Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.5, No.38, 2014

Core Competency and Qualities Framework for Student Researchers: A Case of Wa Polytechnic in Ghana

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Abstract
Polytechnic education has contributed greatly to the development process of Ghana. The various programs offered at the polytechnic level require students to collect data and analyze field data for effective decision making. Polytechnic students need to be well-equipped with specific knowledge, skills and abilities that will allow them to undertake quality applied research. However, there are questions concerning what precisely are those competencies, when are these competencies best employed, and what contextual factors need to be taken into account when carrying out the research. This innovative methodology to competency modeling, designated vigilance-based core competency and qualities (VQC) framework, attaches a level of keenness to the competency description. The framework is aimed at providing guidance for future Higher National Diploma (HND) student researchers as well as their mentors regarding the knowledge, skills, attitudes and behaviours required for carrying out quality project work. The study made use of the qualitative paradigm involving focus group discussions and interviews with 50 final year students to identify 30 critical competencies, grouped under three thematic categories, namely intrapersonal, interpersonal and intellectual. Nine (9) critical factors were established that could affect the student researcher while carrying out the project work. The current research concluded that no matter how proficient the student researcher is, competencies are not kept at an elevated vigilance level in all stages of the project work. Competencies vary based on the need in the related research activities, attaining their peak levels at particular stages and declining markedly to idle at others. Contextual factors may play a helpful role in regulating the vigilance level of a certain competency or they may have a damaging or watering down effect. This study recommends that it is not only imperative to have the appropriate competencies but to apply the appropriate knowledge, skills, attitudes, behaviours and abilities at the right time to carry out a quality scientific project work.
Keywords: core competencies, quality project work, VQC framework, polytechnic education, Ghana

1.0 Introduction

An academic research paper is a kind of writing that stresses the blending of personal insights and secondary material assembled through focused research and analysis of a specific topic. As asserted in the Purdue University's Online Writing Lab (OWL), a research paper "is the culmination and final product of an involved process of research, critical thinking, source evaluation, organization, and composition" (Baker & Brizee, 2011). Thus, the core of an academic research paper is to bring together both primary and secondary data, guided by a demonstrable claim or thesis to come to an original or enlightened conclusion concerning the topic under investigation.

McLaine (1995) compared an academic research to traveling around an unexplored island which takes the student through difficult pathways on an explorative expedition (George, 2002). The facts demonstrating that the researcher has effectively made the journey and that a substantial finding has been accomplished is the academic paper or project work. However, to traverse this journey there are specific competencies such as knowledge in processing and managing information, written communication and other common research aptitudes which the researcher needs to demonstrate (George, 2002). There are also contextual factors that must be taken into account to ensure a successful exploration and discovery.

Academic researchers must be well-equipped with certain knowledge, skills and abilities that will allow them to carry out quality research. On the other hand, questions exist regarding what precisely are those skills, knowledge, attitudes, behaviours and abilities, when are they best employed, and what background factors need to be taken into account while carrying out the research. Not many studies have focused on the researcher's competencies and no published, empirically validated research has addressed this problem for Ghanaian academic researchers.

Business organizations apply the competency profiling methodology as a human resource development instrument and to ascertain the optimal performance of their employees (Marsh & Bishop, 2014). This current study proposes that this method can also be utilized in an educational perspective to uncover the researcher's competencies.

2.0 Statement of Problem

The problem which this study addressed is the lack of uniformity in the quality of project work provided by students enrolled in the Higher National Diploma (HND) level of the Wa Polytechnic. Preliminary investigations carried out in the form of informal interviews and observations singled out three aspects of the problem.

Firstly, while many of the HND students possessed sound knowledge of how research is to be carried out, it is confusing and unclear to them precisely what are the skills required to undertake a quality scientific research or project work. Secondly, whereas some students may be skillful and proficient in the research process, they usually do not get a distinction as they failed to apply their skills at the right time. Thirdly, there are no pertinent competency genres founded on empirical studies that can serve as a frame of reference for prospective HND students to the fundamental competencies of a researcher as well as the suitable stages in which competencies should be employed.

Furthermore, it has been noted that "students have a narrow definition of research and what it entails" (Burgoyne, O'Flynn, & Boylan, 2010). Consequently this manuscript suggests an innovative approach to competency framing by means of empirically designing and corroborating a vigilance-based core competency and qualities (VQC) framework to enable potential polytechnic student-researchers and their mentors to carrying out a quality thesis or project work. The framework distinguishes and elucidates the competencies required of the researcher to complete a high quality project work; skills, abilities, knowledge and other qualities, the best possible awareness level of those capabilities; when these capabilities are actually required and ultimately draw attention to the impact of background factors on the student-researcher while carrying out the academic research.

3.0 Review of Literature

One of the core businesses of polytechnics in Ghana is to "provide opportunities for skills development, applied research and publication of research findings" (Polytechnic Act 2007; Asomah, 2014, p.2). Besides, one type of conventional academic research is the project work or thesis that is obligatory for the partial fulfillment of the National Higher Diploma (HND) degree in many Polytechnics and higher institutions of learning in Ghana. The HND project work requirements and conditions could differ to some extent from one Polytechnic to another, though they typically have some commonalties. The Wa Polytechnic and some other polytechnics in Ghana refer to a project work as an independent methodological study, carried out by the student or group of students, coached and closely guided by a lecturer and the whole process end up with a written thesis or academic paper of empirical nature (Wa Polytechnic Project Work Handbook). In addition, a project work is generally associated with a practical topic within the relevant study area in the HND program. Some scholars are of the view that research skills are important for the successful functioning in today's global knowledge economy (Davis, Evans & Hickey, 2006). Thus a general grounding in research competencies and comprehension at the polytechnic and tertiary levels could bring about receptiveness to applied research and educated utilization of novel and innovative information that take students through into their professional careers (Boikhutso, Dinama & Kebabope, 2013).

Consequently, the main element of carrying out a high-quality project work is based on the capacity of the student-researcher to undertake quality scientific research that will add value to the whole process of knowledge creation. Thus, this draws attention and focus to the wide-ranging requirements considered necessary to perform quality academic research.

3.1 Definition and Qualities of a Competent Researcher

Through the project work polytechnic students are required to demonstrate that they are prepared to take up an agreed-upon research topic in a scholarly approach; that is to say that students need to become competent researchers (Ulrich, 2001) in their respective fields of study.

There is no one exclusive suite of competencies that distinguish a competent researcher. All the same, a review of the extant literature recognized a number of research competencies.

Competent researchers usually demonstrate myriad of characteristics which enable them to engage in the research process. Hussey& Hussey (1997) in their business research book described a competent researcher as a person with the following attributes: analytical skills, written and verbal communication skills, computer processing skills, presentation skills, organization skills, cognitive skills as well as library skills. Competent researchers are also considered as individuals with great motivation, determination, and who are frequently on their own and independent of any outside imposing individuals or schemes (Marsh & Bishop, 2014). Furthermore, they are generally well-informed in their specific field of study and other related areas of their research topic Campion et al., 2011). Competent researchers also have a tendency to demonstrate awareness of different research methodologies, knowledge of procedures for statistical analysis, and they have various other aptitudes such as flexibility, creativity, and ability to mobilize support, encouragement and collaboration from other people (Hussey & Hussey, 1997).

A master's dissertation that concentrated on the competencies of R&D professionals in Egypt as well as

their advancement through competency frameworks, underscored and brought to light other competencies including the ability create a vision, to conceptualize, embrace risk, see into the future and plan ahead, learn from experience, ability to manage self and others, promote collaboration and teamwork, consider ethics, and ensure quality (Hamed, 2003; Fathy & Wahba, 2008).

