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Electronic Statistical Tool (E-STAT): An Instrument for Research Data Analysis

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Abstract:

The inclusion of research subjects in Senior High School fosters students' ability to think critically and solve problems. Students conducting research must decide on an issue or subject, obtain pertinent material, analyze it, and come to intellectual conclusions. By conducting research, students develop their critical thinking skills as well as their ability to objectively assess the facts and provide novel ideas. These abilities are crucial for future career success as well as academic achievement since it prepares students for higher education and lifelong learning. Students develop into active learners who are capable of solving challenging problems and advancing knowledge in various professions. According to Creswell, "research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue". It consists of three steps: pose a question, collect data to answer the question, and present an answer to the question. Therefore, statistical data analysis becomes crucial in any research endeavor since it should be accurate at all times using exact statistical tools to be able to come up to a valid and reliable results. Moreover, there are a lot of researchers in the field of research but not all researchers are statisticians or good in computation. In school context, there are a lot of research teachers in different schools but not all schools have a research statistician. This innovation with the advent of technology will address that existing problem in Senior High Schools. With the help of this innovation, students will be able to analyze and interpret data by simply encoding the data, and it will save their time without jeopardizing the accuracy of the results. In line with the integration of Information and Communication Technology as reiterated in DepEd Order No. 78, s. 2010 in teaching and learning in the implementation of the 2002 Basic Education Program (BEC) which focuses on the shift from teaching/learning about the technology to teaching learning with technology will be implemented, DepEd highlights digital rise program as key player in addressing the challenges in sustaining quality education while attaining the 21st century skills. As our former Education Secretary have said, "we have come a long way, and we have learned a lot from the pandemic, but the greatest take away from this year is that we have to be willing, flexible, and embrace technology." This innovation supports the DepEd's Program, MATATAG in accelerating the delivery of basic education services and provision facilities, and to give support for teachers to teach better.

Introduction:

Statistical data analysis has been playing a big role in the success of research subjects in Senior High School. The innovators innovated the **Electronic Statistical Tool (E-STAT): An Instrument for Research Data Analysis** that helps students to analyze and interpret their collected data from conducting research that is relevant to societal and current issues.

This innovation focuses on inferential statistics, wherein its main uses is to make an estimation about the population, and to test the hypotheses to draw conclusions about the population. This innovation limits itself to the following parametric statistical tools that are commonly used by the students; namely: t-test for Two Independent Means or Independent Sample T-Test, Paired t-test or Dependent Sample t-test and Pearson Correlation Coefficient.

The table below shows when to use the mentioned statistical tools.

t-test for Two Independent Means or Independent Sample T-Test	Paired t-test or Dependent Sample t-test	Pearson Correlation Coefficient
used to determine whether there is a significant difference between the means of two groups	used to determine the significance in the mean difference of two dependent samples. In this tool, each subject or entity is measured twice resulting in pairs of observations.	used to estimate the level of correlation or the relationship between two continuous variables

The innovation, E-STAT, has three sheets for three different statistical tools. The only thing the students need to do is to encode their data on the appropriate sheet, and the E-STAT will automatically analyze it, and interpret if a significant difference or relationship exists between groups or variables.

The innovation itself is not only limited to being used on a laptop or computer, but it can also be used using tablets and mobile phones. This fact alone proves that the E-STAT can be widely and conveniently used by the students in different Senior High Schools.

Objectives of the Study

This innovation entitled "**Electronic Statistical Analysis Tool (E-STAT): An Instrument for Research Data Analysis**" is a learning material that aims to provide assistance to the research teachers in facilitating the learning processes of students in terms of quantitative data analysis in research subjects in Senior High School.

Specifically, the following are the objectives to be achieved by this innovation:

1. Raise the ICT literacy to progress the teaching and learning processes and be enhanced with the aid of technology as reiterated in DepEd Order No. 78, s. 2010.

2. Integrate ICT in the teacher-made learning material that addresses the challenges encountered by the research teachers.

