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TRANSNATIONAL STRATEGY



Development of A Strategy for Implementing Green STEM Education



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List of recommendations

1. Enhancing Teacher Training and Development:

- Prioritize STEM teacher training and development initiatives to attract and retain qualified STEM educators.
- Develop a comprehensive national strategy for ongoing STEM teacher training.
- Establish a model for STEM teacher training in collaboration with universities.
- Include university courses tailored to the needs of science teachers.
- Facilitate online access to a library of validated STEM lessons.
- Promote innovative STEM curriculum development and continuing STEM education.
- Encourage practical activities and green STEM projects within established STEM laboratories.
- Create regulations to involve students from various STEM fields in teacher training.
- Foster lasting relationships between the scientific and educational communities.

2. Investing in STEM Education:

- Direct increased funding to STEM programs, including equipment, laboratories, and technologies.

3. Collaboration and Networking:

- Increase collaboration among stakeholders in STEM education, including teachers and STEM professionals, to provide students with insights into STEM applications in various industries.
- Establish a platform for networking and collaboration in the Green STEM field to share best practices, resources, and ideas.

4. Incorporating Green STEM Education in teacher education and further training:

- Include Green STEM education in the teacher education curriculum by integrating sustainability, environmental protection, and renewable energy concepts into STEM subjects.
- Implement meaningful professional development programs for in-service teachers focusing on integrated STEM and Green STEM education.

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- Integrate Green STEM education into higher education STEM curricula, enriching courses with integrated STEM education and offering a Green STEM approach.
- Utilize learning technologies, such as digital tools and MOOCs, to engage both future and in-service teachers in Green STEM education. Create digital resources designed for Green STEM to enhance learning outcomes across disciplines.
- Promote an open schooling approach, fostering collaboration between universities and the local community. Encourage partnerships with public and private organizations to address real-world problems and contribute to local community development in the context of Green STEM education.

5. Professional Development:

- Provide teachers with access to high-quality professional development opportunities to effectively integrate Green STEM education into their teaching practice. This includes workshops, seminars, and online courses.

6. Utilizing Technology and Innovative Teaching Methods:

- Enhance Green STEM education by using technology and innovative teaching methods, such as online resources, educational games, and interactive tools.
- Encourage educators to employ project-based learning, inquiry-based learning, and student-centered approaches in teaching.

7. Promoting Awareness and Community Involvement:

- Raise awareness of Green STEM education initiatives and involve the community by partnering with local organizations and businesses, engaging parents and students, and emphasizing the importance of sustainability and environmental protection in the wider community.

8. Ensuring Equal Access to STEM Opportunities:

- Implement initiatives to ensure equal access to STEM education opportunities for all demographic groups.



Common priorities for innovations and changes

1. Establishing STEM Centers and Curriculum Reforms:

- Establish STEM centers in universities and schools to promote STEM education. These centers should facilitate research, development, and innovation, enhancing both teachers' and students' capabilities.
- Implement curriculum reforms that focus on STEM subjects such as mathematics, science, and informatics technologies. Integrate STEM into training programs to attract more students to technical education.
- Establish STEM centers at secondary education levels, utilizing existing "Science Laboratory Centers" (EKFE) in Greece to promote STEM and Green STEM education. Private STEM education organizations can enhance these efforts by organizing workshops and acting as open schooling Green STEM initiatives.
- Introduce Green STEM programs at the tertiary level by creating centers within Universities, specifically in the existing "Training and Lifelong Learning Centers." These centers can provide both on-site and online seminars using MOOCs, offering certification to motivate future and in-service teachers.

2. Stakeholder Engagement:

- Identify key stakeholders for effective implementation:
 - For policymakers and curriculum integration: Ministry of National Education.
 - For R&D: Scientific and Technical Research Council.
 - For industry experts: Industry and Business Association.
 - For inservice teachers: Ministry of National Education
 - For NGOs and industry experts: Chamber of Commerce and Industry.
 - For NGOs: Women Entrepreneurs Council.



