Research instruction among secondary schools implementing Science, Technology and Engineering (STE) Program in MIMAROPA Region

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ABSTRACT

Research plays a critical role of expanding the frontier of knowledge and boosting national economic development, but research as a field is undervalued in the Philippines. This study assessed the status of research instruction in terms of course content, teaching strategies, and research collaboration among secondary schools implementing Science, Technology and Engineering (STE) Program in MIMAROPA Region, school year 2015-2016. Mixed method approach utilizing the survey questionnaire, classroom observation and focus group discussion was used in this study. The respondents were composed of the Grade 10 students and the research teachers of the STE high schools. Majority of the teacher-respondents are in middle-age, female, had earned academic requirements for master's program, had moderate experience in teaching, had attended research trainings, and had on-going researches. Overall, both respondents showed somewhat positive attitude ($\bar{x}$ =5.21) towards research activities, however, they manifested negative attitude, specifically, that of research anxiety ($\bar{x}$ =3.45). On the status of research instruction, significant findings were noted in course content, teaching strategies and research collaboration. In terms of content, most of the topics were rated "very well discussed" and "well discussed" except for "Introduction to Statistics" and "Preparation of Proposals"; hence, improvement must be done on these topics. Surprisingly, research teachers had moderately utilized the proposed strategies along these topics. On the other hand, it is noteworthy that the respondents had undergone the right direction in research collaboration by networking with various experts, institutions and organizations.

Keywords: Research Instruction, Science, Technology and Engineering (STE) Program

INTRODUCTION

"Publish or Perish" this quote has always been a motivation for educators and scientists to continuously conduct research to learn and generate new knowledge. Today, living in a publish-or-perish paradigm is a

great challenge to be able to sustain one's career in the academe (Carpenter 2015). Nevertheless, we cannot discredit the fact that research is very important, and that we don't have a choice but to participate and embrace this kind of academic undertaking. Truly, in the academic community, research and publications are considered as a person's contribution to Science as bases for promotion.

Biyo (2003), a multi- awarded teacher, scientist and researcher, said that research is very exciting; it means sleepless nights, disappointments and physical and mental exhaustion. But the joy of discovering something new in nature makes it all worthwhile. However, Sen. Bam Aquino said that research as a field is undervalued in the Philippines during the discussion on the proposed Magna Carta for Scientists (Anonymous 2017). This is the big picture of research in the Philippines. Nevertheless, the importance of research cannot be discredited, thus, participating and embracing this kind of academic undertaking is necessary.

With this in mind, research even in the junior high school was initiated and has been pursued to schools offering special curricular program in science. Seeing the need to provide opportunities for the development of scientific attitude, technological skills and higher order thinking skills among the students in the Basic Education, the Philippine government encouraged school institutions to adopt Science and Mathematics curriculum through Republic Act 7678, which gave the idea of the use of a special Science curriculum.

To pursue this, the Department of Education (DepEd), through its Bureau of Secondary Education (BSE), identified the 112 high schools nationwide with its corresponding identified Special Science Classes (SSC) to implement the enriched curriculum in Science and Technology, and Mathematics. Formerly, the program was called ESEP (Engineering and Science Education Program) now, it is STE (Science, Technology and Engineering) Program.

In the interview of the researcher with some of the research teachers, most of them admitted their professional inadequacy and they felt that some aspects in research instruction need to be strengthened. Similarly, it was a consensus among the members of the Regional Screening and Review Committee (SRC) that some of the research outputs of the students that were submitted as research entries in the conduct of the Regional Science and Technology Fair reflected a kind of research instruction still wanting in excellence and still needing improvements, causing them not to qualify in the higher level of competitions.

Studies that assessed teachers' preparedness in terms of teaching strategies, and instructional practices results revealed that instructional strategy is a key variable in the teaching learning process, Slavin et al. (2012), Pascuala (2006) and Fulp (2002). Slavin et al. (2012) further justified the importance of using appropriate teaching methods, strategies and introduced mastery of learning to enhance instruction and have sufficient potential to improve students' learning.

Students' attitudes towards research are not generally positive. In addition, majority of the students perceived that research was a difficult endeavor (Sabzwari et al. 2009). Students thought that research is a tough and a dry subject (Adam and Holcomb 2006). Meanwhile, students who find research difficult and stressful develop greater research anxiety, thus sacrificing their grades in the course (Paga 2013). Moreover, as cited by Papanastasiou (2005), a positive attitude towards research undertaking is a key to success and progress in the knowledge based societies.