3. Provide a quick, accurate, reliable and convenient electronic statistical tool to analyze and interpret the data gathered to answer research problems.

4. Share the E-STAT to Senior High Schools in the District of Calatrava II.

5. Publish the E-STAT for further dissemination.

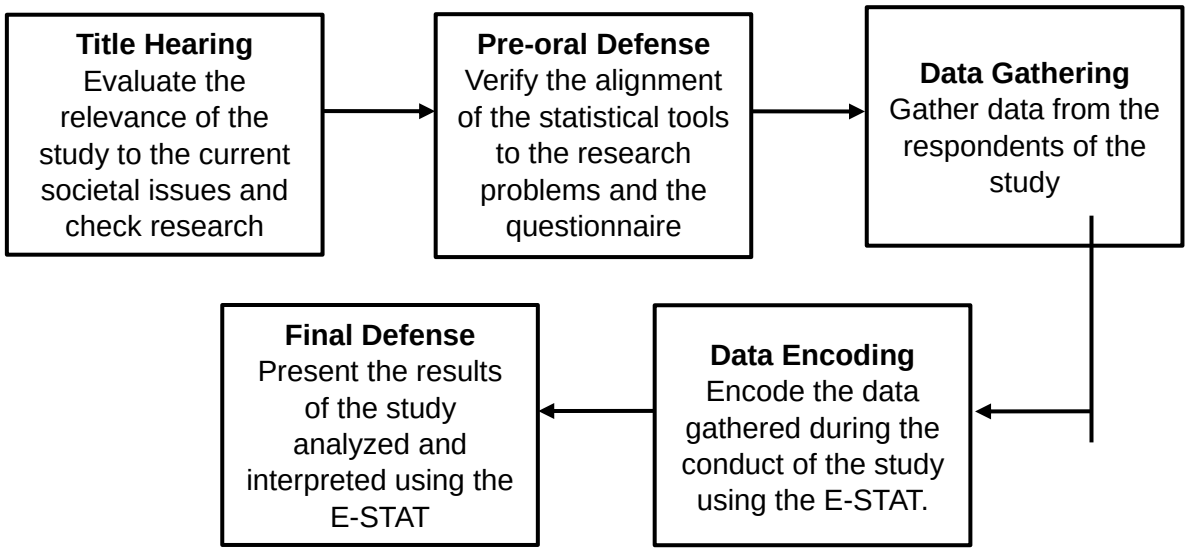
Methodology:

Implementation Procedure:

Conceptualization

This innovation addresses the problem of research data analysis in Senior High School. The research teachers and statistics teacher collaborated to form an idea or concept on how to help Senior High Schools with no research statistician or expert in their group. They were able to come up with an idea of making an electronic tool with the use of Microsoft Excel that will automatically compute, analyze, and interpret data.

Process Flow/Framework:



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Project Management

Implementation Stages	Persons Involved	Corresponding Roles	Management	Output/ Outcome
Pre-Implementation	Research Teachers	Share experiences in teaching research subjects including the difficulties	Consult on the challenges encountered by the research teachers in requiring their students to finish a research output	Consolidated ideas on the challenges encountered by the research teachers
			Conceptualized an idea to easily answer research problems to address the challenges encountered with the use of an electronic tool	Brainstorm for a solution to address the existing problem
	Statistics Teacher	Create the E-STAT to address the difficulties encountered by the research teachers	Developed E-STAT thru Microsoft Excel that can be used using laptop, computer, tablets and mobile phones	Electronic Statistical Tool (E-STAT)
	Research Coordinator	Check the E-STAT and provide comments and suggestions	Present E-STAT to research coordinator for technical assistance	Improved E-STAT
	School Heads	Provide approval for the implementation of E-STAT	Present E-STAT to the school heads for approval of the implementation	Approved letter for implementation
Implementation Stage	Statistics Teacher	Resource speaker during the orientation	Orient research teachers on how to use the E-STAT.	Research teachers are equipped with the knowledge on how to use the E-STAT
	Research Teachers	Facilitate workshop	Conduct workshop to the students on how to use the E-STAT	Students possessed the skills in using the E-STAT
	ICT Teacher	Facilitate the distribution of softcopy of the E-STAT	Assist in installing a copy of E-STAT to DepEd laptops, tablets and computers that can be used by the research teachers and students	DepEd laptops, tablets and computers with E-STAT
	Students	Encode the in E-STAT and use the results for further interpretation	Encode the data gathered from conducting research in the E-STAT	Table in APA format showing the results analyzed and interpreted using the E-STAT
			Use the table in APA format produced by the E-STAT showing the results of the study	
	Statistics Teacher	Verify the accuracy of the result of the study from the data encoded	Present the result to the research statistician for verification and accuracy of the results	Verified results using E-STAT
Post Implementation	Students	Present the results and findings of the study	Present the data generated from the E-STAT during the Final Defense	Utilize and present the data analyzed by the E-STAT during Final Defense
	Research Teachers	Facilitative the Final Defense		
	Panelists	Ask relevant questions pertaining to the results of the study		
	Students and Research Teachers	Comply the requirements needed for the subject	Submit a hard bound of the research output as requirement in the research subject	Hard bound of the research output
	Research & Statistics Teachers and, Students	Give feedback in using E-STAT based on their experiences	Gather feedback in using E-STAT from teachers and students for further improvement	Consolidated feedback as basis for improvement

Timeline

Implementation Stages	Project Management	Timeline
Pre-Implementation	Consult on the challenges encountered by the research teachers in requiring their students to finish a research output	First Week of September 2022
	Conceptualized an idea to easily answer research problems to address the challenges encountered with the use of an electronic tool	
	Developed E-STAT thru Microsoft Excel that can be used using laptop, computer, tablets and mobile phones	Second Week of September 2022 to Second Week of October 2022
	Present E-STAT to the school heads and research coordinator for technical assistance and approval for implementation	Third Week of October 2022
Implementation Stage	Orient research teachers on how to use the E-STAT	First Week of November 2022
	Distribute a softcopy of the E-STAT to research teachers to assist their learners in data analysis	Second Week of November 2022
	Conduct workshop to the students on how to use the E-STAT	
	Encode the data gathered from conducting research in the E-STAT	First Week of December 2022
	Use the table in APA format produced by the E-STAT showing the results of the study	
	Present the result to the research statistician for verification and accuracy of the results	Second Week of December 2022
Post Implementation	Present the data generated from the E-STAT during the Final Defense	First Week of January 2023
	Submit a hard bound of the research output as requirement in the research subject	Third Week of January 2023
	Gather feedback in using E-STAT from teachers and students for further improvement	Fourth Week of January 2023

Resource Utilization

Implementation Stages	Resources	Process of Utilization
Pre-Implementation	Research Teachers	Gather ideas about the challenges encountered and brainstorm for a solution
	Innovators	Developed E-STAT thru Microsoft Excel that can be used using laptop, computer, tablets and mobile phones
	Research Coordinator	Provide technical assistance
	School Heads	Approve the implementation of E-STAT
Implementation Stage	Innovators and Research Teachers	Orient research teachers on how to use the E-STAT
	ICT Teacher	Distribute a softcopy of the E-STAT
	Innovators and Students	Conduct workshop to the students on how to use the E-STAT.
	Statistics Teacher (Innovator)	Verify the accuracy of the results.
Post Implementation	Students	Present the data generated from the E-STAT during the Final Defense
	Research Teachers	Submit a hard bound of the research output
	Innovators	Gather feedback in using E-STAT from for further improvement

Results and Discussion:

Risk and Issues Management

The innovation, E-STAT, is an instrument for research data analysis. This helps the students to analyze and interpret the data gathered during the conduct of their study. The instrument automatically computes and

produces an APA table after data encoding. This allows the students to get away from manual computation of data.

The table below shows the potential risks and issues encountered during the implementation and the action taken to mitigate or eliminate the impact to the target output/outcomes.

