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ACTION RESEARCH CAPABILITY OF MATHEMATICS TEACHERS

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Abstract:

With the issuance of DepEd Order No. 16, s. 2017, basic education teachers in the Philippines are encouraged to conduct action researches towards the promotion of evidence-based decision-making in instruction and administration. Considering this directive, the researchers primarily intended to assess the action research capabilities of the mathematics teachers in secondary schools in Bulan Districts in Sorsogon. Specifically, this study aimed to (1) identify the profile of the mathematics teachers, (2) determine the action research capabilities of the teachers along seven variables; and (3) propose interventions based on the results of the study. The respondents of this research were a total enumeration 63 permanent teachers who were handling mathematics subjects in junior and senior high schools in the four Districts of Bulan, Sorsogon in the school year 2021-2022. The primary research instrument is a survey-questionnaire which was designed based on the Teacher's Competency in Action Research (TCAR) Scale. Findings revealed that most of the mathematics teachers are female, aged 35 years and below, single, have baccalaureate degree, with Teacher I position, have been in service for 1-10 years, have attended 1-3 trainings on action research, and have no other designations. Furthermore, the mathematics teachers are moderately capable in terms of selecting topic for professional growth, planning an action research project, integrating technology in analyzing data, analyzing and presenting action research data, and reflecting on and communicating results. They are capable in terms of integrating technology in writing literature and integrating ethics in action research. The researcher recommends a comprehensive training for teachers on action research covering the seven variables identified, including the use of computer software.

Keywords: Action Research, Capability, Mathematics Teachers, Sorsogon

BACKGROUND OF THE STUDY

Education is seen as the most effective way of developing and realizing human potentials. Hence, it has always been one of the societal priorities around the world. The right to education has universal relevance since it paves the way for realization, development and maximization of human potentials towards contributing to the community (United Nations, 2015). This calls for academic institutions and educational systems to ensure that its mechanisms are always built on providing quality services. This right to quality education is guaranteed by the Constitution of the Philippines (1987) and by the Universal Declaration of Human Rights (1948). In fact, the UNDHR provides that education should be directed towards the full development of the human personality.

The quest towards quality education requires that all phases of education should be able to meet the needs of the generation that it serves. Hence, it is important for schools and educational systems to continuously improve (Easter Michigan University, 2018). The need for schools not to stop innovating and changing is even strengthened about by rapid technological advancements which have created a huge disparity or generation gap between the present and past generations, thereby creating a danger of generations being separated from each other rather than being interdependent (Van Damme, 2014; Miller, 2020).

The need for innovations in education as required by rapidly changing times, technology and learners' needs also requires that it should be based on evidence. Developing new educational practices and programs based on

evidence and systematic investigation helps ensure that they will become effective and efficient (Dockterman, 2016). In addition, evidence-based practices and programs also increase the likelihood of positive learning outcomes, increase accountability, allow the maximization of resources and improve responsiveness to learners' needs (Iris Center, 2022).

A component of evidence-based educational practices is action research which allows educational practitioners to reflect on their practices and make effort to improve them (SAGE Pub, 2016). Action research provides educators the opportunity to assess their own teaching, and explore and test how effective the new strategies, methods, approaches and materials are (Rhalmi, 2011). It also helps teachers develop new knowledge directly related to their classrooms, promotes reflective teaching and thinking, expands teachers' pedagogical repertoire, puts teachers in charge of their craft, reinforces the link between practice and student achievement, fosters an openness toward new ideas and learning new things, and gives teachers ownership of effective practices (Hine, 2013).

Action research is defined as an approach to research which seeks both to take action towards a problem and create knowledge or theory about such action as it unfolds (Coghlan, 2019). It is naturally a part of teaching since teachers are continually observing students, collecting data and changing practices to enhance student learning, and the classroom and school context (Miller, 2017). This is also named in many ways such as participatory research, collaborative inquiry, emancipator research, action learning, or contextual action research but these are mere variations of an approach to research where a certain group of people undergoes the stages of identifying a problem, doing something to resolve it, seeing how successful their efforts were, and if not satisfied, trying again (Maheshwari, 2012).

Due to its crucial role in continuous improvement of education, there have been efforts, both locally and internationally, on promoting action research in schools and educational institutions. To exemplify, the Australian government has included in their Professional Standards for Teachers (2018) the conduct of action research. As such, educational practitioners in Australia are expected to plan for, innovate and implement effective teaching and learning through systematic investigation and inquiry such as action research. Meanwhile, in Singapore, in 2005, the North Zone Clusters of Schools have launched their primary development project with the aim of equipping teachers with the knowledge and skills in conducting action research (Soh, 2006).

