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Editorial

Sustainable Development of STEAM and Mathematics Education with Active and Innovative Methodology

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1. Introduction

There is a broad consensus in recognizing the importance of having a citizenry competent in mathematics which, in this way, contributes to ensuring both their socioeconomic progress and their employability, as well as their personal fulfillment, social inclusion, and active participation as citizens [1–3]. However, there are numerous indicators, both nationally and internationally, that reveal the existence of a deterioration not only in the acquisition of skills but also in the motivation and attitude that students have toward learning mathematical content in particular and mathematicians in a broader sense [4,5]. In science, technology, engineering, arts, and mathematics (STEAM) studies, along with mathematics education, in recent years, active and innovative methods have recognized increasing consecration of specifying the apposite arrangements of students' capacities [6,7]. In daily circumstances, a STEAM education offers various combinations of mathematics disciplines as concrete objects, the teaching/learning of which are merged and ordered so they may be exploited for problem solving [1,8,9].

In varied educational divisions, educational sustainability development (ESD) has pursued lifetime consciousness and features for each individual [10,11]. Thus, in the context of higher education, it should be a fragment of a universal organization which champions sustainability education [12,13]. Precisely, it was elevated to a better understanding of the sustainability concept and reoriented to instructive syllabuses [14,15]. It was also designated with respect to the acquisition of skills, information, worth, and knowledge [14–16]. Sterling [17] stated that sustainable education exists for directing transformative learning, which is an amendment of educational philosophy for the potential fulfilment and economic, social, and ecological interdependence of each individual. Conclusively, through an instructional culture, teaching resolutions are deliberated with the goal of affirming pre-service teachers and capabilities, communications, criteria, and thinking procedures, which perform as transition representatives for sustainable development [18–20].

This Special Issue, "Sustainable Development of STEAM and Mathematics Education with Active and Innovative Methodology", is intended to provide a solid/concrete research corpus. It presents the challenges/skills required for distributing a proper active, innovative, and sustainable STEAM and mathematics education, which is for scholars and/or professionals of dissimilar educational backgrounds and practical fields. In particular, a STEAM and mathematics education can contour the fragments, or is beginning to contour the fragments, of numerous educational organizations' curricula with feasible presentations for numerous categorizations/disciplines. Nevertheless, in higher education institutions (HEIs), efforts should be made toward the Sustainable Development Goals (SDGs), in addition to making ongoing efforts in the working environment to validate a suitable arrangement and advance sustainability-oriented problems.

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2. Scientific Contributions

2.1. Assessment of Students' Mathematical Skills with Respect to the European Qualifications Framework

Stańdo et al. focus on the outcomes of association amongst factors related to students' mathematical proficiencies through socio-economic, demographic, and ontogenetic settings. This article attempts to answer the query of how the mathematical proficiencies of students are developed with regard to their strengths/weaknesses. It also addresses mathematics utilization in daily life. Here, this article scrutinizes the association of results, which comprise a simulated final mathematics exam for eighth-grade elementary students and/or final-year students in high school. In further mathematics classes, mathematics is applied to daily life and the greatest problems with particular extents of material thought.

2.2. Computer Tools for the Sustainability of Knowledge and Developing Active and Innovative Methods in STEAM and Mathematics Education

Körtesi et al. concentrate on learning/teaching mathematics and analyze the functions of information, communication, and technology (ICT) tools, computer algebra systems (CASs) and dynamic geometry systems (DGSs), in education, which allow for the implementation of active and innovative instruction methodologies correlated with sustainable science, technology, engineering, arts, and mathematics (STEAM) education. Similarly, this article emphasizes the requirement of learners to embrace a knowledge of mathematical theory, an indispensable qualification for guaranteeing the reliable/effective use of current version of mathematical software provided. Throughout practical research, this work underlines a mixed teaching method which can meaningfully develop mathematical knowledge sustainability.

2.3. Sustainable Learning, Cognitive Gains, and Improved Attitudes in College Algebra Flipped Classrooms

Karjanto and Acelajado deliberate on the implementation of curricula which nurture the cross-cutting/transversal key competencies for sustainability. This article aims to organize students to become sustainability residents. In numerous conditions and across dissimilar regulations, they can maintain learning throughout their lives. Also, through their tendencies, approaches, and proficiencies, they participate productively and conscientiously toward any challenges for the future world. The flipped classroom, which is an active learning, flexible, student-oriented, and multidimensional instruction, is acknowledged as a sustainable teaching methodology Finally, toward mathematics learned by means of quantitative/qualitative methods, the objective of this article is to examine the effect of pedagogy on the academic accomplishments of learners and their attitudes.

2.4. Technology-Based Pedagogy for Mathematics Education in the Sustainable Development of Mathematics Education

Naidoo contemplates this qualitative study of 38 postgraduate students, which investigated the experiences/perceptions of technology-based instruction during the COVID-19 pandemic. Particularly, the participants are mathematics education students who are practicing mathematics teachers in South Africa. The virtual communities theory was implemented in this practical study. Here, in two interactive virtual workshops, participants were asked for using numerous technology-based instructions. Consequently, these participants were requested to partake in online interviews which concentrated on their experiences/perceptions of technology-based instruction for acquiring a mathematics education. Therefore, this study discloses the challenges/strengths of using technology-based instruction for studying mathematics education during COVID-19.