It is in this light the researcher assessed the extent to which research instruction is implemented in secondary schools with STE Program in MIMAROPA Region, during school year 2015-2016. Specifically, this sought to answer the following research questions: (1). What is the profile of research teachers among secondary schools implementing STE Program in MIMAROPA Region in terms of the following; age; gender; highest educational attainment; years of research teaching experience and research-related trainings attended; (2). What is the attitude of students and teachers towards research? (3). What is the status of research instruction in terms of; course content; teaching strategies; and research collaboration?

METHODOLOGY

This study made use of mixed method approach utilizing the survey questionnaire as the primary instrument, supported by classroom observations, and focus group discussion. The quantitative part used two sets of questionnaires: one for the student and one for the research teachers. To describe the attitude of the research teacher towards research, the Revised Attitude towards Research (R-ATR) scale devised by Papanastasiou (2014) was used.

The qualitative aspect of this study was done through classroom observation and focused group discussion (FGD). Classroom Observation served as a supplemental data gathering instrument to validate the responses of the respondents in the questionnaire. FGD further validated the data provided in the questionnaire. The data which were not captured by the administration of the questionnaire and the conduct of the observation were

collected through FGD. The data gathered through the survey questionnaire, classroom observations and FGD were triangulated to establish a relationship among the variables being studied, and to have a clearer picture of the status of research instruction.

The respondents of this study were the teachers handling research in the seven (7) secondary schools who were chosen using complete enumeration. Meanwhile, the student respondents were those belonging to the upper and lower quartiles of the senior population of the seven (7) secondary school implementing STE Program in MIMAROPA Region. Respondent schools include Oriental Mindoro National High School of Calapan City, Domingo Yu Chu Memorial National High School of Oriental Mindoro, Sablayan National Comprehensive High School of Occidental Mindoro, Landy National High School of Marinduque, Looc National High School of Romblon, Palawan National School of Puerto Princesa City and Narra National High School of Palawan.

Descriptive Statistics such as Frequency Count, Rank and Percentage Technique were used to determine the profile of the teachers. On the other hand, Weighted Mean and Standard Deviation were utilized to examine the attitude of the students and research teachers towards research and the status of research instruction such as course content, teaching strategies and research collaboration.

RESULTS AND DISCUSSION

Profile of Research Teachers among Secondary Schools Implementing STEP in MIMAROPA Region

Majority of the teacher respondents are in middle-age, female, had completed academic requirements for master's program, moderate experience in teaching and had attended research trainings.

Attitudes of Students and Teachers towards Research

Attitudes towards research means a detailed study of thinking, feelings and the person's behavior towards research (Papanastasiou 2011). Table 1 presents the attitudes of students and teachers towards research. This measured research usefulness, research anxiety, and positive research predisposition of the respondents.

Table 1. Attitudes of students and teachers toward research.