In the Philippines, the Department of Education has institutionalized action research in schools through the DepEd Order No. 16 (2017), as amended by DepEd Order No. 26 (2021), which establishes the Research Management Guidelines in basic education schools in the country. In this order, educational practitioners in basic education levels are encouraged to conduct basic and action researches that lead to enhancement of classroom, school or nation-based educational practices and programs. This order also identifies the mechanims for availing of and utilizing resources for research, and initiative with external stakeholders. Moreover, in August 2021, the Department of Education has opened a call for research proposals to strengthen the Basic Education Learning Continuity Plan as schools face the challenges of the COVID-19 pandemic (DepEd, 2021).

Meanwhile, the teaching of mathematics requires significant innovation, especially because this subject is often perceived as difficult and complex. The study of Gafoor and Sarabi (2015) related the difficulty in school mathematics to the nature of mathematics itself and the nature of mathematics teaching-learning. Meanwhile, the study of Ganal and Guiab (2014) found that the method of mathematics intruction greatly infuence the level of difficulty experienced by students towards this discipline. Innovating mathematics teaching, more learners will find it easier and simpler which will increase their interest towards it (Ponce, 2017). Hence, the teaching of mathematics should also be subjected to action research. Segal (2009) enumerates the benefits of action research in mathematics teaching which are being transformational for teachers as a professional development tool by allowing them to engage in a focused study of their own practice, allowing teachers to communicate with others in the field which builds confidence in teachers as professionals, and it makes teachers more actively reflective and more aware of their teaching and their students' learning. The Commission on Higher Education (2017) also recognizes the significance of action research in mathematics education. In the policies, standards and guidelines for bachelor of secondary education, mathematics specialization courses include four units in research in mathematics. This course primarily aims to develop the pre-service mathematics educators' skills in engaging in action research.

In the Schools Division of Sorsogon, as of July 2022, since the implementation of DepEd Order No. 16, s. 2017 there are only 142 action and basic research projects submitted by teachers. Out of these, only 26 or 18.30% are from schools in the four districts of Bulan. These already include both the elementary and secondary schools. In fact, only 13 researches are proposed by teachers from secondary schools in the four districts of Bulan. This very minimal number of researches being conducted in the schools in Bulan Districts suggests that there is a need to assess the capability of the teachers as baseline data for designing a program to improve their research capability.

In addition, with the practical and professional benefits of action research to mathematics education, as evidenced by previously discussed literatures, the researcher believes that it is paramount to assess the action research capabilities of mathematics teachers as baseline information towards the development of a program relevant to their capabilities. Hence, this study was proposed.

OBJECTIVES

This study primarily aimed to evaluate the capabilities of Mathematics Teachers in conducting action research in Bulan Districts, Division of Sorsogon, School Year 2021-2022. Specifically, it sought to determine the profile of the mathematics teachers in terms of sex, age, civil status, educational attainment, position, length of service, relevant Trainings Attended; and designation/s; (2) identify level of capabilities of math teachers in action research along

selecting topic for professional growth, planning an action research project, integrating technology in writing literature, integrating ethics in action research, integrating technology in analyzing data, analyzing and presenting action research data, and reflecting on and communicating results; and (3) propose interventions based on the results of the study.

RESEARCH METHODOLOGY

This study employed the descriptive research design. Boudah (2013) defines descriptive research as a design that seeks to describe a condition, population, or phenomenon. In this design, the researcher does not manipulate the subject of the investigation since the purpose is to describe them as they are based on identified parameters. In descriptive research, the data collected are used to answer a wide range of what, when and how questions that pertain to a specific group (Descriptive Research Studies, 2022). This design is appropriate to the present study since it sought to identify the profile and the research capability levels of the teachers.

A total enumeration of 63 permanent public secondary school teachers who handled mathematics subjects in junior and/or senior high school in the four districts of Bulan, Sorsogon in the school year 2021-2022 were the respondents of the study.

The primary research instrument is a survey-questionnaire which was designed by the researcher based on the Teacher's Competency in Action Research (TCAR) Scale by Cortes, Pineda and Geverola (2020). Since modifications have been made to accommodate the research question of this study, the instrument still underwent a validation process before actual utilization. The instrument is divided into five sections.

