A participatory action research (PAR)-influenced mentoring program for graduate students

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ABSTRACT

The study described a mentoring program of a state-funded research and its effects on research and reflective practices to graduate students. Participatory Action Research (PAR), designed as a methodical and program framework, engaged nine mentors (researchers of a state-funded research) and 29 graduate students (purposively invited) to training-based mentoring (workshops and field work), small group mentoring (within research cells), and peer mentoring (field work and software-aided coding analysis). Observations, mentors' narrations, and reflection journals extracted the experiences of the participants on the mentoring program. These reflections revealed that mentors and mentees learned many skills in the mentoring program. They had transformed challenges and difficulties (time management, field work) into learning episodes leading to reflection-in-action and reflection-on-action. They realized the importance of the theory-practice-reflection paradigm in all research endeavors. Hence, PAR-influenced mentoring helped develop their research skills. However, low engagement of the others may be due to time aspect, which may be looked into in a replicated study.

Keywords: collaborative practice and action, learning episodes, reflective-practitioner, research skills

INTRODUCTION

As a response to the Fourth Industrial Revolution era (FIRe) and as a new education paradigm that could deal with the new disruption and uncertainty brought about by the global pandemic, Education 4.0 (E4.0) envisions knowledge-based economy, high global competitiveness index, and provision for continuity of learning (OECD 2018). Two key drivers of E4.0 that influenced most countries are: 1) quality Science, Technology, Engineering, Mathematics (STEM) education, and 2) a strong system of graduate education (Current trends in higher education 2014). This new-found core of graduate education seeks to develop professionals who are both knowledgeable (advanced knowledge) and skilled (soft skills: capability to lead, a team player, and is terms of quality (Conchada and Tiongco 2015). Thus, efforts gear towards improving the graduate programs able to communicate). Thus, the thrust focuses on investing in graduate education and research infrastructure in the field of STEM, which most closely influence FIRe.

The 2017-2022 Philippine Development Plan (NEDA 2017) and quality assurance in higher and advanced learning (CHED 2012) assert a competitive higher education in the country. However, a low completion rate is still evident. Data shows that only 41% of the 656 state universities and colleges (SUCs), and 23% of the 1,643 private higher education institutions (HEIs) have graduate programs. A skewed distribution of post baccalaureate programs is observed where the majority of program offering clumped on Education (35%), Business Administration (9%), and Nursing (9%) (Ofreneo 2014). These top programs ranked fair or poor in through a holistic development of students as professionals and academicians.

The concept of mentoring is anchored on several theories and has begun inching in the graduate education system to assist students to overcome related challenges and difficulties. These theories include stable and transitional periods as keys of the life cycle (Levinson 1986) and developmental theory by Freud, Jung, and Erickson (Dominguez and Hager 2013). Additionally, Kegan's theory focuses on transformative learning where the learner encounters the distinct stages of experiences (McGowan et al. 2007). Kram (1985) espoused multiple and simultaneous mentoring methods (traditional mentoring, group mentoring, peer mentoring), exemplifying the importance of mentoring relationships. This relationship may be enhanced through Appreciative Inquiry (AI) that identifies and cultivates the best in people through the art and practice of asking questions that strengthens a person's capacity to apprehend, anticipate and improve their potential (Stratton-Berkessel 2020).

This study emphasized peer and group mentoring models (Darwin and Palmer 2009) which require the mentee to remain open to unlearning old skills and learning new ones. Compared to the traditional paradigm of knowledge transfer and wisdom-passing from old to young (Darwin 2000), the model supports Higgins and Kram (2001) concept of mentoring as a development of diverse mentoring relationships or networks, where the mentor acts as a guide (Zachary and Fischler 2009).