3. Roadmap and Collaboration:

- Use information from country reports to shape a roadmap for the Green STEM model for teacher education project.
- Leverage existing reports, research, and initiatives to provide insights and resources for teacher training and professional development.
- Facilitate collaboration and interdisciplinary learning among teachers and students through professional development opportunities.
- Encourage cooperation among educators from various fields to develop STEM-based lessons addressing environmental challenges.
- Provide training sessions, workshops, and online resources to support the implementation of the Green STEM model.
- Share successful STEM-focused lessons and activities to inspire other educators.
- Partner with organizations and NGOs to offer hands-on projects and practical experience in applying STEM skills to real-world environmental challenges.

4. Leveraging Commitment to the Green Deal:

- Capitalize on commitment to the Green Deal, which provides opportunities for advancing Green STEM education.
- Utilize increased resources for research and development to create innovative teaching methods and tools.
- Emphasize the importance of Green Deal evaluation for assessing the impact of Green STEM education and guiding policy decisions.
- Forge partnerships with organizations and NGOs focused on environmental issues to engage teachers and students in practical projects.
- Reform STEM education curriculum by rethinking and restructuring programs to enhance teacher self-efficacy in integrated STEM approaches.
- Focus on developing and testing new teaching methods, starting from early years of schooling, to accelerate changes and monitor progress.



- Implement STEM strategy indicators and a well-designed STEM framework to attract more students to STEM careers, with specialized scenarios in Green STEM and empirical studies for effective educational outcomes.

5. Participation in the Paris Agreement:

- Recognize the significance of international collaboration and collective action in combating climate change.
- Highlight the role of STEM education in addressing climate change.
- Encourage teachers to participate in policy debates and advocacy efforts that support climate action and sustainability.

The implementation of the Green STEM model for teacher education has the potential to create an effective framework for STEM education with a focus on sustainability. It can enhance teacher training, promote interdisciplinary learning, and leverage commitment to environmental initiatives such as the Green Deal and the Paris Agreement to strengthen STEM education in the country.



Analysis of the applicability of the common priorities

1. Cooperation Between Business, Industry, STEM Research, and Education:

- Enhanced Innovation and Research Commercialization: Collaboration can transfer academic knowledge and technologies into the private sector, fostering innovation and boosting economic growth.
- Talent Development and Retention: Engaging with education sectors allows industries to shape the workforce's skills, leading to better employment opportunities, reducing the brain drain, and retaining skilled professionals.
- Fostering Entrepreneurship: Collaboration can lead to the creation of startups, stimulating entrepreneurship, job creation, attracting investments, and enhancing global competitiveness.
- Addressing Industry Challenges: Collaboration provides businesses with expertise and resources to tackle challenges efficiently, enhancing productivity, cost-effectiveness, and sustainability.
- Public-Private Funding Opportunities: A structured cooperation plan can attract funding for research and development, supporting advanced research initiatives and capacity building.

2. Development of STEM-Related Occupations and Career Stages:

- A comprehensive workforce development strategy that aligns with labor market needs is essential.
- Collaboration between educational institutions, government bodies, and industries is critical to identify emerging skill requirements.
- Providing opportunities for upskilling and reskilling ensures a competent workforce adaptable to technological advancements.

3. Universities Community for STEM Education:



- Facilitate networking opportunities among educators, researchers, and policymakers, promoting knowledge sharing.
- Elevate the quality of STEM education through resource pooling.
- Foster a culture of innovation and research in STEM education, encouraging the exploration of new methodologies and technologies.

4. Popularization of STEM Education Across Universities:

- Meeting the growing demand for skilled STEM professionals in various fields.
- Encouraging existing universities to establish dedicated STEM programs.
- Developing partnerships with international institutions to enhance STEM education offerings.

5. Green STEM Education Strategies:

- **Integration of Green STEM Education into the Curriculum:**
 - Create and distribute activities related to EU green perspectives.
 - Organize in-service teacher development programs and introduce elective courses focused on Green STEM education.
- **Collaborative Partnerships:**
 - Collaborate with environmental organizations, government agencies, and local businesses.
 - Provide real-world experiences, internships, and job shadowing in sustainability.
- **Use of Technology:**
 - Create video content for dissemination activities and incorporate measurement and testing stations.
 - Adapt pedagogies to integrate technology for a comprehensive understanding of green technologies.
- **Community Engagement:**



- Organize workshops and events to educate teachers and students on green technologies and benefits.
- Collaborate with organizations and participate in science festivals to engage the local community.
- **Research and Development:**
 - Engage teachers and teacher candidates in creating innovative solutions to environmental challenges.
 - Share knowledge and findings through scientific platforms and academic articles.
- **Professional Development:**
 - Establish a Green-STEM laboratory within the faculty of education.
 - Offer educational workshops, conferences, and online resources for professional development.

