The LaRuS Model as a Science Model that can Address SDG Challenges

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Abstract

Science education is a critical component of DepEd's last-mile program because scientific literacy should be developed among learners at an early age. Correspondingly, teachers' laboratory experiences and basic scientific skills should not be neglected. With this, the teaching and learning process faces formidable challenges, further exacerbated by the onset of the COVID-19 pandemic. Teachers grapple with the complexities of facilitating learning amidst limited resources and community engagement. The LaRuS (Laboratory in Rural School) Model emerges as a crucial innovation, providing a structured framework to address these challenges. By focusing on knowledge acquisition, science process skills, community collaboration, and self-directed learning, the LaRuS Model aims to empower teachers and students in rural settings. It emphasizes the importance of hands-on activities and contextualized learning experiences, bridging the gap between theoretical knowledge and practical application. Moreover, the model promotes critical thinking and problem-solving abilities, essential for lifelong learning and active participation in the community. As the global community strives to achieve Sustainable Development Goals (SDGs), particularly in education, the LaRuS Model offers a promising solution to improve the quality of education in underserved areas. Through collaboration with stakeholders and scaling up implementation efforts, the model has the potential to contribute significantly to equitable education and sustainable development, ultimately fostering positive change in last-milecommunities.

Outline of Empirical Facts

The teaching and learning process of the last miles schools are challenging from the abilities of the teachers to the process of facilitating learning in experiment set-ups added with the onset of a pandemic due to COVID-19, there is a really big need for teachers to be taught on proper handling of materials and how to elicit learnings based from utilizing of what is available in the community (Anders, 2018).

The community partners and the parents play a big role also in the learning process since they are present daily in the modular learning of their children. Science lessons should focus on the daily needs and daily life-long applications of concepts and how it bridges the utilization of these concepts learned in their life in general (Boix & Champollion, 2015).

The insufficient delivery of lessons and hands-on activities hinders the learning process during the pandemic. This is another challenge that the last mile schools were facing. It is expected that teachers will be properly guided on how to utilize laboratory apparatus and equipment in dealing with their pupils during their science classes (Zamora & Dorado, 2015).

With this, teaching and learning models are important for educational innovation because they visually convey novel concepts about learning.

Teaching and learning models define the process of creating certain environmental circumstances that lead the learner to interact in such a manner that specified changes occur. According to Thiet (2017), a teaching model is a pattern or plan that helps to shape the curriculum, to select instructional materials, and guide teachers' actions. This should compose guidelines for activities and goals achieved.

After reviewing the literature and the theoretical framework and interpreting the themes produced in the interview, a model was produced. Figure 1 shows the LaRuS (Laboratory in Rural School) Model which was transcribed and developed from the results of the interview and document and school observations as provided by the last mile school's administrators and teachers.

The LaRuS model is the pakasaritaan of the participants. The LaRuS model or the Laboratory in Rural School Model focused on assisting the facilitators to acquire and possess knowledge assimilated through scientific evidence and readings, science process skills through hands-on scientific laboratory activities, collaboration and coordination with the community, and self-directed learning through flexible learning.

The model created a bigger picture in assisting the last-mile community through laboratory skill acquisition, taking into consideration the engagement of the community being the bigger picture and larger environment to have laboratory activities.

The pakasaritaan theory of Agacaoili is presented as a complete description of elementary science teachers' experiences teaching scientific laboratory skills in rural schools, as well as the position of science laboratories in rural schools as a framework for basic science teaching and learning. This model also reconciled the gaps in teaching practices to help motivate the learners well in the delivery of laboratory science instruction.

Furthermore, the idea of critical thinking is supported by the establishment of learning environments that promote critical thinking both in and out of the classroom. Students who develop critical thinking skills often approach course materials more carefully and effectively, ask more challenging questions, and participate more actively in the learning process. This critical thinking technique extends beyond the classroom and into the community.

The model, therefore, is an answer to the needs of the last-mile schoolteachers to enhance the learning and teaching skills of last-mile communities. Table 1 showcased the superordinate themes gathered from the interview of the participants.

Table 1. *Super Ordinate Themes*

Emerging Themes	Themes	Super Ordinate Themes
The experiences of the teachers and school administrators during the pandemic	Flexible Learning Problems, Issues and Concerns in Teaching Science Localization and Contextualization	Self-Directed Learning Knowledge Acquisition
The challenges of last-mile school teachers in teaching Science	Problems in Teaching and Learning Science Flexible Learning Assessment Strategies Localization in Science Experiments	Science Process Skills
The last-mile school teachers address the challenges of teaching Science	Training workshop Community involvement and collaboration	Community Collaboration

The problems that have been encountered by the participants as they expressed themselves during the interview are a manifestation of their dire need to be capacitated for them to handle lessons well in science in the last-mile schools.