Apparently, graduate mentoring in most institutions in the Philippines differ from what universities in other countries perpetuate. In other countries, a supervisor is assigned to a graduate student upon acceptance to the graduate program. This early engagement of the graduate student in choosing the research topic helps widen the reach of the student to available expertise, research trends and standards (Tanhueco-Tumapon 2016). Thus, the current study details how the current model observed in most Philippine institutions of higher learning may be supplemented through research immersion of graduate students by voluntary engagement in research work of the university even before they enroll in their terminal courses. These supplements encourage expansion of the view and practice of mentoring in the graduate program to start from enrolment to graduation. This schema also provides students with the opportunity to expand workforce development as a responsibility of community engaged research groups (Arrieta et al. 2018) and may help improve students' perceptions of research (Kiersma et al. 2012).

While these theories highlight mentoring, a minority of such studies traces mentoring in the fields of graduate education in the Philippines. In other countries, the use of participatory action research (PAR) as a mentoring framework has been articulated on few occasions (Burke and Hadley 2018). PAR roots on the general attributes of Action Research (AR) that includes participatory character and reflective practice (Kemmis and McTaggart 1988), implemented in mentor education as part of professional development (Aspfors and Fransson 2015). PAR seeks to bring theory and practice, in participation with others, in pursuit of practical solutions to issues of pressing concern to people (Reason and Bradbury 2008) and equality of participants through participation and action (Morales 2019).

Mentoring goes beyond unlearning and learning. It may be attributed to a two-way development of Technological-Pedagogical-Assessment-Content-Knowledge (TPACK) system of mentor and mentees. TPACK describes the acquisition and demonstration of instructional experiences integrating content, pedagogy, and technology in establishing effective instructional practice and environment (Koehler and Mishra 2008), which exemplifies concrete steps of mentor education (Aspfors and Fransson 2015). AI puts a more human perspective on the program, being grounded on positive psychology focusing on the strengths of people and what works well in co-designing their future (Tocino-Smith 2020). Thus, this study designed a mentoring program for graduate education courses in Science, Technology, Engineering, Agri/Fisheries, Mathematics (STEAM) grounded on PAR framework and AI approach to supplement the course and research works of graduate students. Specifically, the study sought to: 1. Describe the mentoring program for graduate students; 2. Describe the development of collaborative practice or action; and 3. Identify the benefits of the mentoring program on research skills and reflective practice.

METHODS

Research Design

The study documented the mentoring program of a state-funded research on the TPACK of Philippine tertiary teachers of courses in STEAM. This state-funded research is a collaboration of 10 (7 state universities and colleges [SUC], namely, Philippine Normal University as Lead Institution, Mindanao State University – Iligan Institute of Technology, Polytechnic University of the Philippines, University of the Philippines Manila, University of the Philippines Los Banos, Batangas State University, and West Visayas State University, and 3 private universities, namely, De La Salle University , Jose Rizal University, and Manuel S. Enverga University Foundation) higher education institutions (HEIs) in the country. Figure 1 shows that the mentoring framework designed using multiple cases labeled as the research cells. The PAR was utilized as methodical framework to implement a mentoring program to volunteer graduate students. The framework emphasized the mentors' (researchers from the 10

collaborating HEIs) and the graduate students' varying roles that defined how the latter may have acquired meaningful and rich learning experiences and how the former emphasized working on AI to draw positive outcomes from the participants. Grounded on PAR and AI, the program supplements the formal supervisor-advisee paradigm to help the latter complete the research requirement of their graduate programs.

Components of Graduate Programs under the State-Funded Institution

Typically, graduate programs in the Philippines include several academic courses with thesis as a terminal course for degree completion. Table 1 shows the course distribution for graduate programs in the lead institution of the state-funded research.

