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Developing an Instrument to Measure Research Skills

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Abstract

A diagnostic instrument to identify the competencies in research knowledge and skills of doctoral student was developed. There is a need to measure student deficiencies in their preparation to conduct doctoral research in order to provide guidance and training. A four stage development of the instrument was conducted. Firstly, through a literature review on the construct in research knowledge and skills were identified and then defined operationally. Items for the instrument were 5 point Likert-type and were either adapted from similar existing instrument or developed by the researcher. Through a pilot study the instruments was validated by peer evaluation and its reliability was measured using internal consistency method. The process also involved item analysis to weed out weak items. The final stage involve in trying to gauge a sample of the current PhD candidates competencies in research. The reliabilities ranged from 0.78 – 0.93 and instrument was judged approach for use. Thus the instrument is beneficial for diagnosing student preparedness in doing research.

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Keywords: Statistical analysis skills; information seeking skills; problem solving skills; communications skills; research methodology skills

1. Introduction

Local universities in Malaysia are receiving more and more students seeking for postgraduate education both at master's and doctoral levels. Because of the policy of internationalization of education and the conducive post graduate environment, it also received an increasing number of students from overseas countries like Indonesia, Middle East and African. The duration of the programme is three years for completion of studies at doctoral level and one to two years for a Masters degree. Most of the doctoral programmes are by research. Students have to undertake a reasonable research work and write a thesis. The thesis is then stringently evaluated in terms of its contribution to knowledge and originality by an external evaluator, usually an academic researcher working in a similar field.

However some students take a long time to embark on their research and hand in their theses. On average, four years is the time to graduate but some may take more time for completion. Sponsored students face the problem of their scholarship being discontinued if they take more than three years though an extension of the scholarship was

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possible base on merit. Supervisors also face the problem of not being able to take new students if these students spend more time and need extra supervision to complete their education.

The main outcome especially for the doctoral programme is to develop the student as a competent researcher i.e. has acquired the knowledge and skills of conducting and disseminating his or her research in a particular field of research. This has been the focus in most of the programmes by research. It is an asset to the country to produce researchers to embark further researcher for economic health or other reason i.e. to be on a cutting-edge with other countries in the use and application of knowledge (Dodani & LaPorte (2008), Murtonen (2005) & Sveiby (2001)).

There are various reasons for students' failure to complete their doctoral degree. The finding from the literature on students difficulties, indicate one of the main cause, is the lack of preparation in knowledge and skills to conduct research. Students are often expected to have for example the skills of seeking and selecting the information using the library or on-line or web, in their field of interest. They should also be well equipped in the methodology of conducting research, including collection and using the tools of analyzing the data and of course communicating and writing research.

This often is not the case even though institutions offer various training facilities to equip the students. Libraries offer courses on seeking information, computing centres also provide training on data analysis and supervisors or advisors do provide but may not be sufficient for guidance and training on research. It is necessary to diagnose students' lack of preparation in research so that they will have a smooth path in postgraduate education. Thus, this study was carried out to develop an instrument to assess student training needs for conducting research.

2. Development Process of the Research Knowledge Skills to Conduct Research Questionnaire

There a number of models or steps involves in the developing questionnaire being propose. A five phase model was used for the development of the questionnaire. The phases involved were presented in the Figure 1

