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Design of an Improvement Process for Enhancing the Professional Performance of Statistical Technicians

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Abstract: This study designs an improvement process based on Advanced Education theory and examines the importance of continuous improvement for the professional performance of statistical technicians. It highlights the essential role of statistics in educational research and the challenges arising from inadequate preparation in this field. Advanced Education theory, focused on professional development, is presented as a viable solution to overcome these deficiencies through a workforce and society-centered approach. Statistics is crucial for the collection, analysis, and interpretation of data in educational research, and its proper use increases the objectivity of results. Advanced Education proposes a higher education system oriented towards professional improvement, based on the integration of theory and practice and the comprehensive development of the individual. It provides tools and knowledge for statistical technicians to stay updated with advancements in their field, enabling them to offer high-quality data analysis and interpretation services. This contributes to the growth and evolution of the profession, is essential for adapting to the technological revolution, and allows statistical technicians to significantly contribute to local development. In conclusion, the continuous improvement of statistical technicians is crucial for local development, and Advanced Education theory provides a solid foundation for this improvement. It is necessary to address the challenges to achieve adequate statistical training for technicians.
Keywords: Statistics, Advanced Education, Professional Development, Local Development, Statistical Technician

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INTRODUCTION

Statistics is essential for collecting, organizing, analyzing, and interpreting data, aiding in understanding and decision-making regarding social, political, and economic phenomena, and predicting future issues with acceptable uncertainty. It is a valuable tool in educational research, providing techniques for all stages of the process, from research design to data analysis and conclusion drawing. However, there are significant challenges due to inadequate statistical training for educators. Advanced Education theory offers a solution by focusing on professional development and integrating theory with practice. This approach aims to improve the statistical skills of educators, enabling them to contribute effectively to educational research and local

Given the significant impact of scientific research on educational development, statistics plays a crucial role in problem-solving through appropriate statistical methods, greatly enhancing the objectivity of results.

In educational research, statistics should be viewed as a comprehensive set of methods, techniques, and procedures for data management, including organization, presentation, description, analysis, and interpretation. This discipline is crucial for identifying and solving educational problems, gaining insights into educational realities, making decisions, and improving educators' professional practices.

Without strategies to improve teachers' statistical thinking, deficiencies in their statistical processing for research will persist. These issues are worsened by limited statistical education at universities, inadequate teacher training, and a lack of relevant courses. Consequently, most teachers fail their statistics courses.

There is an urgent need for professional improvement, highlighting our shared interest in using Advanced Education theory as a fundamental theoretical and methodological support. This theory is seen as a higher education system focused on the workforce and society, aiming to produce knowledge creatively based on professional motives within a specific social context, achieving personal, social, economic, and environmental satisfaction (Añorga, 1995).

Education is transformative and humanistic, based on the integration of theory and practice, and permeates all areas of society. It views teaching and learning as an integrated process where students play a central role. This approach combines instructional and educational elements, as well as cognitive and affective aspects, aiming to contribute to the holistic development of individuals. It mediates the acquisition of knowledge, behavior norms, and ethical values, emphasizing patriotism, solidarity, humanism, and environmental concern (Rivero, 2017).

DEVELOPMENT

Advanced Education, as defined by Añorga (1997) as cited by Echevarría et al. 2023, "is a systematic and organized pedagogical process aimed at professional and human improvement. It emphasizes social, labor, and personal behavior, focusing on cognitive development and value formation. This theory, originating in Cuba, enhances the conceptual, scientific, and methodological foundations of continuous education, improving educational quality. It

promotes human behavior improvement through solidarity, humanism, respect, social commitment, and problem-solving, impacting social environments by emphasizing life purpose, humanity, ethics, and quality of life".

Advanced Education theory is a theoretical and practical proposal that originated in Cuba to enhance the conceptual, scientific, and methodological foundations of educational processes. Its application improves educational practice quality. Historically, it evolved from an educational alternative to a paradigm and then to a scientific theory of education, supported by research from both Cuban and international scientific communities (Cardoso, 2022).

Researchers in the Advanced Education scientific community view human behavior improvement as the aspiration for individuals to adapt content for self-improvement, demonstrating solidarity, humanism, respect, social commitment, responsibility, and problem-solving dedication. This perspective emphasizes the importance of life purpose, humanity, ethics, and quality of life in the social environment (Añorga, 2020).