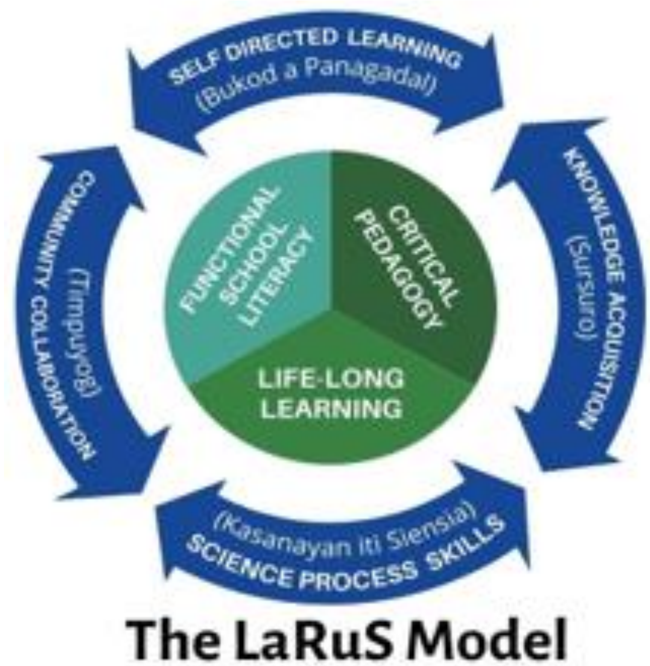
The key findings of the themes that emerged; flexible learning, problems, issues, and concerns in teaching science, localization and contextualization, problems in teaching and learning science, flexible learning, assessment strategies, localization in science experiments, training workshop and community collaboration.

Which produces the superordinate themes and crafted the model: self-directed learning, knowledge acquisition, science process skills, and community collaboration. The coding and theme generation have been complete hence the superordinate themes were established. These superordinate themes made up the main cycle of the model. These are very essential as it originates and emanates from the sarita of the participants. Their stories, challenges, and experiences and how they survived these pakasaritaan made the construction of the model strong and essential.

Laboratory instruction implies that direct contact with the observation and manipulation of scientific materials is preferable to other ways of gaining comprehension and appreciation (Zengele, 2016). Learners who participate in well-designed laboratory activities acquire problem-solving and critical thinking abilities, as well as receive exposure to laboratory processes, materials, and equipment.

The LaRuS model is founded on the conviction for aspiring rural science teachers to acquire the necessary knowledge and skills. They must participate in a program of coherent and context-specific learning experiences that meet requirements and challenges and that will enhance their laboratory skills essential for teaching the science process skills.

Figure 1. The Larus Model



The model suggested that for a learning facilitator be able to share the best scientific laboratory skills with the learner, he or she should learn and possess the following: 1) knowledge acquired based on scientific evidence, readings and contextualized or localized materials; 2) science process skills from hands-on scientific laboratory activities, assessment strategies and localized materials; 3) collaboration and coordination with the community, and; 4) self-directed learning that he or she can apply the lessons and activities on his own and on flexible modes. When all of these features are achieved there will be a functional school literacy that capacitates an individual to participate in all tasks that need scientific laboratory skill literacy for the efficient functioning of his/her group and community, as well as to continue using reading, writing, and calculating for personal and community growth., a critical pedagogy that challenges the learners to apply the acquired knowledge from laboratory activities in their communities and a life-long learner that will apply the scientific laboratory concept and skills acquired in their daily life.

The model is a cycle-like image presenting the dynamics of laboratory science teaching; these domains are situated in the outer part of the loop. These dynamics are self-directed learning, knowledge acquisition, science process skills, and community collaboration. The circular nature of the model represents a balance among these four dynamics. The color shade signifies the branding of PNU that symbolizes its strong base, especially in teaching, and learning. The inner cycle is a smaller circle representing the products of laboratory teaching in the last-mile schools. Green in three different shades indicates the diversity, harmony, and influence of the environment in the establishment of the last-mile schools. It is believed that when these essentials are cultivated with dynamics presented in the outer layer-functional school literacy, critical pedagogy, and lifelong learning- then these results will be obtained.

Policy Recommendations

The development and validation of the LaRuS (Laboratory in Rural School) Model, as described in the study, align well with several Sustainable Development Goals (SDGs) related to education, particularly Goal 4: Quality Education.

Here's how the LaRuS model can contribute and scale up in alignment with SDGs:

SDG 4: Quality Education. The LaRuS model directly addresses the need for quality education by focusing on scientific literacy among learners in last-mile schools. Emphasizing self-directed learning, knowledge acquisition, science process skills, and community collaboration contributes to a holistic and quality education approach.

SDG 9: Industry, Innovation, and Infrastructure. The hands-on scientific laboratory activities incorporated into the model promote innovation and practical skills development, aligning with the goal of fostering inclusive and sustainable industrialization.

SDG 17: Partnerships for the Goals. The LaRuS model encourages collaboration and coordination with the community, fostering partnerships that can contribute to achieving various SDGs, particularly those related to poverty reduction, health, and well-being.

SDG 3: Good Health and Well-being. Through the emphasis on community collaboration, the LaRuS model may indirectly contribute to health and well-being by promoting awareness and understanding of scientific principles that can be applied to health-related issues in rural areas.

SDG 1: No Poverty and SDG 2: Zero Hunger. Improving education in last-mile schools, as targeted by the LaRuS model, can contribute to breaking the cycle of poverty and enhancing opportunities for better livelihoods, aligning with SDG 1 and SDG 2.

SDG 8: Decent Work and Economic Growth. By enhancing the quality of education and promoting practical skills through the LaRuS model, it supports the goal of decent work and economic growth by preparing learners with relevant skills for future employment.

To scale up and better align with the SDGs:

- Collaboration with government bodies, NGOs, and international organizations can help implement the LaRuS model in a wider range of last-mile schools.
- Training programs and capacity-building workshops for facilitators, as recommended, should be organized at scale to ensure effective implementation.
- Establishing partnerships with local communities and industries can enhance the sustainability and impact of the LaRuS model.
- By integrating these considerations, the LaRuS model can contribute significantly to the global efforts outlined in the SDGs, especially in addressing education disparities in last-mile schools and promoting sustainable development.

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