



## Graduate Research School

### Research Proposal Coversheet for Candidates in Research Higher Degrees

# RP

**This form should only be used by students currently enrolled in a Masters by Research (by thesis) or PhD programme at UWA.** Please submit the proposal and coversheet, marked "Direct" to the Graduate Research and Scholarships Office, Hackett Hall (M358). The proposal must address the Board's Guidelines (available at <http://www.postgraduate.uwa.edu.au/forms>). **Incomplete proposals will be returned.** Please retain a copy for your reference. The candidate, principal supervisor and Head of School are required to sign this coversheet where indicated prior to submission to the Board of the Graduate Research School. **The signature indicates that the information contained in the proposal is complete and correct and that all signatories have discussed and agreed on the information.** Please note that if the supervisor information below differs from that previously reported to the Graduate Research and Scholarships Office, records will be updated to reflect these changes.

**You are required to submit TWO (2) copies of the proposal and TWO (2) coversheets.**

<b>SURNAME:</b>	Njiru	<b>STUDENT NUMBER:</b>	
<b>GIVEN NAMES:</b>	Joseph Njeru	<b>TITLE:</b>	Mr
<b>POSTAL ADDRESS:</b>			
<b>TELEPHONE NO:</b>	<b>EMAIL:</b>		
<b>SCHOOL:</b>	Graduate School of Education		
<b>DEGREE:</b>	Doctor of Philosophy (PhD)		
<b>RESEARCH CODE:</b>	330101		

Details may be found at [www.acs.uwa.edu.au/stats/Internal/asrc/RFCIDIXA\\_E.html](http://www.acs.uwa.edu.au/stats/Internal/asrc/RFCIDIXA_E.html)

2. SUPERVISOR		
1. Surname: Chapman	Title: Dr	Position:
Given Name(s): Anne	Email: Anne.Chapman@uwa.edu.au	Lecturer
UWA School:	Graduate School of Education	
CO-SUPERVISOR		
2. Surname: Vidovich	Title: A/Prof.	Position:
Given Name(s): Lesley	Email: Lesley.Vidovich@uwa.edu.au	A/Prof.
3. FURTHER INFORMATION AND DECLARATIONS		
<b>A Research Proposal (following UWA Research Proposal &amp; Details of Proposed Research Guidelines) must be attached</b> (indicate that this has been attached by ticking the box)	<input checked="" type="checkbox"/>	
<b>A detailed time-plan must be attached.</b> (indicate that this has been attached by ticking the box)	<input checked="" type="checkbox"/>	
What are the anticipated annual costs? (N.B. A figure must be provided) See the research budget on Page 12	<input checked="" type="checkbox"/>	\$2695

How much will the School provide?	\$300
If necessary, please indicate the source(s) of extra funds: A grant awarded by Lucent Technologies Philanthropic Foundation (through Dr Elaine Chapman) will be used to provide funding for the extra research expenses).	
If statistical advice is relevant to the proposal, is it available in the School? If not, how will it be obtained?	YES
If there has been any formal School review of the proposal, please describe the process:  The research proposal was presented to a panel in the Graduate School of Education on 20 <sup>th</sup> July 2005. The Panel comprised of Prof. Tom O'Donoghue (Chair), Dr. Elaine Chapman (principal supervisor), Prof. Stephen Houghton and Dr. Graham Douglas. The Panel recommended that the research proposal be accepted and passed subject to minor amendments. There minor recommendations have been incorporated in this research proposal.	
The Board of the Graduate Research School seeks confirmation that:	
(a) the candidate's proposal has been adequately discussed with the supervisor/s; and	YES
(b) (i) the candidate's proposal can be carried out with the available funding, facilities and equipment; or	YES
(ii) the necessary funding, facilities and equipment will be made available during the candidature.	YES
Does this project involve field or other work outside the University?	YES
What are the costs of this work?	\$ 2695
Will the School undertake to pay the expenses?	NO
If not, is the student aware of the possible financial obligations?  This project will be undertaken as a component of a large grant held by the principal supervisor. All associated costs for the conduct of the research will be met with funds drawn from this grant.	N/A
Are there confidentiality or intellectual property issues that need to be considered? (If "No" do not complete the next section)	NO
Is there any aspect of the candidate's research that is likely to result in the generation of intellectual property of potential commercial value to the University?	NO
Is there likely to be any restriction on the disclosure of information arising out of the candidate's research or provided to the candidate for example, confidential information or patentable inventions?	NO
Is intellectual property already in existence in the School or the University which is pertinent to this particular project?	NO
<b>If "Yes" to any of the above an Intellectual Property Questionnaire available at <a href="http://www.postgraduate.uwa.edu.au/forms">http://www.postgraduate.uwa.edu.au/forms</a> is attached.</b>	<input type="checkbox"/>

#### 4. SCHOOL DECLARATION - TO BE COMPLETED BY ALL PARTIES

The Board seeks the assurance of the Head of School that the School certifies that the attached details of the proposed topic and supervision is appropriate and that supervision, equipment,