The first section deals with the profile of the respondents in order to answer research question no. 1. Specifically, the items that will be gathered are gender, age, highest educational attainment, position, length of service, trainings related to action research, and other designations. The second section of the survey-questionnaire deals with the action research capabilities of the teachers which are subdivided into seven; namely, selecting topic for professional growth, planning an action research project, integrating technology in writing literature, integrating ethics, integrating technology in analyzing data, analyzing and presenting action research data, and reflecting on and communicating results. Each subsection is comprised of several indicators. A five-point Likert scale will be used in the self-assessment to be made by the teachers. The third component of the survey-questionnaire deals with the possible interventions that may be done to improve the research involvement and capabilities of the teachers.

The researcher employed both descriptive and inferential statistical tools in analyzing and interpreting the data gathered from the accomplished survey-questionnaire. For research question no. 1 and 2, the researcher used descriptive statistical tools, namely, frequency count and percentage to describe generally the profile of the respondents and their level of action research capabilities. For research question no. 2, frequency count and weighted mean were used. The weighted mean per indicator was interpreted using the scale below:

Weighted Mean	Verbal Interpretation
4.50 – 5.00	Highly Capable
3.50 – 4.49	Capable
2.50 – 3.49	Moderately Capable
1.50 – 2.49	Poorly Capable
1.00 – 1.49	Not Capable

To provide answers to research questions no. 3, frequency count and ranking were utilized. Unstructured interviews were also conducted to support the quantitative data.

RESULTS AND DISCUSSION

Profile of the Mathematics Teachers

Presented in Table 1 are the profiles of the mathematics teachers in terms of sex, age, civil status, educational attainment, position, length of service, number of relevant trainings attended, and other designation.

Table 1 shows that mathematics teaching in the secondary schools in the Municipality of Bulan is dominated by female teachers which comprise 58.73% of the population of mathematics educators. Meanwhile, the remaining 41.27% of the 63 mathematics teachers are male. The profile of the mathematics teacher in terms of age. Their ages are divided into groups: 25 years and below, 26-35 years, 36-45 years, 46-60 years, and 61 years and above. The majority of the mathematics teachers are single which comprise 58.73%. Meanwhile, 25 or 39.68% are married while one is widowed.

Table 1 presents also 32 or 50.79% of the mathematics teachers have a baccalaureate degree. Meanwhile, 22 or 34.92% of them have masters units while six or 9.52% have master degree. Lastly, three or 4.76% of them have doctoral units while none of them have a doctoral degree. And more than half or 53.96% of the mathematics teachers are ranked Teacher I which is the entry-level position for public school teachers in the Philippines. Meanwhile, 15 or 23.81% are Teacher III while 10 or 15.87% are Teacher II. The position with the least frequency is Master Teacher with only 4 or 6.35% of the mathematics teachers in Bulan.

Table 1. Profile of the Mathematics Teachers

Profile		f	%
(Sex)			
Female		37	58.73
Male		26	41.27
(Age)			
25 years and below		14	22.22
26-35 years		32	50.79
36-45 years		12	19.05
46-60 years		5	7.94
(Civil Status)			
Single		37	58.73
Married		25	39.68
Widowed		1	1.59
(Educational Attainment)			
Baccalaureate Degree		32	50.79
With Masteral Units		22	34.92
With Masteral Degree		6	9.52
With Doctoral Units		3	4.76
(Position)			
Teacher I		34	53.96
Teacher II		10	15.87
Teacher III		15	23.81
Master Teacher		4	6.35
(Length of Service)			
Less than 1 year		8	12.70
1-10 years		45	71.43
11-20 years		7	11.11
21-30 years		2	3.17
More than 30 years		1	1.59
# of Trainings Attended			
None		18	28.57
1-3		39	61.90
4-5		3	4.76
More than 5		3	4.76
Other School Designations			
With Other School Designations		11	17.46
Without Other School Designations		52	82.54

It is also revealed that 45 or 71.43% of the mathematics teachers are in service for one to ten years. This comprises a large majority of the respondents. Meanwhile, eight or 12.70% of them are less than one year in service, and seven or 11.11 are in service for 11-20 years. Only two of them are in service for 21-30 years while there is one who is in service for more than 30 years.

