



Research Competencies of Science, Technology, Engineering and Mathematics (STEM) Students in a State College in Zamboanga City, Philippines

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ABSTRACT

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Purpose: This study aimed to investigate the level of research competencies of Science, Technology, Engineering and Mathematics (STEM) students from a State College concerning research conceptualization, formulation of research methods and design and data gathering, processing and

analysis. **Research Methods:** In this study, a survey design was employed. There were 89 Grade 12 STEM students participated in this study by evaluating their selves using the Research Competencies Inventory Checklist (RCIC). **Findings:** The findings showed that, in general, students were competent to conduct research. This finding suggests that students gained the necessary knowledge and skills to conduct research. However, there were some competencies that need to be enhanced: i. describe the background of the research; ii. draw out and manage information from different studies; iii. construct research

instrument; iv. select appropriate statistical tool in data analysis and v. infer and explain qualitative data. **Implications for Research and Practice:** The institution can conduct a seminar - workshop by inviting experts who can supply enough knowledge in the enhancement of the abovementioned research competencies. In addition, research teachers can develop supplementary instructional materials, such as modules and workbook, to facilitate teaching research.

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Introduction

The K to 12 Philippine Basic Education is in its 8th year of implementation. It is a flagship program of the Philippine Department of Education. The program is legally anchored on Republic Act No. 10533, otherwise known as the Enhanced Basic Education Act of 2013, a response to the mandate of the Philippine Constitution that the state shall provide quality education for all. The aim of this program is to produce students who mastered skills, such as information, media and technology skills, learning and innovation skills, effective communication skills, and life and career skills, which will prepare them for career opportunities.

The K to 12 program covers kindergarten (Republic Act No. 10157 or Kindergarten Education Act) and twelve years of basic education - enhanced six (6) years elementary education; decongested four (4) years junior high school education; and additional two (2) years senior high school curriculum.

The senior high school curriculum offers a wide range of subjects that will lead young Filipinos to enter tertiary education or a career in business and industry. Basically, the curriculum has four (4) tracks, from which students can choose depending on their interests: academic, sports, arts and design and technical vocational. In 2016, 60.6% of junior high school graduates choose the academic track (Sarmiento & Orale, 2016). Since every track is composed of different strands, the academic track offers Science, Technology, Engineering and Mathematics (henceforth referred to as STEM); Accountancy, Business and Management (ABM); Humanities and Social Sciences (HUMSS); and General Academic Strand (GAS). Based on the data mind in DepEd Zamboanga City, out of 7,368 students enrolled in Academic Track for Academic Year 2016-2017, 2, 592 students prefer STEM. The curriculum of STEM is science- and mathematics-oriented.

STEM, same with other strands has three sets of subjects: Specialized, Core and Applied. One of the applied subjects offered is Research. Research can be encountered by any person on his day-to-day life given that results of research are being presented in books, newspapers, reports and television programs. Walliman (2011) defined research as a general term for an activity that involves finding out things you do not know in a more or less systematic way. In more academic interpretation, research involves finding out things that no one knows. He also added that it is a method of advancing knowledge.

In the Philippine settings, research can be defined as an interconnected activity that is determined by the need to find solutions to the problem that is best done in an orderly approach focusing on building a strong foundation for a theoretical framework where research work can be built (Bueno, 2016). Arthur and Hancock (2009) pointed out that research consists of four main stages: Research Conceptualization, Formulation of Research Methods and Design, Data Gathering, Processing and Analysis, and Communication of Results.

Weiss (1998), as cited by Nutley et al. (2003), revealed that research can be utilized for the following use: 1.) instrumental use or decision making for policy and practice;

2.) conceptual use or provide new ways of thinking; 3.) mobilization of support or a tool for persuasion; and 4.) wider influence or can be used by other scholars or researchers.

As mined from the Department of Education, STEM students, same with other senior high school students, should take the following: (1) Practical Research 1 which develop students' critical thinking and problem - solving skills using qualitative research; (2) Practical Research 2 which develop students' critical thinking and problem - solving skills using quantitative research; and (3) Inquiries, Investigation and Immersion a culminating activity that allows students to apply their learning during Practical Research 1 and 2.

In addition, STEM students may take Research or Capstone Project (an alternative course for Work Immersion) that allow students to identify the scientific, technological or mathematical problems, design and apply an appropriate methodology, formulate hypothesis and draw conclusions based on their investigation through the guidance of a research adviser.

