Amplifying the Impact of Extension Programs: Empowering Teachers in the Development of Research-Based Instructional Materials

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Abstracts: The training of teachers plays a crucial role in ensuring the provision of quality education. This study aimed to assess the impact of training quality on teachers' capabilities in developing research-based instructional materials (RB-IMD). Specifically, it examined the relationship between the content, nature, and scope of the training attended, as well as the design of learning and assessment within the training, and teachers' proficiency in RB-IMD. The research employed a mixed-methods approach, incorporating qualitative and quantitative methods, to analyze the capabilities of 115 participants in RB-IMD. The findings revealed that the majority of the attended trainings focused on instructional materials and were conducted locally at the participants' school, district, or College of Education. The quality of the training, including its content, nature, and scope, as well as the design of learning and assessment, exhibited a significant positive correlation with teachers' proficiency in RB-IMD. Furthermore, the teachers' capabilities in RB-IMD, including needs analysis, development process, research production fund sourcing, collaboration with users and other experts, research dissemination, and research utilization, showed a significant positive correlation with the quality of training attended across different scopes. These results indicate that the extension program plays a significant role in enhancing teachers' research-based capabilities in developing instructional materials.

Keywords: Extension program, Instructional materials development, Research-based on teachers' capability

1. INTRODUCTION

The important mission of every educational institution is to provide high-quality education to its clientele, and the teacher plays an essential role in this important mission, thus training them is very important. Recognition of the importance of teachers to student outcomes has resulted in a shift in aid investment from a primary focus on increasing access to education to increase support for interventions aimed at improving teacher quality in developing countries (Colclough, 2005). Barber & Mourshed (2007) stated that the quality of an education system cannot exceed the quality of its teachers. A teacher's quality speaks of capabilities in doing and accomplishing the mission. Teacher quality as measured by skills, knowledge, and qualifications plays a decisive role in students' progress (Hanuchek,2003; Barber & Mourshed, 2007; Varga, 2007). Besides, the teacher has a complex task that is to deliver the knowledge that brings impact to student performance towards lifelong learning this calls for a teacher who has a capability that models lifelong learning, a teacher that engages in on-going professional development and applies it to teaching practice. Therefore, engaging them to training for professional development can boost their performance towards quality teaching and improve their teaching capability.

However, today's professional development training continues to use pedagogical methods instead of andragogical ones to teach new ideas and concepts to teachers and staff. This idea poses the problems of limited buy-in and frustration. The danger of continuing to use pedagogical training is that it has created a culture of dependence on the top-down instructional process (Steinke, 2012). Meaningful professional development involves educators as whole persons-their values, beliefs, and assumptions about teaching (Beavers, 2009). Moreover, another approach to professional development nowadays is the one-size-fits-all workshops that usually offer to disseminate new information to teachers to fix what is broken (Diaz-Maggioli, 2004). They also inhibit the opportunity for critically examining education systems and for questioning, "the very nature of what we understand by learning" (GoI, as cited in Butler and Leahy, 2011). Hadad & Draxter (2002) contends that a new paradigm for teacher education must emerge that replaces one-shot training with lifelong professional preparedness and development of teachers along a continuum of initial preparation, structured opportunities for retraining, upgrading, and acquisition of new knowledge and skills and continuous support.

Moreover, a news article in Philippine Daily Inquirer by Calleja as cited by Ali (2018) reported that some Grades

1 and 7 teachers saw the lack of materials to help them cope with the proponent of the K to 12 system called a "spiraling approach" to learning as the great challenge ahead for the program. Imelda Paddayunan, a Grade 1 teacher at Toro Hills Elementary School in Project 8, Quezon City, disclosed she was still confused on how to teach her subjects, describing a training program she attended from May 28 to June 1 as "hastily done." "We are not yet ready," is her fearless opinion aired and published in the Philippine Daily Inquirer. Moreover, Abarro & Wilfredo (2016) stated that the Department of Education as an agency of the government should take part in addressing problems, particularly the teaching-learning process. In other words, the teachers should conduct research relative to the solutions of the problems in their classrooms, which will, in turn, improve the educational system of the country. Although there is no specific mandate coming from the higher authorities of the Department of Education requiring teachers to conduct research, the conduct of research should be promoted by the middle-level educational managers in order make realistic decisions. To corroborate this concept, the DepEd issued DO No. 65, s. 2003 which institutionalizes the research-based decision and policymaking in the department. This order stipulates that research is the basis of crafting policies in the department.

Thus, the extension project of the College of Education, Caraga State University, Ampayon, Butuan City, Philippines aimed to capacitate teachers in the implementation of K-12 education in Caraga; that is, for teachers to evolve research-based instructional materials that will enhance learning experiences of learners along with the spiraling progression approach by Bruner as cited by (Howard, 2007). Teacher training is a crucial component for high quality education (Buchberger, Campos, Kallós, Stephenson, 2000); and transfer of teacher training, as it shows how trainees apply the competencies they have learned, is a relevant aspect to assess the effectiveness of training in the schools.

It is in this juncture that this research is conducted, to examine teachers' capability in research-based instructional materials development, to find out the quality of the teachers' training/s attended, assess the teachers' capability on research-based instructional materials development, and examine the significant relationship between the equality of the training/s attended and teachers' capability in Research-Based Instructional Material Development among the teacher participants or the adult learners of the teachers training offered by the College of Education, Caraga State University, Ampayon, Butuan City. Through examining these experiences and teachers' capability in research-based instructional materials development, this study can explore the needs of teachers and the learning contexts that will help them grow towards continuing professional development and the enhancement of the extension project of the College.

2. THEORETICAL FRAMEWORK

The study anchors on Bandura's social cognitive theory, Knowles' theory of andragogy, and several theories of learning and adult development that were identified by Trotter (2006) by themes that are relevant for designing teacher professional development.

The Social cognitive theory of Bandura revolves around the notion that learning correlates to the observation of role models, and that individuals possess a self-system that enables them to exercise a measure of control over their thoughts, feelings, motivation, and actions. This self-system provides reference mechanisms and a set of sub-functions for perceiving, regulating, and evaluating behavior, which results from the interplay between the system and the environmental sources of influence. As such, it serves a self-regulatory function by providing individuals with the capability to influence their cognitive processes and actions and thus alter their environments.

Knowles theory of andragogy, on the other hand, is described as "the art and science of helping adults learn." Knowles espouses the idea that teachers are adult learners who are expected to be self-directed and to take responsibility for their decisions. Andragogy posits that learning acquisition is different for adults. In an adult-learning situation, the learner is the driver and focus of the learning experience. Andragogy incorporates the following underlying assumptions about adults as learners: adults need to know why they need to learn. Adult learners embrace a self-concept of being responsible for their learning. The adult learner's varied life experiences serve as precious resources in the learning environment.

Trooter (2006) outlines several theories of learning and adult development that are relevant for designing teacher professional development. The following are identified themes; Adults come to learning with experiences that are useful as resources for new learning, and adults should choose their learning opportunities based on interest and their own classroom experiences/needs. “Active learning” suggests moving away from traditional learning models that are generic and lecture based toward models that engage teachers directly in the practices they are learning and, preferably, are connected to teachers’ classrooms and students. Active learning, in sharp contrast to sit-and-listen lectures, engages educators using authentic artifacts, interactive activities, and other strategies to provide deeply embedded, highly contextualized professional learning. Active learning is also an “umbrella” element that often incorporates the elements of collaboration, coaching, feedback, and reflection and the use of models and modeling.

Greenleaf, Litman, Hanson, Rosen, Boscardin, Herman, & Jones (2011) describe an active teacher professional learning model that improved student science learning. California high school biology teachers participated in PD integrating academic literacy and biology instruction through a program called Reading Apprenticeship. The PD was inquiry-based, subject focused, collaborative, and designed to address teachers’ conceptual understandings as well as pedagogical content knowledge. Buczynski and Hansen (2010) describe how 4th through 6th-grade teachers had the opportunity to participate in “constructivist, hands-on experiences” through the use of science kits. These were the same science kits that teachers would then go on to use in their classrooms with their students. Similarly, teachers in a study by Heller et al. (2012) completed the same scientific investigations they analyzed in written teaching cases.