The data provide both positive insights and areas for improvement. While the majority of them have already attended at least three training on action research, a significant portion of 28.57% remains untrained in action research. With the issuance of DepEd Order No. 16 (2017), action research has been one of the thrusts of instructional competence among teachers. Hence, it is important that all of the teachers be trained so that they will have the necessary knowledge and skills to conduct action research as a method of discovering innovative teaching strategies.

Table 2 also shows that a large majority of teachers have no other school designations while 11 or 17.46% have other school designations which are disbursing officer, school 4Ps coordinator, mathematics coordinator, property custodian, BAC chairman, SBM coordinator, school librarian and school registrar

These data corroborate to the national context in the Philippines. According to The World Bank (2022), secondary schools in the country are dominated by female teachers comprising 71% of the teaching population in 2020. These data manifest that younger mathematics teachers dominate the secondary schools in the Municipality of Bulan. To sum up, 73.01% of the mathematics teachers are below 35 years old. These data provide positive insights to the mathematics teaching profession. With the wide generational gap between the younger and older generations, younger

teachers tend to become more responsive to the needs of today's learners, especially with the need for the integration of modern technology. In fact, Torres, Mohand, Garcia and Reche (2020) found that younger mathematics teachers with some teaching experience had positive attitudes towards the use of technology in teaching.

These data present the need to encourage mathematics teachers to pursue graduate studies as one of the primary forms of professional development. Summing up those in the first two categories, 85.71% of the mathematics teachers still do not have master's degree. Sevim and Akin (2021) found that teachers who pursue graduate studies have improved skills on scientific thinking and research, communication, teaching and assessment, and converting theories into practice. Similarly, Republic Act 10912 (2016) or the Continuing Professional Development Act recognizes the need for professionals in the Philippines, including teachers, to seek continuing professional development initiatives. Hence, the promotion of graduate studies is a must for public school teachers, including secondary school mathematics teachers.

The data reveal consistency with the previously provided data. The respondents' profile in terms of age reveal that a large majority of them are still young and do not have masteral degree which is helpful for promotion. Hence, most of them are still in the entry-level position. Meanwhile, only eight of the respondents are master teachers. This is expected since the plantilla positions for master teachers are proportionate to the number of teachers in the specialization. With master teachers present in the Municipality of Bulan, improved action research productivity is expected since they are mandated to conduct at least one (1) action research every year based on the Results-Based Performance Management System (RPMS) Tool for Master Teacher I-IV. The conduct of action research is one of the objectives under Key Result Area (KRA) 1 which is instructional competence.

The data support the age profile of the respondents. Since most of them are below 35 years old, it is expected that majority of them will have 10 years of experience at most. With them being relatively new in service, continuing capability-building and professional development should be put into priority. Investment on their professional growth will be of use for the Philippine educational system for longer period since they majority of them are still new in service.

The data provide both positive and unfortunate insights. While majority of them have already attended at least three trainings on action research, a significant portion of 28.57% remain untrained on action research. With the issuance of DepEd Order No. 16 (2017), action research has been one of the thrusts of instructional competence among teachers. Hence, it is important that all of the teachers be trained so that they will have the necessary knowledge and skills to conduct action research as a method of discovery innovative teaching strategies.

The presence of the other school designations among mathematics classroom teachers is relevant in this study since time is significant in the conduct of action research. Teachers who have additional school designations will have additional workloads which lessen their opportunity to conduct action research. It is also notable that four of the respondents have more than one other school designation. With this set-up, in addition to their classroom teaching, they will have difficulty in conducting and completing action research projects.

Level of Action Research Capabilities

This section presents the level of action research capabilities of the mathematics teachers in terms of seven variables; namely, selecting topic for professional growth, planning an action research project, integrating technology in writing literature, integrating ethics in action research, integrating technology in analyzing data, analyzing and presenting action research data, and reflecting on and communicating results.

Selecting topic for professional growth. Table 2A presents the level of action research capabilities of mathematics teachers in terms of selecting topic for professional growth. The variable is composed of four indicators which were assessed through a five-point Likert Scale.

Generally, the mathematics teachers have an average weighted mean of 3.42 which is described as "moderately capable" in terms of selecting topic for professional growth. They recorded the highest weighted mean of 3.54 in knowing how to choose a list of topics that are of interest to them before selecting which is described as "capable". They are "moderately capable" in the other three indicators. Meanwhile, they have the lowest weighted mean of 3.33 in terms of taking a literature search and review for their proposed topic.

