biomedical Sciences	
Information and Communication Technologies (ICTs)	√
Aerospace	
Pharmaceuticals	
Sustainable Agricultural Production	
Green Chemistry	
Oil, Gas and Coal	
Renewable Energy	
Minerals	
Biotechnology	
Nanotechnology and New Materials	
Climate Change	
Biodiversity and Bioprospection	
Marine Sciences	
Productive Inclusion and Social Technologies	
Housing and Sanitation	