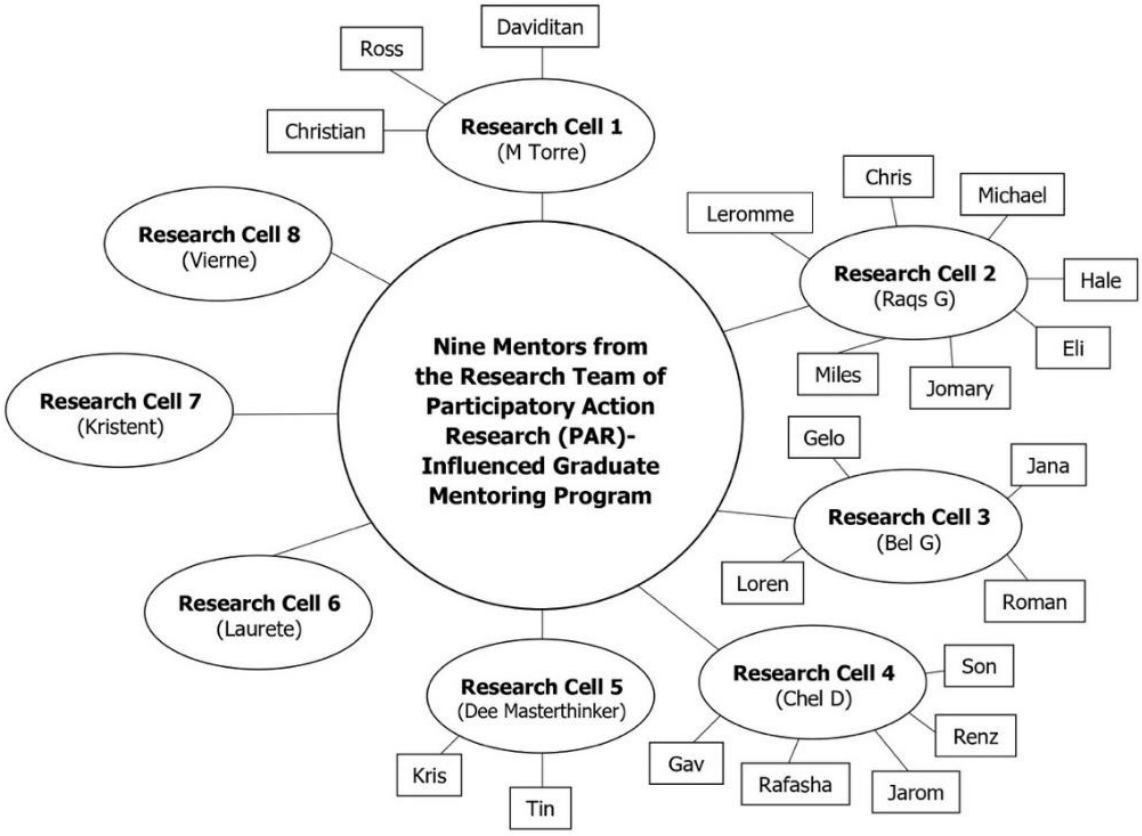

Figure 1. PAR-influenced mentoring framework for graduate education [names are pseudonyms]. The participants in oblong cell (senior mentees) were the first batch mentored by the nine researcher mentors, while in the rectangle cells (junior mentees) were the second batch mentored by the senior mentees.

Table 1. Program components and course distribution of graduate programs in the Lead Institution.

Components of the Programs	No. of Units	
	MA	PhD
Core Courses	9	12
Electives	3	6
Specialization Courses	18	24
Thesis/Dissertation	6	12
Foreign Language	0	6
TOTAL	36	60

Participants

A total of nine mentors (researcher from the 10 collaborating institutions of the state-funded research) and 29 graduate students (from the 10 collaborating institutions with names of the participants in this study as pseudonyms) were the participants of the mentoring program (Figure 1; Table 2). The first batch of mentees that included eight graduate students were purposively selected from the lead institution (Table 2).

The selection criteria include being currently enrolled in a dissertation course, working on his/her dissertation, and is a science/math education graduate student. These eight graduate students were labelled as the 'senior mentees' in Table 2 that defined each research cell in the study based on the methodical framework (Figure 1). These eight senior mentees had expressed their willingness to be part of the mentoring program (in their commitment forms) as supplement to the formal supervision by their official course (dissertation writing) supervisor. Permission was also sought for such an arrangement from the administration of the lead institution. The second batch of mentees included 21 graduate students who were in the different fields of STEAM education and mass communication programs and were active graduate students in any of the 10 collaborating institutions of the state-funded research. These second batch tagged as the 'junior mentees' in Table 2 populated five of the oblong cells (Figure 1). To qualify, the research team used the same selection criteria as aforementioned. They voluntarily signified their interest to join the mentoring program through the commitment form. They were also aware that the mentoring program is only ancillary to the formal supervision by their respective supervisors.