Table 2A
Level of Action Research Capabilities of Mathematics Teachers in terms of Selecting Topic for Professional Growth

Indicators	Weighted Mean	Descriptive Rating
I can develop a research proposal that supports my professional development.	3.37	Moderately Capable
I can choose questions that interest my teaching colleagues, counselors, and administrators.	3.43	Moderately Capable
I know how to choose a list of topics that are of interest to me before selecting the one.	3.54	Capable
I can take a literature search and review my proposed topic.	3.33	Moderately Capable
Average Weighted Mean	**3.42**	**Moderately Capable**

These data mean that teachers have moderate competence in selecting action research topic. While this result may seem balanced, this still calls for a need to improve the teachers' capability especially since the selection of topic is the first stage in conducting action research. It is also notable that they have the lowest rating in conducting literature review. Hence, it is still important to retool the teachers on this aspect.

This result is supported by the study of Cortes, Pineda and Geverola (2021) which found that majority of basic education teachers regard the selection of action research topic as a difficulty area. Specifically, the conduct of literature review is greatly a concern for the teachers. The study of Tindowen, Guzman and Macanang (2019) also revealed that teachers find the conduct of literature search and review as a difficult aspect of conducting research.

Planning an action research project. Table 2B presents the level of capabilities of the mathematics teachers in terms of planning an action research project. There are 11 indicators for this variable which were assessed through a five-point Likert Scale.

It is shown in Table 2B that the mathematics teachers are generally "moderately capable" in terms of planning an action research project with average weighted mean of 3.45. Specifically, they are "capable" in terms of identifying what has been done in previous studies and the gaps for choosing a topic with weighted mean of 3.68, ensuring that the topic is grounded on the realities of the school with 3.62, and stating research questions in common language with weighted mean of 3.49. However, it is still notable that the respondents are only "moderately capable" along the majority of the indicators.

Table 2B
Level of Action Research Capabilities of Mathematics Teachers in terms of Planning an Action Research Project

Indicators	Weighted Mean	Descriptive Rating
I can narrow the research topic to put it in a researchable concept.	3.40	Moderately Capable
I can state research questions in common language.	3.49	Moderately Capable
I can ensure that the topic I will be working on is grounded in the realities of the school.	3.62	Capable
I can identify what has been done in previous studies and the gaps when choosing a topic.	3.68	Capable
I can identify underlying assumptions of previous authors on their research questions.	3.41	Moderately Capable
I can evaluate my sources when conducting literature search and review.	3.37	Moderately Capable
I can track and write references of the literature used in the review.	3.40	Moderately Capable
I am aware on the usefulness and limitations of various qualitative data collection tools.	3.43	Moderately Capable
I can conduct research in a systematic and disciplined manner.	3.43	Moderately Capable
I can determine appropriate data sources to establish data triangulation.	3.32	Moderately Capable
I am aware on the usefulness and limitations of various quantitative data collection tools.	3.40	Moderately Capable
Average Weighted Mean	**3.45**	**Moderately Capable**

Particularly, they have the lowest capability in terms of determining appropriate data sources to establish data triangulation with weighted mean of 3.32 which is described as "moderately capable".

These data imply a need to improve the capabilities of teachers in this aspect, especially since they are only "moderately capable" along the majority of the indicators. In addition, they fully need a capability-enhancement training on determining appropriate data sources to establish triangulation of data. Interestingly, they also have low rating in terms of evaluating sources for literature review which is consistent with the result in Table 2A.

These results are relevant to the findings of the study of Caingcoy (2020) which revealed that teachers were generally moderately capable in terms of planning towards action research. The researcher emphasized the significance of learning how to plan an action research since it is the foundation of the research project; hence, the teachers' capability of this aspect should be ensured and enhanced.

Integrating technology in writing literature. Table 3C provides the level of action research capabilities of the teachers in terms of integrating technology in writing literature. There are two indicators which were assessed through a five-point Likert scale.

It is shown in Table 3C that the mathematics teachers are generally "capable" in terms of integrating technology in writing literature. Specifically, they have the same weighted mean of 3.68 in the two indicators.