3. METHODOLOGY

This study utilized a descriptive correlational design to examine the association between educational preparation, in-service education, quality of attended trainings, and teacher’s ability to develop research-based instructional materials (RBIMD). The descriptive correlational design facilitated the exploration of relationships among the variables of interest. Both qualitative and quantitative methods were employed to evaluate and depict teachers' proficiency in creating research-based instructional materials. The study included 115 participants who were teachers attending a training organized by the College of Education and the Graduate School of Caraga State University, Butuan City, Philippines as part of the project focused on enhancing teacher capability in developing research-based instructional materials.

4. RESULTS AND DISCUSSION

This section presents the results of the analysis of the training received by the teacher participants in terms of the content, nature, scope, peer collaboration, peer coaching, and involvement in study groups.

Extent of trainings received by the teacher participants in terms (content of training, nature of training, scope of training, peer collaboration, peer coaching, and study groups involvement.

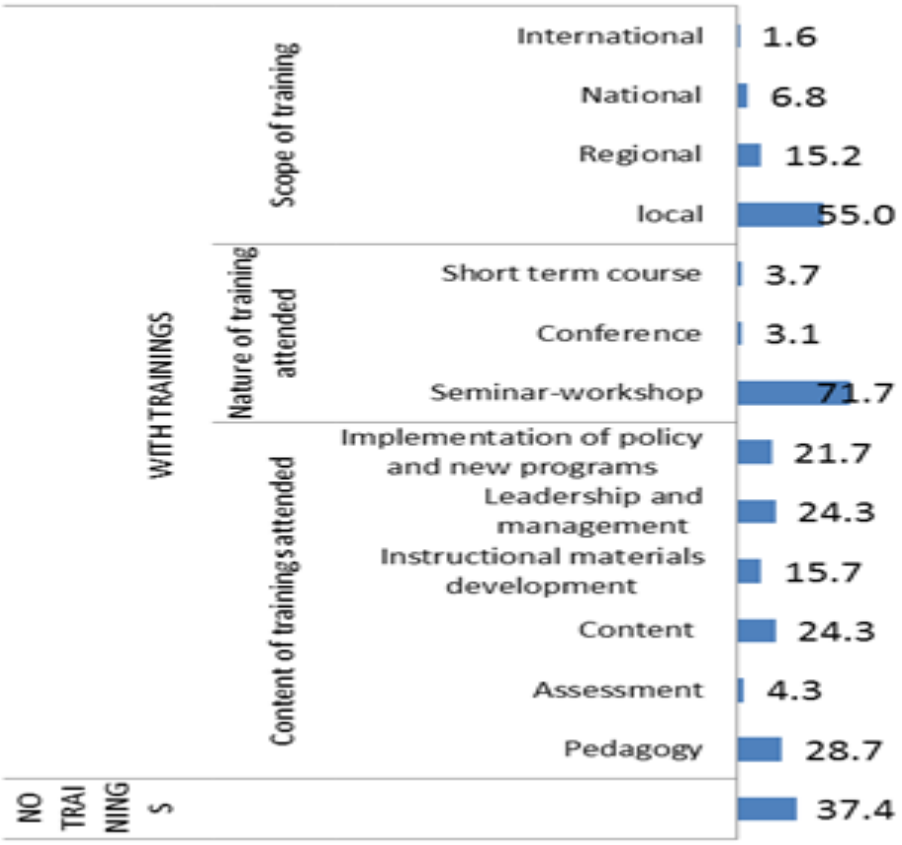

Figure 1. Percent Distribution of Teacher Participants as to their Trainings Attended.

The findings are summarized in Figure 1, 1.1, and Table 1. Figure 1 illustrates the percentage distribution of teacher participants based on the trainings they attended, including the nature, scope, and content of the trainings. In terms of the content of the trainings attended, the majority of participants received pedagogy-oriented training (28.7%), followed by content-oriented training (24.3%) and leadership and management-oriented training (24.3%).

The significance of these findings lies in understanding the impact of these capability-building programs on student achievements. Research by Zuzovsky (2003) indicates that students taught by teachers who frequently participate in pedagogically oriented professional development activities achieve less if they have low academic aspirations. However, this negative effect is weak for students with average academic aspirations and does not exist for those with high academic aspirations.

In contrast, Zuzovsky's (2003) study also reveals that frequent participation of teachers in content-oriented professional development has a positive effect on students with low or medium academic aspirations but has no or even a negative effect on students with high academic aspirations. This finding is supported by Garet, Porter, Desimone, Birman, & Yoon (2001), who found that teachers themselves report that professional development focused on content knowledge contributes to changes in instructional practice.

Darling-Hammond, Hyler, and Gardner (2017) provide further support for these findings by sharing an interesting case in which mathematics professional development was conducted in a district with a large number of non-credentialed teachers. They found positive effects on students' learning only for teachers who already possessed a higher level of content knowledge. This suggests that the effectiveness of professional development may depend, in part, on the teacher's existing content knowledge as a foundation for absorbing new lessons (Santagata, Kersting, Givvin, & Stigler, 2011).

However, a study by Roth, Garnier, Chen, Lemmens, Schwille, & Wickler (2011), which focused on helping teachers analyze science teaching and improve pedagogy, demonstrated the benefits of job-embedded and

content-focused professional development. The results showed that teachers who participated in this program had students who achieved greater learning gains compared to those whose teachers received content training alone. This further emphasizes the need for professional development programs that address both teachers' content-based and pedagogy-based training needs.

Table 1 shows the mean ratings of teachers' responses on the extent of their peer collaboration, peer coaching, and study group activities as part of their in-service education. It can be readily viewed that mean responses indicate strong agreement with the different indicators of in-service education except for peer coaching.

Table 1. Extent of Experience among Teacher Participants in Terms of Peer Collaboration, Peer Coaching and Study Group Involvement.

Indicators *Teacher participants were able:*		**Mean**	**Verbal Description**
Peer Collaboration			
	support the work of the team.	4.54	Strongly agree
	share responsibility and leadership.	4.51	Strongly agree
	work together with group of people whose interest and goal is the same as mine.	4.54	Strongly agree
	contribute to team/group meetings.	4.50	Strongly agree
	establish collaborative norms.	4.43	Agree
	build healthy relationship.	4.58	Strongly agree
Peer Coaching			
	model diverse opinions and/or innovations.	4.20	Agree
	accept the accountability of my partner	4.23	Agree
	encourage one another to participate in doing school task	4.46	Agree
	build self-esteem and confidence in doing school task.	4.41	Agree
	work and share ideas with peers to solve problem.	4.46	Agree
	plan lessons with the peer.	4.30	Agree
Study Group Involvement			
	participate group task and share ideas.	4.52	Strongly agree
	bring positive atmosphere in a committee.	4.50	Strongly agree
	work with a group for a purpose of helping one another.	4.59	Strongly agree
	solve problem through brainstorming with other teachers.	4.51	Strongly agree
	share how the instructional materials worked in class.	4.37	Agree
	share how the lesson or strategy is effective in the teaching-learning process.	4.40	Agree

In particular, mean ratings on teachers' responses (mean above 4.50) indicate that teachers strongly agreed on the indicators of peer collaboration. Hence, peer collaboration is highly manifested in the community of practice in the DepEd.

Data revealed that there is a slight uncertainty noted in their lower mean response in the establishment of norms in peer collaboration (mean of 4.43 only). This implies that norms in peer collaboration are not that highly practiced among teacher participants. In the study of Cole and Gutierrez K. & Rogoff B. as cited by Turpen & Finkelstein (2010), stated that norms are considered repeated use of shared practices. As other sociocultural researchers have claimed, "Every continuing social group, such as members of a classroom or workplace, develops a culture or set of social relationships that are peculiar and common to its members" (Kumpulainen & Renshaw, 2003). In which Instructors and students make choices implicit or explicit, which, in collection, establish a microculture with specific norms and expectations of the participants (Cobb, Stephan, McClain, & Grayemejer, 2001; Finkelstein, 2005). This further implies that though peer collaboration is practiced teacher participants are still on the process of establishing norms, that this best practices in having a collaborative community will become a

repeated practice or norms. Ronfeldt, Farmer, McQueen, & Grissomm (2015) also state that the quality of teacher collaboration positively influences teacher performance and student achievement.