Exposing students to conduct research will allow them to (1) increase students' understanding towards research process, laboratory techniques and scientific problem after research exposure; (2) think and work like scientist specifically on how research is being conducted, extending knowledge, understanding the theories that will guide them in their research project and interpreting scientific data; (3) build confidence towards their ability in doing research and initiating scientific discussion with supervisors; and (4) provide them opportunities to pursue their interest and reshape their future career plans like graduating with honours and pursuing careers in conducting research (Lopatto,2004; Myatt, 2009).

In the study of Zhang and Swaid (2017), after STEM students at Philander Smith College exposed to different research topics, as well as various means of presentation of results, such as conference poster presentation, discussion forums and paper publication, the students were able to (1) develop and build stronger interest in understanding the nature of research; (2) gain confidence when presenting research results in public; (3) develop team collaboration skills; (4)improve communication skills and (5) improve understanding and be better prepared for further studies.

In addition, Kardash (2000) pointed out that at the end of university research experience among science undergraduates, the students were able to gain the ability to orally communicate their project, conduct observations, collect data and relate this study to the big picture. However, the ability to develop hypotheses, write a research paper and analyze data improved the least because the faculty did not provide them such training.

Casinto (2016) stated that students who are engaged in research are expected to be inclined to conduct research. Students who are inclined to carry out research are motivated to know more about existing and emerging problems; investigates and systematically gathers information about certain events from a reliable source, and draw comprehensive conclusions and present recommendation based on gathered

facts. In addition, students must have motivation and information literacy (Barranoik, 2001).

However, it was observed that students struggle in conducting research. Based on some informal interviews, some students were having difficulty in research conceptualization, some students in the formulation of research methods and design and some in data gathering, processing and analysis. Ciocon (2018) aimed to determine the level of the research capability of grade 12 students in three pilot public secondary senior high schools in the Municipality of Murcia. The scope of this study was to assess the research capability of the respondents concerning technical aspects, major and other parts of the research paper and determine if significant difference exists when group according to track. Results revealed that students were competent in the three areas. Among the parts of a research paper, students found it was easy to write chapters 1 and 5, while chapter 2 was the hardest part. Moreover, students in the academic track outperformed the technical-vocational-livelihood track.

Santos (2019) assessed the research capability of the first batch of senior high students by devising a questionnaire and using methodological triangulation of the samples' self, experts' and researcher's assessment on the research paper outputs to compare if consistent results were found so that validity was established. Results showed that it was evident from the three sets of assessments made that choosing an appropriate sample of the study was a strong capability while presenting reviews of related literature (8-10 pages) was an area that required improvement. One-way ANOVA was carried further, and it supported and strengthened the validity and reliability of the assessments made on the research capability of the respondents.

Monitoring how competent the students are in different research competencies is indeed essential (Molina, 2019). Students will be incompetent to conduct research when pursuing tertiary education if the knowledge gap of the students will not be addressed. For instance, Arellano, Morano and Nepomuceno (n.d.) conducted a study in determining the proficiency level in basic research skills among 963 graduating students in a university. Results showed that students were able to identify factors when choosing a research problem, formulating the conclusions from research findings, applying sampling techniques, correctly choosing a data-gathering instrument and identify variables as the majority of students correctly answered the respective items. Less than half of the population was able to state hypothesis, choose an appropriate scale for qualitative variables, identify research design and appropriate statistical tests and state elements of the introduction of a research proposal. Students performed poorly in outlining the general steps and procedures for carrying out a research project. In addition, majority of the students was not proficient in the lower order research competencies.

Formeloza and Pateña (2013) determined the level of the research capability of maritime students in Lyceum International Maritime Academy. Results revealed that students are moderately competent in technical aspects such as grammar, sentence construction and communication skills. Concerning parts of a research paper, students

need improvement in the construction of questionnaires, developing research designs and determining statistical tools and treatment.

In addition, being incompetent in conducting research can be manifested in the respective workplace. For instance, Mallari and Santiago (n.d.) revealed that the level of some SUC accountancy faculty was that of a master, while some was that of an apprentice. This means that they had read about and studies the particular aspect of research, but the knowledge was below average, making them short of the ability to use it professionally.