Moss (1966) discussed quite a number of other competencies such as the aptitude to delegate responsibilities, source for research funding and grants, outline, expound and exhaustively develop a research problem. Moss (1966) dissertation findings were also connected to the researcher's capability to study, interpret and understand the information read, obtain knowledge about how to outline a research project, the capacity to formulate exact observations to social phenomena, and the capacity to decode meaning from research findings. Since Moss (1966) research was based on the educational researcher, he as well came out with competencies pertaining to having essential knowledge of philosophy of education, particularly how societies and cultures develop as well as the social psychology.

Notwithstanding the value-added from the above and related studies, there is yet a lack of direction and support for the inexperienced researcher when compared with the growing significance of research as a whole and the consequence to the competent researcher. Besides, no published empirical studies were discovered which addressed the precise set of competencies necessary for an HND student researcher.

3.2 The Origins and Development of Competency Profiling

The competency modeling framework is not a novel phenomenon in itself. Competency profiling has been in existence since the era of the Roman Empire, particularly when the Romans made an effort to particularize the characteristics or qualities of a first-rate Roman soldier (Kierstead, 1998). Moreover, in the year 1911, Taylor was acknowledged as one of the first people who became aware of and inquired to know the distinction between an effective employee and the less effective worker as they are performing their task assignment (Sandberg, 2000).

Nevertheless, the expression itself came into the limelight in 1959, when White (1959) categorized a human attribute and labeled it a "competence" (see Rothwell & Lindholm, 1999, p. 92). Then, it was in the 1970s, when McClelland (1973) brought in the concept of competency measurement (Mirabile, 1997). McClelland suggested testing and assessing for a person's competency as against the prejudice connected with assessing the intelligence of a person, so that it would be possible to make a forecast of a person's prospective performance (Mirabile, 1997).

On the basis of the above, McClelland initiated and established the Hay-McBer company and later came out with the competency-based approach for forecasting a worker's task performance as well as the overall success of an organization. This was further employed as a relevant tool for human resources management (Kierstead, 1998).

3.3 The Concept of Competency

There seems to be no one commonly acknowledged definition for the term "competency", which is also branded as competence. Therefore, there is confusion and misunderstanding surrounding the word which remains unsettled (Cooper, Lawrence, Kierstead, Lynch, & Luce, 1998). The following are generally established definitions:

- An ability, skill, knowledge, capability or attribute linked with effective and high performance on a particular job, such as leadership task, analytical thinking and problem solving. In addition, it may include values, motives and beliefs (Mirabile, 1997).
- The skills, attitudes, knowledge, behaviours as well as other qualities needed to achieve a task, career, or desired future activity (Shellabear, n.d.; Blancero, Boroski, & Dyer, 1996).
- Series of behaviours displayed over and over again by outstanding performers than by ordinary performers (Klein, 1996).
- The set of skills and traits that people or workers must possess to be effective and accomplish an assigned work (Mansfield, 1996).
- Both knowledge and skills that motivates and brings about effective task performance (McLagan, 1996, p. 61).
- A person's exhibited skills, knowledge and capabilities (D. Ulrich, Brockbank, Yeung, & Lake, 1995).

The expression "competency" is every now and then denoted by the acronym: KSAOs – knowledge, skills, abilities, and other characteristics (Campion et al., 2011; Kierstead, 1998). At other times, competency is replaced with the phrase "success factors" (Mirabile, 1997).

3.4 How Competency Models Developed

Competency models are the structures of support that involve the capabilities needed for effective performance of a particular task (Marrelli, Tondora, & Hoge, 2005). There are several designs and methods for creating

competency models. They rely on the explicit needs behind the models, the variety of ways employed to assemble the information that would create it and the identifiable drives of the population or persons who design it (Mirabile, 1997). Additionally, the competencies that are incorporated in the framework may be organized and orchestrated differently from one model to the other. Usually, there is not a single optimal way. What influences the best approach is usually based on the particular need necessitating its development (Marrelli, et al., 2005). Nonetheless, there are certain common properties in the constituent elements of those models.

In an article concerning competencies written by Patricia McLagan (1996), she described competency models as important tools for decision-making, which can be applied to make predictions about the future and which can be designed by identifying existing ideal or exemplary actors and framing the model on the basis of what these ideal performers really do. McLagan (1996) further asserted that there are only a few clear procedures for the construction and usage of competency models.

One of the competency profiling methods initiated by the Hay-McBer company succinctly summed up the construction of these models under just three main steps. The first step consists of exploring the work assignments, responsibilities, tasks, roles and employment settings of the target activity, by means of in-depth interviews and/or focus group discussions with experts in the specific subject matter as well as with exemplary performers. The second step entails isolating the attributes or the qualities of the best performers by way of interviewing and/or observing them closely. The third step involves validating the competency model based on any of the three preferences (Rothwell & Lindholm, 1999). Then repeat the process to ascertain if the same results can be obtained. Finally, it is important to have the best or exemplary performers corroborate it or make an assessment of the job performers utilizing the constructed model (Vazirani, 2010; Rothwell et al., 1999).

In their book entitled, "Performance Consulting: Moving Beyond Training", Robinson & Robinson (1996) discussed the major components of a competency model as follows: (a) performance outcomes, which consist of the results a performer should accomplish on the job; (b) competencies, which involves a clear account of core competencies necessary for a successful performer; (c) best performance practices, which spells out the activities necessary to realize the performance outcomes and accordingly these performance activities can be discovered through literature search or observation and also by interviewing exemplary or best performers, their mentors, and/or experts in the field of study; (d) quality criteria, which represents the measurable criteria that should be employed to determine the quality by which the performance outcome is accomplished; and lastly (e) the contextual or workplace factors, which comprise a listing of the critical elements that will either support or impede the realization of the performance outcomes. Robinson & Robinson (1996) further clarified that exemplary performers together with their mentors constitute the fundamental data sources of behaviours and attitudes that lead to success. The next important sources of data come from the literature search and review followed by subject matter experts. Besides, Robinson & Robinson (1996) referred to focus group discussions and interviews as the most effective and efficient ways for gathering research data.

McClelland (1978) asserted that the best way to identify and document competencies is through behavioural event interviews (BEI). McClelland (1978) described behavioural event interviews as in-depth face-to-face dialogue which necessitates the soliciting of critical incidents from players or performers and writing down what the performers or players were actually feeling, thinking, doing throughout the incident (Rothwell & Lindholm, 1999). The use of focus group discussions and face-to-face interviews as general data collection methods from best performers and their mentors in constructing or designing competency models were compared with the use of a survey, which is ideal and useful only when a researcher has to collect information from many research participants (Campion et al., 2011; Mirabile, 1997).

In conclusion, competency models aim at the real historical achievements of best performers applying a combination of diverse data collection methods such as face-to-face interviews, observations, focus group discussions, competency dictionaries and literature reviews so as to be able to predict the future work performance of a person. Even though the study of McClelland (1978) on the concept of competency, which initially had applications in the field of education, there is greater interest to apply the concept to the field of business and organizational sector as well (Rothwell et al., 1999).

3.5 Competency-Based Models and their Relevance in Corporations

Competency-based models have been launched in corporations as a human resource management & development (HRMD) tool. Competency models have been designed and utilized for the purpose of facilitating and sustaining the optimal performance of an employee, which in turn will allow the organization to realize its overriding goals (Robinson & Robinson, 1996; Campion et al., 2011). For example, the American Society for Training and Development (ASTD) has designed a competency-based model to address the diverse and competing roles of the human resource management and development profession (McLagan, 1989).

The application of competency-based models are widespread in several professions and in the field of business including, IT companies, banking and insurance, manufacturing industries, transportation companies as well as leadership and management consulting firms (Cooper, Lawrence, Kierstead, Lynch, & Luce, 1998).