## **A. PROPOSED STUDY**

### **TITLE**

Self-Regulated Learning in Working with Information and Communication Technology (ICT)

### **BACKGROUND**

An important goal of education is to develop students as self-regulated learners who are not only cognitively, but metacognitively, engaged in their own learning experiences. The proposed research will examine the cognitive, metacognitive, and motivational aspects of self-regulated learning in the use of Information and Communication Technology (ICT). There will be a particular emphasis on how the use of ICT facilitates learners within cooperative and collaborative learning contexts. The outcomes of the research will not only further understanding of the impact of ICT investments in modern education institutions, but will also provide a set of instruments that can be used to measure students' self-regulation in ICT-rich contexts. A further goal will be to examine the links between self-regulated learning and academic motivation, metacognition, learning strategies and self-efficacy. From the preliminary review of literature done by this author, no specific instruments have been developed to measure students' self-regulation in an ICT-rich environments. Further, no instruments that measure key dimensions of ICT-rich learning environments which facilitate students' self-regulation, are available.

Research provides substantial evidence that ICT can have a positive effect on students' enjoyment and interest in learning, leading to increases in their ability to self-regulate. Becker (2000) cited at least four key benefits for ICT use in education: increased commitment to the learning task, increased independence and motivation for self-directed study, enhanced self-esteem, and improved behavioural habits. Literature connecting ICT with learning presents a multifarious view of ICT application and student learning (Cavanagh & Romanoski, 2004). The mode of participation of students in the learning process is typically varied. Students can work independently, in groups, or interact virtually. The cognitive processes constituting learning are also varied. These include constructivist activities such as memorisation, problem solving, and creativity. Further, the outcomes or products of ICT usage tend to be multidimensional. ICT can affect the quality of learning products and the pace at which given tasks are completed. Accessibility to ICT in learning environments can be an incentive for learning, and ICT use can influence general motivation and learning engagement.

Of particular interest in recent times has been the ability of ICT to support and facilitate self-regulated learning processes. Pintrich (2000) defined self-regulated learning as "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features in their environment" (p. 453). Some major areas of regulation are cognition, motivation/affect, behaviour, and context. There will be several components or specific dimensions of self-regulation within each of these key areas. For example, the self-regulation of behaviour involves the active control of resources, which includes time management, study environments, concrete resources such as books, and other people such as peers, tutors, and teachers. According to Snow, Corno, and Jackson (1996), models of self-regulation usually share four phases: goal-setting, monitoring, adjusting, and ongoing reflecting. All phases are directed by the learner.

Zimmerman (1990) posed that self-regulated learners are metacognitively, motivationally, and behaviourally active participants in their own learning. Self-regulated learners are also intrinsically motivated, and strategic (Winne & Perry, 2000; Zimmerman, 1990).

Metacognition is reflected in the awareness learners have about their academic strengths and weaknesses and strategies they can use to meet the demands of challenging tasks in classrooms. Intrinsic motivation is evident in their belief that ability is incremental, focus on personal progress and deep understanding, high efficacy for learning, and attributions linking outcomes to factors they can control (e.g., effective use of strategies). Finally, strategic describes how these learners approach challenging tasks, choosing from a repertoire of tactics and strategies those they believe are best suited to solving a problem and applying them appropriately. Further characteristics of self-regulated learners are that they view learning as a systematic and controllable process, accept greater responsibility for their achievement outcomes, approach tasks with confidence, diligence, and resourcefulness, proactively seek out information when needed, and take the necessary steps to master this information. Self-regulated learners also plan, set goals, organise, self-monitor, and self-evaluate at various points during the learning process. Because of this, they are metacognitively aware, knowledgeable, and decisive in their approach to learning. In general, they are also self-motivated and report high levels of self-efficacy (i.e., belief in themselves as learners), have internal locus of control (i.e., accept responsibility for successes and failures and value the importance of effort), and have high levels of intrinsic task interest (Pintrich & Degroot, 1990).

Self-regulated learners not only need to possess cognition (knowledge to build upon), and metacognition (the knowledge and monitoring of learning strategies), but they must also be motivated to use their metacognitive strategies to build upon their understandings of instructional material (Pintrich & Degroot, 1990). Self-regulation has been studied in traditional classrooms in order to provide an understanding of how students use their cognition, metacognition, and motivation in order to experience successful learning. As Miltiadou (1999) puts it, cognitive and metacognitive strategies provide the building blocks for constructing knowledge within a learning environment while motivation provides the fuel for student engagement. Research conducted by Blocher (1997) has shown that self-regulated students have a strong desire to learn and are goal directed.