Figure 2 shows the summary on the extent of in training as to the nature of training, peer collaboration, peer coaching and study group involvement.

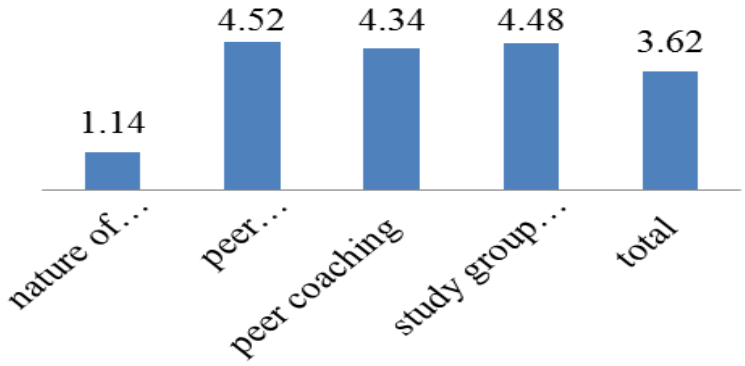

Figure 2. Summary on the Extent of Training of Teacher Participants.

Results show that the highest mean score obtained was on peer collaboration (4.52) which is very high. This means that most teacher participants were able to practiced peer collaboration among teachers in their school. This is supported by DepEd Order No.35, s.2016 “The Learning Action Cell (LAC) In the DepEd, which stipulates that a Learning Action Cell is a group of teachers who engage in collaborative learning sessions to solve shared challenges encountered in the school facilitated by the school head or a designated LAC Leader. LACs will become the school-based communities of practice that are positive, caring, and safe spaces. Key aspects of the process are on-going collaborative learning or problem solving within a shared domain of professional interest, self-directed learning, and reflective practice leading to action and self-evaluation, and collective competence”.

The nature of training on the other hand has the lowest mean (1.14) on the extent of in-service education. This is based on the premise that most of the LAC sessions happen in their school with a group of teachers who are in the same field or area of specialization, without really going to formal training, workshops or conferences. This is done to enable teachers to support each other to continuously improve their content and pedagogical knowledge, practice, skills, and attitudes (DepEd Order No.35, s.2016).

However, results have shown the extent of in-service education of teacher participants is high with a mean of 3.62. This means that in-service education capacitates teacher participants to do research and develop instructional materials.

Quality of the teachers trainings attended as to nature, content, scope of training, design of learning and assessment of learning.

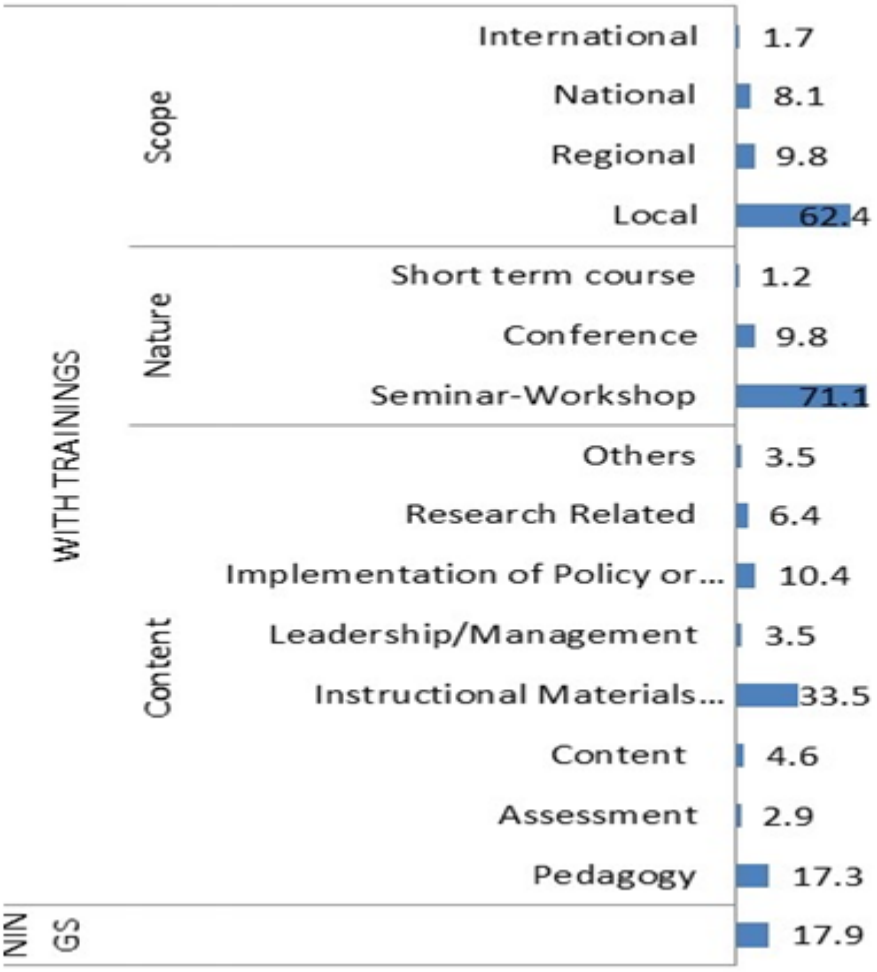

Figure 3. Percent Distribution of Teacher Participants as to Trainings Attended.

Data in Figure 3 reveal the nature of training attended. As to the nature of the trainings attended the majority of teacher participants (71.1%) attended the seminar workshop. This implies that the trainings attended are not purely a lecture type but they are also engage in the learning process. As to the content, most of the trainings attended are more on instructional materials related trainings (33.5%). This implies that teacher participants attended one or more trainings conducted by the College of Education, Caraga State University, Ampayon, Butuan City, under the extension project of the College, entitled “Teachers Training on Instructional Materials Development and Enhancement of their Research Capability. Training of Teachers on Instructional Materials (IMs) Development Extension project under the “Education in Caraga” extension program is now in its third year of implementation. Series of trainings has been conducted which truly empower teachers to be more effective in dealing with their students, this has been materialized because of the active partnership and support of the Department of Education (DepEd) Caraga Region together had been seeking ways to capacitate its educators in Caraga Region in developing technologies that will advance school management efficiency and efficacy in enhancing the content of elementary and high school K to12 curricula.

As to the scope (62.4%) consider the training as local since it is conducted locally at their school, district or at the College of Education. Data also reveals that 17.9% from teacher participants has no training from other institutions. This further suggests that some teachers have not given an opportunity to develop their professional career. Johnson and Fargo (2010) echoed these equity challenges, they note “Teachers in urban schools often are caught with many distractions occurring in a daily basis and struggle to engage learners who are often distracted by complicated lives outside of school”. Thus, challenges in implementing effective professional development where teacher professionals can attend professional development activities extend beyond the school and the classroom.

Table 2 shows the mean ratings on teachers' responses on the quality of training attended as to design of learning and assessment of learning.

As to the design of the learning teacher, participants agreed to most of the indicators. The indicators on the facilitator/instructor acted as a rich resource for their learning during the learning experience and having flexibility in designing their own learning experience got the highest mean (4.37). This implies meaningful professional development, where adult needs are considered. Beavers (2009) opined that meaningful professional development involves educators as a whole persons their values, beliefs and assumptions. Just as one should differentiate learning for students in the classroom, professional development for adults must also focus on their individual needs. However, the mean rating (4.17) on the indicator of the purpose of this learning experience was made clear to me got the lowest mean. This is further supported by teacher participants on the responses that "they don't really received the invitation, they just come because their principal or supervisors texted them to attend to such trainings."

Table 2. Quality of Trainings Attended by Teacher Participants as to Design of Learning and Assessment of Learning.