Salom (2013) assessed the research capability of the faculty members of DMMMSU Mid La Union Campus. The researcher concluded that the respondents gained enough knowledge and skills to put the research process into practice. However, it was also revealed that there was a need for improvement in writing skills to present, analyze and interpret research findings and the use of statistical tools.

Formeloza and Pateña (2013) also determined the level of the research capability of maritime faculty members in Lyceum International Maritime Academy through a survey. Results revealed that faculty members were competent in technical aspects such as grammar, sentence construction and communication skills. However, the faculty needed an improvement in the competency on the construction of questionnaires, developing research designs and determining statistical tools and treatment.

With these premises, assessing students' research competencies is a must. In this study, the researcher aimed to determine the level of research competency of Grade 12 STEM students in conducting research. Hence, there are limited studies conducted on senior high school since it is newly integrated into the Philippine basic education. Specifically, this study aimed to answer the following research questions:

1. What is the level of competency among Grade 12 STEM students when conceptualizing research?
2. What is the level of competency among Grade 12 STEM students when formulating research methods and design?
3. What is the level of competency among Grade 12 STEM students when gathering, processing and data analysis?

Evaluating the level of students' competency in conducting research could serve as baseline data for the administrators to facilitate in the conduct of seminar - workshops intended for research teachers and students. Teachers can also use the generated data to improve their teaching in research by providing more activities suitable on students' level. The findings can serve as a basis in developing learner's material, such as workbooks or modules.

Method

Research Design

In facilitating the gathering data to answer the objective of this study, the researcher utilized a survey design. Survey is a systematic method for data gathering from a sample for the purposes of constructing quantitative descriptors of the attributes of the larger population of which the entities are members (Avedian, 2014). To carry the survey design in this study, a checklist was used to determine the level of research competencies.

Research Sample

The respondents of this study were Grade 12 students from a State College in Zamboanga City, whose specialization was in STEM during the academic year 2019 - 2020. The researcher utilized total enumeration or all students were selected to be part of this study. Hence, the STEM population was manageable. In this study, 89 students participated. These students were able to take the course Practical Research 1 and 2. In addition, these students were able to write and conduct complete research. Below is the demographic profile of the respondents.

Table 1.

Demographic Profile of the Students

| Variable | | N | Percentage (%) |
|---|---------|----------|-----------------------|
| Sex | Male | 53 | 59.55 |
| | Female | 36 | 40.45 |
| Type of Junior High School where Graduated | Public | 83 | 93.26 |
| | Private | 6 | 6.74 |

Research Instruments and Procedures

The questionnaire used in the study was the Research Competencies Inventory Checklist (RCIC) adopted and slightly modified from Molina (2019). It is a 4 - point Likert scale with the following proficiency level: 4 - Highly Competent, 3 - Competent, 2 - Somewhat Competent, 1 - Not Competent At All). The RCIC has a total of 94 items: 45 items belong to research conceptualization; 28 items belong to formulation of research methods and design; and 21 items belong to data gathering, processing and analysis. The RCIC is shown in *Appendix A*.

Validity and Reliability

The instrument was validated by three (3) college professors whose expertise is in research. The RCIC obtained an Aiken validity value of 0.89, which can be interpreted as valid. According to Azwar (2015), as concurred by Elvionita and Fauzi (2019), any value greater than Aiken value of 0.60 indicates that the instrument is valid.

After validation, the instrument was pilot tested in two (2) schools, with 100 respondents. When analyzed using Cronbach's alpha, it obtained an alpha value of 0.96. According to George and Mallery (2003), an alpha value greater than 0.90 indicates excellent internal consistency.

Ethical Consideration

The researcher secured permission from the State College President and the senior high school unit Principal. Upon approval, the researcher met the students and distributed the assent and consent form and orient the students on the purpose of the study. More so, Research Ethics Clearance was secured from WMSU-CSM Ethics Review Panel with the code: 2019-007-CSMG-GS-ER issued on November 5, 2019.

Data Gathering Procedure

On the appointment date, the researcher collected the assent and consent form per students and distributed personally the RCIC to the STEM students in their respectively classroom. The researcher explained to the students the nature of the checklist and how to determine their level of research competencies. The assessment took only 15 minutes.

Analysis of Data

The gathered data were tallied and tabulated. Mean per item was obtained and Mean per competency was computed. The computed mean per item and competency were interpreted using the information in Table 2, which was adopted and modified from Santos (2019).