Table 2C
Level of Action Research Capabilities of Mathematics Teachers in terms of Integrating Technology in Writing Literature

Indicators	Weighted Mean	Descriptive Rating
I can use search engines to explore internet sites which will build my review of related literatures.	3.68	Capable
I can use technology when doing bibliographical entries in Microsoft Word.	3.68	Capable
Average Weighted Mean	**3.68**	**Capable**

These data are related to the results presented in Tables 3A and 3B. While the previous data revealed that teachers have difficulty in literature searching, these data provided that teachers have the capability to integrate technology in literature searching. Their competence in using technology may be explained by the fact that most of them are aged 35 years old at most; hence, they belong to the younger generations of teachers who have the sufficient grasp of technology for various purposes.

These data run contrary to the results of the study of Caingcoy (2020) which found that teachers had high level of difficulty in using technology in literature review. The researcher highlighted the need for training that could enhance teachers' skills along this process.

Integrating ethics in action research. Table 2D presents the level of action research capabilities of the mathematics teachers in terms of integrating ethics in action research. The respondents were assessed in eight indicators under this variable using a five-point Likert Scale.

Generally, the respondents are "capable" in terms of integrating ethics in action research with an average weighted mean of 3.59. They are "capable" in five of the eight indicators. They have the highest weighted mean of 3.86 in terms of writing letter of consent to parents or legal guardians. On the other hand, they have the lowest weighted mean of 3.41 which is described as "moderately capable" in terms of writing an assent form.

The data show favorable results in terms of the teachers' capability to integrate ethics in action research. This implies that teachers have the baseline knowledge on the ethical contexts of conducting action research. This could be explained by the nature of the teaching profession which holds emphasis to ethical standards in their practices. This is supported by the high weighted mean garnered in terms of writing letters to parents and guardians which is already being done by the teachers in the context of their teaching responsibilities. Hence, the teaching experiences of the teachers influence their capabilities to integrate ethics in action research.

These results are supported by the study of Zolina (2019) which also found that secondary school teachers demonstrate a high degree of awareness on the fundamental principles of research ethics despite the majority having no formal training on research ethics. Similarly, the study of Shivananda, Doddawad and Vaswani (2020) found that faculty members in educational institutions generally have prior knowledge on research ethics which could be attributed to the training they attended related to this aspect.

Table 2D
Level of Action Research Capabilities of Mathematics Teachers in terms of Integrating Ethics in Action Research

Indicators	Weighted Mean	Descriptive Rating
I can write an assent form.	3.41	Moderately Capable
I can write letter of consent to parents or legal guardians.	3.86	Capable
I know the guidelines in securing consent from my immediate head and teacher researchers.	3.70	Capable
I can examine ethical slippages such as concealment and exaggeration when analyzing data.	3.44	Moderately Capable

I can provide information in the right way to participants.	3.76	Capable
I can present and disseminate findings in line with ethical guidelines.	3.59	Capable
I can identify ethical issues which may arise ahead in an action research project (e. g. research topic, method, design of instruments, archiving, etc.).	3.44	Moderately Capable
I can apply the basic principles of ethical research which are stipulated in various codes and guidelines (e.g. The Belmont Report, 1979).	3.49	Capable
Average Weighted Mean	**3.59**	**Capable**

Integrating technology in analyzing data. Table 2E presents the action research capabilities of the mathematics teachers in terms of integrating technology in analyzing research data. The respondents were evaluated in three indicators using a five-point Likert scale.

It is evident in Table 2E that the mathematics teachers are generally "moderately capable" in terms of integrating technology in analyzing data with average weighted mean of 3.30. They are also "moderately capable" in all the three indicators with the utilization of computer software for qualitative and mixed-method data having the lowest weighted mean of 3.25.

This relatively lower capability can be explained by the usual exclusion of the use of computer software for research in the curricula of teacher-education undergraduate and graduate studies. While research subjects are already included in the curricula of teacher-education programs, the utilization of computer software is often not introduced; hence, teachers do not have enough knowledge regarding this aspect. This result signifies the need for a training to improve the capability of teachers in utilizing technology for data analysis.

Table 2E
Level of Action Research Capabilities of Mathematics Teachers in terms of Integrating Technology in Analyzing Data

Indicators	**Weighted Mean**	**Descriptive Rating**
I can operate computer software in analyzing qualitative data (e. g. NVivo 10.0).	3.25	Moderately Capable
I can operate computer software in analyzing quantitative data (e. g. SPSS).	3.40	Moderately Capable
I can operate software programs for analyzing mixed-method data (e. g. Dedoose).	3.25	Moderately Capable
Average Weighted Mean	**3.30**	**Moderately Capable**

Caingcoy (2020) similarly found that teachers have difficulty in using technology in analyzing research data which could be explained by the lack of training and exposure to statistical computer software. Hence, a training is needed to improve their knowledge and skills on utilizing computer tools for data analysis. Corollary, Kimani & Simba (2017) have found that training on computer software for research purposes such as the SPSS significantly increase the data analysis competence of researchers and research enthusiasts.