The competency framework acts as a decision-making tool that explains the critical capabilities required for carrying out a particular job and which may be employed as an important basis for creating and developing employee training programs, coaching and mentoring, hiring of employees as well as in making important decisions concerning succession planning and career development issues (Marsh & Bishop, 2014; Tripathi & Agrawal, 2014; McLagan, 1996). As already has been pointed out, even though competency models are frequently employed in business organizations their application is increasing in the field of education.

3.6 Competency-Based Models and their Relevance in the Field of Education

In the field of education, especially in higher education, human resource managers use competency models to associate the competencies required in the place of work with the outline of program core curricula and prospectus (Rothwell et al., 1999). For instance, the University of Louisville (UoL) supported the creation and enhancement of its Human Resource Education (HRE) course model based on the competencies defined by the ASTD for human performance upgrading. The UoL made this decision with the aim of ensuring that the competencies of college students will be aligned with the authentic competencies needed for the specific job in the organization (University of Louisville, 2003).

In Ghana, the new educational reform has put stress on science, technology, technical education and training and the study of mathematics with aiming at positioning Ghana for rapid but sound development. Consequently, all ten national polytechnics are supposed to structure their academic programs to align and comply with the principles of Competency-based training (CBT). Polytechnics are mandated to offer tertiary education in the areas of applied science and arts, business, science, technology, economics and manufacturing. The polytechnics thus have a special mission of training young men and women to take up the middle level man power needs required for business, administration, industry and commence. Thus, competency-based training seeks to deal with the above listed challenges based on the principle of "Do it yourself" (Amankwah, 2011). Competency profiling and training has therefore appeared at the right time to enable polytechnic graduates to obtain the essential knowledge, skills, abilities, personal qualities and attitudes to effectively and efficiently carry out professional roles, and quality applied research is one of them.

Moreover, educators everywhere are concerned about the critical competencies that the various educational formation and training programs need to concentrate on so as to improve the quality of teaching and learning and be able to cope with the global challenges. For that reason, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has been collaborating with the International Bureau of Education (IBE) and have come out with many published working papers which surveyed those competencies and made use of the international experiences in establishing guiding principles and strategies to their accomplishment (United Nations Educational, Scientific and Cultural Organization, 2003).

3.7 The Notion of Vigilance

The expression "vigilance" was originally initiated by a British neurologist by name Henry Head, who later asserted that high vigilance prepares the mind and body to respond to any internal and external events (Tassi, Bonnefond, Hoeft, Eschenlauer, & Muzet, 2003, p. 83). Additionally, Broughton and colleagues (1994) insinuated that the word "vigilance" was more broadly referred to the central nervous system to mean the effectiveness and efficiency of the processes within the nervous system in responding to stimuli or events (Tassi et al., 2003). In daily usage, vigilance stands for a person's state of readiness, alertness or attention.

In an effort to apply an innovative and imaginative approach to competency modeling, the researcher was inspired to operationalize the notion of vigilance in this research study. Thus within the context of this current study, the fundamental competencies necessary to carry out a quality scientific research are investigated as to the extent of vigilance or state of readiness to positively act in response to the many equivalent research activities. To put it differently, to be able to undertake a quality project work, the student researcher must be alert and attentive to the requirements and conditions of the diverse project work research stages and key activities, and correspondingly utilize specific set of competencies to perform these activities. On the other hand, if the student fails to apply the right competencies (i.e. knowledge, skills, abilities, behaviours, aptitudes) at the right time, then there will be paucity and deficiency in action and as a result the student researcher may not be able to carry out a quality research.

4.0 Research Design and Methodology

In this current research, an improved theoretical/conceptual framework was prepared with the direction of the Robinson & Robinson (1996) narrative for building competency and performance frameworks in business establishments as well as Mirabile's (1997) characterization of the name "competency". Robinson et al (1996) proposed three factors that can have an effect on a job's performance outcomes: the capabilities of the worker, best practices as well as contextual or environmental factors. Furthermore, Robinson et al (1996) showed the significance and value of having predetermined computable quality criteria alongside performance outcomes are

evaluated. The improved conceptual framework for this research proposes four aspects or factors that may influence the quality of academic research. They are capabilities of the student-researcher, the research activities, background factors that impede or give support to the student-researcher as well as the best possible vigilance level of every competency to confidently react to the various activities of the research process (Fathy & Wahba, 2008). In this current investigation, the four factors enumerated above were transformed into research questions and the resultant analyzed responses constructed the VQC framework.

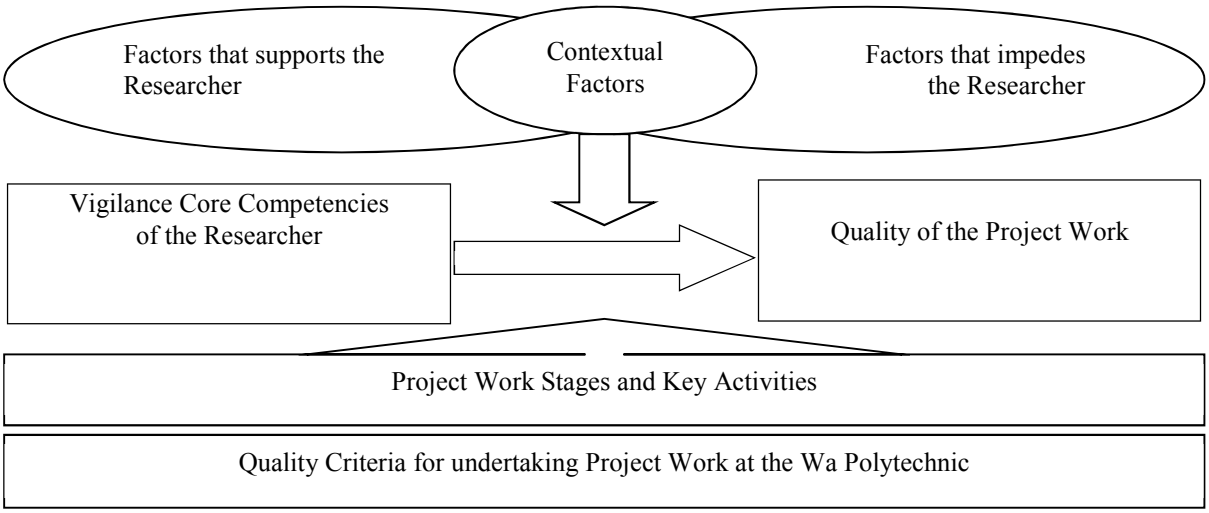

Figure 1: Improved Theoretical Framework

The targeted population for this current study was fifty (50) exemplary student researchers who successfully completed their HND studies in 2012 and 2013 from the Wa Polytechnic, their mentors, four project work assessors from the Polytechnic as well as the research methodology course lecturers of the Polytechnic.

Data were assembled utilizing a triangulation of interviews, focus group discussions and observations. The researcher used the constant comparison analysis technique as described by Gay & Airasian (2003) in this study to taper and cluster the data gathered and organize them into suitable categories.

The constant comparison method belongs to the qualitative analysis paradigm that leads more and more to comprehending and incorporating the respondents' important perspectives on the topics examined. It is a technique used for recognizing both differences and similarities by making comparison of new evidence to past evidence (Fram, 2013; Gay et al., 2003). Throughout all the focus group discussions and interviews carried out for this research, the respondents were given a list of most likely competencies together with competency definitions that were identified from the extant literature (Fathy et. al, 2008); initial exploration, and prior interviews carried out with some exemplary researchers for regularly comparing the respondent's contributions. All competency statements which were pointed out by a small number of respondents or which were not corroborated by relevant behavioural occurrences were deleted or removed from the comparison. In the end, the combined set of competencies revealed were grouped into thematic clusters according to the similarities that emerged between them. Additionally, visual (or graphical) presentations were employed where appropriate with the aim of facilitating the documentation of the research findings.