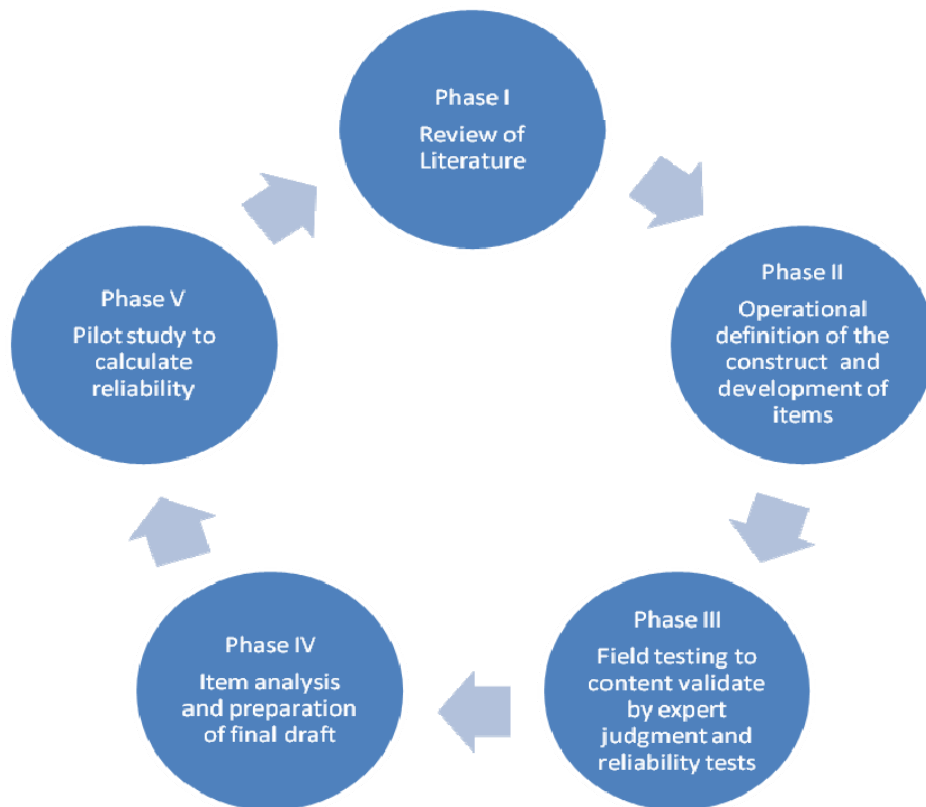


Figure 1. Five phase model for development of questionnaire

2.1 Phase I

A review of literature on the development of ability to conduct research was carried out. There were few studies of this nature. The studies on development of research skills provide evidence on the components or construct of research to be used in this study. The review revealed that there were many components of research skills involved. A few of the studies do develop their own instruments to measure the skills (Gilmore & Feldon (2010), Kardash (2000), Powers & Enright (1987)). It is critical for this study to measure adequately the knowledge and skills in order to conduct research, so open ended items may not be suitable to adapt for the study. Similarly instruments that are to be completed by an external observer in order to measure the student research abilities were also felt not appropriate. This is because an instrument that require student themselves to evaluate or self assessed their research knowledge and skills is being sought. Since none is found suitable for the study, the researchers decided to develop one.

A review was carried out to identify the constructs of research skills that are deemed important to conduct research. There were a range of skills necessary for research and there were different label being used for similar constructs. After comparing and analysis of the construct that have been identified, five constructs were selected as major or deemed important to conduct research which overlaps with a number of instruments. Thus these were used for the study and defined operationally.

The operational definitions of these construct are as follows:

i. Statistical/Quantitative Analysis Skills

Statistical/Quantitative Analysis Skill is the ability to carry out data collection procedures involving planning and selecting appropriate data collecting tools or instruments, identify an appropriate method (quantitative and qualitative) for interpreting and manipulating data and applying an appropriate statistical tools for test of significance besides understanding. The limitations of analysis techniques (for example, understanding the assumptions behind a statistical analysis, and examining whether your data fit these assumptions) and drawing and interpreting appropriate conclusion from results of analysis.

ii. Information Seeking Skills

Information seeking skill is the awareness varians sources of information that are available. It is the ability to search, use, and evaluate information.

iii. Problem Solving Skills

Problem solving is the ability to identify, define and analyze problems, to create solutions and evaluate then, and to choose the best solution for a particular context. It requires imaginative and innovative thinking to find new ways to approach a problem, analytical skills to examine the consequences of a particular solution, and reasoning skills to weigh one solution against another. Problem solving involves the background skills of imaginative and creativity, logic and reasoning, data collection, conceptual thinking, reflection and feedback, and scientific experimentation.

iv. Communication Skills

Communicating skills is the ability to write and present the research and its findings. It is communicating to others the purpose and outcomes of research. It the ability to summarize information, explain the purpose, objectives, conclusions of the research, and tailor the communication to the needs and knowledge level of a particular audiences.

v. Research Methodology Skills

It involves identifying and designing appropriate research procedures, understanding the limitations and scope of research design (for example, sample sizes and data type).

2.2 Phase II

After identifying the construct, and defining it operationally, items were developed for each construct. Some of the items from existing instruments which are available in the literature were adapted. The rest of the items were developed by the researchers based on the operational definition of the construct. A Likert-type of scale was preferred where students were asked to tick against each item.

Table 1. Sample of items for the construct

Constructs		Sample of items for each construct	
1.	Statistical/Quantitative analysis skills	B16 B19	I am not interested in the quantitative method The Statistic program is difficult to be used.
2.	Information seeking skills	C3 C6	I am aware that information can be obtained through various means (e.g. electronic media, images, audio and video). I use other sources besides the library in my institution such as the <i>inter-library loan</i> service.
3.	Problem solving skills	C13 C15	I will look at the strategy to find information again in order to get exactly what I want if it is not successful the first time. I evaluate the accurateness of the content by reading other sources mentioned by the writer.
4.	Communication skills	E12 E34	I am able to do a presentation with confidence. I am able to speak in Bahasa Melayu.
5.	Methodology skills	E27 E28	I have a negative attitude towards research methodology The methodology book is difficult to comprehend.

2.3 Phase III

The draft items were then sent to three senior researchers for content validation. Each judge was asked to review each items and place the items according to the constructs it belongs based using the operational definitions. Each judge was asked to work separately. After completion of the review by all the judges the items were examined again. If there were consensus on the placement of the item with the construct as defined (the item was an appropriate measure of the construct) then the item was selected. If there was no consensus on the item, the items will be dropped. Majority of the items was found suitable to measure the construct. The draft, questionnaire was piloted to test the reliability of the test. A group of 50 students who were currently about to complete their doctoral post-graduate in education were approached to fill the questionnaire during their registration for the second semester of their course. Internal consistency method was used to calculate the reliability of the test. From the output of the results, it showed that the reliability of the test and its construct have reached moderately high coefficient indicating its reliabilities.