Advanced Education theory supports various proposals to address issues in sectors like education, health, nutrition, and tourism. These include strategies for professional development, pedagogical models, and educational programs. Beneficiaries include educators, healthcare professionals, and workers nearing retirement. The theory is particularly beneficial for education, providing tools for statistical technicians to adapt to advancements and maintain high-quality data analysis. Continuous improvement is crucial, especially with rapid technological changes, ensuring professionals stay updated and contribute significantly to their fields.

Panesso V. et al., 2024, explain that "the pedagogical strategy has the qualities that distinguish it: The essential strategy relations are expressed in the dialectic which must accompany its indicators and instruments: human, communicative, participatory, democratic, agreed, dialogic, transformer and systemic. The qualities that are cultivated in the men must have a controllable, measurable and quantifiable effect in the longer or shorter term. This means that when measuring the effect on the social environment that has professional behavior, human, quantitatively. labor, involves measuring it ".

Echevarría et al. 2023, explain too that "continuous improvement is increasingly crucial in the context of the technological revolution, which demands better-prepared educators. Advanced Education maximizes this process by involving graduates at all educational levels in the workforce or society. Continuous training and new skill acquisition are essential for statistical technicians and educators to adapt and thrive in a rapidly evolving technological environment, ensuring high performance and significant contributions to their fields."

In the contemporary context, promoting local community development through science and innovation involves coordination with the government and universities.

Echevarría et al. 2023, in your text discusses, the inclusion of social, economic, and environmental variables in the United Nations' 2030 Agenda, as well as

institutional dimensions. It highlights the contributions of various authors on local development, focusing on de- centralization, regional development, the role of municipal governments, social innovation, and the n eed for stakeholder intervention and training. (Comisión Económica para América Latina y el Caribe [CEPAL], 2019), (Díaz-Canel Bermúdez, M. y Fernández González, A. 2020), (Guzón, A y Pérez, L .2015), (Labrada, C y Areas, M .2008), (Limia, M .2008).

The text discusses the evolving role of universities in society, emphasizing their potential to adopt models, defend values, and engage in societal debates to improve social performance. Núñez (2019) notes that while progress has been made, there is still much to be done. Díaz-Canel and Fernández (2020) highlight the increasing importance of higher education in regional development, positioning universities as key partners with the government.

Continuous training of human capital is crucial for effective leadership and active participation across all educational levels. This is particularly important for enhancing the professional performance of statistical technicians. However, challenges such as inadequate human resource preparation, poor organizational culture, and limited competency development still hinder local and community development efforts.

These issues have been highlighted in studies from Cuba, García M. T. (2018), Echevarria J., Panesso J., Reyes L (2023)., Nápoles D. (2020), García D. (2021), Armas W (2021), From Colombia, Panesso V. (2024)., Panesso V. (2018). Caicedo, L. Y. (2019), and from Angola, Quimba J. (2016), Elavoko A. (2022), and Miranda J (2022).

IMPROVEMENT OF PROCESS DESIGNED

In summary, the new almost standardized and designed procedure in the projects is summarized as follows:

1. Continuous Training and Education:

   - **Ongoing Learning**: Implement regular training programs to keep statistical technicians updated with the latest advancements in statistical methods and technologies.

   - **Advanced Courses**: Offer specialized courses that focus on new statistical software, data analysis techniques, and emerging trends in the field.

2. Integration of Theory and Practice:

   - **Practical Application**: Encourage the application of theoretical knowledge in real- world scenarios. This can be achieved through internships, workshops, and collaborative projects with industry partners.

   - **Case Studies**: Use case studies and practical examples to illustrate the application of statistical theories in solving real-world problems.

3. Development of Soft Skills:

   o **Communication Skills**: Enhance the ability of technicians to communicate complex statistical concepts clearly and effectively to non-experts.

   o **Problem-Solving Skills**: Foster critical thinking and problem-solving skills to enable technicians to tackle diverse challenges in their work.

4. Use of Advanced Tools and Technologies:

   o **Software Training**: Provide training on the latest statistical software and tools to improve efficiency and accuracy in data analysis.

   o **Technological Adaptation**: Encourage the adoption of new technologies that can aid in data collection, analysis, and interpretation.

5. Professional Certification and Accreditation:

   o **Certification Programs**: Establish certification programs that validate the skills and knowledge of statistical technicians, enhancing their credibility and career prospects.

   o **Accreditation**: Work towards obtaining accreditation from recognized bodies to ensure the quality and standard of the training programs.

6. Collaboration and Networking:

   o **Professional Networks**: Promote participation in professional networks and associations to facilitate knowledge sharing and professional growth.

   o **Collaborative Projects**: Encourage collaboration with other professionals and institutions to broaden the scope of learning and application.