Indicators	Mean	Verbal Description
Design of learning		
The environment in this learning experience was engaging.	4.21	Agree
The purpose of this learning experience was made clear to me.	4.17	Agree
Learners were full partners with the facilitator in this learning experience.	4.20	Agree
The climate in this learning experience can best be described as collaborative.	4.30	Agree
The facilitator/instructor acted as a rich resource for my learning during this learning experience.	4.37	Agree
I had flexibility in designing my learning experience (activities, assignments, etc.)	4.37	Agree
Assessment of learning		
I was satisfied with the extent to which I was an active partner in this learning experience.	4.21	Agree
I knew why the learning strategies were appropriate for the learning goals.	4.30	Agree
This learning experience was just what I needed given the changes in my life/work.	4.30	Agree
I feel that my mastery of this material will benefit my life/work.	4.29	Agree
The knowledge gained in this learning can be immediately applied in my life/work.	4.30	Agree
This learning experience motivated me to give my best effort.	4.24	Agree

As to the assessment of learning teachers, participants had agreed to all indicators. In an andragogical orientation, learners freely choose their learning goals and make independent decisions about what, how and when they want to learn. It is based on assumptions that learners are self-directed, have the capacity to make decisions for them, and have a range of life experiences that impact on their learning (Choy & Delahaye, 2003). This is evidenced by the high response rating of 4.30 on the indicators; that teacher participants knew why the learning strategies were appropriate for the learning goals, that the learning experience is what they needed given the changes in their life/work, and on the indicator that the knowledge gained can be immediately applied in their life/work. Among the indicators in the assessment of learning indicator on teacher participants satisfaction on the extent to which they are active partner of the learning experience got the lowest mean rating (4.21). Professional development should create a climate in which participants feel respected; encourage their active participation; build on their experiences; employ collaborative inquiry; guide learning for immediate application; and empower the participants through reflection and action based on their learning (Lawler & King as cited in Lawler, 2009). This further implies that facilitators in trainings would consider this adult principle and conduct more planning and preparations to meet adult learners need.

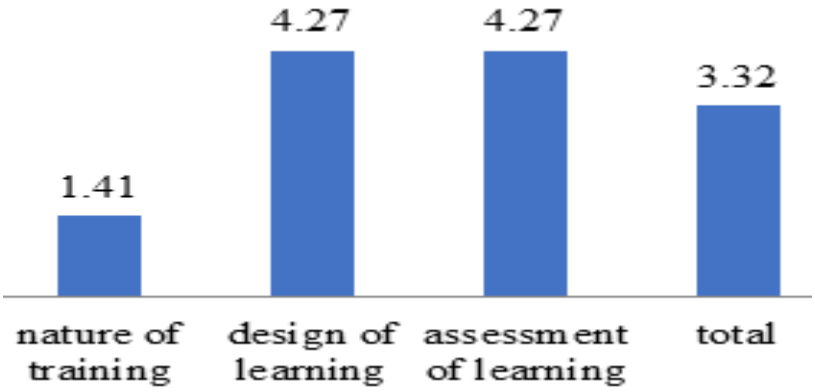

Figure 4. Summary on the Quality of Teachers' Trainings Attended.

Figure 4 reveals that the design of learning and assessment of learning has the higher mean (4.27). This means that teacher participants can already manage their own learning able to identify the relevance and the quality of training attended. Darling-Hammond, Hyler, & Gardner (2017) highlighted that professional development programs that had teachers engage as learners through the use of curriculum and materials they would then employ with their students. The nature of training had the lowest mean, this implies that teacher participants are not particular as to the nature, adult learners are more particular with engagement or being an active learner. Active learning, in sharp contrast to sit-and-listen lectures, this is highly contextualized professional learning (Darling-Hammond, Hyler, & Gardner, 2017).

On the other hand a total mean of 3.32 connotes a higher mean. This implies that the training attended is of quality able to engage adult learners in the learning process. Teacher preparation and training consider teachers as adults that initiate the learning process in the classroom. Teachers need to become life-long learners so as to keep abreast with their students in the changing era and education perspective (Morales, 2016).

Teachers' capability on research-based instructional materials development (RB-IMD) as to needs analysis, instructional materials development process, research production, fund sourcing, collaboration with users & other experts, research dissemination, and research utilization

This part presents the analysis on the teachers' capability on research-based instructional materials development (RB-IMD) as to needs analysis, instructional materials development process, research production, fund sourcing, collaboration with users & other experts, research dissemination, and research utilization. The results are presented in Table 3, Figures 7, 7.1 and 7.2.

Table 3 shows teachers' capability on research-based instructional materials development (RB-IMD) as to needs analysis and instructional materials development process.

Table 3. Teachers' Capability on Research-Based Instructional Materials Development as to Needs Analysis and Instructional Materials Development Process.

Indicators ***I was able to:***		**Mean**	**Verbal Description**
Needs analysis			
1	identify users and uses of the needs analysis	3.92	Agree
2	describe the target population and the service environment	3.86	Agree
3.	identify problems and needs	4.01	Agree
4.	assess the importance of the needs	3.99	Agree
5.	communicate the results to decision makers, users, and other relevant audiences	3.90	Agree

IMs development process *As I designed IMs I was able to:*			
1.	analyze the "instructional problem" and determine the learning objectives and goals.	3.84	Agree
2.	design a strategic "blueprint" of the materials and methods needed to achieve the learning objectives and goals.	3.76	Agree
3.	develop and create content based on the design blueprint and assemble into an instructional package or curriculum, which is then reviewed and revised based on feedback received.	3.77	Agree
4	implement the procedures that prepare facilitators to conduct and learners to participate in the learning event, as well as actions that support carrying out the activities and assessments as intended.	3.77	Agree
5.	evaluate learner performance or conduct pilot-testing.	3.73	Agree

The data reveals that teachers' participants had agreed on all indicators, in a moderate level, this implies that there are teachers who were not able to experience the needs analysis process in the conduct of Instructional Materials (IMs) development. However, there is a higher response on the indicator on they can identify problems and needs (4.01). It is essential that teachers learn how to identify the needs of their students and their own professional learning needs. They also need to develop a self-regulatory skill that will enable them to monitor and reflect on the effectiveness of the changes they make to their practice (Timperley, Wilson, Barrar, Fung, 2008).

Moreover, with regards to teachers' capability on research-based instructional materials development (RB-IMD) as to instructional materials development process, data show teacher participants had agreed in all indicators mentioned. Significant findings on the indicator with the highest response mean rating of 3.84, that as teacher-designed IMs they are able to analyze the "instructional problem" and determine the learning objectives and goals. This implies that teacher participants are doing an analysis phase before making Instructional Materials. Participants were able to highlight a research-based IMs development, where the instructional problem is clarified, the instructional goals and objectives are established, and the learning environment and learner's existing knowledge and skills are identified.

However, as to the response, as they are able to evaluate learner performance or conduct pilot-testing on the Instructional Materials developed, this has the lowest rating (3.73) in all the indicators. This further implies that some of the teacher participants fail to accomplish an important phase in the development of instructional materials, the evaluation phase which this phase is very important to make sure that IMs developers attain their goals and if the instructional materials are able to meet the learner needs (Las Johansen, Quisumbing, Funcion, Gotardo, Verecio, & Cinco, 2017).

Figure 5 presents the distribution of teacher participants in their capability on research-based instructional materials development as to research production. The teachers' participant research production was measured on the type of research conducted, the number of research conducted, the nature of collaboration among experts and practitioners, and the nature of fund sourcing. The data reveal that research production as to the type of research conducted that teacher participants had engaged in action research (18.6%), strategic intervention material (18.1%), improvised material (16.4), and science investigatory project (14.1). This implies that teachers are now starting to fully engage in research. However, the majority of teacher participants (63.3%) conducted only a few research or counted as one (1) research output in the type of research conducted. This research is funded personally (57.1%) and most of the participants are co-authors (27.7%). The finding further implies that research engagement needs collaboration among experts or a community of experts for it to flourish. As schools have increasingly structured teaching as a collaborative community endeavor, it makes sense that teacher collaboration is an important feature of well-designed Professional development (National Commission on Teaching and America's Workforce, 2016) "Collaboration" can span a host of configurations—from one-on-one or small-group interactions to school-wide collaboration exchanges with other professionals beyond the school (Darling-Hammond,

2009).