Attitudes	Students			Teachers			Overall		
	$\bar{x}$	s.d.	Verbal Interpretation	$\bar{x}$	s.d	Verbal Interpretation	$\bar{x}$	s.d	Verbal Interpretation
RESEARCH USEFULNESS									
Research is useful for my career.	7.00	0.00	Very positive attitude	6.18	1.11	Fairly positive attitude	6.59	0.56	Very positive attitude
Research is connected to my field of study.	6.86	0.38	Very positive attitude	5.57	1.48	Fairly positive attitude	6.22	0.93	Fairly positive attitude
The skills I have acquired in research will be helpful to me in the future.	6.57	0.79	Very positive attitude	6.26	1.13	Fairly positive attitude	6.42	0.96	Fairly positive attitude
Research should be indispensable in my professional training.	6.71	0.49	Very positive attitude	4.28	1.49	Undecided	5.50	0.99	Fairly positive attitude
	6.79	**0.42**	**Very positive attitude**	**5.57**	**1.30**	**Fairly positive attitude**	**6.18**	**0.86**	**Fairly positive attitude**
RESEARCH ANXIETY									
Research excites me. *	3.29	2.06	Somewhat negative attitude	3.53	1.34	Undecided	3.41	1.40	Somewhat negative attitude
Research makes me feel at ease. *	3.46	1.85	Somewhat negative attitude	4.33	1.78	Undecided	3.90	1.82	Somewhat positive attitude
Research does not stress me at all. *	3.57	2.15	Undecided	2.85	1.61	Somewhat negative attitude	3.21	1.88	Somewhat negative attitude
Research makes me feel relaxed. *	3.33	2.58	Somewhat negative attitude	3.24	1.65	Somewhat negative attitude	3.28	2.12	Somewhat negative attitude
Research is easy*	3.71	1.98	Undecided	3.19	1.74	Somewhat negative attitude	3.45	1.86	Somewhat negative attitude
	3.47	**2.12**	**Somewhat negative attitude**	**3.43**	**1.62**	**Somewhat negative attitude**	**3.45**	**1.82**	**Somewhat negative attitude**
POSITIVE RESEARCH PREDISPOSITION									
I enjoy research.	6.57	0.53	Very positive attitude	5.62	1.00	Fairly positive attitude	6.10	0.77	Fairly positive attitude
I love research.	6.43	0.53	Fairly positive attitude	5.29	1.22	Somewhat positive attitude	5.86	0.88	Fairly positive attitude
I am interested in research.	7.00	0.00	Very positive attitude	5.72	1.11	Fairly positive attitude	6.36	0.56	Fairly positive attitude
Research is pleasant.	6.00	1.41	Fairly positive attitude	5.40	1.06	Somewhat positive attitude	5.70	1.24	Fairly positive attitude
	6.50	**0.62**	**Fairly positive attitude**	**5.51**	**1.10**	**Fairly positive attitude**	**6.01**	**0.86**	**Fairly positive attitude**
GRAND WEIGHTED MEAN	**5.89**	**1.05**	**Fairly positive attitude**	**4.84**	**1.34**	**Somewhat positive attitude**	**5.21**	**1.08**	**Somewhat positive attitude**

NOTE: * *These statements are reversed form of the Original Statements*

Results reveal that the respondents exhibit a fairly positive attitude towards research usefulness ($\bar{x}$=6.18), for they strongly agreed that research is very useful to their own chosen career ($\bar{x}$=6.59). Likewise, the respondents developed fairly positive attitude towards the following indicators such as the skills they have acquired in research will be helpful in their future ($\bar{x}$=6.42); research is connected to their field of study ($\bar{x}$=6.22) and research is indispensable in their professional training ($\bar{x}$=5.50). This affirms the study of (Siemens et al. 2010), where results revealed that majority of the students felt that research would be beneficial in their career realizing the need of spending more time on research activities.

Similarly, the respondents have fairly positive attitude towards positive research predisposition ($\bar{x}$=6.01), as they manifest interest in research ($\bar{x}$=6.36); they enjoy research ($\bar{x}$=6.10); they love research ($\bar{x}$=5.86) and they find research pleasant ($\bar{x}$=5.70). The results imply that the respondents generally have optimistic perception about research.

However, the interesting result of the study is that the two groups of respondents have somewhat negative attitude such as research anxiety as they slightly disagree that research makes them feel at ease ($\bar{x}$=3.90); research is easy ($\bar{x}$=3.45); research excites them ($\bar{x}$=3.41); research makes them feel relaxed ($\bar{x}$=3.27) and research does not stress them at all ($\bar{x}$=3.21).

This result conforms to the findings of Adams and Holcomb (2006) that the attitudes towards research were generally negative. This result is validated by the responses of the respondents in the FGD conducted where majority of them stated that they didn't like research along the mentioned aspects. Overall, the respondents have somewhat positive attitude towards research undertakings ($\bar{x}$=5.21).

However, the findings of the study imply that both the students and teachers need help in transforming their negative attitudes toward research to positive especially along the following aspects: (1) minimizing fear and anxiety, and (2) coping with stressful conditions and the feeling of being nervous in conducting research. This conforms to the findings of (Sabzwari et al. 2009) that majority of the students perceived that research was a difficult endeavor despite their positive attitude towards research. The difficulties may be attributed to what Adams and Holcomb (2006) stated that students do not understand the concepts of research and its importance in their professional life.

Status of Research Instruction

Course content. Course content specifies what is to be learned as specified in the instructional objectives such as concepts, values, skills and attitudes which need to be learned by research students. Table 2 shows content along planning, implementation and presentation.