6. Establishing STEM Centers:

- Integrate STEM sections into national "Science Laboratory Centers" (EKFE) for primary and secondary education, enriching activities with Green STEM approaches through workshops and seminars.
- "Innovation centers" in every educational region will include a "STEM education" section, enriched with Green STEM approaches and projects on Education for Sustainable Development.
- Provide crucial support for teachers educating students with disabilities, emphasizing modifications, accommodations, individualized programs, adapted curriculum, and collaborative learning.

7. Establishing Green STEM Programs in Tertiary Level:

- Collaborate with the "Hellenic Scientific Association of Information & Communication Technologies in Education" to engage University professors in promoting Green STEM education.
- Communicate with all universities to include Sustainable Development and environmental awareness topics in their STEM programs.



8. Reforming STEM Education Curriculum:

- Evaluate workshops and seminars to inform the design of Green STEM components in existing STEM curricula and activities.
- Leverage digital technology for disseminating Green STEM approaches, making digital educational resources and prototype scenarios accessible to all educational levels.

Incorporating these integrated strategies will promote STEM education and green STEM awareness, fostering innovation, sustainability, and technological advancement in education.



Conclusion

In summary, the identified priorities offer a comprehensive blueprint for enhancing STEM education within the context, illuminating a path towards the transformation of the educational landscape. By expanding the horizons of teacher training, establishing accessible STEM centers, and nurturing a collaborative university community, the prospects for STEM education in the region become increasingly promising.

The commitment to elevate STEM teacher training reflects a concerted effort to ensure that educators are equipped with the essential knowledge and pedagogical tools to inspire and guide the next generation of STEM enthusiasts. Through tailored training programs and initiatives, teachers will not only enhance their teaching capabilities but also ignite the curiosity and passion of their students. This, in turn, paves the way for a more knowledgeable and skilled workforce, ready to tackle the multifaceted challenges of the 21st century.

The establishment of accessible STEM centers signifies more than just the creation of physical spaces; it is the cornerstone of fostering a culture of innovation and research. These centers serve as hubs for collaboration, enabling the convergence of ideas, resources, and expertise. Here, both educators and students can immerse themselves in the wonders of STEM, engaging with cutting-edge technology, and participating in hands-on research projects. These experiences not only inspire future STEM professionals but also prepare them for the evolving demands of STEM careers.

The endeavor to nurture a collaborative university community amplifies the collective voice of educators, researchers, and policymakers, promoting knowledge sharing and continuous improvement. As this community grows, it becomes a wellspring of innovative methodologies and technologies, which, in turn, enrich the STEM education experience. This unified approach, characterized by a shared commitment to excellence, empowers STEM education professionals to continuously elevate their standards and outcomes.

The collaboration of stakeholders with various organizations is crucial for realizing the recommendations and priorities aimed at an open schooling approach. Professional development initiatives will involve workshops and seminars for teachers, special educators, and future teachers, all rated and accredited. A well-designed framework is proposed to foster inclusive STEM learning, promoting accessibility for all students. Empirical studies on the attitudes of the educational community toward Green STEM education, combined with the recommendations, will contribute to forming guidelines for curriculum inclusion. The critical role of digital technology is emphasized in achieving the outlined recommendations and priorities.



However, the successful execution of these priorities is contingent on more than just intent; it requires an unwavering commitment from governmental bodies, educational institutions, and all stakeholders vested in the advancement of STEM education. These initiatives hold the potential to significantly influence the future of education, propelling STEM disciplines to new heights and preparing the workforce for the multifaceted challenges that await. Through persistent collaboration and a shared vision, the transformation of STEM education becomes an achievable and enduring reality, promising growth, innovation, and sustainable development within the educational landscape.

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