7. Feedback and Evaluation:

   o **Regular Assessments**: Conduct regular assessments to evaluate the progress and effectiveness of the training programs.

   o **Feedback Mechanisms**: Implement feedback mechanisms to gather input from technicians and continuously improve the training process.

8. Focus on Ethical Practices:

   o **Ethical Training**: Include modules on ethical practices in data handling and analysis to ensure integrity and professionalism.

   o **Compliance**: Ensure that all practices comply with relevant laws and regulations.

By following these steps, the professional performance of statistical technicians can be significantly enhanced, enabling them to contribute more effectively to their fields and adapt to the rapidly evolving technological landscape.

MEASURING THE EFFECTIVENESS OF TRAINING

Measuring the effectiveness of training is crucial to ensure that your programs are meeting their objectives and providing value. Here are some methods you can use:

1. Pre- and Post-Training Assessments:

   o **Knowledge Tests:** Conduct tests before and after the training sessions to measure the increase in knowledge and skills.

   o **Skill Assessments:** Evaluate practical skills through hands-on tasks or simulations before and after training.

2. Feedback Surveys:

   o **Participant Feedback:** Collect feedback from participants about the training content, delivery, and overall experience.

   o **Trainer Feedback:** Gather input from trainers on the engagement and performance of participants.

3. Performance Metrics:

   o **Work Performance:** Monitor changes in work performance and productivity after training.

   o **Quality of Work:** Assess improvements in the quality and accuracy of the work produced by the trainees.

4. Behavioral Changes:

   o **Observation:** Observe changes in behavior and application of new skills in the workplace.

   o **Self-Assessment:** Encourage participants to self-assess their progress and identify areas for further improvement.

5. Return on Investment (ROI):

   o **Cost-Benefit Analysis:** Compare the costs of training with the benefits gained, such as increased efficiency, reduced errors, and higher productivity.

   o **Impact on Business Goals:** Evaluate how the training has contributed to achieving business objectives and goals.

6. Long-Term Tracking:

   o **Follow-Up Surveys:** Conduct follow-up surveys several months after training to assess long-term retention and application of skills.

   o **Career Progression:** Track the career advancement and professional development of participants over time.

7. Benchmarking:

- o **Industry Standards:** Compare your training outcomes with industry benchmarks and standards.

- o **Peer Comparison:** Assess how your training results stack up against similar programs in other organizations.

By using a combination of these methods, you can gain a comprehensive understanding of the effectiveness of your training programs and identify areas for improvement.

FUTURE DEVELOPMENTS PROPOSED

In statistics, various new technologies have emerged and are being applied to improve data collection, analysis, and visualization. Within the ongoing research program, new investigations are planned to enrich training curricula, and the Cuban government is interested in applying these statistical technologies to improve patient care in the national health system.

Several deficiencies in the historical data within the health system need to be corrected. However, simultaneously, research projects are being initiated in:

- **Bayesian Statistics**: Due to its flexibility and ability to incorporate prior and new information into the analysis, which is useful given the mentioned difficulties in historical data.
- **Modeling for Predictive Analysis in the Health Sector**: To make predictions about future trends based on historical data.
- **Artificial Intelligence and Machine Learning**: Complementing the previous area to generate predictive models and perform pattern analysis in the data. Machine learning algorithms can be used to improve the accuracy of statistical models.

In the future, research projects will be implemented in:

- **Data Visualization**, integrated with the Internet of Things (IoT) and the development of dedicated sensors (with the collaboration of the University of Informatics Sciences - UCI). In fields such as health and the environment, sensors collect real-time data, allowing for continuous and dynamic statistical analysis. Advanced visualization tools enable data to be represented in a more comprehensible and attractive manner.
- **Sentiment Analysis** (with the collaboration of researchers in psychology and communications): To analyze opinions and sentiments expressed in text.

These technologies are transforming the way data is collected, analyzed, and used in statistics, allowing researchers and professionals to obtain more accurate and relevant conclusions.

CONCLUSIONS

Validated through extensive research, Advanced Education theory has demonstrated its importance and contribution to pedagogy through practical application and strong epistemological and ontological foundations. Similarly, improving the professional performance

of statistical technicians, based on this theory, can leverage its scientific basis to address challenges and advance in their field.

With the followed research process and using a pilot group, efforts have been made to im- prove the design process and the results obtained.

Conflict of interest:

The authors declare that this manuscript is original, does not contain classified or restricted elements for disclosure, nor for the institution where it was carried out. It has not been previously published, nor is it under review by another publisher. The authors are responsible for the content of the article, and it contains no plagiarism, conflicts of interest, or ethical issues

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