Analyzing and presenting action research data. Table 2F presents the action research capabilities of the mathematics teachers in terms of analyzing and presenting action research data. The respdents were evaluated in 13 indicators using a five-point Likert scale.

The mathematics teachers are generally "moderately capable" in terms of analyzing and presenting action research data with average weighted mean of 3.34. They are "moderately capable" in 11 out of 13 indicators, and "capable" in two indicators.

The respondents have the highest weighted mean of 3.51 which is described as "capable" in terms of summarizing collected data in a dependable and accurate manner. They are also "capable" in terms of developing a data collection plan with weighted mean of 3.48. On the other hand, they have the lowest weighted mean of 3.14 and 3.19 which are described as "moderately capable" in terms of determining the appropriate analysis for qualitative data, and creating a coherent story from all the data collected respectively.

These results are supported by the study of Salde and Mamaoag (2021) which also found that teachers have moderate capability in terms of data analysis and interpretation based on their self-assessment. However contrary to

the results of this study, they also found that teachers have high level of capability in terms of writing the research results. Similarly, Abarro & Mariño (2016) found that secondary school teachers are moderately capable in terms of writing the results and discussion of their research projects. Finally, both of these studies recommend the conduct of training to improve the teachers capability in terms of analyzing and presenting research data.

Table 2F
Level of Action Research Capabilities of Mathematics Teachers in terms of Analyzing and Presenting Action Research Data

Indicators	Weighted Mean	Descriptive Rating
I can align appropriate statistical test with parametric and nonparametric data to address issues of validity in quantitative action research studies.	3.25	Moderately Capable
I can determine which analysis suits to qualitative data.	3.14	Moderately Capable
I can develop a data collection plan.	3.48	Moderately Capable
I can summarize collected data in a dependable and accurate manner.	3.51	Capable
I can interpret the underlying meaning or the implication of the data.	3.43	Moderately Capable
I can perform preliminary and iterative steps involving reading, describing, and classifying research data before proceeding to data analysis.	3.38	Moderately Capable
I can identify techniques involved in qualitative data analysis.	3.35	Moderately Capable
I can analyze quantitative data regardless if the test involves descriptive or inferential.	3.33	Moderately Capable
I can identify emerging themes in an inductive analysis of qualitative data.	3.29	Moderately Capable
I can analyze both quantitative and qualitative data in mixed-method research deigns.	3.29	Moderately Capable
I can create a coherent story from all the data collected.	3.19	Moderately Capable
I can make visual display for the reader to easily understand information.	3.40	Moderately Capable
I can present qualitative data in graphs, charts and networks when necessary.	3.43	Moderately Capable
Average Weighted Mean	**3.34**	**Moderately Capable**

Reflecting on and communicating results. Table 2G presents the action research capabilities of mathematics teachers in terms of reflection on and communicating results. The respondents were evaluated in 13 indicators using a five-point Likert scale.

Generally, the respondents are "moderately capable" in terms of reflecting on and communication action research results with average weighted mean of 3.30. They are specifically "moderately capable" in 12 out of 13 indicators while "capable" in one indicator which is discussing the purposes of an action research with weighted mean of 3.49. Meanwhile, they have the lowest weighted mean of 3.17 in terms of identifying which journals are tagged as credible and predatory which is described as "moderately capable". Their capability to disseminate results of action research in journals and conference is in close second lowest with weighted mean of 3.19 which is also described as "moderately capable."

Table 2G
Level of Action Research Capabilities of Mathematics Teachers in terms of Reflecting on and Communicating Results

Indicators	Weighted Mean	Descriptive Rating
I can identify the distinction between an action plan and the action research process itself.	3.44	Moderately Capable
I can discuss the purpose of an action plan.	3.49	Moderately Capable