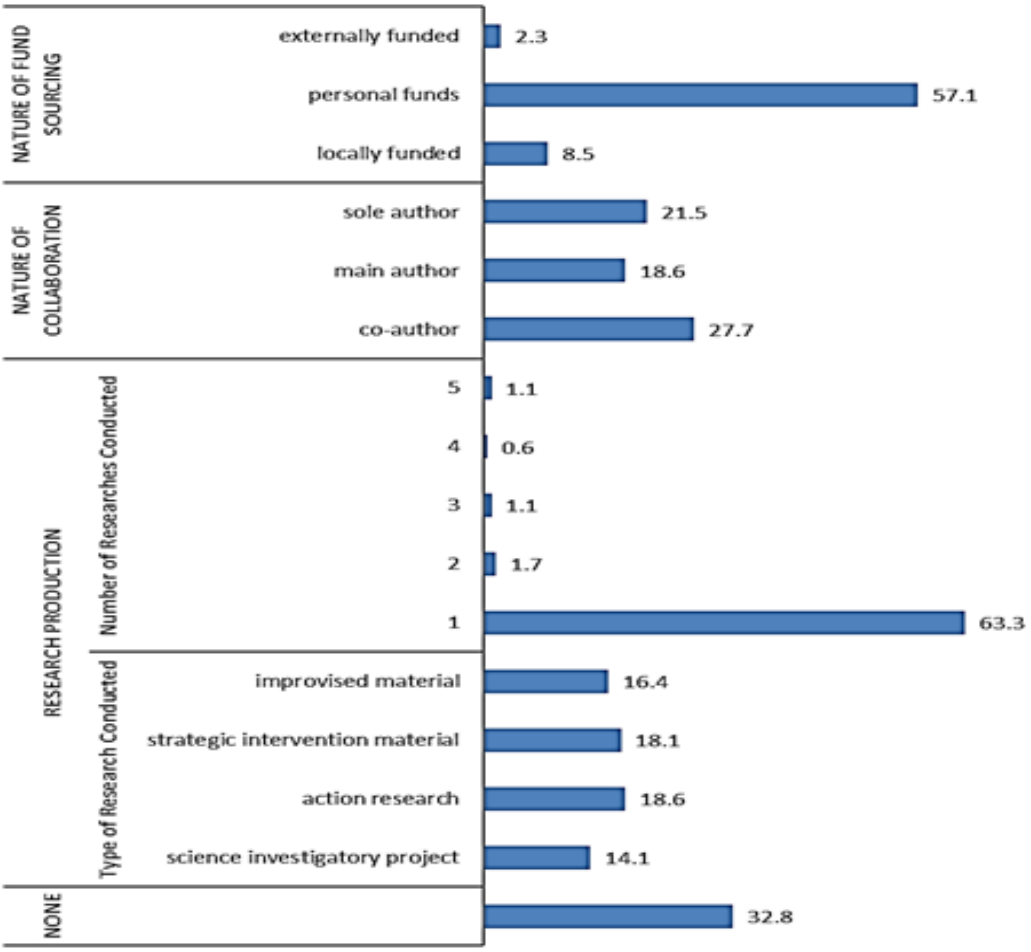

Figure 5. Percent Distribution of Teacher Participants in Their Capability on Research-Based Instructional Materials Development as to Research Production.

The data reveal that research generated by teacher participants is disseminated or presented in the regional level (54.5%), as to the type of research presented most of the teacher participants presented strategic intervention material (18.0%), this is more so in Science and Math subjects. Noteworthy findings on science investigatory projects (11.8) have the lowest percentage of presentations, even though Science teachers are encouraged to do an investigatory project, particularly in the science fair. As to the number of research presented, teacher participants agreed to have presented their research, yet findings have shown that only a few numbers of research presented had one (1) research presented or 47.2% of the teacher participants.

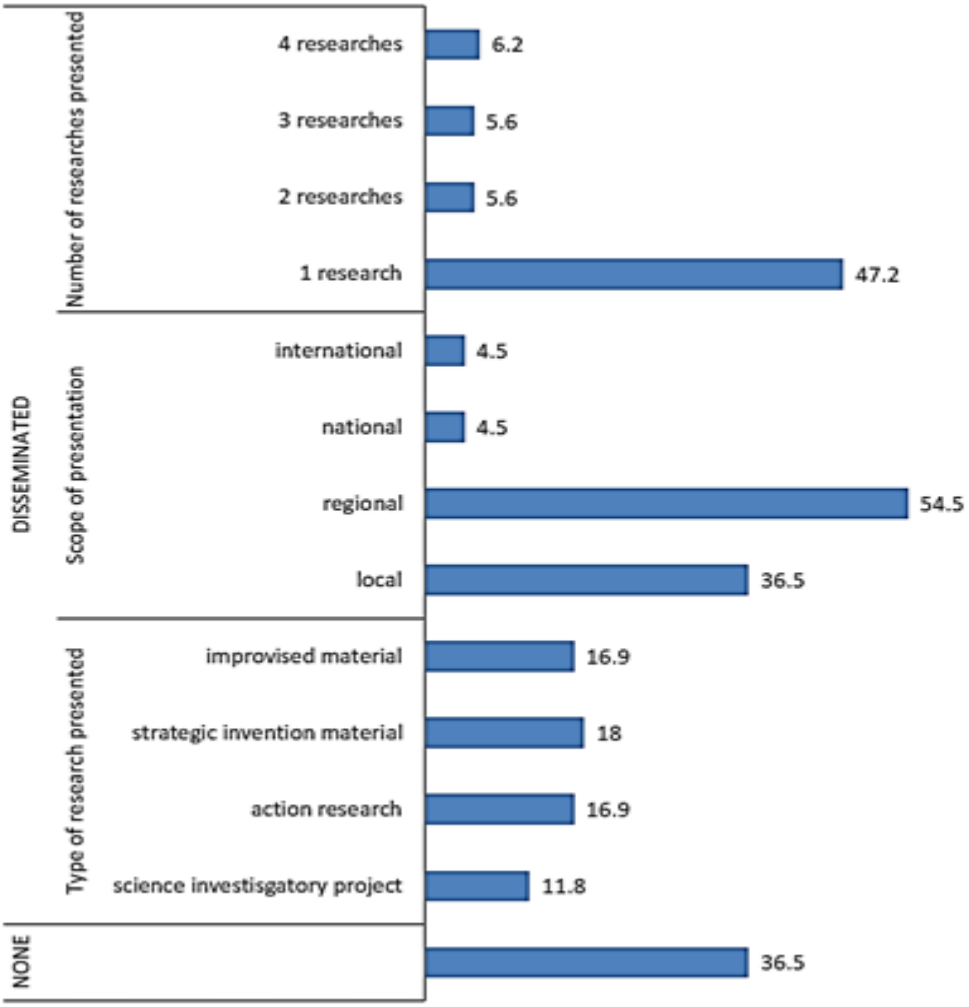

Figure 6. Percent Distribution of Teacher Participants in Their Capability on Research-Based Instructional Materials Development as to Research Dissemination.

The result implies that teacher participants are not that engaged in research, though there are regional presentations attended (54.5), still a great percentage are not engaged in research. This implies that these teachers need to be trained and collaborate with experts in research. Morales (2016) in her study stated that University researchers collaborate with basic education teachers to form research cells or teacher networks is foreseen to bring heaps of success in the conduct of action research. Hence, participative action research can uplift Philippine teacher professionalization and teacher promotion for teacher quality and quality education. Moreover doing research is highly encouraged in DepEd through DepEd Order no. 66, s. 2007, stipulates criteria in assessing teachers for promotion highly hinge on teacher education and meritorious accomplishment especially in research and development focused on the conduct of action research in varied levels.