Table 2

Interpretation of Research Competencies

| Level of Competency | Interpretation |
|----------------------------|-----------------------|
| 3.26 - 4.00 | Highly Competent |
| 2.51 - 3.25 | Competent |
| 1.76 - 2.50 | Somewhat Competent |
| 1.00 - 1.75 | Not Competent at All |

Results

Competencies on Research Conceptualization

The first stage in conducting research is Research Conceptualization. In this process, students were expected to identify and select a research topic, describe the background of the topic, formulate objectives or research questions, cite the beneficiaries of the study, set scope, select literature, construct a theoretical and conceptual framework and define variables. Table 3 shows the level of research competencies among Grade 12 STEM students on research conceptualization.

Table 3*Competencies on Research Conceptualization*

| Competencies | Current Proficiency Level | Interpretation |
|---|----------------------------------|-----------------------|
| 1. Identify research topics. | 2.55 | Competent |
| 2. Select research topics. | 2.55 | Competent |
| 3. Construct research titles. | 2.61 | Competent |
| 4. Describe the background of the research. | 2.48 | Somewhat Competent |
| 5. Formulate research questions that can be investigated. | 2.58 | Competent |
| 6. Cite the target beneficiaries with specific benefits. | 2.64 | Competent |
| 7. Indicate the scope and boundaries of the study. | 2.70 | Competent |
| 8. Select relevant literature that is related to the present study. | 2.63 | Competent |
| 9. Draw out and manage information from different literature. | 2.49 | Somewhat Competent |
| 10. Cite literature and related studies. | 2.71 | Competent |
| 11. Construct theoretical – conceptual framework. | 2.54 | Competent |
| 12. Define the terms in the study. | 2.55 | Competent |

Table 3 revealed that students were competent in performing most of the competencies in research conceptualization. Citing literature and related studies, indicating the scope and boundaries of the study and citing the target beneficiaries with the specific benefits obtained the highest mean score of 2.71, 2.70 and 2.64, respectively. On the other hand, students were somewhat competent in describing the background of the research and drawing out and manage of information from related literature with a mean score of 2.48 and 2.49, respectively.

Competencies on the Formulation of Research Methods and Design

The second stage of the research process is the formulation of research methods and design. Students would formulate research method and design, select study sites, identify the population, choose appropriate sampling method, construct valid and reliable research instrument, propose a procedure for data collection, choose appropriate statistical tools and consider research ethics. Table 4 shows the level of research competencies among Grade 12 STEM students on the formulation of research methods and design.

Table 4*Competencies on the Formulation of Research Methods and Design*

| Competencies | Current Proficiency Level | Interpretation |
|---|---------------------------|--------------------|
| 1. Choose the most appropriate research design. | 2.85 | Competent |
| 2. Select study sites appropriately. | 2.59 | Competent |
| 3. Describe and choose the sample of the study. | 2.69 | Competent |
| 4. Construct research instruments. | 2.41 | Somewhat Competent |
| 5. Propose proper data gathering procedures. | 2.81 | Competent |
| 6. Select the appropriate statistical tool in analysing data based on the posited objectives. | 2.34 | Somewhat Competent |
| 7. Impose appropriate ethics in research. | 2.81 | Competent |

Table 4 revealed that students were competent to perform the majority of the competencies in the formulation of research methods and design. Choosing the most appropriate research design, proposing proper data gathering procedure and imposing appropriate research ethics obtained the highest mean score of 2.85, 2.81 and 2.81, respectively. Meanwhile, students were somewhat competent in constructing research instruments and selecting the appropriate statistical tool in analysing data based on the posited objectives with a mean score of 2.41 and 2.34, respectively.

Competencies on Data Gathering, Processing and Analysis

In data gathering, processing and analysis, the students were expected to employ the data-gathering plan, present data through tables or graphs, use statistical tools to analyze the data, interpret data, compose research findings, draw conclusions and provide recommendations. Table 5 shows the research competencies level of STEM students in this process.