The revolution of ICT within education has vastly increased the number of resources available to students to support and facilitate self-regulatory learning processes. ICT allows learners to set goals for their learning, monitor, regulate, and control their cognitions, motivations, and behaviours across a broad range of learning situations (e.g., within independent, cooperative, and collaborative projects) and learning tasks (e.g., higher-order problem-solving, open-ended design projects). Despite this, few studies have been done to identify the unique dimensions of self-regulation within ICT-rich learning contexts. Fewer studies still have sought to examine ways in which these dimensions can be measured in a reliable, valid, and systematic way.

### **Testing Self-Regulated Learning**

In part because self-regulated learning is so ill-defined, and in part because it is a complex cognitive event which involves numerous activities for the learner (Howard-Rose & Winne, 1993), researchers have a difficult time in measuring this construct. Three scales which have attempted to quantify self-regulated learning are the *Self-Regulated Learning Rating Scale* (SRLRS) (Corno, Collins, & Capper, 1982); *The Learning and Study Strategies Inventory* (LASSI) (Weinstein, Palmer, & Schulte, 1987); and *The Motivated Strategies for Learning Questionnaire* (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1993). Each of these instruments is a paper and pencil based scale. Each, however, adopts a somewhat different definition of the self-regulated learning construct. Corno's SRLRS comprises 20 questions which include components including attending, rehearsing, monitoring, strategic planning, selecting, connecting, and tactical planning. The LASSI is a set of 77 questions designed to measure 10 dimensions of self-regulation: anxiety, attitude, concentration, information processing, motivation, selecting main ideas, self-testing, study aids, test strategies, and time management. It follows the theory that self-regulated learning is a generalisable skill, and attempts to measure learners' overall use of these strategies. The MSLQ includes 17 different

scales: seven motivational scales and 10 learning strategies, including metacognitive self-regulation. The MSLQ is grounded in the theory that self-regulated learning is a context-specific activity which differs from class to class or subject to subject.

### **New Model of Self-Regulated Learning in an ICT rich environment**

The aim of the proposed study is to conceptualise, design, and validate a set of instruments for evaluating self-regulation in ICT-rich learning environments. Initially, a preliminary model of self-regulated learning within these contexts will be devised on the basis of a literature review and from an expert panel session. Feedback from the panel session will be analysed, and dimensions will be constructed on the basis of these responses. Once the instruments have been developed, it will be pilot-tested with a small sample of students from four Western Australian public universities. After modification, a large sample ( $n > 300$ ) drawn from the same institutions will complete the instruments online. These data will be subjected to a Rasch model analysis to check for unidimensionality and fit to the measurement model. The use of the Rasch approach will allow for the construction of a linear measure of self-regulated learning in which all dimensions are calibrated on the same scale as the item difficulties. As proposed by Messick (1989, 1995), Cherryholmes (1988), the Medical Outcomes Trust Scientific Advisory Committee (1995), Bond and Fox (2001), and Andrich (1996), item and person measures, and fit information will be used to ensure that the final measure is reliable and that valid inferences can be made on the basis of responses to it.

To achieve this, a conceptual scale of items by difficulty (from easy to hard) for self-regulated learning with the use of ICT will be created. Items will be ordered conceptually by difficulty (vertically) under each sub-heading and by perspective (horizontally). This will be the conceptual structure of the final instruments. Rasch analysis calibrates the item difficulties and student measures on the same linear scale. A substantial number of checks will be made to ensure that the data fit the parameters of the Rasch measurement model. The indices used will include global item fit, global student fit, ordered thresholds in line with the ordering of the response categories, individual item fit, individual student fit, item-trait interaction fit for unidimensionality, item separation indices, and targeting. If students' responses to questions that relate to any single characteristic fit the Rasch measurement model, easy items will be endorsed by students with low, medium, and high overall levels of that characteristic; medium items will be endorsed only by students with medium and high levels of the characteristic; and hard items will be endorsed only by those with high levels of the characteristic. If the responses do pattern in this way, this will provide strong evidence of the construct validity of the measure, which will suggest that it can be used to draw valid inferences about learners' self-regulation levels.

### **ORIGINALITY AND SIGNIFICANCE**

The proposed research has the potential to make several contributions to scholarship and practice in the fields of education, measurement, and educational psychology. From a practice standpoint, the results of this research will be directly relevant to the Australian education system. The outcomes will (i) provide educators with a means by which they can systematically assess students' self-regulation levels, and (ii) highlight relationships between students' self-regulatory and motivational processes. In so doing, these outcomes may not only increase educators' awareness of the importance of self-regulation and its key dimensions, but also impact significantly on the ways in which ICT is utilised as a learning tool.

This research also has the potential to make at least three specific contributions to scholarship within the fields of education, measurement, and educational psychology.

First, it will define and expand current knowledge of self-regulated learning in ICT-rich learning environments, and identify the main aspects and sub-aspects of self-regulated learning

in these contexts. In so doing, it will improve the theory of ICT use in education settings and evaluate how ICT relates to students' self-regulated learning processes. Further, it will extend upon and elaborate current theory within the field of self-regulation, by exploring components of this construct across a range of learning situations and tasks.