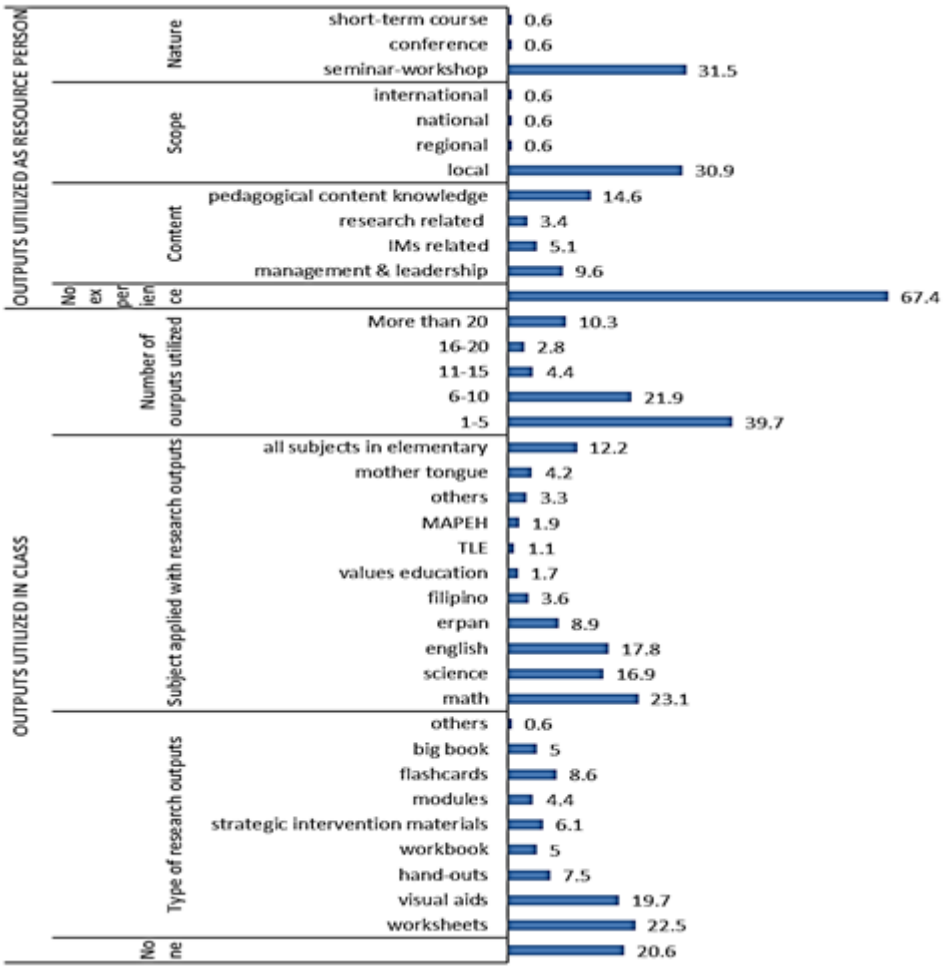

Figure 7. Percent Distribution of Teacher Participants in Their Capability on Research-Based Instructional Materials Development as to Research Utilization.

Figure 7 presents the percent distribution of teacher participants in their capability on research-based instructional materials development as to research utilization. As to research utilization outputs utilized in class and outputs utilized as resource person is considered. Data have shown that all subjects were applied with research outputs since teacher participants were diverse having different specializations. The highest response is in math subjects (23.1) for both elementary and secondary teacher participants. As to the type of research output, worksheets, and visual aids are the most developed (22.5 mad 19.7) respectively. As to the number of outputs utilized 39.7% agreed to have utilized around 1 to 5 outputs. Moreover, as to outputs utilized as resource persons, where teacher participants are invited as resource persons data reveal that as to content it is more on pedagogical content knowledge (14.6%) and less response on research related (3.4%), where most these outputs utilized teacher participants were invited in a seminar-workshop (31.5%).

A significant relationship between the educational preparation, in-service education, quality of the training/s attended, and teachers' capability in Research-Based Instructional Material Development (RBIMD)

This section presents correlation analyses between educational preparation, in-service education, quality of the training attended and teachers' capability in research-based instructional materials development.

Table 4 shows the results on the analysis of the correlation between the independent variables and the variables of teachers' research capability on RB-IMD in terms of needs analysis and development process.

Table 4. Extent of In-Service Education among Teacher Participants Capabilities in Rb-Imd as to Needs Analysis and Development Process.

Independent Variable	**Capability on Research-Based Instructional Materials Development**			
	Needs analysis		**Development process**	
	R-coeff	**p-value**	**R-coeff**	**p-value**
Educational preparation				
Highest educational attainment	0.024	*0.802*	-0.037	*0.695*
Accreditation status of program graduated	0.102	*0.277*	-0.008	*0.936*
Research Preparation	0.072	*0.446*	0.102	*0.276*
In-Service Education				
Extent of in-service training				
Content of training	0.186*	*0.050*	0.113	*0.228*
Nature of training	0.192*	*0.040*	0.133	*0.157*
Scope of training	0.177	*0.059*	0.125	*0.183*
Peer collaboration	0.071	*0.450*	0.064	*0.499*
Peer coaching	0.150	*0.109*	0.051	*0.591*
Study group involvement	0.113	*0.228*	0.138	*0.142*
Quality of Teachers' Training Attended				
Nature of training				
Content of training	0.170	*0.070*	0.231*	*0.013*
Nature of training	0.107	*0.256*	0.146	*0.120*
Scope of training	0.157	*0.094*	0.236*	*0.011*
Design of learning	0.187*	*0.048*	0.139	*0.139*
Assessment of learning	0.202*	*0.030*	0.185*	*0.049*

Correspondingly the null hypothesis- there is no significant relationship between the educational preparation and teachers' capability in Research-Based Instructional Material Development (RBIMD). The data reveal that Teachers' capability on RB-IMD has no significant correlation with educational preparation (p-values greater than 5%). Literature (Falk & Blumenreich, 2005; Alber & Nelson, 2002) noted that classroom research is one way of improving reflectivity. They claimed that classroom research helps improve various aspects of learning in the classroom. Significant documentation also provides evidence that effective professional development of teachers heavily depended on reflective teaching (O'Sullivan, 2002). Foregoing results suggests that the research capability of teachers does not correlate with educational preparation because undergoing research is based on reflective practice. In the study of Morales (2016), where she reviews participatory action research as an approach to teacher professional development. In her study, it draws ideas of combining the features of Action Research (AR) and Participatory Action Research (PAR) to plot research cell design or teacher network design to enhance research for action, action for research and creation of knowledge and theories while solving problems occurring in classroom settings.

Teachers' capability on RB-IMD as to needs analysis has significant positive correlation with the extent of their in-service training as to content and nature of training (R=0.186, p-value=0.050 & R=0.192, p-value=0.040, respectively). This implies that those teacher participants who are highly exposed to research related or were exposed to varied pieces of training tend to be more competent in doing RB-IMD. Relatively, Mizell, H. (2010) attests to the importance of this finding, by explaining that Professional development is most effective when it occurs in the context of educators' daily work. She further explains that school-based professional development helps educators analyze student achievement data to immediately identify learning problems, develop solutions, and promptly apply those solutions to address students' needs. Therefore, the extent of teachers' in-service training as to nature and scope significantly contributed to teachers' capability as to needs analysis because teachers benefit most in the in-service training if they can immediately apply what they learn, especially in the classroom setting.

Peer collaboration, peer coaching and study group involvement do not correlate significantly with the teachers' capability on RB-IMD as to needs analysis and IMs development process. This finding supports on the low responses of the indicators in peer collaboration, peer coaching, and study group involvement in the indicators; if they have established norms, model diverse opinions and/or innovations and if they share how instructional materials work in class. This implies that teacher participants did not received extra support from peers leading to a negative relationship to teachers capability on RB-IMD as to needs analysis and development process. Because in the study of Mizell, H. (2010) states that teachers' especially new teachers' jungle on overwhelming number of unfamiliar issues, if these unfamiliar issues are left to themselves, they may develop counterproductive behaviors. However, teachers who received intensive mentoring had a significant effect on student achievement (Strong, Fletcher, & Villar, 2004). This is also supported by Learning Forward (2011) as cited by Killon, J., (2015) states that collaboration of teachers when practiced with a focus on instructional strategies, curriculum, and assessment particularly has benefits to both teachers and students.

