

The Element of Research Skills for the Implementation of Research by Postgraduate Students in Malaysia

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Postgraduate research is more demanding of the ability of students to be independent, where throughout the process conducting research it is a challenging journey. This study was conducted to know the expert opinion about the research skills for postgraduate students in Malaysia. This study uses the Fuzzy Delphi Method to identify expert agreement about the elements of research skills. The total sample is 13 experts in the social sciences and humanities were selected using purposive sampling. Data were analysed based on the calculation of the Fuzzy set. This study found that the element of research skills are inference skills, research design skills, moral and ethical research skills, and integrity skills. The implementation of research skills for conducting research is expected to provide opportunities for students to increase the potential and personal qualities during their studies at the postgraduate level.

Key words: *Research Skills, Postgraduate Student, Research, Fuzzy Delphi Method.*

I. INTRODUCTION

Malaysia is a rapidly developing country either in infrastructure or human resources to achieve the objective of becoming a developed nation. Along with the rapid development of the country, education in Malaysia is undergoing an ongoing process of change. Educational institutions are the main drivers in ensuring a holistic transformation (Abdullah et al., 2020; Amiruddin et al., 2020). Malaysia aspires to be a developed and high-income nation in accordance with the planning of the 11th Malaysia Plan. Requirements of postgraduate/graduate professional workforce are becoming increasingly urgent. Postgraduate students have a significant impact on the emergence of new knowledge based on their area of expertise (Raddon & Sung, 2009). In this regard, human resources who have high educational qualifications, especially graduates of postgraduate, can be a catalyst for the emergence of a variety of theories, concepts, new knowledge and innovation.

Students face many challenges throughout the research process at the postgraduate level (Finch & Fafinski, 2014; Sumarwati, Yunus & Ibrahim, 2017). There are postgraduate students who do not continue their studies because of frustration and are slow in completing their investigations (Asogwa, Wombo & Ugwuoke, 2014). This is because they are trapped in certain emotions so that makes them despair to continue research and decide to not graduate as expected earlier. The student fails at the postgraduate level because students do not understand the research process clearly, and they do less preparation to do a variety of research activities so that students have to take a long time to adapt with a research culture and lack of knowledge about the research process as a whole (Chris, 2005). Lack of knowledge, lack of ideas and not achieving the desired targets cause students to fail in conducting research (Heinrich, 2005).

The main problem faced by students at the beginning of the research process is a lack of research skills (Ssegawa & Rwelamila, 2009), research skills used to understand the basic knowledge, concept or theory related to the research carried out. This is important because of the benefit to accuracy in data collection, research instruments and data analysis techniques (Feldon et al., 2015). Most PhD students have no experience in how to conduct research (Meerah, 2010). This is because, postgraduate research is more demanding of a students' ability to be independent, in which the process of conducting research is a challenging journey. This study aims to identify expert agreement about the elements of research skills required by the postgraduate student to conduct research successfully.

II. RESEARCH SKILLS

In conducting research, students need research skills. Research at the graduate level is more demanding of students' capabilities to be independent in carrying out scientific research in detail. Research skills are a variety of skills used by students to find, identify, select, use and evaluate things and information related to the research (Miller, 2000). It can be concluded that the research skills help researchers to identify and explore the matter in more depth in answer to the questions that arise when the study was conducted. Elements of research skills include:

A. Inference Skills

Inference skills are skills in making a reasonable initial conclusion, which may be true or not, to make a decision or describe something or an observation (Joni, 2005). Mastery of inference skills is very important to enable postgraduate students to be able to study, understand and identify areas of specialisation that are of interest before choosing a supervisor, identifying a research topic in their field of specialisation, choose the appropriate supervisor with specialisation which will be reviewed and can measure the ability of self before choosing something to be studied. Students have a good relationship with supervisors so as to obtain support and motivation that will enhance the effectiveness of communications during the process of research implementation.



B. Research Design Skills

Research design skills are an important aspect for students to understand the intricacies of research, basic knowledge of research and make the right choice in doing a study (Murdoch-Eaton et al., 2010). This knowledge is important for conducting the research; a student needs to understand in detail various advantages and the lack of methods, instruments and data analysis techniques. Furthermore, students have to choose the method of study, instruments and data analysis techniques suitable and appropriate to achieve the objectives of the research conducted.

C. Moral and Ethical Research Skills

The thesis is a scholarly paper that in the process of production, students are demanded to be compliant with the various regulations and code of ethics (Bowen, 2005). Students need to learn to comply with various existing rules to be able to train in discipline and professional ethics. Students must have the ability to convey an idea or concept through scholarly writings produced with great responsibility (Colaprete, 2012). Therefore, various matters discussed or written in a thesis should be based on professional ethics and morals.