Second, this research will make an original contribution by testing the model of self-regulated learning developed across a broad sample of tertiary level students. This will also allow for the establishment of normative levels of self-regulation within such populations.

Third, given that the data analysis will be based on current Rasch modelling techniques (using the computer program RUMM: Andrich, Sheridan, & Luo, 2005), this study will be the first to establish a reliable, valid, and linear measure of students' self-regulation. The proposed research will conceptualise, design, and validate a set of instruments for evaluating self-regulated learning in ICT rich environments. Self-regulation in using ICT measures will be calibrated on the same scale as the item difficulties.

## **B. RESEARCH PLAN**

### **SPECIFIC AIMS**

There will be two primary aims of the proposed research. These are to:

1. Devise a conceptual model of self-regulated learning that is relevant to ICT-rich learning environments.
2. Devise a series of instruments based on the conceptual model to measure different dimensions of self-regulated learning. The focus in this instrument will be on students' propensity to use self-regulation under different circumstances, rather than their base ability to use such strategies. Given the goal of constructing linear measures, each dimension of this construct will be measured using a separate scale. Together, these instruments will be used to collect data from students in Australian universities.
3. Correlate students' self-regulation levels with their motivation, self-efficacy, learning strategies and metacognition levels.

### **RESEARCH QUESTIONS**

The focus of this research will be based on five research questions.

1. How would a model of self-regulated learning in an ICT-rich environment be operationally defined?
2. Can a set of linear, self-report instruments for assessing different dimensions of self-regulated learning be established?
3. What is the relationship between self-regulated learning and academic motivation to achieve, learning strategies, metacognition, and self-efficacy?

### **TIME LINE (3 YEAR RESEARCH PLAN)**

2005 February to July

Prepare and finalise research proposal  
Research Ethics clearance

Literature review will be continuous throughout the research

2005 July to December	Expert Panel Sessions Instrument development
2006 January to December	Initial test of the survey instruments Data collection Writing theses chapters
2007 January to December	Data analysis and writing the thesis chapters Writing and re-writing the thesis chapters
2007 December	Present thesis for examination

## **METHODOLOGY**

### **Phase I: Development and construction work**

The first phase of this research will involve constructing a model of self-regulation in ICT-rich tertiary learning environments. The goal of this will be to capture elements of self-regulation that are both common to or generic across learning environments, and those that are specific to ICT-rich contexts (i.e., those elements that involve some use of ICT tools). This will first be achieved through an extensive review of the relevant literature. This will utilise the available library and inter-library services offered by the University of Western Australia.

The model will then be subjected to broad scrutiny through an expert panel session. The use of this session will allow a number of interest groups to be represented and to provide a thorough discussion of the model adopted. The panel session will allow elaboration and refinement of the constructs generated on the basis of the literature review. Researchers and academics in the areas of ICT and self-regulation will be recruited through individual contacts, and will receive guiding questions in advance to allow them to prepare for the session. At least 6 expert panellists will be recruited to participate in a total of three sessions. All sessions will be conducted within the Graduate School of Education at the University of Western Australia. Experts from interstate and overseas institutions will be invited to participate in the session via teleconference. On the basis of these discussions, a new model of self-regulated learning when working with ICT will be developed, leading to the construction of the initial survey instruments.

The previous stage will result in data on relevant theoretical constructs in self-regulated learning, and on the use of ICT within higher education institutions. Key dimensions of self-regulated learning derived on the basis of these theoretical frameworks will be used to form the initial model for the instruments developed. These dimensions will be devised and ordered conceptually by difficulty under each sub-heading. The difficulty orderings will reflect the content of the items within the instruments (e.g., “I use ICT to communicate with my friends” would be expected to be easier to endorse than an item such as, “I use ICT to do all of my academic work”). The response format used will be in the form of a proportion statement regarding the number of times that the student would choose to use ICT to self-regulate as compared with alternative strategies (e.g., “I do this all of the time” “I do this most of the time”).

### **Phase II: Initial Pre-testing of the Survey Instruments**

The new survey instruments will be pre-tested with a small group ( $n = 15$ ) of graduate university students. Types of specific feedback sought will include question clarity, suggestions for rewording, and examples of specific behaviours brought to mind in the rating of each item.

Some of the specific types of feedback that will be sought in this stage will be adapted from Bell (1987). These will include (i) How long did it take to complete the instruments? (ii) Were the instructions clear? (iii) Were the response categories easy to interpret? (iv) Did you object to answering any questions? (v) Do you think there are any related questions that should be asked, and (vi) Do you have any ethical concerns in completing this instruments? Participants will then be asked to provide any additional comments that they consider to be relevant. This trial will be conducted face-to-face, so that the feedback can be collected easily. Changes to the survey instruments will then be made on the basis of this feedback.