Table 5*Competencies on Data Gathering, Processing and Analysis*

| Competencies | Current Proficiency Level | Interpretation |
|---|---------------------------|--------------------|
| 1. Gather data. | 2.98 | Competent |
| 2. Present data. | 2.50 | Competent |
| 3. Infer and explain qualitative data. | 2.42 | Somewhat Competent |
| 4. Process statistical techniques to analyze quantitative data. | 2.56 | Competent |
| 5. Present results. | 2.54 | Competent |
| 6. Create a coherent summary. | 2.76 | Somewhat Competent |
| 7. Draw conclusions from research findings. | 2.64 | Competent |
| 8. Formulate recommendations. | 2.70 | Competent |

As shown in Table 5, students were competent to perform most of the competencies in data gathering, processing and analysis. Gathering data, creating a coherent summary and formulating of recommendations obtained the highest mean score of 2.98, 2.76 and 2.70, respectively. However, the students were somewhat competent in inferring and explaining qualitative data with a mean score of 2.42.

Discussion, Conclusion and Recommendations

The senior high school students were engaged to conduct a complete research as a fulfilment of the course requirement in Practical Research. Students were exposed on different competencies in research conceptualization, the formulation of research methods and design and data gathering, processing and analysis. Research competencies pertain to the combination of knowledge and skills for a student to conduct research. In this study, students were competent to perform majority of the competencies. According to Wilensky (2002), as affirmed by Tan (2007), this is a condition where students created new knowledge. Nonetheless, it is not evitable that there were some competencies that requires enhancement.

Students were competent to perform most of the competencies in research conceptualization. Citing literature and related studies, indicating the scope and boundaries of the study and citing the target beneficiaries with the specific benefits obtained the highest mean scores. Citing literature and related studies refers to the searching of literature which are based on the nature and variables of the study and using appropriate citation format. This competency appeared as competent in the study of Santos (2019). Having one of the highest mean score signifies the availability of internet sources and reading materials for the students (Gomez and Panaligan, 2013). Students expressed that the use of internet sources and reading materials are essential for review of related literature (Tan, 2007). Indicating the scope and boundaries of the study pertains to identifying what are the things to be included and excluded in the study. In the study of Estacio *et al.* (2018), this competency properly cannot perform properly by their respondents. Citing the target beneficiaries with specific benefits highlight the importance of the study such as, solution to a problem, economic upliftment and contribution to the pool of knowledge and impact in the community/school/environment. However, students were somewhat competent in describing the background of research and drawing out and managing of information from related literature. Describing the background of research is essential because it allows the audience to have an overview on the nature of the paper. In describing the background of research, the researcher outline the historical development in the literature leading to current topic, highlight the research topic from broader to specific perspective and establish the knowledge gap. In Gomez and Panaligan's (2013) study, even this competency the verbal interpretation is competent, yet it is ranked at the bottom. Drawing out and managing of information from related literature pertains to the use of various strategies to organize the searched literature and studies. Students in the tertiary education also find difficulty in selecting and organizing related scholarly articles (Tan, 2007).

In the formulation of research methods and design, choosing the most appropriate research design obtained the highest mean. In selecting appropriate research design, one must consider the objectives of the study, the type of data needed and the method in analysing data. The exposure of students on the different research design in both qualitative and quantitative research attribute for this findings. Lopatto (2004) and Myatt (2009) pointed out that students' exposure in research increase the students' understanding in research. However, these findings do not cohere with the findings of Arellano, Morano and Nepomuceno (n.d.), wherein only less than half of their respondents can identify appropriate research design. Propose data gathering procedure obtained the second highest mean score in this study. This result paralleled with the findings of Formeloza and Pateña (2013) and Gomez and Panaligan (2013). Zhang and Swaid (2017) emphasized exposures of students in conducting research develop and build interest in doing research. Imposing appropriate ethics in research has the third highest score mean. With the Data Privacy Act of 2012, teachers are emphasizing ethics when teaching research. Thus, faculty has an influence in developing students' research competencies (Kardash, 2000). However, students were somewhat competent in constructing research instrument and selection of appropriate statistical tool. The construction of research instrument is essential for data gathering. However, students do not enough knowledge on how to construct a valid and reliable instrument. Students usually adopt instrument from existing work yet failed to ask permission from the author. Selection of appropriate statistical is essential in converting raw data into meaning data. These two competencies were pointed out by Arellano, Morano and Nepomuceno (n.d.), Formeloza and Pateña (2013) and Gomez and Panaligan (2013) that requires enhancement on their respondents.