D. Integrity Skills

When students write and cite sources of reference in accordance with the rules of copyright material then it shows that the students train themselves to be responsible. Student error in writing a thesis is incorrect reference writing and plagiarism (Manchishi, Ndhlovu & Mwanza, 2015). When a student writes and cites reference sources in accordance with copyright material regulations then it shows that the student is an individual who is responsible (Doe, 2013). The thesis at the postgraduate level must produce original knowledge (Baptista et al., 2015). Accordingly, the integrity of skills enable a student to have values like transparency, honesty, trustworthiness, adhering to the principle, not easily influenced and reliable.

III. METHODOLOGY

Fuzzy Delphi Method is an integration of the Delphi method and the concept of fuzzy sets which seeks to obtain the consensus of experts. The Delphi method is used to record and identify expert opinion in predicting something that is being studied by a researcher (Aicher & Sagas, 2008). Fuzzy sets provide a simple method to explain or derive conclusions if the data are unclear, inaccurate, or if information is missing (Agboola et al., 2013). In the process of Fuzzy Delphi, researchers translate expert answers on a Likert scale to a Fuzzy scale (Mohd Jamil et al., 2013) i.e. by changing the language variables to be a Fuzzy Triangular number. The fuzzy number or language label contained in the Fuzzy Delphi method allows the researcher to not misinterpret in identifying feedback from the experts (Badiru, 2013). Therefore, in this study, the researcher uses the Fuzzy Delphi method to gain approval and consensus from experts.

The total sample for this study using Delphi Fuzzy, is 13 experts in the social sciences and humanities from the University Teknologi Malaysia (UTM), University Malaya (UM), University Kebangsaan Malaysia (UKM), University Putra Malaysia (UPM), University Pendidikan Sultan Idris (UPSI), University Tun Hussein Onn Malaysia (UTHM), University Utara Malaysia (UUM), and University Sains Malaysia (USM). When there are the same criteria or high uniformity the experts who will be involved in a study using the Delphi method, then the appropriate number of experts is 10 to 15 people (Adler & Ziglio, 1996). The sample for experts in this Fuzzy Delphi study is determined by using purposive sampling. The first step before using the Fuzzy Delphi method is to formulate a questionnaire (Aliev, Fazlollahi & Aliev, 2004). The language variables will then be changed into a Triangular Fuzzy number. Fuzzy numbers are in the interval 0, 1 or 0 to 1 (Luhandjula, 2007). Further questionnaires were distributed to experts face-to-face to identify the agreement and consensus of the experts. In this study, a questionnaire for the Fuzzy Delphi study uses the Likert Scale 5. Thus, the expert is required to answer each question using the Likert Scale 5 scale which would then be converted based on the Fuzzy scale as shown in Table I.

TABLE I. LIKERT SCALE AND FUZZY SCALE

<i>Likert Scale</i>	Interpretation of Likert Scale	<i>Fuzzy Scale</i>
1	Strongly Disagree	(0.0, 0.0, 0.2)
2	Not Agree	(0.0, 0.2, 0.4)
3	Simple Agree	(0.2, 0.4, 0.6)
4	Agree	(0.4, 0.6, 0.8)
5	Strongly Agree	(0.6, 0.8, 1.0)

IV. FINDINGS AND DISCUSSIONS

The number of samples for this Fuzzy Delphi study is a total of 13 experts in the social sciences and humanities. This study used the Fuzzy Delphi Method to identify expert agreement about the elements of research skills required by the doctoral student to conduct research successfully. Data from the study were analysed based on the calculation of Fuzzy sets.

TABLE II. INFERENCE SKILLS

Item	<i>Triangular Fuzzy Numbers</i>			<i>Fuzzy Score (A)</i>
	$d \leq 0.2$	Expert agreement (%)	Experts consensus value (%)	
Identify areas of specialisation that they are interested in before choosing a supervisor	0.108	100%	86.54%	0.654
Identify research topics that are relevant to the field of study	0.080	100%		0.669
Choose the appropriate supervisor in the specialised fields that will be studied	0.259	46.15%		-
Measure their own ability before choosing something to be investigated	0.145	100%		0.623

Table II shows that there is an item in the inference skills "choose the appropriate supervisor in the specialised fields that will be" a threshold value (d) = 0.259 and there is no expert consensus on this item as the expert consensus value is 46.15% and it's less than 75%, then this item is dropped. However, the other three items have a threshold value of $d \leq 0.2$ and the percentage of agreement of the expert group shows that the percentage is more than 75%. The findings of this study obtained that inference skills are an element of research skills for conducting research at the postgraduate level. Therefore, by having inference skills then students are able to identify areas of specialisation that they are interested in before choosing a supervisor, identify research topics that are relevant to the field of study, choose the appropriate supervisor in the specialised fields that will be studied and is able to measure their own ability before choose something to be investigated. This study is in line with the study that found that inferences skills enable students to have the ability to make a reasonable initial conclusion to make an informed decision (Joni, 2005).