### **Phase III: Large Scale Application and Validation**

The new survey instruments will be completed by a large group ( $n > 200$ ) of university students. In this phase, the instruments will be administered in an online format. Online implementation has several advantages over pen and paper surveys. Distribution and completion of the survey will be simpler and faster, and the return process will be more convenient for respondents because no postage is required. Online implementation provides the opportunity to ensure that mandatory questions are completed. It also saves data entry time and avoids errors and missing data that result from the submission of illegible responses. Participants will be recruited online from all three public universities within Western Australia.

After collecting the large scale data with the new instruments, the Rasch Unidimensional Measurement Program (RUMM) (Andrich, Sheridan, & Luo, 2005) will be used to examine the properties of each component within the instruments. Traditionally, the most common means of measuring attitudes have been based on principles derived from classical test theory. However, it is now recognised that these methods have deficiencies and that *latent trait theory*, also referred to as *item response theory (IRT)*, is a more desirable model of measurement (Andrich, 1982; Hambleton & Swaminathan, 1985; Molenaar, 1995). IRT focuses on the relationship between the observable responses to instrument items and the traits that are assumed to underlie these responses. A mathematical formula is used to describe this relationship (Hambleton & Swaminathan, 1985; Rasch, 1980/1960) and this forms the foundation of the measurement model. The attempt to obtain formal measurements through the use of such models should lead to a “greater understanding of the variables or trait in question” (Andrich, 1997, p. 878).

RUMM is currently one of the most widely used computer programs available for creating linear scales (Andrich, Sheridan, Lyne & Luo, 2005). The computer program provides six tests to evaluate the fit of the data to the measurement model, thus allowing a linear scale to be created (see Waugh, 2003). The measurement model requires that item difficulties be ordered from easy to hard. This implies that persons with high overall levels of a particular trait should be able to endorse the hard, medium, and easy items positively. Persons with moderate levels of the trait should endorse the moderate and easy items positively (but not the hard items). Persons with low levels of the trait should endorse only the easy items positively (but not the moderate and hard items). Mathematically, Rasch methods produce scale-free person measures and sample-free item difficulties (Andrich, 1988b; Wright & Masters, 1982, 1981). This means that differences between pairs of person measures and the corresponding pairs of item difficulties should be sample independent, a requirement of a linear measure.

Andrich (1989) described five basic requirements for measuring social variables. The first centred on the notion of ‘unidimensionality’ and continuous levels of traits. In order to measure a trait, it must be possible to make comparisons of the form, ‘more’ or ‘less’ of the trait. Therefore, instruments that conform to this model must allow the location of the items that measure the trait, and the people measures of the trait, to be plotted on a linear continuum, thus forming a scale which conveys meaningful measurement (see Andrich, 1989). The second requirement is based on the need for formalising measurement with the use of statistical models. The use of such models means that the differences between item and person

parameters can be determined, and checks can be made on the 'consistency of the estimates', thus providing an index of internal consistency for the instruments (see Andrich, 1989).

The third and fourth requirements are related to the consistency of the item locations on the continuum. 'Additivity' must first be met by the item locations. To meet this criterion, each item must hold a determined scale value (equal distance between locations) in relation to the other items, or it is rejected (see Andrich, 1989). Item locations should also be invariant across groups of people. It is a requirement that the same measures, or scale values, can be obtained regardless of which items are used to estimate the measures, and regardless of which individuals are used to calibrate the items. In particular, the attitudes or opinions of those who constructed the scale should not affect the item statistics. The fifth requirement is that data must fit the a priori criteria stipulated for the scale.

#### **Phase IV. A Self-Regulatory Task-Based Assessment**

In the fourth phase of this study, a sample of 40 university students, drawn primarily from the University of Western Australia, will complete an assessment task that involves significant levels of self-regulatory behaviour, alongside the instruments developed within this study. This will be a general knowledge task which demonstrates key dimensions of self-regulation such as action control, personal evaluations of the task-undertaking process, and metacognitive monitoring and control. Perry and VandeKamp (2000) and Perry et al. (2002) have demonstrated how to create such complex tasks. Each question in the task will be designed in such a way that, before reaching the answer, the learner will have had the opportunity to demonstrate tactics and strategies and recollection of prior knowledge in problem solving. The task will also allow self-evaluation and the use of strategy knowledge. A pilot test of the self-regulation assessment task will be done with a small group of university students ( $n = 20$ ). Scores on the two measures will then be correlated to provide some index of criterion-related validity for the self-report instruments.

#### **Phase V: Correlating Self-Regulation with Academic Motivation to Achieve, Learning Strategies, Metacognition, and Self-Efficacy**

The last phase in this study will examine the associations between self-regulated learning, academic motivation to achieve, learning strategies, metacognition, and self-efficacy. In this phase, a further 200 university students will complete four instruments in addition to the self-regulation components developed. It is anticipated that the entire exercise should take no more than 20 minutes. If response rates are particularly poor, it will be possible under the auspices of the relevant grant to offer small incentives for students to complete the exercise. Analyses will rely primarily on multiple regression and canonical correlation analysis.