Instruments

Graduate mentoring reflection template/form. The form contained 11 questions. Four questions focused on the gained insights/learning of the mentees regarding their involvement in the mentoring program. The other seven questions highlighted their professional learning as they reflected on the whole research activity.

Graduate mentoring handbook. The handbook highlights salient information about how the mentoring program began, the pedagogical framework used in implementing the mentoring program, resources, policies, data collection instruments, guidelines for apprenticeship and the reflection templates by the mentees after their attendance in the different activities within the aforementioned state-funded research.

Table 2. Mentors and participants of the study in Participatory Action Research (PAR)-influenced mentoring program.

Nine Mentors from Research Team	Senior Mentees/Mentors in each Research Cells (PhD Science Education)	Junior Mentees	Program
Mentor 1 [M1] Mentor 2 [M2] Mentor 3 [M3] Mentor 4 [M4] Mentor 5 [M5] Mentor 6 [M6] Mentor 7 [M7] Mentor 8 [M8] Mentor 9 [M9]	Laureante	No junior mentees	
	M Torre	Ross	PhD Science Education
		Christian	MA Science Education
		Dadivitan	
	Raqs G	Leromme	MA in Information and communication
		Chris	MA in Mathematics
		Michael	
		Hale	
		Eli	MA Science Education
		Jomary	
		Miles	
	Bel G	Gelo	PhD Science Education
		Loren	
		Roman	
		Jana	
	Dee Masterthinker	Kris	MA Mass Communication
		Tin	
	Chel D	Gav	MA Science and Mathematics Education
		Rafasha	
		Jarome	
		Renz	
		Son	
	Kristent Vierne	No junior mentees	

Data Collection

Senior graduate mentees. The research team (mentors) documented the implementation of the entire mentoring program. In the implementation, recruitment of graduate student volunteers commenced before the data collection stage of the aforementioned state-funded research. The team first invited eight graduate students (senior mentees specified in Table 2) to join the meetings attended by the researchers of the aforementioned state-funded research, which also served as the invitees' immersion activity before their formal orientation to the project and to the mentoring program. After consent, the team oriented these senior mentees on the details and phases of the state-funded research. The team also sourced the challenges and difficulties the senior mentees are currently encountering in their research work and determined which research skills they want to learn or enhance. Upon consolidation of their needs, the research team presented the mentoring program from where these senior mentees could source knowledge and address their identified difficulties. Based on these needs, the research team conducted trainings on how to utilize the research instruments and discussed all requisites to data gathering (e.g. forms, allowances, allowable expenditures, government issuances on liquidation process and travel) procedures. There were free seminars/workshops (conducted in two to three days, in about five workshops) to train the senior mentees on interviewing, transcribing, and software-aided coding analysis. The research team (mentors) also provided the details of on-site transactions during the scheduled school visits for the state-funded research (data collection phase). Note that the program is not focused on assigning a specific mentee to a mentor, but each of the members of the research team is believed to be able to contribute as a mentor.

In order to develop collaborative practice and action and to identify the benefits of the mentoring program on research skills and reflective practice, the research team sent these senior mentees to actual field research works to collect country-wide data. The senior mentees were asked to accomplish the Graduate Reflection Template/Form for every assignment/deployment. They were also subjected to journaling technique as an approach to get an in-depth information about their experiences and challenges to describe and map the connections of their experiences in the mentoring program. Their journal entries were compiled for documentation and analysis.