Teachers' capability on RB-IMD as to IMs development process has significant positive correlation with the quality of teachers' training attended as to content and scope of training (R=0.231, p-value=0.013 & R=0.236, p-value=0.011, respectively). This positive correlation can be noted in Figure 4.4 as to the trainings attended with other institutions as to the content of the trainings attended most of the teacher participants (33.5) attended instructional materials development related trainings and as to the scope majority of teacher participants attended seminar-workshop (62.4%) where they are highly engaged in the learning process. "Professional development is more effective when teachers participate with others from their school, grade, or department" (Porter, A. C., Garet, M. S., Desimone, L. D., Yoon, K. S., & Birman, B. F. 2000).. In research on adult basic education professional development, Smith, C., Hofer, J., Gillespie, M., Solomon, M., & Rowe, K. (2003) also found that teachers from the same adult basic education program participating together in professional development changed their thinking and acting more after the professional development, as compared to teachers who participated without other teachers from their workplace.

The quality of teachers' training attended as to the design of learning has a significant positive correlation with the teachers' capability on RB-IMD as to needs analysis (R=0.187, p-value=0.048). A positive correlation can be traced to the content of training attended; most of the teacher participants had attended the instructional materials-related training, in which they are taught to conduct needs analysis in developing a RB-IMD. This implies that the quality of training attended by teacher participants greatly contribute to their capability in RB-IMD as to the design of learning. As these teachers attend training they also collaborate with other teachers. Learning Forward (2011) as cited by Killon, J., (2015) opined that teacher collaboration is a powerful learning design. This standard emphasizes using active engagement, appropriate learning designs, and application of theories and research on learning.

Quality of teachers' training attended as to assessment of learning has a significant positive correlation with the teachers' capability on RB-IMD as to needs analysis and IMs development process (R=0.202, p-value=0.030 & R=0.185, p-value=0.049, respectively). The finding further suggests that the learning experience gained from the trainings attended is beneficial and is timely to their life and work as a teacher. Since most of the trainings attended from other institutions are about instructional materials development related, this is very essential to the teaching and learning process and with the change of curriculum to K-12 curriculum and with the spiraling progression approach, teachers in the field are in quandary on what to do. This is actually a marked of change as Sowder (2007) maintains that professional growth is characterized or "marked by change in teachers' knowledge, beliefs, and instructional strategies."

Table 5 shows that the correlation between the Independent Variable and Teachers' Research Capability on RB-IMD in terms of Research Production has significant positive correlations in terms of educational preparation with nature of research conducted, number of outputs produced, collaboration with users and other experts and fund sourcing. The (R 0.230, p-value 0.013, R 0.248 p –value 007 , R 0.211 p value- 0.023 , R 0.269p-value .0004 respectively. This implies that teachers must be equipped in their research preparation as mentioned that researcher should acquitted in the identifying research questions and formulating the research problem according to Dash (2005).

Table 5. Statistics on the Correlation between the Independent Variables and Teachers' Research Capability on Rb-IMD in Terms of Research Production.

		Capability of RB-IMD in Terms of Research Production				
Independent Variable	**Statistics**	**Nature**	**Number**	**Collabo-ration**	**Fund Source**	**Total**
Educational Preparation						
Highest educational attainment	R-coeff	0.230*	0.248**	0.211*	0.269**	0.240**
	p-value	0.013	0.007	0.023	0.004	0.010
Accreditation status of program graduated	R-coeff	0.141	0.137	0.136	0.130	0.130
	p-value	0.133	0.143	0.146	0.165	0.166
Research Preparation	R-coeff	-0.113	-0.136	-0.148	-0.154	-0.141
	p-value	0.227	0.146	0.116	0.099	0.134
In-Service Education						
Extent of in-service training						
Content of training	R-coeff	0.307**	0.317**	0.339**	0.306**	0.312**
	p-value	0.001	0.001	0.000	0.001	0.001
Nature of training	R-coeff	0.277**	0.291**	0.314**	0.278**	0.28**
	p-value	0.003	0.002	0.001	0.003	0.002
Scope of training	R-coeff	0.253**	.259**	.282**	.254**	0.259**
	p-value	0.006	0.005	0.002	0.006	0.005
Peer collaboration	R-coeff	0.124	0.123	0.144	0.158	0.157
	p-value	0.187	0.189	0.126	0.091	0.094
Peer coaching	R-coeff	0.189*	0.171	0.179	0.202*	0.189*
	p-value	0.043	0.067	0.056	0.030	0.043
Study group involvement	R-coeff	0.126	0.104	0.096	0.163	0.128
	p-value	0.180	0.270	0.308	0.082	0.172
Quality of Teachers' Training Attended						
Content of training	R-coeff	-0.064	-0.035	-0.048	-0.024	-0.034
	p-value	0.495	0.709	0.612	0.803	0.718
Nature of training	R-coeff	-0.121	-0.095	-0.096	-0.08	-0.095
	p-value	0.197	0.315	0.307	0.397	0.314
Scope of training	R-coeff	-0.062	-0.033	-0.028	-0.021	-0.029
	p-value	0.509	0.723	0.768	0.821	0.755
Design of learning	R-coeff	0.044	0.02	0.056	0.094	0.067
	p-value	0.641	0.836	0.555	0.316	0.477
Assessment of learning	R-coeff	0.06	0.026	0.072	0.083	0.073
	p-value	0.521	0.787	0.445	0.376	0.440

More so with the trainings, in terms of the content of training, nature of training, scope of training and peer coaching is significantly correlated in terms of nature of research conducted, number of outputs produced, collaboration with users and other experts and fund sourcing with (R .037 p-value .001,0.37 p-value .001, R 0.339 p-value .000 R 0.306 p-value 0.001 R.312 p-value 0.001 , R .189 p-value 0.043) respectively . This implies that teachers need to undergo service training/ workshop specifically in research preparation and production.

Table 6 shows the results on statistics on the correlation between the independent variable and Teachers 'Research Capability on RB- IMD in terms of Research Dissemination.

Teachers 's Capability in RB-IMD in terms of dissemination as to the number, nature and scope of research presented has significant positive correlation with the educational preparation as to the highest educational attainment (R= 0..181 p-value 0.052 , R =.184 p-value 0.049 , R=.174 p=value0.62 respectively). The implication is

that the higher the educational attainment of the teachers and exposed/ involved in research preparation/ publication, it is easier to do the research dissemination through peer /co- teachers in the same field of specialization. In research Universities, dissemination of research is highly encouraged and DepEd continues to promote and strengthen the culture of research.

Table 6. Statistics on the Correlation between the Independent Variables and Teachers' Research Capability on Rb-Imd In Terms of Research Utilization.

		Capability on RB-IMD in terms of Research Utilization		
Independent Variable	**Statistics**	**Type**	**Number Developed**	**Number Utilized**
Educational Preparation				
Highest educational attainment	R-coeff	-0.058	-0.052	-0.084
	p-value	0.54	0.578	0.373
Accreditation status of program graduated	R-coeff	0.149	0.139	0.151
	p-value	0.113	0.138	0.108
Research Preparation	R-coeff	0.016	0.163	0.179
	p-value	0.862	0.082	0.055
In-Service Education				
Extent of in-service training				
Content of training	R-coeff	0.148	0.185*	0.201*
	p-value	0.115	0.048	0.031
Nature of training	R-coeff	0.136	0.170	0.186*
	p-value	0.147	0.069	0.046
Scope of training	R-coeff	0.1	0.119	0.134
	p-value	0.29	0.206	0.152
Peer collaboration	R-coeff	0.199*	0.151	0.126
	p-value	0.033	0.106	0.181
Peer coaching	R-coeff	0.117	0.110	0.080
	p-value	0.211	0.242	0.394
Study group involvement	R-coeff	0.021	0.008	-0.021
	p-value	0.825	0.93	0.825
Quality of Teachers' Training Attended				
Content of training	R-coeff	-0.027	-0.177	-0.194*
	p-value	0.772	0.059	0.038
Nature of training	R-coeff	-0.036	-0.173	-0.182
	p-value	0.702	0.065	0.051
Scope of training	R-coeff	0.010	-0.117	-0.126
	p-value	0.919	0.212	0.179
Design of learning	R-coeff	0.171	0.093	0.075
	p-value	0.068	0.321	0.424
Assessment of learning	R-coeff	0.105	0.091	0.071
	p-value	0.264	0.333	0.449

Moreover, finding have shown that there is a significant positive correlation with the extent of in-service education as to content of training with the teachers' capability in RB-IMD in terms of research utilization as to the number of IMs developed and utilized (R=0.185, p=0.048, R=0.201, p=0.031, respectively). Teachers' capability in RB-IMD in terms of research utilization as to the number of IMs utilized has a significant positive correlation with the trainings as to the nature of training (R=0.186, P=0.046). Moreover, Teachers' capability in RB-IMD in terms of research utilization as to the type of IMs developed has a significant positive correlation with the trainings as to peer collaboration (R=0.099, P=0.033). In this light, a significant point raised in the study is traceable in the trainings

attended and strong agreement in the indicators of peer collaboration; teacher participants attended seminar-workshop in instructional materials development. The trainings help them to have understanding on the importance of research-based instructional materials development, thus developed and utilized IMs. Moreover, significant positive correlation is detected in peer collaboration in research utilization because research participants were able to support the work of the team, share responsibility and leadership, work together with group of people whose interest and goal ate the same, able to contribute with the team and build healthy relationship. Buczynski, S. &. Hancen, C.B. (2010), teachers create a collective force for improved instruction and serve as a support group for each other's work on their practice.