5.0 Analysis and Presentation of Results

5.1 Required Core Competencies of the Student Researcher

This current study has identified 30 core competencies as necessary for carrying out a high-quality project work. These critical competencies were put into three thematic categories: interpersonal, intellectual and intrapersonal. The interpersonal category focused on critical competencies required to interact and communicate well with other people. The intellectual category dealt with the cognitive characteristics of the researcher. The intrapersonal category addressed the researcher's personal and intimate nature. Table A1 shows a complete list of the competencies identified; their definitions based on the application of guiding competency dictionaries and from other common English dictionaries as well as their categorization under key relevant categories.

5.2 Project Work Activities

The study has also identified five key stages and twenty-four core activities for carrying out a project work research: Stage one focused on activities which have to do with the research problem identification and research

questions formulation; Stage two came out with activities concerning the design of the research map and strategy; Stage three addressed the activities considered necessary for data gathering; Stage four concentrated on activities connected with data analysis and deriving conclusions and appropriate recommendations from the data; and finally, Stage five dealt with activities needed for preparing and getting ready for the project work defense. Table A2 shows the full progression of the research stages alongside their core activities.

5.3 Identification of Vigilance Competencies

All the thirty (30) core competencies identified in this research work were evaluated and reviewed for their degree of vigilance in conjunction with each research activity. Also, the vigilance concentrations were described as high, medium, low, or idle, according to the competency's degree of significance to the related research activity. Tables A3, A4, and A5 respectively give the broad vigilance-based core competency patterns that were validated in two focus group discussions organized with the research respondents.

Furthermore, for the purpose of constructing the final picture of the vigilance-based core competency and qualities framework, additional analyses were carried out. Consequently, the researcher made an effort to examine the competency categories required in each of the five stages of the project work process and exhibit the patterns of their related competencies as well as the corresponding vigilance concentrations in graphical form. To accomplish this, all the various vigilance levels corresponding to the core competencies given in the matrices were initially converted to an equivalent numerical scale. Therefore, high, medium, low and idle vigilance were correspondingly ranked as 3, 2, 1, and 0 on the numerical scale. The arithmetic mean of the vigilance intensity for each competency-category was then computed by simply adding up the vigilance amounts of its core distinctive competencies and the result then divided by the total number of competencies derived based on it. For instance, to compute the arithmetic mean (average) of the vigilance level corresponding to the interpersonal core competency-category in Stage 1 of the project work; each vigilance levels of the resulting five competencies were summed up in this way: Interpersonal skills and networking, 3; listening ability, 3; oral communication and observation, 3; presentation skills, 2; written communication, 2 (3+3+3+2+2 = 13); and so the arithmetic mean (average) vigilance level computed for the interpersonal category is equal to 13/5, which is approximated to 3, and this can be described or interpreted as "high vigilance" level. The justification behind this was to ease the exhibition of the complete core competencies as well as competency-categories on pictographic displays to further discover their patterns and make clear their implications. Figures 2, 3, 4, 5, and 6 respectively give the graphical picture of the vigilance-based core competency categories.

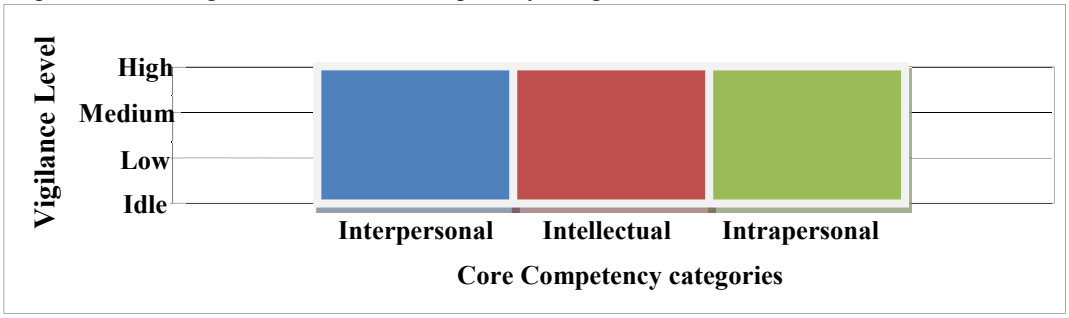

Figure 2: Competency-category Vigilance Levels in Stage 1: Research Problem & Research Question Identification

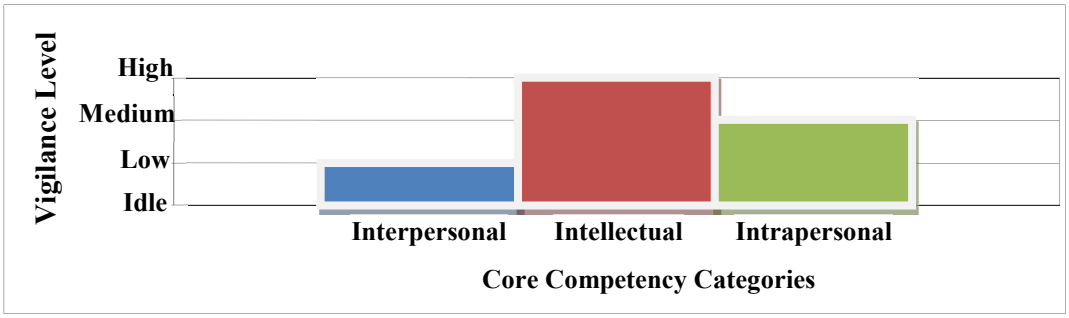

Figure 3: Competency-category Vigilance Levels in Stage 2: Research Plan Design

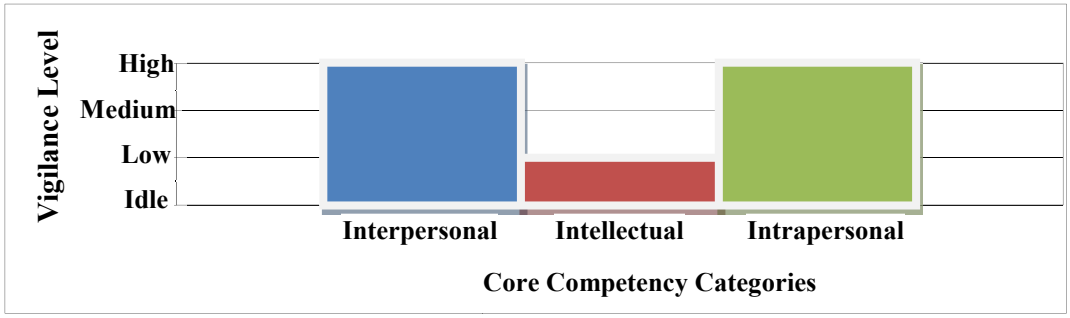

Figure 4: Competency-category Vigilance Levels in Stage 3: Data Collection Process