Junior graduate mentees. Since the state-funded research requires nation-wide data, the team sourced new recruits (junior mentees) following the same selection criteria. For this second batch, the senior mentees served as immediate mentors to the junior volunteers (junior mentees). The senior mentees simulated all processes to formally orient the new batch of mentees (21, with eight active field researchers in the project). Here on, five research cells (Figure 1) were formed by assigning junior mentees to senior mentees. The senior mentees conducted tutorials (within their research cells) on how to administer interviews, classroom observation, and transcribe and implement software-aided coding analysis. With the PAR framework, the research team (mentors) coursed through assignments to field works to the senior mentees who communicate to their junior mentees within their research cells all pre-requisite data and processes needed for the conduct of the field work. The senior mentees also permitted the junior mentees within their research cell to work collaboratively with other members of the research team (mentors) and the other junior mentees who are assigned on the same field work. In detail, the research team involved the senior mentees in five out of seven components of the state-funded project. While the junior mentees concentrated on aiding the research team in terms of data gathering (three components of the project).

Data Analysis

The research team collated all graduate students' reflections through software-aided MAXQDA 2018 (VERBI Software 2019) coding analysis. Meticulous transcription, organization of responses, and abstractions were done on the reflections sourced from the accomplished templates. The transcripts were reviewed for errors and are read several times to immerse with the details of the interview before coding. Statements were broken into parts, gave prior meaning to codes, and noted the frequency of code occurrences. Finally, the research team assigned memos to the identified code system, to include the statements of the participants and finally crafted emergent themes from the constructed cluster of ideas.

RESULTS

The themes generated from the analysis match the three priori constructs: mentoring, collaborative action and practice, and benefits of the mentoring program.

Mentoring Program

The mentoring program trained six of the eight (75%) senior mentees for the first round of data collection (February to December 2018) and 21 junior mentees for the second batch of mentoring (January 2019 - March 2019) (Table 3).

The mentoring and training activities in each research cell enabled transfer of technology (interview strategies, data collection approaches, correspondence to other officials, coding and data analysis), and

upskilled members of each of the research cells through peer mentoring.

Collaborative Practice and Action

Table 4 shows the abstraction process done on the coded responses leading to the theme, collaborative practice and action. This abstraction process denotes that their challenging experiences (e.g. test of self-confidence) are stimulants of action and collaboration to counter these struggles.

Benefits of Mentoring Program on Research Skills, and Reflective Practice

Table 5 shows that the thematization of one of the prior constructs labeled as benefits of the mentoring program on research skills and reflective practice, emphasize three major categories that feature reflective-practice. As shown, the three categories cover a wide range of competencies of teacher-researcher which include technological capacity, research skills and professional and personal enhancement.

Table 3. Training and activities in mentoring program for senior and junior mentees.

Senior Mentors (pseudonyms)	Junior Mentees	Training and Mentoring Activities
Raqs G	7	• Batch 1 of Field work (February to December 2018) • Attendance to all the five 2-3-day workshop (be the research team on different topics in research) • Mentoring sessions of and constant communication (through face-to-face, short-messages, email or social media) with junior mentees • Batch 2 of Field work (January 2019 - March 2019)
Bel G	4	
M Torre	3	
Chel D	5	
Dee Masterthinker	2	
Laurente	0	• Field work (February to May 2018) • Attendance to all the five 2-3-day workshop (be the research team on different topics in research)
Kristent	0	• Attended 1 of 5 workshops • Had administrative tasks leading them to forego the program
Vierne	0	
TOTAL	21	

Table 4. Abstraction of coded responses of participants leading to the category, 'collaborative practice and action'.