However, there is no significant correlation with the trainings as to the scope of training, peer coaching, study group involvement with teachers' capability in RB-IMD in terms of research utilization as to the type and number of IMs developed and utilized (p-values greater than 5%). This implies that though the teacher participants met with colleagues' locally and often share both positive and constructive reactions to authentic instances of teacher practice such as lesson plans, demonstration plans, or videos instruction, Woodworth, Arshan, & Gallagher (2017) does not necessary mean that they can developed and utilized IMs, hence Knapp (2003) supports that Professional development that is sustained, offering multiple opportunities for teachers to engage in learning around a single set of concepts or practices, has a greater chance of transforming teaching practices and student learning.

However, an alarming result on the negative correlation on the quality of trainings attended as to content of training (R=-0.194, p=0.038). Even though these teachers had undergone IMs development training, this can be traced on the IMs utilized it is more on worksheets and visuals aids, the output of the training conducted is more on modules. There is also no significant correlation with the in-service education as to the quality of trainings attended as to the design of learning and assessment of learning capability with teachers' capability in RB-IMD in terms of research utilization as to the type and number of IMs developed and utilized (p-values greater than 5%). This means that the agreement in the indicators of the quality of trainings attended as to the design of learning and assessment of learning is more on how the teacher participant perceived his or her learning in each experience. Darling-Hammond, Wei, Andree, Richardson, & Orphanos (2009) stated that though research has not yet identified a clear threshold for the duration of effective professional models, it does indicate that meaningful professional learning that translate to changes in practice cannot be accomplished in short, one-off workshops.

Table 7. Statistics on the Correlation between the Independent Variables and Teachers' Research Capability on Rb-Imd in Terms of Research Utilization.

Independent Variable	**Statistics**	**Capability on RB-IMD in terms of Research Outputs Utilized as Resource Speaker**			**Total**
		Type	**Nature**	**Scope**	
Educational Preparation					
Highest educational attainment	R-coeff	0.272**	0.257**	0.262**	0.108
	p-value	0.003	0.006	0.005	0.250
Accreditation status of program graduated	R-coeff	0.052	0.023	0.019	0.124
	p-value	0.583	0.81	0.839	0.188
Research Preparation	R-coeff	-0.162	-0.179	-0.179	-0.005
	p-value	0.084	0.055	0.055	0.961
In-Service Education					
Extent of in-service training					
Content of training	R-coeff	0.429**	0.440**	0.448**	0.368**
	p-value	0.000	0.000	0.000	0.000
Nature of training	R-coeff	0.412**	0.424**	0.432**	0.347**
	p-value	0.000	0.000	0.000	0.000
Scope of training	R-coeff	0.403**	0.425**	0.431**	0.318**
	p-value	0.000	0.000	0.000	0.001

Peer collaboration	R-coeff	0.283**	0.287**	0.287**	0.297**
	p-value	0.002	0.002	0.002	0.001
Peer coaching	R-coeff	0.237*	0.229*	0.230*	0.207*
	p-value	0.011	0.014	0.014	0.027
Study group involvement	R-coeff	0.148	0.136	0.14	0.067
	p-value	0.115	0.147	0.135	0.474
Quality of Teachers' Training Attended					
Content of training	R-coeff	0.106	0.105	0.116	-0.043
	p-value	0.260	0.264	0.216	0.648
Nature of training	R-coeff	0.158	0.185*	0.193*	-0.006
	p-value	0.091	0.048	0.039	0.948
Scope of training	R-coeff	0.192*	0.213*	0.219*	0.041
	p-value	0.040	0.022	0.019	0.661
Design of learning	R-coeff	0.216*	0.250**	0.256**	0.245**
	p-value	0.020	0.007	0.006	0.008
Assessment of learning	R-coeff	0.302**	0.337**	0.341**	0.251**
	p-value	0.001	0.000	0.000	0.007

Table 7 shows the results on the statistics on the correlation between the independent variables and the variables of teachers' capability in RB-IMD in terms of research outputs utilized as Resource Speaker as to the type, nature, and scope of speaking engagement.

Teachers' capabilities in RB-IMD in terms of Research Outputs Utilized as Resource Speaker as to the type, nature and scope of training has a significant positive correlation with educational preparation as to the highest educational attainment (R=0.272, p=0.003; R=0.257, p=0.006 & R=0.262, p=0.005 respectively). As a result of teachers' participation to trainings they gained confidence and expertise resulting to have significant correlation with the utilization of this research outputs as resource speaker. However, there is no positive correlation as to the accreditation status of program graduated and research preparation. This means that educational preparation whether a program is accredited or whether teacher participants had research preparation does not directly influence research utilization as to outputs as speaker in a training. In the study of Zuzovsky (2009) stated that duration of the preparation periods does not differentiate with high or low duration of the preparation period as to the effectiveness of teachers.

An analysis on the relationship between Teachers' capabilities in RB-IMD in terms of Research Outputs Utilized as Resource Speaker as to the type, nature and scope of training with the in-service education indicators indicates sufficient evidence to show significant positive correlation as to the content, nature and scope of training and peer collaboration and peer coaching. Significant results are indicated in bold and asterisk face with the level of significance as exponents of the coefficients. This significant positive correlation indicate that teacher participants were truly engaged with their own school, district or division through sharing their expertise as resource speaker, as they already had gained knowledge and skills in IMs development.

Quality of trainings attended as to the nature of training has significant positive correlation with the Teachers' capabilities in RB-IMD in terms of Research Outputs Utilized as Resource Speaker as to the nature and scope of training (R=0.185, p=0.048 & R=0.193, p=0.039 respectively). As to scope of training there is also a significant positive correlation (R=0.192, p=0.040; R=0.213, p=0.022 & R=0.219, p=0.019 respectively) with Teachers' capabilities in RB-IMD in terms of Research Outputs Utilized as Resource Speaker as to the type, nature and scope of training. Moreover, Quality of trainings attended as to the learning design and assessment of learning has significant positive correlation with the Teachers' capabilities in RB-IMD in terms of Research Outputs Utilized as Resource Speaker as to type, nature and scope of training. This positive significant correlation is traceable on how teacher participants value the training attended as to the indicator that the knowledge gained in this learning can be immediately applied in their work, one of the pieces of evidence of that application is through sharing it with others

in the in-service training.

5. CONCLUSION AND RECOMMENDATION

The quality of training as to the design and assessment of learning create an impression on their satisfaction as an active learner and the knowledge gained will be applied in their work, therefore the experienced in the training can be useful in teachers' daily classroom undertakings especially with IMs development. Regarding research production, research dissemination, most of the teacher participants do not have engagement in action research. As to fund sourcing and collaboration with their research outputs, teacher participants still have limited access with other funding agencies or scholarships. Therefore, engaging them professional development in research and IMs development can enhance their capability. Finally, teacher participants can produce and utilizing IMs in their classes and able to do speaking engagement to share their knowledge and expertise. Teachers' capability can be a great asset for these teachers to develop more IMs to be utilized in their classroom and share it with others through bringing them as an example in an speaking engagement about RB-IMD.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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