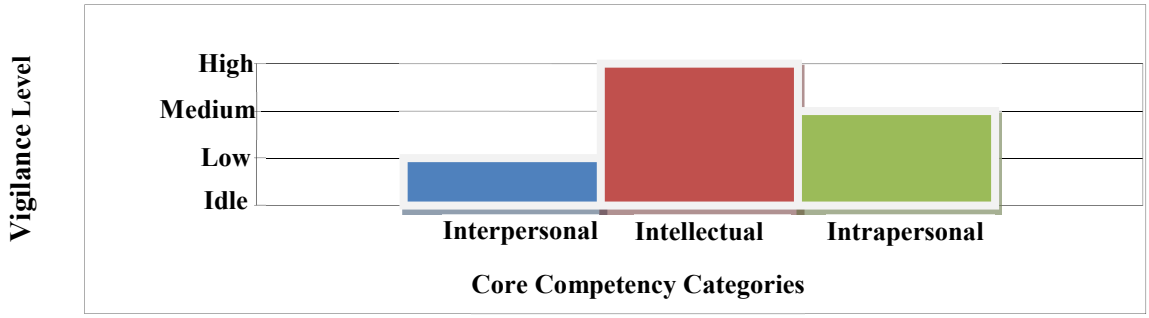

Figure 5: Competency-category Vigilance Levels in Stage 4: Data Analysis, Conclusions, and Recommendations

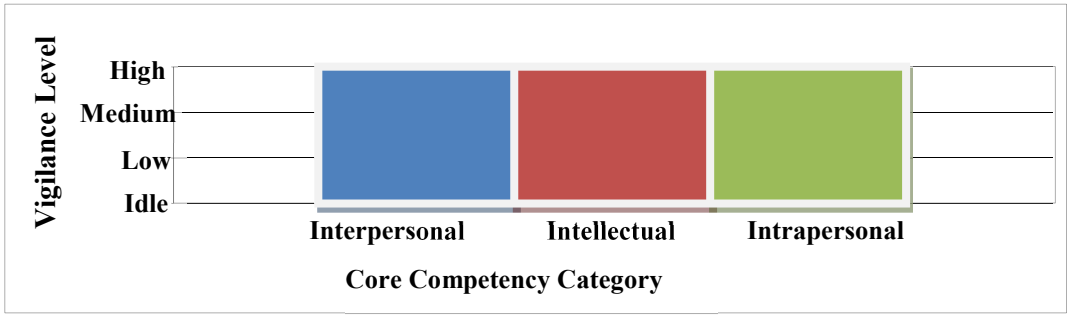

Figure 6: Competency-category Vigilance Levels in Stage 5: Project Work Defense

5.4 Project Work Quality Standards

This study recognized the measurable and assessable criteria for obtaining a distinction in the HND project work as 80 per cent and above. Whereas the comprehensive measurable standard of the HND project work assessment are divided into following: (i) *the form* is marked over 10%, including the quality of the write-up, the use of correct grammar, spelling, and style; (ii) *the content* is marked over 70%, which takes into account the research motivation, research design and methodology as well as conclusions derived from the research; (iii) *the presentation* is marked over 20% and this includes the presentation made at the defense, answers to questions from the panel of evaluators as well as how time was managed.

5.5 Contextual and Background Factors

The research underscored nine background or contextual factors that either contribute or impede the researcher. They are support from the mentor, support from family and friends, knowledge-sharing, learning situation, competitiveness, researcher's work experience, domestic and family responsibilities, work engagements, and cultural and social perceptions regarding academic research in Ghana.

Consequently, the information collected and analyzed for this research project, the researcher was able to build a vigilance-based core competency and qualities (VQC) framework that indicated the various vigilance amounts connected with each competency constellation right through the five key stages of carrying out a quality project work at the Wa Polytechnic. The framework also incorporated the influencing background factors that both impedes and give support to the researcher. Figure 7 below displays the graphical representation of the proposed VQC framework.

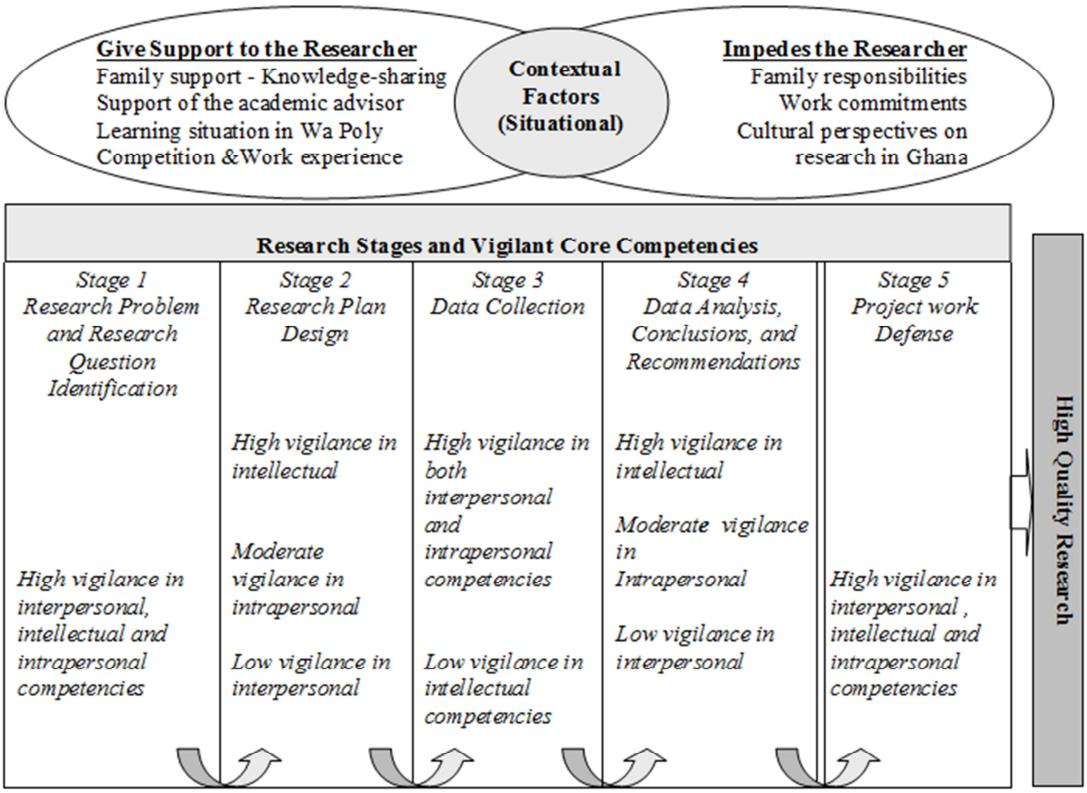

Figure 7: Vigilance-Based Core Competency & Qualities Framework

6.0 Conclusions and Recommendations

This current study recommends that it is not only imperative and critical to possess the right competencies but also to be able to apply these competencies at the right time to perform high quality academic project work. Thus a new terminology, *vigilant Core competencies*, was formulated to illustrate the activity and stage-related application of the fundamental competencies. However, it was obvious that regardless of how competent a student-researcher may be his or her core competencies may not always be kept at elevated vigilance level in each and every activity of the research process. Rather, they vary based on their valid and appropriate requirement. In addition, carrying out a quality academic study was not only based on the skilled researcher but background or contextual factors also have a substantial impact of either positively or negatively regulating the vigilance level of the competency. Therefore, care must be taken in an attempt to generalize the findings of the proposed Vigilance-based Core Competency and Qualities (VQC) framework. The framework should not be seen as a perfect measuring tool except if further validation and testing is carried out on a bigger sample of exemplary or best researchers from various disciplines not only limiting it to the academic discipline.

The Vigilant-based Core Competency and Qualities Framework developed in this current study is intended to provide guidance for student-researchers and their mentors to help in conducting a quality project work or thesis. Polytechnic students who already possess those core competencies must employ them in the research process at the right time otherwise the competencies will become ineffective. This research further recommends to student researchers to keep all the set of competencies very vigilant in stages one and five of the research process. Furthermore, they should maintain their intellectual competencies highly vigilant in stages two and four and keep their interpersonal as well as their intrapersonal competencies vigilant in stage three. Should it happen that the researchers do not have some of the core competencies identified, it is still possible that their deficiencies can be improved by: (1) obtaining intensive training based on research competencies; (2) making effective use of the academic mentor's support; (3) asking a family member for the necessary support; (4) sharing knowledge and experience with classmates, lecturers and friends; (5) making effective use of available facilities and resources at the learning environment; (6) working on research themes or topics which are related to their everyday work experience; and finally (7) remaining focused and persistent in whatever obstacles and problems confronting them.