Sample verbatim responses	Code (f=frequency)	Category	Theme
"My blood ran cold as I initially faced them, but eventually I realized that I have to establish confidence doing it." [M Torre]. "I stuttered and still felt nervous in asking questions during the interview." [Laurente] "In the interview phase, I had difficulty communicating the questions to the respondents since they have different perspectives or frame of reference, that is why I had to simplify the questions and give more probing questions."	Test of self-confidence (f=12)	Challenges to address	Collaborative Practice and Action
"They (students in the participating institutions) speak in their own language [dialect or L1], and their teacher allowed them, so I was not able to understand the content because of the language barrier" [Bel G].	Use of dialect (f=12)		
"Since my mentees were also employed and are also enrolled in their thesis writing, we all had difficulty in attending field works and scheduled meetings." [Dee Masterthinker]	Time management (f=4)		
"I think you should practice more on conducting the interview," [Mentor 1].	Practice (f=9)	Action and collaboration	
"I was happy to learn that I had mentees who successfully and actively participated in the field work." [Raqs G]. "I feel proud that I was able to contribute to improving the research skills of the members of my research cell, and this also developed me as a researcher and mentor as well" [M Torre].	Participate, contribute (f=4)		

Table 5. Benefits of the mentoring program on research skills, and reflective practice of the participants.

Sample verbatim responses	Code (f=frequency)	Category	Theme
"preparing, data gathering in a qualitative research instruments to be prepared. Instrument to be accomplished and signed prior to the interview like the consent form" [Dee Masterthinker]	Skills in qualitative research instruments (f=15)	Technical improvement	Benefits on Research Skills, and Reflective Practice
"workshops greatly help and develop my skills in coding qualitative data that easy"…We learned the nitty-gritty of qualitative research work. We get involved in transcribing and coding. I learned a lot. Memoing of the significant data, deciding what mother code can we make. These tasks helped us to be mindful of all the mother codes that we assign so that, it will be easier for us to do the coding and assigning daughter code" [M Torre]	Skills in coding (f=15)		
"It gears up my research skills and gives me confidence in doing qualitative research", "my skills as a qualitative researcher was honed" [M Torre]. "I was given the chance to apply the theoretical skills knowledge I acquired during the program. I was able to see the real picture of qualitative research, and challenges and problems of conducting qualitative study" [Bel G] "I would like to enhance my skills in conducting research and to be more involved in projects like this" [Laurente].	Improvement of research skills in general (f=15)	Research Skills improvement	
"I am looking forward to more productive research engagements with my learning institution to deliver quality research services to my future students" [Raqs G]. "The knowledge I gained during the mentoring process will be very helpful when I will be conducting my researchers. During the mentoring, I learned about the protocols in conducting interviews and classroom observations" (2) [Bel G]. "Honestly, my experiences were beyond words. On a personal note, it was indeed a meaningful and memorable academic learning endeavor" [Raqs G].	Learnings of participants (f=15)	Professional development and personal improvement	
"As a teacher, the experience and knowledge I gained from my involvement in this project and mentoring program will help me improve my teaching skills. As a research teacher, I could also see these to give more meaningful classroom discussions with my students." [Laurente]	Improvement of teaching of research skills (f=4)		
"Content upgrading is what we have drawn from the use of technology in research, and the learning derived from interacting with fellow STEAM educators." [Bel G].	Content upgrading (f=10)		

DISCUSSION

The study described a PAR-influenced mentoring program that highlights research cells as the unit skills improvement. Abstractions and thematization led to themes parallel to the aforementioned priori constructs.

Mentoring Program

In the mentoring program, Kegan's theory on the distinct stages of experiences (McGowan et al. 2007) was visible. The mentees in the early development stage might expect a mentor as a guiding authority, while more advanced mentee might prefer a

mentor who questions deep-seated beliefs and engage them in reflective and progressive development (Dominguez and Hager 2013). Apparently, the mentoring program had reached this state in the different levels of mentoring within the research cells. In fact, multiple and simultaneous mentoring methods (traditional mentoring, group mentoring, peer mentoring), exemplifying the importance of mentoring relationships (Kram 1985) and emerging varied bonds were vivid in each research cell. A system of transfer of technology and knowledge empowering the participants (Darwin 2015) through the participatory nature of the program that evolves developmental approach (Feldhaus and Bentrem 2015) and peer mentoring (Khoo et al. 2019) were evident. Raqs G, a senior mentee claimed, "I was happy to learn that I had mentees who successfully and actively participated in the field work". Everyone, from mentors to junior mentees, engages in the rigors of theory-practice-reflection (Morales 2019) in the different forms of mentoring imbedded in the program (e.g. a resource-based, group mentoring, training-based, and executive mentoring) (Reh 2019).