I can identify the basic components of an action plan.	3.37	Moderately Capable
I can design an action plan following the "Steps to Action Chart" format.	3.29	Moderately Capable
I can work with an array of people to develop action plan depending on the scope of action research effort.	3.38	Moderately Capable
I can write the action research report in a scholarly manner.	3.27	Moderately Capable
I can formally write an action plan as a complete report for the action research project when considered for publication in a professional journal.	3.25	Moderately Capable
I am aware on the guidelines in academic writing agreed-upon conventions of style (e. g. Publication Manual of the American Psychological Association).	3.21	Moderately Capable
I am aware of the basic organizational structure for formatting an action research report.	3.22	Moderately Capable
I am aware on the fundamental submission guidelines to a research journal when considering an action research project for publication.	3.24	Moderately Capable
I can identify which journals are tagged as credible and predatory.	3.17	Moderately Capable
I can disseminate results of action research in journals and conferences.	3.19	Moderately Capable
I can present information without revealing confidential details regarding participants or location.	3.40	Moderately Capable
Average Weighted Mean	**3.30**	**Moderately Capable**

These data manifest that teachers do not have sufficient knowledge and skills in reflecting on and communicating action research results. This could be explained by the fact that basic education teachers are not highly exposed to research dissemination initiatives such as fora, conferences and journals. This is understandable since, compared to those in higher education institutions, teachers in basic education levels are not inherently mandated to conduct research. The enjoinment towards conducting research for basic education teachers only came with the issuance of DepEd Order No. 16 in 2017. This, therefore, calls for comprehensive teacher-trainings on research communication and dissemination. There is also a need to increase the opportunities for teachers to be exposed in research dissemination initiatives such as presentation in research fora and conferences.

These results are supported by the study of Gonzales, Corpuz, and Dellosa (2020) which also found that basic education teachers are moderately capable in terms of research dissemination. Meanwhile, the study of Mejia and Salcedo (2020) found that secondary school teachers generally have adequate knowledge in terms of reporting and sharing research findings. However, it was also found in their study that publication and presentations are often less emphasized by teacher-researchers. Hence, it is important that they be oriented and trained in disseminating their research through presentations and publications.

Training Design for Action Research Capabilities of the Mathematics Teachers

It is revealed that the training of teachers on the use of software/ computer application for analyzing quantitative and qualitative data ranked first with frequency of 57. It is followed both by training on the preparation of action research proposals and reports, and orientation on the research trends and thrusts relevant to their respective fields of specialization with frequency of 49. Providing financial incentive system for completing, presenting and publishing action research was also found to be necessary by the teachers with frequency of 46. This is followed by training of teachers on the use of various search engines and applications for literature searching and review, and training on determining reputable research journals and preparing research articles based on the journal guidelines with frequencies of 43 and 40 respectively.

The institutionalization of research mentoring system through partnership with research institutions, and the establishment of a district-based peer-reviewed research journal where teachers can publish their research articles were the least necessary as perceived by the mathematics teachers with frequencies of 32 and 31 respectively.

CONCLUSIONS

Based on the findings, the researchers arrived at the following conclusions:

1. Most of the mathematics teachers are female, aged 35 years and below, single, have baccalaureate degree, with Teacher I position, have been in service for 1-10 years, have attended 1-3 trainings on action research, and have no other designations.

2. The mathematics teachers are moderately capable in terms of selecting topic for professional growth, planning an action research project, integrating technology in analyzing data, analyzing and presenting action research data, and reflecting on and communicating results. They are capable in terms of integrating technology in writing literature and integrating ethics in action research.
3. Training on the use of software/ computer application for analyzing quantitative and qualitative data, preparation of action research proposals and reports, and research trends and thrusts relevant to their respective fields of specialization were perceived as the most necessary to improve the action research capabilities of the teachers.

RECOMMENDATIONS

Based on the findings and conclusions of the study, the researchers recommend the following:

1. A comprehensive training for teachers on action research covering the seven variables identified that cover the entire research process from conceptualization to dissemination needs to be conducted to improve their action research capabilities.
2. The use of computer software and applications for conducting researches should be given emphasis when training in-service teachers, and in college curricula and instruction in teacher-education programs.
3. Financial incentive system for completing and disseminating action researches may be crafted and proposed to encourage teachers to conduct research since it will provide more immediate and concrete benefits as compared to promotion.
4. Professional development programs such as scholarships and access to graduate education should be given attention to encourage teachers to enroll in graduate studies which is found to be beneficial to their action research capabilities.
5. School structuring system should be reviewed to avoid teachers having too much workload which hinders their opportunity and enthusiasm to conduct researches.
6. Further studies on the different contexts of action research among teachers such as research involvement, research attitude, research challenges and research institutional support may be conducted.

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