The mentors and academic advisors of student researchers can also be guided by the vigilance-based core competency and qualities framework proposed in this study on condition that they continuously contrast it with the up-to-date performance status of their students under their supervision. This constant evaluation will

enable both mentors and academic advisors to become aware of first warning signs that require their intervention for fine-tuning students competencies' vigilance levels to those recommended in the VQC framework. Consequently, mentors and academic advisors should consider the following factors if they desire to succeed in this: (a) carrying out frequent meetings and discussions with all student researchers, (b) creating and maintaining an open-communication network, and (c) appreciating the way of thinking, experience and understanding of student researchers.

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Appendices

Table A1: Core Competency Taxonomy

Interpersonal Competencies	Definitions	Sources of Definitions	Example of Competencies as described by Research Respondents
Interpersonal Skills & Networking (IS & N)	The skills that allow effective exchange of ideas and social contacts between people; scope to which people get along and relate positively with one another; also the ability to exchange information and/or services among a people or organizations.	- Oxford English Online Dictionary. - Webster Online Dictionary. - Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "one needs to have wide relations " - "The researcher should be able to communicate appropriately" - "networking is critical in research work" - "As a researcher you need to be able to obtain support from other people"
Listening Ability (LA)	Ability to comprehend and obtain meaning from verbal material. This also involves the capacity to remain attentive.	- Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "A student researcher must be able to listen carefully and not merely hear words" - "if you are a poor listener, you could end-up with erroneous analysis & as a result flawed conclusions"
Oral Communication & Observation (OC & O)	Capacity to communicate thoughts, ideas and facts verbally; via correct grammar, suitable body language, right tone, and identifies non-verbal cues. This also consists of the act of watching, noticing and observing.	- Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005. - Oxford English Dictionary.	- "It is vital particularly when interacting with the research respondents" - "this skill will be needed particularly while defending project work report" - "a good academic researcher must have a bird's eye view to examine and discern the things around him/her"
Presentation Skills (PS)	This denotes the act of plainly presenting one's self before others. This may contain the use of different aiding presentation devices and methods, such as power point presentations.	- Research Respondents	- "if a student researcher is not good at presenting himself/herself, others may misconstrue his/her research outcomes" - "during the defense conference, one will certainly need this skill"
Written Communication (WC)	Capacity to communicate thoughts, ideas, as well as facts in writing by way of employing right grammar, spelling and document structure, standard document formatting, and other scholarly methods to communicate a message in written form.	- Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "your project work will mean less if not nothing, if one cannot appropriately write it down on paper" - "there are clear accepted report writing layout and formats a student needs to be aware of"

(Table A1 Continues)

Table A1. ***(Cont'd)***

Intellectual Competencies	Definitions	Sources of Definitions	Example of Competencies as described by Research Respondents
Analytical (Synthesis) & Critical Thinking (A&C)	Understanding circumstances, problems and issues by breaking data into bits and pieces, or tracing the repercussions of a situation in a methodical manner.	- State System of Higher Education Competency Dictionary, 2000. - University of Ottawa Directory of Competencies, 1998.	- "Research involves making an effort to know what you do not know. Therefore, you must always dig deep down, comprehend, and explore" - "You also need effective analytical thinking to be able to carry out a research study"
Collecting & Organizing Data & Information (CDI)	The way by which a person manages and copes with information flow. This involves the capacity to identify, methodically assemble, and categorize data as well as information.	- Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "Managing the reading sources and references, aided me greatly while performing the research" - "Correct and accurate coding of the data gathered is essential"
Computer Knowledge (CK)	This entails the knowledge and skill to work with and make use of different computer software. For instance, MS office tools, statistical packages and others.	- Research Respondents.	- "The student need to be well-versed with MS Word and MS Excel to be able to write the final manuscript" - " He/she needs to know how to work with certain statistical packages such as SPSS so as to perform data analysis"
Conceptual Thinking (CT)	The capacity to discover connections or patterns between events that are not observably related, and to discover crucial or core issues.	- State System of Higher Education Competency Dictionary, 2000.	- "The student researcher may need to think top-down or bottom-up to be able to comprehend certain situations"
Decisiveness (D)	Exercises sound judgment by making reliable and educated decisions. Also means the capacity to make decisions that are founded on reliable and factual information.	- Competency Definitions of the Federal Energy Regulatory Commission, 2004. - Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "You must take the right decision at the right time" - "The researcher should be able to decide when s/he reaches data saturation, conclusions, but this must be rooted in facts and not just appearances or illusions" - "as the person conducting the research, you are the one to make the right decision and no one else should"
Evaluation (E)	The capacity to assess critically and review one's and others' work according to proper and well-defined criteria.	- Research Respondents.	- "You need to always critique your own work for the sake of continuous improvement" - "It is proper to evaluate the work of others before using them in your own research"

(Table A1 Continues)

Table A1. ***(Cont'd)***

Intellectual Competencies	Definitions	Sources of Definitions	Example of Competencies as described by Research Respondents
Innovativeness & Creativity (I&C)	Ability of a person to solve a problem or design something new. To bring in newness or changes. Capacity to view situations from different standpoints. That is, the modification of what is conventional by the initiation of new aspects. The skill to change or modify by bringing about something new.	- Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005. - Oxford English Online Dictionary. - Webster Online Dictionary.	- "This does not mean one must be a genius, however the student must be creative in the research work" - "The capacity to generate new models which people can benefit from"
Internet & Digital Library Searching Skills (I&D)	This refers to the ability to effectively search using the Internet (world wide web) as well as digital libraries for getting important information and data.	-Research Respondents.	- "The researcher must be skilled at searching the internet as well as the digital library databases such as EBSCO to obtain rich information to enhance your research"
Knowledge of Research Types & Methodologies (KRT)	The knowledge of making a distinction between different kinds of research anchored in the 4 main groupings: process, purpose, logic, and outcomes. It refers to the entire approach to the research process, i.e. from the conceptual foundation to data collection and analysis.	- Wahba, 2005. - Research Respondents	- "an important thing you should be aware of is the possible approaches in which you can use to conduct your research" - "if you used a wrong research approach, you will probably reach wrong findings"
Knowledge of diverse Data Collection Techniques & Tools (KDC)	This has to do with the knowledge of the various methods of gathering data such as carrying out focus group discussions, in-depth interviews, developing and using questionnaires.	- Gay and Airasian, 2003. - Research Respondents	- "Be familiar with data collection from the proposed research sample can be a challenge" - "the student must be well-informed about the different techniques and methods used to gather relevant data from a specific sample"
Knowledge of Data Analysis & Interpretation Tools & Techniques (KDA)	This denotes the knowledge of differentiating between different data analysis and interpretation instruments as well as methods that can be employed in both quantitative and qualitative studies. Examples are the SPSS, constant comparison method, etc.	- Gay and Airasian, 2003. - Research Respondents.	- "Employing incorrect methods for data analysis, or applying them wrongly could lead to erroneous analysis, that leads to flawed conclusions, and the student researcher would not want this to happen to him/her!"