Potential risks and issues encountered during the implementation	**Action taken**
Error on data encoding committed by the students	Re-orient the students on how to encode their data properly and check it when they are done
Encoding the data in the wrong sheet	Provide definition of statistical tools and when to use it in every sheet
Lack of computer literacy	Provide workshop to the students with the assistance of the ICT teacher

Progress Monitoring Chart

Process	**Persons Involved**	**Tools Used in Monitoring**	**Outcomes of the Innovation**
Developed E-STAT	Statistics Teacher and ICT Teacher	Laptop with Microsoft Excel	Electronic Statistical Tool (E-STAT)
Presentation of E-STAT for authorization	School Heads, Research Coordinator and Research Teachers	Laptop and projector	Approval Letter
Implementation of E-STAT	Innovators, Research Teachers and Students	Computers, laptops, tablets and mobile phones with Microsoft Excel	Implementation Data
Gather feedback from using E-STAT	Innovators, Research Teachers and Students	Interview and Feedback Forms	Feedback and evaluation on the use of E-STAT
Give appropriate action to the concerns encountered during the implementation of E-STAT	Innovators	Monitoring and Evaluation Form	Provide solution to the concerns encountered in using the E-STAT

Output/Outcomes

Outputs/Outcomes (Enumerate the outputs or outcomes produced from the innovation)	**Beneficiary/ies (who benefited the corresponding outputs or outcomes)**
1. Analyze and interpret data gathered from conducting research.	Research Teachers and Students
2. Generates quick, accurate and reliable results.	
3. Produce an APA table for presentation of the results.	
4. Assist students to discuss the results of the study.	
5. Provide basis on the implication of the results of the study.	
6. Give a conclusion about the difference and relationship of the groups or variables used in the study.	
7. Students would be able to produce a hard bound of the study using the innovation.	

Sustainability Plan

Persons Involved	**Future Actions to Sustain the Implementation**	**Enhancement Plans**
School Heads	Encourage innovators to continuously develop the innovation to meet international standard	Provide a training in developing existing innovations

Research Coordinator	Ensure that research teachers finish the learning competencies in the research subjects	Conduct Learning Action Cell (LAC) sessions with the research teachers
Innovators	Improve the E-STAT by adding Descriptive Statistics and Non-parametric Statistical Tools for Inferential Statistics	Join workshops in statistical tools with the integration of ICT
Research Teachers	Continuously use the E-STAT in analyzing data in the research subjects	Provide workshop to the students on how to use the E-STAT
Statistics Teacher	Constantly provide assistance to the research teachers and students in using the E-STAT	Assist the research teachers in conducting workshop to the students on how to use the E-STAT
ICT Teacher	Develop students' computer literacy	Conduct training on how to use the Microsoft Excel
Students	Encode data gathered from conducting study using the E-STAT	Continuously use the E-STAT
Parents	Financially support the students in their academic requirements in research	Provide constant support to the students

Conclusion:

The innovation significantly enhance educational practices through ICT integration and technological empowerment. By prioritizing ICT literacy, the initiative aligns with the educational directives set forth by DepEd Order No. 78, s. 2010, thereby fostering an environment where teaching and learning are enriched through technology. The integration of ICT into teacher-made learning materials not only addresses existing educational challenges but also ensures that these materials are dynamic and responsive to evolving educational needs.Moreover, the development of E-STAT as a sophisticated electronic statistical tool marks a substantial advancement in research methodology within the educational sector. Its ability to provide quick, accurate, reliable, and convenient data analysis will empower educators and researchers to effectively address research problems and make informed decisions based on robust statistical insights.The initiative's commitment to sharing E-STAT with Senior High Schools in the District of Calatrava II underscores its dedication to promoting equitable access to cutting-edge educational tools. Furthermore, the decision to publish E-STAT for broader dissemination ensures that its benefits extend beyond immediate stakeholders, potentially influencing educational practices on a larger scale. Overall, this innovation represents a pivotal step towards enhancing educational quality and research capabilities through technology-driven solutions.

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