### **ETHICAL CONSIDERATIONS**

Appropriate ethical issues will be adhered to. In the online questionnaire, an hyperlink to a letter will be created outlining the purpose of the research and the rights of the participants. Participation will be voluntary and students will be able to withdraw at any time without prejudice. Learners' participation will have nothing to do with any formal or informal assessment of their study areas/units. No reference to individual results will be made in any reports or publications produced on basis of the study results. University personnel will make first contacts before recruitment of participants. The researcher will access the students to participate in the research through the University authorities.

## **EFFORTS TO ENSURE NON-DUPLICATION OF PREVIOUS WORK**

An extensive literature review has been conducted using ProQuest, ERIC, PsycINFO, and EICompexWeb. Searches have also been made in leading journals in education and educational psychology, including the *British Journal of Educational Psychology*, *The American Journal of Educational Psychology* and the *Australian Journal of Education*. Papers providing citation trails to key papers for the project were established through the students' existing network of people working in the education and educational measurements. Additionally, discussion with the supervisors, Dr. Elaine Chapman and Dr. Russell Waugh, established that the topic and focus in this research has not been done elsewhere.

## **DEFINITION OF TERMS**

In the context of this research study, terms will be defined to have the following meanings.

**Self-regulated Learning** is an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features in their environment (Pintrich 2000). Thus, self-regulation of behaviour involves the active control of resources. This includes: time management; where students study; the study environment they create; the concrete resources such as books; and other people such as peers, tutors and teachers.

**Information and Communications Technology (ICT) rich environments** refers to learning environments where innovative ways of using the latest forms of technology (mainly through computers and new media) is utilised to a high level, providing learners with global access to information, learning and support. The focus of an ICT-rich environment is on the subject being taught or studied, rather than developing learner's skills with, and knowledge of, the technologies themselves. (IT – Information Technology – comprises the knowledge, skills and understanding needed to use ICT appropriately and effectively).

**Metacognitive Learning** is the ability to think about how one learns a task. As an instructional approach, metacognitive learning emphasizes awareness of the cognitive processes that facilitate one's own learning and its application to academic and work assignments. Typical metacognitive techniques include systematic rehearsal of steps or conscious selection among strategies for completing a task. Instruction using metacognitive learning usually teaches the student to analyse his/her own learning and apply such insights to academic and work assignments. Typical metacognitive techniques include systematic rehearsal of a task or specific selection of previously learned strategies for completing a task.

**Motivation** is the internal process that energises, directs and sustains individual behaviour. In a University setting, learners need motivation in order to achieve academically. Motivation in education is typically associated with high levels of interest in learning, proactive attitudes to achieve, and active attempts to learn from others. In this study, motivation to achieve will be defined as a response to academic tasks that is enhanced by Information Communication Technology (ICT) through striving for excellence desire to learn and Personal Incentives (extrinsic, intrinsic and social rewards).

**Academic Achievement** is the evidence of knowledge acquisition, literacy, and learning. In a university environment, this achievement is normally assessed through learners' assignments, class participation, test scores in examinations, and individual cumulative grades.

**Self-efficacy** is people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances (Bandura, 1986, in Linnenbrink & Pintrich, 2003, p. 120). Self-efficacy is different from self-esteem in that it is a personal

judgment of competence, rather than an emotional reaction to actual accomplishments. Self-efficacy is more specific to a task (e.g., "I can reduce fractions correctly") instead of a generalized notion of competence (e.g., "I am good at math").

## C. SCHOLARS

### **Professor Monique Boekaerts**

Center for the Study of Education and Instruction  
Faculty of Social and Behavioural Sciences  
Leiden University  
Wassenaarseweg 52, P.O. Box 9555, 2300 RB Leiden  
The Netherlands  
Tel.+ 31(0)71-5273400/5273401 (secre.)  
Fax +31(0)71-5273398/3619; kr. 3A27  
E-mail: boekaerts@fsw.leidenuniv.nl.

Professor Monique Boekaerts is currently a professor in the Department of Education at Leiden University. She holds the chair of Learning and Instruction, and is program director of the research program "Self-Regulation and Learning".

### **Professor David Andrich**

Dean and Professor in Education  
Murdoch University  
Murdoch WA 6150  
Ph: +61 9 9360 6538  
Fax: +61 9 9360 5090  
Email: D.Andrich@murdoch.edu.au

Professor Andrich is currently the Dean and Professor in Education at Murdoch University. He has published articles in psychological, educational, sociological and statistical journals, and has been involved in the development of the Rasch measurement computer program, RUMM (Andrich, Sheridan & Luo, 2005).