(Table A1 Continues)

Table A1. ***(Cont'd)***

Intellectual Competencies	Definitions	Sources of Definitions	Example of Competencies as described by Research Respondents
Planning (P)	To determine in advance and in give some details as to how something is to be performed or organized. Capacity to plan and follow a set direction so as to accomplish a goal.	- MSN Encarta Online Dictionary. - Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	-"Student researchers need to plan ahead of time, to prevent unwarranted surprises" - "Research work is about planning and doing things methodically"
Reading & Reading Comprehension (R&R)	Explores, identifies, and understands the meaning of written sentences, words, and characters. This consists of the capacity to grasp and learn from written materials by recognizing fundamental facts and main ideas and thoughts.	- Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "Frequent reading, is critical element in research" - "Research is not only concerning reading, it is the capacity to obtain meaning and understanding from what has been read"
Summarizing & Abstracting (S&A)	The capacity to give a shortened version of an idea that has been communicated or written, emphasizing its key points. This also connotes the capacity to make a synopsis of; to recap; or to state concisely.	- MSN Encarta Online Dictionary. - Oxford English Online Dictionary.	- "The student researcher must be able to summarize the key points in what is read, and then briefly state the main points in what he/she writes" - "The project work report begins with an abstract"
Intrapersonal Competencies	**Definitions**	**Sources of Definitions**	**Example of Competencies as described by Research Respondents**
Accuracy & Quality Consciousness (A&Q)	The longing to see things worked out reasonably, clearly, and in a right and exact manner. This also means appreciating excellence.	- University of Ottawa Directory of Competencies, 1998.	- "An vital element of performing academic research is the capacity to develop reliable findings" - "I usually felt not satisfied with the quality of my research work, but I worked hard to improve it"
Commitment & Dedication (C&D)	The act of making a pledge or engaging in something, and the sacrificing or devoting one's self and other personal resources to the pursuit of a goal or purpose.	- Webster Online Dictionary. - Oxford English Online Dictionary.	- " I like my project as if it were my child and I never hesitated to put in all my time and energy" - "Students used to concentrate on their project work and stick to it"
Curiosity & Information Searching (C&IS)	The basic longing to know and/or learn a lot with reference to people, things, and issues.	- Oxford English Online Dictionary. - University of Ottawa Directory of Competencies, 1998.	- "you need to be *skeptical* while looking for information or data" - "you must have the passion to know and learn more about many things"

(Table A1 Continues)

Table A1. ***(Cont'd)***

Intrapersonal Competencies	Definitions	Sources of Definitions	Example of Competencies as described by Research Respondents
Flexibility/ Adaptability (F/A)	The capacity to adjust to and work very hard within a range of circumstances. This involves understanding and acknowledging diversity and opposing views on an issue.	- State System of Higher Education Competency Dictionary, 2000.	- "it is not good to oppose others viewpoints in order to build your own" - "Occasionally, you must learn to adapt yourself to working under pressure"
Initiative (I)	A personality attribute exhibited in an eagerness and ability to start action; a kind of "go-getting" approach.	- Webster Online Dictionary.	- "If you are not prepared to do it yourself, no one else will do it for you"
Integrity/Honesty (I/H)	The attribute or condition of being sincere; truthfulness and honesty of conduct, talk, etc.; reliability; freedom from deception or craftiness. Also means the level of dependability and ethical behaviour of a person.	- Webster Online Dictionary. - Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "The researcher must respect the confidentiality of research respondents" - "S/he should ensure that the findings are derived real information and not his/her own intuition" - "It is necessary to report the exact research findings, even if they do not in line the original hypotheses"
Persistence (Per)	The attribute of continuing progressively regardless of obstacles, problems or difficulties.	- MSN Encarta Online Dictionary.	- "The researcher must try hard and continue with the research in spite of the many obstacles s/he may face"
Results Orientation (RO)	A matter of being accountable for accomplishing results, or for doing better than a standard of excellence.	- State System of Higher Education Competency Dictionary, 2000.	- "You must never put the blame on others when things do not work out as expected of your research" "Set goals that are achievable and ensure that these goals are attained" - "From start my aim was not just to pass, but to obtain a distinction"
Self-confidence (SC)	This entails a belief in one's capabilities to achieve a goal. This means having faith in one's power as demonstrated in more and more challenging situations & trust in one's decisions or judgment.	- State System of Higher Education Competency Dictionary, 2000.	- "Believe or faith in one's capabilities" - "I got this feeling straightaway from the start that I will succeed in doing a high quality project work"
Self-management (SM)	The scope, to which one plans, sets goals, prioritizes, sets up standards, manages tasks, pays attention to deadlines, and tracks progress relating to personal performance.	- Georgia's Competency Dictionary for Workforce Planning (G-COMPS), 2005.	- "Constantly reflect and assesses your performance based on the goals set for yourself" - "You must manage your time very well, the time wasted you cannot get back "

(Table A1 Continues)

Table A1. ***(Cont'd)***

Intrapersonal Competencies	Definitions	Sources of Definitions	Example of Competencies as described by Research Respondents
Self-motivation (SMo)	Motivated to work by one's own passion and desire. Also implies the ability to encourage oneself particularly in times when facing research challenges.	- Oxford English Online Dictionary. - Research respondents.	- "You need to frequently encourage yourself" - "Try to always be positive and do not fall so easily to your downturn and despair" - "Tell yourself you can do it, and you will surely do it"

Table A2: The Project Work Stages and Key Activities

Stages	Major Activities
Stage1: Research Problem & Research Question Selection	1.1 Decide on the research topic 1.2 Identify people who will directly benefit from the research topic 1.3 Validate the topic through preliminary exploration – primary and secondary data collection – with the subject matter experts, literature review, etc 1.4 Refine the problem statement and spell out the research objective 1.5 Develop and explain the theoretical or conceptual framework 1.6 Define and write out the research questions and hypotheses or propositions
Stage 2: Research Strategy/ Design	2.1 Describe all the variables to be used under the study 2.2 Identify the research method to be used based on the nature of the research topic 2.3 Identify and describe the nature of the sample research respondents in terms of the size, criteria and frame. 2.4 Explain the type of data to be gathered; primary and secondary 2.5 Select and describe relevant data collection techniques and tools based on the nature of the topic 2.6 Arrange for follow-up to ensure high response rate 2.7 Select and explain relevant data analysis techniques according to the nature of the research topic 2.8 Plan a reasonable time schedule for performing the research
Stage 3: Data Gathering	3.1 Carry out data collection employing the relevant data collection techniques & instruments 3.2 Make a follow-up with the sample research respondents 3.3 Organize data for analysis; conduct *cleansing* of the data by transcribing it, tabulating it
Stage 4: Data Analysis, Conclusions, & Recommendations For further research	4.1 Analyze the data gathered through the use of the relevant data analysis tools & techniques 4.2 Infer perceptive analysis; give examples that can be link the conclusions derived from the results of the research to the original topic 4.3 Make a benchmark of the research findings to the literature review 4.4 Present recommendations that are derived from the results of the study 4.5 Identify areas of future research related to the topic under study
Stage 5. Project Work Defense	5.1 Write the final report according to the formal writing styles; APA 5.2 Defend the research report in front of the Project Work Committee.