Students were competent on data gathering, processing and analysis. The competency on perform data gathering using observation, interview or questionnaire obtained the highest mean. The second highest mean for this stage is to create a coherent summary. A coherent summary contains the purpose of the study, respondents and methods, and highlights the findings. Formulation of recommendations has the third highest mean score. Recommendation suggest possible solutions that needs further study, recommends action to be taken and suggest possible topics which were unable to cover in the study. In the study of Santos (2019), the respondents classified themselves as highly competent on the abovementioned competencies. However, students were somewhat competent in inferring and explaining qualitative data. Since in qualitative research no numerical data are obtained only qualities, the researcher should know how to analyze and interpret these responses. Students also obtained low score in analysis of qualitative data which denotes students are not competent in this competency (Estacio, L. *et al.*, 2018).

As research is integrated in the basic education curriculum, students are now competent to conduct research. Teachers play important role in attaining this result (Kardash, 2000; Lopatto, 2004; Myatt, 2009; Zhang and Swaid, 2017). However, there were some competencies that requires enhancement. Thus, the researcher recommends that institution should conduct seminar - workshops by inviting experts on the identified competencies where students are somewhat competent. The

institution should develop workbooks and modules that will provide more practice and exposure.

The researcher acknowledges the shortcomings and conditions that were not able to control and might have an impact in the research findings. These includes that more STEM students must be invited from different schools to serve as respondents of the study. Another is to consider also other specialization, such as Humanities and Social Sciences (HUMSS), Accountancy, Business and Management (ABM) and Technical-Vocational-Livelihood (TVL), to see the real status of research as a discipline.

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APPENDIX A
RESEARCH COMPETENCIES INVENTORY CHECKLIST

Instructions: The *Research Competencies Inventory Checklist* is designed to assess and determine honestly and accurately your proficiency level for each identified competencies in different research area. First, please fill in the required information. Then, encircle only the current level of your proficiency in doing research according to your best assessment. There are four (4) proficiency levels with corresponding descriptions indicated in the succeeding table.

Student Code: _____ School: _____

| Level | Type | General Descriptions |
|-------|--------------------|---|
| 4 | Highly Competent | Has the knowledge or skill about the competency and is able to perform the task without additional support or guidance. |
| 3 | Competent | Has the knowledge or skill about the competency and is able to perform the task with some support or guidance. |
| 2 | Somewhat Competent | Aware of the competency but unable to perform the task without substantial assistance. |
| 1 | Not Competent | Unaware of the competency and is unable to perform the task without any lecture or training. |

A. RESEARCH CONCEPTUALIZATION

| Research Competency As a Practical Research Student, I can | Current Proficiency Level | | | |
|--|------------------------------|---|---|---|
| 1. identify research topic based on | | | | |
| a. recommendations in published or unpublished studies. | 4 | 3 | 2 | 1 |
| b. school's research agenda. | 4 | 3 | 2 | 1 |
| c. consulting other people like teachers, parents and friends. | 4 | 3 | 2 | 1 |
| d. personal experience. | 4 | 3 | 2 | 1 |

| | | | | |
|---|---|---|---|---|
| e. current events through social media, TV or radio. | 4 | 3 | 2 | 1 |
| f. books, magazines, journal articles and other research references. | 4 | 3 | 2 | 1 |
| 2. select research topic based on | | | | |
| a. researcher's interest and ability. | 4 | 3 | 2 | 1 |
| b. researcher's strand or field of expertise. | 4 | 3 | 2 | 1 |
| c. availability of facilities/equipment/tools. | 4 | 3 | 2 | 1 |
| d. how significant and timely. | 4 | 3 | 2 | 1 |
| e. how researchable the topic is. | 4 | 3 | 2 | 1 |
| f. how feasible the topic is. | 4 | 3 | 2 | 1 |
| 3. construct research titles that | | | | |
| a. indicate the subject and scope of the study accurately. | 4 | 3 | 2 | 1 |
| b. create a positive impression and stimulate readers' interest. | 4 | 3 | 2 | 1 |
| c. identify key variables of the study. | 4 | 3 | 2 | 1 |
| d. is limited to 10 to 15 words. | 4 | 3 | 2 | 1 |
| 4. describe the background of the research by | | | | |
| a. outlining the historical development in the literature leading to the current topic. | 4 | 3 | 2 | 1 |
| b. highlighting the research topic from a broader to specific perspective. | 4 | 3 | 2 | 1 |
| c. establishing the knowledge gaps. | 4 | 3 | 2 | 1 |
| d. citing literature but not to give methods, results and discussion. | 4 | 3 | 2 | 1 |
| 5. formulate research questions that can be investigated, which are | | | | |
| a. congruent to the research topic. | 4 | 3 | 2 | 1 |
| b. clearly stated, precise and accurate. | 4 | 3 | 2 | 1 |
| c. not answerable by yes or no. | 4 | 3 | 2 | 1 |
| d. defined as the type of data to be generated. | 4 | 3 | 2 | 1 |
| 6. cite the target beneficiaries with the specific benefits, such as | | | | |
| a. solution to a problem. | 4 | 3 | 2 | 1 |
| b. economic upliftment. | 4 | 3 | 2 | 1 |
| c. contribution to the pool of knowledge. | 4 | 3 | 2 | 1 |