Collaborative Practice and Action

The participants encountered challenges and difficulties forcing them and the team to take action, which, then led to opportunities for collaborative practice for research implementation (Lodge et al. 2018). In fact, these encountered challenges and with the objective assessment of mentors, initiated practice and simulations within the research cells (either face-to-face or online) strengthened their bonds within their respective cells to practice collaboration and participatory contribution. AI by the mentors may have helped the participants transform these challenges to positive perspectives (Won and Choi 2017). An example, one of the mentors blatantly expressed, "I think you should practice more on conducting the interview" to his group while on board a field work. Evidently, collaborative learning and practice, which include celebrating, setting goals and reflecting on progress, peer teaching, critiquing and revising, and problem solving (Martin 2017) were manifested in each research cell and demonstrated the ideals of participatory framework that showcase reflective practices (Morales 2019). In fact a senior mentee [M Torre] claimed, "I feel proud that I was able to contribute to improving the research skills of the members of my cell and this also developed me as a researcher and mentor."

Benefits of Mentoring Program on Research Skills, and Reflective Practice

As teachers, all mentees were able to enhance their professional practice and research skills. They value the "technical improvement" and enhancement of their research skills by building their confidence in doing qualitative research and analysis (Kiersma et al. 2012). Their reflections implied that the program may have provided them the nexus for bridging theory and practice of research (Joubert and de Villiers 2015). They also considered "professional improvement" that highlighted their professional development through protege orientation. Evidently, there were good and strong mentor-mentee relationships that motivated mentees for productive research engagement. Holistically, the individual benefits that the participants derived from the project created their positive outlook towards research, notwithstanding the fact that their respective research cells instituted activities and relations that instigated skills improvement of both the mentors and the mentees. Overall, they attested that they were retooled and were able to sharpen their skills and felt that the mentoring program somehow impacted their character as teacher-researcher (Table 5).

Finally, the participants believed that they gained pedagogical knowledge improvement through country-wide exposure to the real conditions of research and education in STEAM programs.

These results imply that PAR as a methodical and program framework established a structured mentoring program beyond the scope of adviser-advisee mentoring, exemplifying collaborative learning, practice, and action. The program engaged all faculties—physical, emotional, socio-cultural, and psychological—of mentors and mentees leading to reflective and reflexive actions that might have developed a habit of mind and a reflective and reflexive culture. The activities within the mentoring program value the triangulation of theory-practice-reflection that helped the graduate students enhance their research skills and become good field researchers for the state-funded research.

The study is a documentation of a mentoring program of the state-funded research that reports a rich set of experiences of mentors and mentees. However, data collection may include video/audio recording of field observations for the mentoring process to capture all data sourced from the volunteers as mentees. PAR as a methodical and program framework may augment and complement professional learning and continuing professional development programs with an aspect of a micro-credentialing system in graduate school in-service field.

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ROLE OF AUTHORS: *MPEM – Lead researcher, paper conceptualization and writer of article; CPP – researcher, mentor, paper conceptualization, and writer of article; RAA – researcher, mentor, paper conceptualization and writer of article; JCA Jr. – researcher, mentor, paper conceptualization and writer of article; LEE – researcher, mentor, paper conceptualization and writer of article; TOA – researcher, mentor, paper conceptualization and writer of article; BRB – researcher, mentor, paper conceptualization and writer of article; ECA – researcher, mentor, paper conceptualization and writer of article; RDS – researcher, mentor, paper conceptualization and writer of article; RPB – researcher, mentor, paper conceptualization and writer of article; FMM – researcher, mentor, paper conceptualization and writer of article, Language Editor; MDG – participant, senior mentor, writer of article; MOT – participant, senior mentor, writer of article; RAG – participant, senior mentor, writer of article; NAC – Data consolidation.*