TABLE III. RESEARCH DESIGN SKILLS

Item	Triangular Fuzzy Numbers			Fuzzy Score (A)
	$d \leq 0.2$	Expert agreement (%)	Experts consensus value (%)	
Determine the appropriate research methodology for achieving the objectives	0.108	100%	100%	0.654
Identify appropriate methods for data collection	0.130	100%		0.638
Identify appropriate research instrument to be used in the study	0.145	100%		0.623
Identify appropriate data analysis techniques to be used in the study	0.152	100%		0.608

Table III shows that this study found items of research design skills have a threshold value i.e. $d \leq 0.2$, then the first requirement is obeyed. Besides, the percentage of agreement of the expert group shows that the percentage is more than 75% with expert consensus value of 100%. This study found that research design skills are an element of research skills for the implementation of research at the postgraduate level. These findings support the study found that research design skills enable students to have the ability to understand the basic knowledge, concept or theory related to the research carried out; this is important because it's useful for accuracy in data collection, research instruments and data analysis techniques (Bowen, 2005). Therefore, by having the research design skills then the student will have the ability to determine the appropriate research methodology for achieving the objectives, identify appropriate methods and instruments for data collection and identify appropriate data analysis techniques to be used in the study.

TABLE IV. MORAL AND ETHICAL RESEARCH SKILLS

Item	Triangular Fuzzy Numbers			Fuzzy Score (A)
	$d \leq 0.2$	Expert agreement (%)	Experts consensus value (%)	
Appreciate other people's work	0.130	100%	94.87%	0.638
Applying moral values in conducting a research	0.174	92.31%		0.608
Respect for the idea and comment of supervisors	0.195	84.62%		0.608
Maintain ethics in conducting a research	0.145	100%		0.623
Comply with existing guidelines in conducting a research	0.163	92.31%		0.623
Comply with existing regulations in conducting a research	0.043	100%		0.685

Table IV shows that this study found items of moral and ethical research skills have a threshold value i.e. $d \leq 0.2$, then the first requirement is obeyed. Besides, the percentage of agreement of the expert group shows that the percentage is more than 75% with expert consensus value of 94.87%. It is concluded that the findings of this study find that moral and ethical research skills are an appropriate element of research skills for conducting research based on postgraduate students. The finding is consistent with studies showing that moral and ethical research skills must be owned by a student conducting research (Colaprete, 2012). This is because even communicating ideas through writing scientific concepts is produced responsibly. The study found that moral and ethical professional skills enable postgraduate students to have the ability to appreciate other people's work, apply moral values in conducting research, respect for the ideas and comments of supervisors, maintain ethics, comply with existing guidelines and comply with existing regulations in conducting the research.

TABLE V. INTEGRITY SKILLS

Item	Triangular Fuzzy Numbers			Fuzzy Score (A)
	$d \leq 0.2$	Expert agreement (%)	Experts consensus value (%)	
Avoid plagiarism in writing a thesis	0.163	92.31%	92.31%	0.623
Ensure the authenticity of the idea of writing a thesis	0.087	92.31%		0.669
List the name of the original author according to format references in each study	0.163	92.31%		0.562

Table V shows that this study found items of integrity skills has a threshold value i.e. $d \leq 0.2$, then the first requirement is obeyed. Besides, the percentage of agreement of the expert group shows that the percentage is more than 75% with an expert consensus value of 92.31%. The findings show that integrity is an element of research skills for the implementation of research among postgraduate students. The study found that the integrity skills needed for postgraduate students to enable them to avoid plagiarism in writing the thesis, ensure the authenticity of the idea of writing a thesis and list the name of the original author according to format references in each study. The finding supports the study found that integrity skills are skills that enable an



individual to have good ethics and conduct an activity with professionalism (Widang & Fridlund, 2003).

V. CONCLUSIONS

As a rapidly developing country, Malaysia encourages the younger generation to improve the quality of self. This is useful for solving the existing problems that are, by applying new knowledge or by developing a theory to derive innovative solutions. A country that has a number of PhD graduates on a large scale, have the opportunity to acquire knowledge of the various contributions and new concepts. Graduates of the postgraduate degree can become a catalyst to knowledge, concepts, new research and development of knowledge allowing it to be adopted to improve the quality of society in general. Therefore, postgraduate students in Malaysia are important because this can increase the number of professionals who have the knowledge and skills to generate knowledge development, improve the quality of competitiveness and indirectly can drive the country's economic growth. This study found that inference skills, research design skills, moral and ethical research skills and integrity skills are an appropriate element of research skills for the implementation of research by postgraduate students. Implementation of research skills for conducting research is expected to provide opportunities for postgraduate students to increase the potential and personal qualities during their studies at the postgraduate level. This is because it is not something that is easy for students to face a variety of challenges throughout conducting research.

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