Findings of the study reveal that the two groups of raters unanimously agreed that the following course contents are discussed to a very large extent or they are very well discussed: Problem Identification ($\bar{x}$=4.64), The Research Process ($\bar{x}$=4.56), Introduction to Research ($\bar{x}$=4.54), and Variables in Research $\bar{x}$=4.51) while Ethics in Research ($\bar{x}$=4.48), Actual Conduct of the Study ($\bar{x}$=4.30), Research Design ($\bar{x}$=4.27), Research Objectives ($\bar{x}$=4.24), Data Collection ($\bar{x}$=4.21), Research Tools ($\bar{x}$=4.10), Data Processing ($\bar{x}$=4.06), Data Analysis and Interpretation ($\bar{x}$=4.04), Preparation of the Final Research Paper ($\bar{x}$=4.04) are discussed to a large extent or well discussed.

It is interesting to note that the respondents rated the Introduction to Statistics in Research ($\bar{x}$=2.99), and Preparation of Research Proposal ($\bar{x}$=2.94) as discussed to some extent or moderately discussed only.

As revealed, it was noted that the concepts under statistical tools and preparation of research proposal were moderately discussed. As supported during the FGD, the same topics were identified to be the least discussed and preferred topics of the student respondents'.

The result denotes that moderate discussion of these topics will negatively affect the optimum learning opportunity and knowledge preparation of students in research in the classroom as these topics are believed to be very crucial in the preparation of research proposals and the completion of the scientific investigation. It will also affect the success of the research process.

In the effort to improve and maximize research instruction especially along research planning which serves as the waterloo of most students as revealed in the data and during the FGD, concerned teachers must allocate sufficient time for every difficult lesson especially along the topics under prior to preparation of Chapters I, II, and III which are very vital in the preparation of Research Proposal. Proper time management in teaching difficult concepts can facilitate the attainment of the objective of research instruction.

To facilitate the teaching of statistical tools, it is noteworthy to encourage teachers to incorporate the use of technology in teaching statistical concepts. Literature reveals that the use of Pearson Higher Education Statistics (PHStat) software in teaching Statistics is found to be effective. Likewise, sufficient trainings in the use of the program will be more beneficial for both research students and teachers.

Table 2. Summary table for the status of research instruction in terms of course content.

Indicators	Overall			Ranking
	$\bar{x}$	s.d	Verbal Description	
A. RESEARCH PLANNING				
1. Introduction to Research	4.54	0.67	Very well discussed	3rd
2. The Research Process	4.56	0.59	Very well discussed	2nd
3. Problem Identification	4.64	0.57	Very well discussed	1st
4. Research Objectives	4.24	0.92	Well discussed	8th
5. Variables in Research	4.51	0.72	Very well discussed	4th
6. Research Design	4.27	0.85	Well discussed	7th
7. Research Tools	4.10	0.95	Well discussed	10th
8. Introduction to Statistics in Research	2.99	0.92	Moderately discussed	14th
9. Preparation of Research Proposal	2.94	0.74	Moderately discussed	15th
OVERALL	4.08	0.77	Well discussed	Third
B. RESEARCH IMPLEMENTATION				
10. Data Collection	4.21	0.85	Well discussed	9th
11. Actual Conduct of the Study	4.30	0.65	Well discussed	6th
12. Data Processing	4.06	1.01	Well discussed	11th
13. Data Analysis and Interpretation	4.04	0.96	Well discussed	12.5th
OVERALL	4.10	0.87	Well discussed	Second
C. RESEARCH PRESENTATION				
14. Preparation of the Final Research Paper	4.04	1.04	Well discussed	12.5th
15. Ethics in Research	4.48	0.75	Well discussed	5th
OVERALL	4.26	0.90	Well discussed	First
GRAND TOTAL	4.15	0.85	Well discussed	

Teaching strategies. Teaching strategies are methods and approaches which consist of purposeful, planned activities and tasks that are undertaken in the classroom to bring about the expected outcomes. Table 2 displays the summary table for the status of research instruction in terms of utilization of teaching strategies per major topic.

It could be discerned from Table 3 that the two groups of raters perceive that the research teachers highly utilized teaching strategies, except for the Introduction to Statistics in Research (Statistical Tool) ($\bar{x}$=2.86), and 2) Preparation of Research Proposal ($\bar{x}$=2.98).