## D. BIBLIOGRAPHY

- Andrich, D. (1982). Using latent trait measurement to analyse attitudinal data: a synthesis of viewpoints. In D. Spearitt (Ed.), *The improvement of measurement in education and psychology*, (pp. 89-126). Melbourne: ACER.
- Andrich, D. (1988a). A General Form of Rasch's Extended Logistic Model for Partial Credit Scoring. *Applied Measurement in Education*, 1(4), 363-378.
- Andrich, D. (1989). Distinctions between assumptions and requirements in measurement in the social sciences. In J.A. Keats, R. Taft, R. A. Heath & S. Lovibond (Eds.), *Mathematical and Theoretical Systems*, pp. 7-16. Amsterdam (North-Holland): Elsevier Science Publishers.
- Andrich, D. (1996). Category ordering and their utility. *Rasch Measurement Transactions*, 9, 465-466.
- Andrich, D., Lyne, A., Sheridan, B., & Luo, G. (2005). *RUMM: A windows-based item analysis program employing Rasch unidimensional measurement models*. Perth: Murdoch University.
- Bandura, A. (1977), Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, 84,191-215.

- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Becker, H., (2000). Pedagogical motivations for pupil computer use that lead to student engagement. *Educational Technology*, 40 (5),pp.5-17.
- Bell, J. (1987). *Doing your research project*. Philadelphia: Open University Press.
- Blocher, M. (1997). *Self-regulation of cognitive strategies and motivation to enhance interaction and social presence in computer mediated communication*. Unpublished doctoral dissertation, Arizona State University, Tempe.
- Boekaerts, Monique, Maes, Stan & Karoly, P., (2005). Self-Regulation Across Domains of Applied Psychology: Is there an Emerging Consensus? *Applied Psychology: an International Review* 54 (2), 149-154.
- Bond, T. G., & Fox, C. M. (2001). *Applying the Rasch model: Fundamental measurement in the human sciences*. London: Erlbaum.
- Cavanagh, R.F., & Romanoski, J. (2004). Application of the Rasch model to develop a measure of classroom information and communication technology learning culture. Paper presented at the 2nd International Conference on Measurement in Health, Education, Psychology and Marketing: Developments with Rasch and Unfolding Models: Murdoch, Western Australia.
- Chen, A-Y., & Looi, C-K., (1999). Teaching, learning and inquiry strategies using computer technology. *Journal of Computer Assisted Learning*, 15 (2), pp.162-172.
- Cherryholmes, C. (1988). Construct validity and the discourses of research. *American Journal of Education*, 96, 421-457.
- Corno, L., Collins, K. M., & Capper, J. (1982). Where there's a way there's a will: Self-regulating the low achieving student. (ERIC Document Reproduction Service No. ED 222 499).
- Cox., M.J., (1997). *The effects of Information Technology on students' motivation: final report*. NCET.
- Duckworth, J., (2001). *Notschool.net research phase - final report*. [http://www.notschool.net/what/pubs/pdf/final report. pdf](http://www.notschool.net/what/pubs/pdf/final%20report.pdf) (Accessed 18 April 2005).
- Hambleton, C. & Swaminathan, H. (1985). *Item response theory: principles and applications*. Boston: Kluwer Nijhoff Publishing.
- Howard-Rose, D., & Winne, P.H. (1993). Measuring component and sets of cognitive processes in self-regulated learning. *Journal of Educational Psychology*, 85, 591-604.
- Linnenbrink, E.A., & Pintrich, P.R. (2003). The role of self-efficacy in student engagement and learning in the classroom. *Reading and Writing Quarterly: Overcoming Learning Difficulties*, 19(2), 119-137.
- Miltiadou, M. (1999). *Motivational constructs as predictors of success in the online classroom*. Arizona State University.
- McInerney, D. M. & McInerney, V. (1994). *Educational Psychology: Constructing Learning*. Sydney: Prentice Hall.
- Medical Outcomes Trust Scientific Advisory Committee, (1995). *Instrument Review Criteria*. *Medical Outcomes Trust Bulletin*, 1-4.
- Messick, S. (1989). Validity. In R.L. Linn (Ed.), *Educational Measurement* (3rd ed., pp.13-103). New York: Macmillan.
- Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist*, 50, 741-774.
- Molenaar, I. (1995). Some background for item response theory and the Rasch model. In G. Fischer & I. Molenaar (Eds.), *Rasch Models: foundations, recent developments and applications* (pp. 1-14). New York: Springer-Verlag.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3<sup>rd</sup> ed.). Thousand Oaks, CA: SAGE Publications.
- Perry, N.E. (2002). Using qualitative methods to enrich understandings of self-regulated learning. *Educational Psychologist*, 37(1), 1-3.
- Perry, N. E., & VandeKamp, K. O. (2000). *Creating classroom contexts that support young*