| | | | | |
|--|---|---|---|---|
| d. impact in the community/school/environment. | 4 | 3 | 2 | 1 |
| 7. indicate the scope and boundaries of the study by | | | | |
| a. confining the things to be included in the study. | 4 | 3 | 2 | 1 |
| b. emphasizing the things to be excluded in the study. | 4 | 3 | 2 | 1 |
| 8. select relevant literature that is related to the present study by | | | | |
| a. selecting the books, published and unpublished thesis in the library, research journals and other related references. | 4 | 3 | 2 | 1 |
| b. accessing research databases, such as Google Scholar and ProQuest. | 4 | 3 | 2 | 1 |
| c. accessing the official data, records and documents both from government and non-government agencies. | 4 | 3 | 2 | 1 |
| 9. draw out and manage information from different literature using | | | | |
| a. note taking/ recording. | 4 | 3 | 2 | 1 |
| b. matrix. | 4 | 3 | 2 | 1 |
| c. graphic organizers. | 4 | 3 | 2 | 1 |
| d. indexing. | 4 | 3 | 2 | 1 |
| e. annotation. | 4 | 3 | 2 | 1 |
| 10. cite literatures and related studies | | | | |
| a. based on the nature and variables of the study. | 4 | 3 | 2 | 1 |
| b. using appropriate citation format (e.g MLA and APA). | 4 | 3 | 2 | 1 |
| 11. construct a theoretical - conceptual framework | | | | |
| a. by adapting the generated theories and findings from different studies. | 4 | 3 | 2 | 1 |
| b. by identifying the variables of the study as applied to the present study. | 4 | 3 | 2 | 1 |
| c. to show the relationship among variables in a researcher - made framework. | 4 | 3 | 2 | 1 |
| 12. define the terms in the study using | | | | |
| a. conceptual/theoretical definition. | 4 | 3 | 2 | 1 |
| b. operational definition. | 4 | 3 | 2 | 1 |

B. FORMULATION OF RESEARCH METHODS AND DESIGN

| Research Competency As a Practical Research Student, I can | Current Proficiency Level | | | |
|---|--------------------------------------|---|---|---|
| 1. choose the most appropriate research design based on | | | | |
| a. the objectives of the study. | 4 | 3 | 2 | 1 |
| b. the type of data needed. | 4 | 3 | 2 | 1 |
| c. the method in analysing data. | 4 | 3 | 2 | 1 |
| 2. select study sites appropriately by | | | | |
| a. highlighting the characteristics of the place that meets the need of your study. | 4 | 3 | 2 | 1 |
| b. providing a map (if ecological study) | 4 | 3 | 2 | 1 |
| 3. describe and choose the sample of the study by | | | | |
| a. highlighting the characteristics of the respondents that meets the need of your study. | 4 | 3 | 2 | 1 |
| b. determining the sample size appropriately. | 4 | 3 | 2 | 1 |
| c. using probability sampling (e.g., random sampling). | 4 | 3 | 2 | 1 |
| d. using nonprobability sampling (e.g., purposive sampling) | 4 | 3 | 2 | 1 |
| 4. construct research instruments by | | | | |
| a. setting the objectives of the instrument. | 4 | 3 | 2 | 1 |
| b. pooling items/statements that measure what seeks to be measured. | 4 | 3 | 2 | 1 |
| c. establishing its content validity. | 4 | 3 | 2 | 1 |
| d. establishing its reliability (e.g., the use of KR20 or Cronbach's alpha). | 4 | 3 | 2 | 1 |
| 5. propose proper data gathering procedures which includes | | | | |
| a. asking permission and approval from the institution where the respondents come from. | 4 | 3 | 2 | 1 |
| b. how to administer the observation/interview/survey. | 4 | 3 | 2 | 1 |
| c. the date on the administration of the observation/interview/survey. | 4 | 3 | 2 | 1 |
| d. how to perform the treatment in the study (if experimental). | 4 | 3 | 2 | 1 |