The computed grand overall weighted mean of ($\bar{x}$=4.07; Table 3) implies that the two groups of raters unanimously agreed that along research instruction the teachers used variety of teaching strategies, such as lecture-discussion, group assignment, consultancy sessions, chalk-talk, board work, home exercises, group project, workshop, exposure trips and interviews.

In support to the above findings, it was also noted during the classroom observation that as part of the teaching learning process, the teachers conduct review and give overview of day's course content, employ non-lecture learning activities which motivate and provoke critical thinking creating an atmosphere conducive to learning, utilize other tools/instructional aids (i.e. technology, computer, video, overheads).

In addition, teachers deliver well-planned instruction and present the lesson in an orderly manner using the most appropriate teaching method/strategy. It was also observed that teachers are adept in the art of questioning, the technique of handling student's responses and cites up-to-date information about the subject.

However, it is alarming that the teacher-respondents moderately utilized the aforementioned strategies to the most complicated research topics such as the Introduction to Statistics in Research (Statistical Tools) and Preparation of Research Proposal.

As claimed by many educators, there is a dire need for teachers to maximize the use of effective teaching strategies, and the topics must be fully discussed. Slavin et al. (2012) justified the importance of using appropriate teaching methods and strategies, for it can enhance instruction and significantly improve students' learning. Slavin et al. (2012), Pascuala (2006) and Fulp (2002) in their studies assessed teachers' preparedness in terms of teaching strategies and instructional practices; they considered instructional strategy as a key variable in the teaching learning process.

Table 3. Summary table for the status of research instruction in terms of utilization of teaching strategies per major topic.

Indicators	Students			Teachers			Overall			
	$\bar{x}$	s.d.	Verbal Description	$\bar{x}$	s.d.	Verbal Description	$\bar{x}$	s.d.	Verbal Description	Rank
I. RESEARCH PLANNING										
1. Introduction to Research	4.26	0.88	Highly utilized	4.14	0.72	Highly utilized	4.20	0.80	Highly utilized	
2. The Research Process	4.01	1.16	Highly utilized	4.09	0.81	Highly utilized	4.05	0.99	Highly utilized	
3. Problem Identification	4.25	0.88	Highly utilized	4.34	0.67	Highly utilized	4.30	0.78	Highly utilized	
4. Research Objectives	4.27	0.89	Highly utilized	4.49	0.65	Highly utilized	4.38	0.77	Highly utilized	
5. Variables in Research	4.23	0.90	Highly utilized	4.44	0.53	Highly utilized	4.34	0.72	Highly utilized	
6. Research Design	4.18	0.88	Highly utilized	4.42	0.53	Highly utilized	4.30	0.71	Highly utilized	
7. Research Tools	4.20	0.90	Highly utilized	4.27	0.83	Highly utilized	4.24	0.87	Highly utilized	
8. Introduction to Statistics in Research (Statistical Tool)	2.89	1.06	Moderately utilized	2.82	0.82	Moderately utilized	2.86	0.94	Moderately utilized	
9. Preparation of Research Proposal	2.96	0.92	Moderately utilized	3.00	0.69	Moderately utilized	2.98	0.81	Moderately utilized	
OVERALL	3.92	0.94	Highly utilized	4.00	0.62	Highly utilized	3.96	0.78	Highly utilized	3rd
II. RESEARCH IMPLEMENTATION										
10. Data Collection	3.93	1.01	Highly utilized	4.17	0.81	Highly utilized	4.05	0.91	Highly utilized	
11. Actual Conduct of the Study	3.97	1.04	Highly utilized	4.20	0.65	Highly utilized	4.08	0.85	Highly utilized	
12. Data Processing	4.11	0.96	Highly utilized	4.36	0.61	Highly utilized	4.24	0.79	Highly utilized	
13. Data Analysis and Interpretation	3.45	0.80	Highly utilized	4.28	0.76	Highly utilized	4.12	0.78	Highly utilized	
OVERALL	3.99	0.95	Highly utilized	4.25	0.71	Highly utilized	4.12	0.83	Highly utilized	1st
III. RESEARCH PRESENTATION										
14. Preparation of Final Research Paper	4.17	0.97	Highly utilized	4.25	0.74	Highly utilized	4.21	0.86	Highly utilized	
15. Ethics in Research	4.14	0.98	Highly utilized	4.00	1.12	Highly utilized	4.07	1.05	Highly utilized	
OVERALL	4.16	0.98	Highly utilized	4.12	0.93	Highly utilized	4.14	0.96	Highly utilized	2nd
GRAND OVERALL	4.02	0.96	Highly utilized	4.12	0.75	Highly utilized	4.07	0.86	Highly utilized	