2.5. Implementation of STEM Education Using Partial Least Squares Approach

Wijaya et al. focus on the determination of the elements prompting pre-service teachers' intents and the outcomes of gender/age on the science, technology, engineering, and mathematics (STEM) implementation of education as well. Among pre-service secondary

school teachers, the theory of planned behavior (TPB) was embraced to envisage the affiliation between the social influence, knowledge, attitude, apparent effectiveness, control, and behavioral intention (BI) of STEM education. Here, the results displayed that observed effectiveness had an affirmative importance and a connection with the pre-service teachers' attitudes toward STEM education. Habit had an affirmative importance in motivating interactive intentions and the implementation of teachers. Subjective standards did not have a substantial correlation with BI and employment.

2.6. Design Framework for Mathematical Activities in Hong Kong Mathematics Education

Lo et al. concentrate on the establishment of a design framework in Hong Kong for mathematical modeling activities which are appropriate for teachers and students. Here, the study explores the scheme and content of certified mathematical modeling paradigms announced by the Hong Kong Education Bureau, exploiting a document analysis approach. For an emerging framework, the outcomes stipulate the foundation to be expended in the future design of activities in mathematical modeling. Therefore, four examples were identified and examined in terms of their fundamental constituents, level of learning involvement in mathematical modeling, and design features.

2.7. Students' Perceptions of Online Learning during the COVID-19 Pandemic

Curelaru et al. deliberate on a thematic examination of the views/perspectives of university students regarding online learning. Specifically, this article describes their clarifications and understandings of the alteration from face-to-face courses in a traditional manner to online teaching during the COVID-19 pandemic. Some of the main themes obtained from the information denote the negative facets of online learning described by participants. These relate to its drawbacks, such as health/psychosocial difficulties and learning procedure glitches. Examples include a lack of feedback and challenges, misinterpretations, extra academic necessities, and disengagement. Other recurring premises refer to the positive features of online learning and its advantages, such as contentment, accessibility, and psychological/medical safety.

2.8. Educational Innovations for STEAM Education in Digital Technology Environments

Lavicza et al. focus on three instances of projects on both pedagogical and technological advances to elucidate the influence of fast technological modifications on research. The research team members established and expended technological applications in the research projects, exploiting design-based research (DBR). Here, it was not only necessary to redesign the methods proposed on the basis of the research results; in addition, the technological modifications were so fast that the materials/pedagogies also needed to be adjusted while considering how to redesign the project for the next sequence on the basis of the analysis of the obtained data. Therefore, this study reveals an extra facet to be measured in DBR in addition to examining technology integration or innovative technologies.

2.9. Service Learning as an ESD in a STEM University Course

Martín-Sánchez, González-Gómez, and Jeong deliberate on a service learning (SL) methodology for the design, implementation, and evaluation of as a STEM education for sustainable development (ESD) approach in a university course. A pre- and post-test methodology was expended to evaluate the SL suitability of such an education for a sustainable development (ESD) approach. It resulted in a substantial escalation in the students' knowledge for the strategies of innovative teaching, along with appropriate contents, as well as in their comprehension of SDGs. Furthermore, in the SL project, the students' contribution afforded them an awareness of the community repercussions of sustaining the atmosphere and producing an advantage for the whole community. Thus, this research displays how the SL teaching methodology is a significant instrument for the accomplishment of both curricular competences and environmental awareness. Here,

theoretical experience pertains to concrete work to accomplish an actual community service and is therefore a very appropriate instruction strategy pertaining to EDS.

2.10. SEM Statistical Software Packages for a Sustainable Mathematics Education

Sakaria et al. focus on the ideal selection of patented statistical software packages for structural equation modeling (SEM) methods, which are insufficient despite its immense significance in sustainable education. Here, this study provides a systematic review which is obliged to examine the experimental studies to fill this existing gap. Web of Science (WoS), Scopus, and Education Resources Information Center (ERIC) databases were searched to identify publications from 2018 to 2022. Current version of Lisrel, Amos, Mplus, SmartPLS, R package (plspm), and WarpPLS statistical software provided was utilized to determine an optimal choice. Despite the extensive practice of a diversity of statistical programs, SmartPLS and AMOS were thoroughly applied in CB-SEM and VB-SEM/PLS-SEM, respectively.

3. Conclusions

This Special Issue encompasses articles, reviews, short notes, etc., on active and innovative approaches toward methodologies and advanced research related to sustainable STEAM and mathematics education [21,22]. Here, it encourages theoretical, methodological, and empirical research on teaching and learning, competencies and assessment, policy, program development and implementation, instructor preparation, community- and project-based learning, institutional collaborations and partnerships, and other relevant topics. Particular focus was directed toward active and innovative teaching and learning approaches and methodologies that have been substantiated to be relevant to sustainable STEAM and mathematics education, such as flipped classrooms, blended learning, escape rooms, gamification, technology-based classrooms, future classrooms, virtual reality, e-learning and online learning, project-based learning, service-learning, and inclusive learning.

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