| | | | | |
|--|---|---|---|---|
| 6. select the appropriate statistical tool in analysing data based on the posited objectives | | | | |
| a. descriptive statistics (e.g., frequency and percentage). | 4 | 3 | 2 | 1 |
| b. mean and standard deviation. | 4 | 3 | 2 | 1 |
| c. establishing statistical relationships among variables (e.g., Pearson product-moment correlation coefficient and chi-square test). | 4 | 3 | 2 | 1 |
| d. establishing statistical differences between groups (e.g., T-test and F-test). | 4 | 3 | 2 | 1 |
| 7. impose appropriate ethics in research by | | | | |
| a. asking permission from the author to use the research instruments for the purpose of the study. | 4 | 3 | 2 | 1 |
| b. paraphrasing and citing the authors to avoid plagiarism. | 4 | 3 | 2 | 1 |
| c. securing assent form (if respondents are below 18 years old) | 4 | 3 | 2 | 1 |
| d. securing informed consent form (if respondents are 18 years old and above). | 4 | 3 | 2 | 1 |
| e. protecting the identity of the respondents. | 4 | 3 | 2 | 1 |
| f. following the protocol for animals used in the research. | 4 | 3 | 2 | 1 |
| g. performing treatment reversal (example: Treatment will be given to group A, while group B will have no treatment. After a certain period, treatment will be given to group B, while group A will not receive any treatment.) | 4 | 3 | 2 | 1 |

C. DATA GATHERING, PROCESSING AND ANALYSIS

| Research Competency As a Practical Research Student, I can | Current Proficiency Level | | | |
|---|---------------------------|---|---|---|
| 1. gather data using | | | | |
| a. observation. | 4 | 3 | 2 | 1 |
| b. interview or focus group discussion. | 4 | 3 | 2 | 1 |
| c. survey questionnaire. | 4 | 3 | 2 | 1 |
| 2. present data in | | | | |

| | | | | |
|---|---|---|---|---|
| a. tabular form. | 4 | 3 | 2 | 1 |
| b. graphical form. | 4 | 3 | 2 | 1 |
| c. text form to discuss results and cite implications. | 4 | 3 | 2 | 1 |
| 3. infer and explain qualitative data using | | | | |
| a. basic statistics like frequency and percentage. | 4 | 3 | 2 | 1 |
| b. thematic analysis or building patterns. | 4 | 3 | 2 | 1 |
| 4. process statistical techniques to analyze quantitative data | | | | |
| a. using appropriate statistical technique. | 4 | 3 | 2 | 1 |
| 5. present results in/by | | | | |
| a. logical order based on the order of the research objectives. | 4 | 3 | 2 | 1 |
| b. accurately and reliably manner. | 4 | 3 | 2 | 1 |
| c. no repetitive manner (e.g., data presented in the graph, no longer presented in tabular form). | 4 | 3 | 2 | 1 |
| d. showing the relationship between the data gathered and existing studies. | 4 | 3 | 2 | 1 |
| 6. create a coherent summary that | | | | |
| a. contains the purpose of the study, respondents and methods. | 4 | 3 | 2 | 1 |
| b. highlights the findings based on the data gathered. | 4 | 3 | 2 | 1 |
| 7. draw conclusions from research findings that are | | | | |
| a. aligned with the objectives. | 4 | 3 | 2 | 1 |
| b. factually learned from the study. | 4 | 3 | 2 | 1 |
| c. concise yet conveyed all necessary information. | 4 | 3 | 2 | 1 |
| 8. formulate recommendations that | | | | |
| a. suggest possible solutions that need further study. | 4 | 3 | 2 | 1 |
| b. recommend action to be taken. | 4 | 3 | 2 | 1 |
| c. suggest possible research topics which were unable to cover in the study. | 4 | 3 | 2 | 1 |