- children's development of self-regulated learning. *International Journal of Educational Research*, 33, 821–843.
- Perry, N.E, VandeKamp, K. O., Mercer, L. K., & Nordby, C. J. (2002). Investigating teacher student interactions that foster self-regulated learning. *Educational Psychologist*, 37, 5–15.
- Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451-502). San Diego: Academic Press.
- Pintrich, P. R. & De Groot, E. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82, 33-40.
- Pintrich, P. R., Smith, D.A.F., Garcia, T., & McKeachie, W.J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement*, 53, 801-813.
- Rasch, G. (1980/1960). *Probabilistic models for intelligence and attainment tests (expanded edition)*. Chicago: University of Chicago Press (original work published in 1960).
- Snow, R., Corno, L. & Jackson, D. (1996). Individual differences in affective and cognitive functions. In D. Berliner & R Calfee (Eds), *Handbook of educational psychology* (pp. 243-310). New York: Macmillan.
- Schunk, D. H. (1990) (Sp. Ed.). Motivation and Efficacy. *Journal of Educational Psychology*, 82, 1.
- Waugh, R. F. (2003) (Ed.). *On the forefront of Educational Psychology*. New York: Nova Science Publishers.
- Waugh, R. F. (2005) (Ed). *Frontiers in Educational Psychology*. New York: Nova Science Publishers.
- Waugh, R. F. & Njiru, J. N. (2005). Measuring Academic Motivation for High School Students in Malaysia Using a Rasch Measurement Model. *In Frontiers in Educational Psychology* (Waugh R.F., Ed) (pp. 3-35). New York: Nova Science Publishers.
- Weinstein, C.E., Palmer, D.R., & Schulte, A.C. (1987) *Learning and Study Strategies Inventory*. Clearwater, FL: H&H Publishing.
- Wright, B. & Stone, M. (1979). *Best Test Design: Rasch measurement*. Chicago, IL: MESA press.
- Zimmerman, B. 1989. A Social Cognitive View of Self-regulated Academic Learning. *Journal of Educational Psychology*, (81:3), pp 329-339.
- Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: an overview. *Educational Psychologist*, 25, 3-17.
- Zimmerman, B. J., Bandura, A. & Martinez-Pons, M. (1992). Self-Motivation for academic attainment: the role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal*, 29, 663-667.
- Zimmerman, B, & Schunk, D. (2001). Reflections on theories of self-regulated learning and academic achievement. In B. Zimmerman, & D. Schunk (Eds), *Self-regulated learning and academic achievement: Theoretical perspectives* (pp. 289-208). Mahwah, NJ: Erlbaum.

## **E. FACILITIES**

Dr Elaine Chapman, Lecturer, Graduate School of Education and Dr Russell Waugh, Senior Research Fellow, Graduate School of Education will supervise the project. Dr. Chapman is experienced in educational measurement and psychology, statistical techniques, and some background in the area of Information and Communication Technologies (ICT). Dr Russell Waugh is experienced in educational psychology and measurement and in Rasch modelling. Their preliminary recommendations and feedback on this research proposal have been incorporated in this proposal.

- (i) Special Equipment - RUMM 2020 software (Andrich, Lyne, Sheridan, & Luo, 2005)
- (ii) Special Techniques – Factor Analysis and Rasch analysis (supervisors are familiar with these procedures.
- (iii) Special Literature- Inter Library loans for journal articles and books unavailable in UWA

**F. ESTIMATED COSTS**

<b>Research Budget</b>			
<b>Item</b>		<b>Amount (AUD)</b>	<b>Payment notes</b>
1	Digitalising and applying the questionnaire on the internet (consultancy)	500	Cash when service is rendered
2	One Independent Research Assistant	875	\$35/hr (approx 25 hrs)
3	Relief payment to Teleconference Expert Panel participants (40/hr for 3 sessions, 6 panellists)	720	Paid when conference is completed
4	Communication (internal and external) e.g., postage, ethics permission (\$.50 per letter)	100	Cash made on continued basis
5	Statistical Software (RUMM)	500	Cash when purchase is made
Total		2695	

**Source of Extra Funding**

This project will be undertaken as a component of a large grant held by the principal supervisor awarded by Lucent Technologies Philanthropic Foundation. All associated costs for the conduct of the research will be met with funds drawn from this grant.

**TRAVEL PLAN**

The researcher will participate in conferences as they become available during the course of the research. Funding will be sought from the University and/or from external agencies for this purpose as according to the University policies.

**G. CONFIDENTIALITY AND INTELLECTUAL PROPERTY**

It is possible that this research will generate new knowledge that could be made available commercially, and in this event, a formal agreement will be reached beforehand on the

apportionment of any revenue raised. The university solicitor will be consulted in drawing up this contract should the matter arise. All data from individual participants in all phases of the research project will remain strictly confidential. The data will be stored in a secure digital format within the Graduate School of Education, University of Western Australia. No names will be recorded in the database. ID numbers will be created to represent participants at the data entry stage. No reference to individual participants will be made in any resulting publications.

## **H. APPROVALS**

This research will use human subjects and so, before commencing the research, ethics approval to undertake research involving human subjects will be sought from the Human Research Ethics Committee.

## **G. SUBMISSION OF RESEARCH PROPOSAL/ DETAILS OF PROPOSED RESEARCH**

Two copies of the Research Proposal Coversheet and this proposal that has the details of the proposed research have been submitted to the Graduate Research and Scholarships Office, Hackett Hall (M358), University of Western Australia.