Table A3: Matrix for Interpersonal Competencies: Vigilance-Based Core Competency Framework

Project Work		Core Interpersonal Competencies				
		IS&N	LA	OC&O	PS	WC
Stage 1		**w**	**w**	**w**	**y**	**y**
Activity	1.1	y	**x**	**z**	**x**	**x**
	1.2	y	y	y	**x**	**x**
	1.3	**w**	**w**	**w**	**y**	**z**
	1.4	**x**	**x**	**x**	**x**	**y**
	1.5	**y**	**x**	**x**	**x**	**y**
	1.6	**x**	**x**	**x**	**x**	**y**
Stage 2		**x**	**z**	**x**	**x**	**w**
Activity	2.1	**x**	**x**	**x**	**x**	**w**
	2.2	**x**	**x**	**x**	**x**	**w**
	2.3	**x**	**x**	**x**	**x**	**w**
	2.4	**x**	**x**	**x**	**x**	**w**
	2.5	**x**	**x**	**x**	**x**	**w**
	2.6	**x**	**x**	**x**	**x**	**z**
	2.7	**x**	**z**	**x**	**x**	**z**
	2.8	**x**	**x**	**x**	**x**	**x**
Stage 3		**w**	**w**	**w**	**w**	**w**
Activity	3.1	**w**	**w**	**w**	**w**	**w**
	3.2	**w**	**w**	**w**	**x**	**w**
	3.3	**x**	**x**	**x**	**x**	**w**
Stage 4		**y**	**x**	**x**	**x**	**w**
Activity	4.1	**x**	**x**	**x**	**x**	**w**
	4.2	**y**	**x**	**x**	**x**	**w**
	4.3	**x**	**x**	**x**	**x**	**w**
	4.4	**x**	**x**	**x**	**x**	**w**
	4.5	**x**	**x**	**x**	**x**	**w**
Stage 5		**y**	**w**	**w**	**w**	**w**
Activity	5.1	**x**	**x**	**x**	**x**	**w**
	5.2	**y**	**w**	**w**	**w**	**x**

Key **w** = High Vigilance; **y** = Medium Vigilance; **z** = Low Vigilance; **x** = Idle Vigilance

Table A4: Matrix for Intellectual Competencies: Vigilance-Based Core Competency Framework

Project Work		Core Intellectual Competencies													
		A&C	CDI	CK	CT	D	E	I&C	I&D	KRT	KDC	KDA	P	R&R	S&A
Stage 1		**w**	**w**	**z**	**w**	**w**	**w**	**w**	**w**	**w**	**w**	**z**	**x**	**w**	**w**
Activity	1.1	y	z	x	z	y	z	w	y	z	x	x	x	y	x
	1.2	w	z	x	w	y	x	x	w	x	x	x	x	y	x
	1.3	w	w	x	w	w	w	x	w	x	w	z	x	w	w
	1.4	w	x	x	w	w	w	w	w	z	x	x	x	w	x
	1.5	w	x	z	w	w	w	w	w	w	x	x	x	w	y
	1.6	z	x	z	z	z	z	z	x	y	x	x	x	w	x
Stage 2		w	w	w	w	w	z	w	w	w	w	w	w	w	x
Activity	2.1	x	z	z	w	x	x	x	y	x	x	x	y	y	x
	2.2	w	x	z	w	w	x	w	w	w	w	w	w	w	x
	2.3	w	z	z	w	z	x	y	y	w	y	z	w	y	x
	2.4	w	w	z	w	x	x	x	w	w	y	z	w	w	x
	2.5	w	w	z	w	w	x	x	w	w	w	z	w	w	x
	2.6	x	x	z	x	x	x	x	z	w	z	z	w	z	x
	2.7	w	x	w	w	w	x	x	w	w	x	w	w	w	x
	2.8	x	x	x	x	z	z	z	x	x	x	x	w	x	x
Stage 3		x	w	w	x	x	x	z	x	x	w	y	z	x	x
Activity	3.1	x	w	x	x	x	x	x	x	x	w	y	z	x	x
	3.2	x	w	x	x	x	x	z	x	x	w	y	z	x	x
	3.3	x	w	w	x	x	x	x	x	x	x	y	z	x	x
Stage 4		w	w	w	w	w	w	w	y	w	x	w	z	w	w
Activity	4.1	w	w	w	w	w	x	w	y	w	x	w	z	y	x
	4.2	w	x	z	w	w	w	w	y	w	x	w	z	y	x
	4.3	w	x	z	w	w	w	y	x	x	x	y	z	w	z
	4.4	w	x	z	w	w	w	y	x	x	x	z	z	x	w
	4.5	w	x	z	w	w	w	z	x	x	x	x	z	x	x
Stage 5		w	w	w	w	w	w	z	z	w	w	w	w	z	w
Activity	5.1	x	w	w	x	z	w	z	z	x	x	x	w	x	w
	5.2	w	x	x	w	w	x	x	x	w	w	w	w	z	w

Key w = High Vigilance; y = Medium Vigilance; z = Low Vigilance; x = Idle Vigilance

Table A5: Matrix for Intrapersonal Competencies: Vigilance-Based Core Competency Framework

Project Work		Core Intrapersonal Competencies										
		A&Q	C&D	C&IS	F/A	I	I/H	Per	RO	SC	SM	SMo
Stage 1		**w**	**y**	**w**	**w**	**w**	**w**	**y**	**w**	**y**	**z**	**w**
Activity	1.1	**z**	**z**	**w**	**x**	**w**	**w**	**z**	**z**	**z**	**x**	**w**
	1.2	**z**	**z**	**w**	**x**	**w**	**x**	**z**	**z**	**z**	**x**	**w**
	1.3	**y**	**z**	**w**	**w**	**w**	**w**	**z**	**z**	**z**	**x**	**w**
	1.4	**w**	**z**	**w**	**w**	**x**	**x**	**z**	**w**	**z**	**x**	**w**
	1.5	**w**	**y**	**w**	**y**	**y**	**x**	**z**	**w**	**z**	**x**	**w**
	1.6	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**z**	**w**
Stage 2		**w**	**y**	**w**	**y**	**x**	**x**	**y**	**w**	**y**	**y**	**x**
Activity	2.1	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**z**	**x**
	2.2	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**z**	**x**
	2.3	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**z**	**x**
	2.4	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**z**	**x**
	2.5	**w**	**y**	**w**	**y**	**x**	**x**	**y**	**w**	**y**	**z**	**x**
	2.6	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**z**	**x**
	2.7	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**z**	**x**
	2.8	**w**	**y**	**w**	**x**	**x**	**x**	**y**	**w**	**y**	**y**	**x**
Stage 3		**w**	**w**	**w**	**w**	**w**	**w**	**w**	**w**	**y**	**y**	**w**
Activity	3.1	**w**	**w**	**w**	**w**	**w**	**w**	**w**	**w**	**y**	**y**	**w**
	3.2	**w**	**w**	**w**	**w**	**w**	**w**	**w**	**w**	**y**	**y**	**w**
	3.3	**w**	**w**	**w**	**w**	**x**	**w**	**w**	**w**	**y**	**y**	**w**
Stage 3		**w**	**w**	**w**	**x**	**x**	**w**	**w**	**w**	**y**	**w**	**w**
Activity	4.1	**w**	**w**	**w**	**x**	**x**	**w**	**w**	**w**	**y**	**w**	**x**
	4.2	**w**	**w**	**w**	**x**	**x**	**w**	**w**	**w**	**y**	**w**	**x**
	4.3	**w**	**w**	**x**	**x**	**x**	**x**	**w**	**w**	**y**	**w**	**x**
	4.4	**w**	**w**	**x**	**x**	**x**	**w**	**w**	**w**	**y**	**w**	**w**
	4.5	**w**	**w**	**z**	**x**	**x**	**w**	**w**	**w**	**y**	**w**	**w**
Stage 4		**w**	**w**	**x**	**w**	**z**	**w**	**w**	**w**	**w**	**w**	**w**
Activity	5.1	**w**	**w**	**x**	**x**	**x**	**w**	**w**	**w**	**w**	**w**	**w**
	5.2	**w**	**w**	**x**	**w**	**z**	**w**	**w**	**w**	**w**	**w**	**w**

Key **w** = High Vigilance; **y** = Medium Vigilance; **z** = Low Vigilance; **x** = Idle Vigilance

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