Research collaboration. Research collaboration refers to manifested initiatives in working with others for partnership to realize the objectives of an investigation. Table 4 shows the status of research instruction in terms of research collaboration.

Table 4. Summary table for the status of research instruction in terms of Collaboration.

Classification of Profession Institution/Organization/Entity	Specific Name of Profession Institution/Organization/Entity
Experts	1. Electrical Engineer 2. Mechanical Engineer 3. Agricultural Technologist 4. Licensed Technician
Government Agencies	1. Department of Agriculture 2. Department of Agrarian Reform 3. Department of Science and Technology 4. Industrial Technology Development Institute 5. Department of Public Works and Highways 6. Department of Trade and Industry 7. Department of Health (District Hospitals and Provincial Hospitals 8. Department of Environment and Natural Resources 9. National Food Authority 10. National Irrigation Administration
Non-Government Organizations	1. SAMVECO – Sablayan Market Vendors Multi – Purpose Cooperative 2. Puerto Princesa City Water District
Academic Institutions	1. Western Philippine University 2. Holy Trinity University 3. University of the Philippines – National Sciences Research Institute
Laboratories	Clinical Laboratory 1. Suretech Diagnostic Laboratory, Narra, Palawan. 2. Intertek Testing Services Philippines, Inc. intertek provides clients across the world with quality control, research, testing, measurement, and certification activities for industry, commerce, markets, institutions, and governments

It was revealed from the survey and the focus group discussion that research teachers and students had functional research collaboration. They were able to collaborate with experts, government agencies, Non-Government organizations, and Higher Educational Institutions (HEI's). The respondent schools through the Research teachers and the students attempted to link and collaborate with clinical laboratories through testing, measurement, and certification activities.

The foregoing results imply that the schools through the efforts made by the research teachers had undergone the right directions, priorities and thrust by networking with various experts, institutions, organization and entities. They manifested and promoted partnership/collaboration with other research institutions, local and national as well as with industry and private laboratories, for the conduct of research and application of research outputs.

This manifestation of participation and networking conforms with the basic policies and principles advocated by NHERA (2009), stipulating the intent that all research endeavors should involve the participation of as many stakeholders as possible and should be organized preferably as network instead of stand-alone undertaking of schools or individual researcher.

CONCLUSION AND RECOMMENDATION

The teacher respondents belong to the middle-age level, mostly female, had earned certain academic requirements for master's program, have moderate experiences in teaching and had attended research-related trainings. Overall, both respondents have somewhat positive attitude towards research activities, however, negative attitude, specifically that of research anxiety, was noted. On the status of research instruction in terms of course content, topics were well discussed, but improvement on instruction on the topics regarding "Introduction to Statistics in Research" and "preparation of research proposals" is wanting. Along teaching strategies, majority of these are highly utilized. However, it's also alarming to note that research teachers moderately utilize the strategies along topics identified to be moderately discussed, thereby instruction in these aspects ought to be strengthened. On the other hand, it is noteworthy that the respondents had undergone the right direction in research collaboration by networking with various experts, institutions and organizations.

All research teachers must continue their professional growth by pursuing graduate degrees. Attainment of both master's and doctorate degrees is indispensable and required to all research teachers. Research teachers may consider looking for scholarship grants offered by HEIs', Department of Education (DepEd) and other agencies here and abroad. It is

highly recommended that there is a need to develop positive attitudes towards research for both students and teachers.

Teachers' commitment and dedication are indispensable in quality teaching. There is a need for teachers to maximize the use of effective teaching strategies and the topics must be discussed to a very large extent. Thus, teachers must allocate sufficient time for discussion of every difficult lesson especially along the concepts covered by Chapters I, II and III, for they are vital components in the preparation of research proposal. In addition, the teaching of statistical tools is encouraged to incorporate technology in teaching various statistical concepts.

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