2.4 Phase IV

The next phase, involved item analysis, using and the output of the analysis on inter-correlations between the items and its constructs. A few items were deleted from the questionnaire because the value of the coefficient was below 0.3. A final draft of the questionnaire was again piloted to another group of 50 PhD students. The reliability of items was again checked.

2.5 Phase V

The reliability for each construct was again computed and the results are displayed in the Table 1. As the reliabilities of the constructs were sufficiently high, the instrument is ready for use. A sample of items for each construct is provided in the Table 1.

Further checked on the validity was carried out by comparing the scoring of the students on the questionnaires with the data gathered through interview. The interview was carried out on a sample of students. They were asked students on the difficulty and preparedness on the skills measured after the students have answered the questionnaire. There were convergent in the findings between using interview and students’ respondent on the questionnaire. Thus the instrument is ready to be using (see Appendix).

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References

Dodani, S. & LaPorte, R. (2008). Ways to strengthen research capacity in developing countries: Effectiveness of a research training workshop in Pakistan, Public Health. *Journal of the Royal Institute of Public Health*, 122, 578 – 587.

Gilmore, J. & Feldon, D. (2010). Measuring graduate students teaching and research skills through self-report: Descriptive findings and validity evidence. Paper presented at the *Annual Meeting of American Educational Research Association*, Denver, CO, April 30 – May 4, 2010.

Kardash, C.A. (2000). Evaluation of an under graduated research experience: Perceptions of undergraduate interns and their faculty mentors. *Journal of Educational Psychology*, 92(1), 191 – 201.

Murtonen. (2005) University student’s research orientations: Do negative attitudes exist toward quantitative methods? *Scandinavian Journal of Educational Research*, 49(3), 263 – 280.

Powers, D.E. & Enright, M.K. (1987). An analytical reasoning skills in graduate study: Perception of faculty in six fields. *Journal of Higher Education*, 58 (6), 658 – 682.

Sveiby. 2001. A knowledge-based theory of the firm to guide strategy formulation. *Journal of Intellectual Capital*, 2(4): Internet Version.

Appendix

Information Seeking Skills

Please tick (✓) the relevant boxes based on the scale below.

No.	Questions/ Statements	1 Strongly disagree	2 Disagree	3 Neither agree nor disagree	4 Agree	5 Strongly agree
1	I premeditate the types of information that I need like books, articles, journals and others.					
2	I am aware that information found in journals are more often checked, edited and criticized compared to information found in magazines.					
3	I am aware that information can be obtained through various means (e.g. electronic media, images, audio and video).					
4	I am aware that the primary source is the first source (original source) that records work related to the literature.					
5	I am aware that the secondary source is the source that discusses the work of others.					
6	I use other sources besides the library in my institution such as the <i>inter-library loan</i> service.					
7	I identify and look for synonyms, themes or key words that can be used to find information based on my topic.					
8	In order to find information, I read general texts like					

	dictionaries or encyclopedia articles to gain more understanding on the terminologies used in my topic.					
9	I need to broaden my search using key words given that the existing source of information indicates that my topic of research is too narrow.					
10	I am aware that I can use truncation (or shortcuts) in my search or I can also use root words to start my search.					
11	I am aware that I can find a book based on the title given.					
12	I have to conduct the search according to the field in order to identify the materials titles according to a particular field.					
13	I will look at the strategy to find information again in order to get exactly what I want if it is not successful the first time.					
14	I usually evaluate the writers expertise to see if he/she is qualified in the written field.					
15	I evaluate the accurateness of the content by reading other sources mentioned by the writer.					
16	I understand the contextual effect for instance how various cultures, history and geography can influence the perspective of the information.					
17	I realize that time is a factor that influences the relevance of the information to my topic of research.					
18	I get the confirmation of my understanding on a certain topic by getting an opinion or an expert's view (through individual interviews, email, telephone and others)					
19	When searching for information, I arrange each item systematically.					
20	I am able to adjust with the various quotation styles used.					
21	When searching for information using a database, I know how to store it into my disk or to email it to my email.					
22	I can record quotations in order to seek information.					
23	I write down the important concepts myself using my own words.					
24	I use the main ideas obtained from the information researched in order to support my topic.					
25	I combine the main ideas from one source or more in order to form a new idea.					
26	I can construct my own conclusion based on the information gathered.					

Methodology Skills

Please tick (✓) the relevant boxes based on the scale below.

Please respond on your ability to conduct research.

No.	Questions/ Statements	1 Very Poor	2 Poor	3 So so	4 Satisfactory	5 Very Satisfactory
1	Ability to plan a research					
2	Developing a research question					
3	Searching for a research problem					
4	Doing a literature review					
5	Design an experiment study					
6	Selecting an instrument					
7	Developing an instrument					
8	Collecting of survey data					

9	Writing an abstract					
10	Preparing a manuscript for publication					
11	Selecting an appropriate research method					
12	Choosing an appropriate method analysis of data					
13	Interpretating the result of a research study					