

STEM Education in Europe - The Way Forward

Policy Recommendation for Decision Makers in VET

Ireland

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The 11th February 2021 marked six years since the United Nations declared this date 'International Day of Women and Girls in Science' this looks to give recognition to women in science and technology and create greater gender equality. Ireland strives to become the best education system in Europe by 2026 which would adhere to Government's goals, this correlates to students having the resources to reach the highest level of education possible for instance scholarships are provided for women who wish to pursue STEM careers: 'Intel Women in Technology Scholarships' <https://www.iua.ie/press-releases/scholarship-programmes-for-women-studying-stem-international-day-of-women-girls-in-science-2021/> and for people with special learning needs where 'The Disability Access Route to Education (DARE)' reduces the points for places in third level education to make STEM courses accessible to school leavers who experience challenges in their education as result of a special learning need <http://accesscollege.ie/dare/>. The aspiration is to increase access numbers to a further 30% by 2025.

Diversity and Inclusion within STEM professions will prevail when Equality is universally understood and is enacted in educational policies in real-contexts, for this reason projects such as SENSE are essential to achieve the transition in an Irish labour market where women make up just 25% of those in STEM-related jobs.

"Equality is not always about treating everyone the same – it is about treating people in such a way that the outcome for each person can be the same. This means putting things in place to support people to achieve similar outcomes" (National Youth Council of Ireland, 2020).

STEM supporters (ambassadors) can help fill a niche in STEM promotion where learners need an external influence to spark in some and reinforce in others their curiosity in STEM careers. It is envisaged that STEM supporters embody a two-fold purpose: role model and promoter of STEM. Diversity and inclusion are key elements in recruitment of STEM supporters. In this way STEM professionals with special learning needs and women become STEM supporters and role models.

1. Real-life context to be employed when teaching STEM in VET

PROBLEM STATEMENT

A focus group facilitated by Galway Technical Institute GRETB (Galway Roscommon Education Training Board) identified that the learning of STEM concepts would improve if related to the real-life contexts.

The background to this issue predominantly lies in the contextualisation of teaching STEM subjects because learners wish to apply the knowledge and skills learned. This issue can be addressed by the schools themselves with help from Third Level Institutions and industry.

Currently the SENSE Project is a solid initiative in helping solve this issue as role models in terms of STEM supporters would provide a real-life link between STEM concepts and their contextualisation in practical terms- how they translate to industry and other professions.

Visits to school from industry in present times tend to be based on teacher-talk or be lecture-based as it is also commonly known. Speakers from industries have been invited to talk in schools and act as role models but this could be optimised if workshops are facilitated to be more engaging and hands-on, to quote a well-known Chinese proverb:

I hear and I forget

I see and I remember

I do and I learn (understand)

RECOMMENDATION

- 1. Creating close links with Industry with role models can facilitate information sessions where scientific concepts can be applied for learners.** This can be implemented by government policies encouraging industry to link with schools for the future of STEM in Ireland. Incentives like providing funding for these links would facilitate both the schools and industry to take part. Funding would help with transport and preparing and delivering STEM promoting session costs. This would be of benefit as learners have advised they wish to connect their learning with real-life and contextualising STEM concepts with someone who is in the profession inspires further learning and understanding and creates a memory for learners when deciding which career path to take.
- 2. The link between schools and industry can be supported by Third Level Institutions with the creation of projects to bring STEM to life in the classroom-** demonstrating day to day application of STEM concepts in the labour market. For instance, final year trainee teachers could complete projects in designing of didactic resources. This approach has been adopted by Cell EXPLORERS, National University of Ireland Galway where final year science students from the Biochemistry department create Molecular Biology sessions to present to primary and secondary schools in their national workshops/roadshows around Ireland. This model has proved to be highly effective and many lessons on engaging Irish youngsters to pursue STEM professions can be learned from this renowned Irish science outreach programme. This option will work because it has worked in slightly different context but with similar ethos.
- 3. Facilitating tours to industry/universities/Institutes of Technologies is a practical way for Fourth Year (Pre-Leaving Certificate) learners to gain insight into real-life STEM professions** if work experience opportunities are unavailable. In the tours learners would observe STEM concepts in action. The efficacy of this approach would see the learners gain deeper understanding shadowing the work STEM professionals - bringing STEM to life in a dynamic and memorable manner.

EVALUATION CRITERIA

- The uptake of STEM courses for students with special learning needs and girls in Third-level institutions and Further Education and Training is expected to increase by 15% because of STEM supporters' dissemination of the opportunities available.

2. Infrastructure for provision of STEM modules, STEM focused classrooms with appropriate technology to bring scientific concepts to life

PROBLEM STATEMENT

Infrastructure needs to be improved as currently classrooms particularly in Primary and Further Education are not fully equipped to create a holistic approach to learning STEM. This issue arises from the ever updating technologies which enhance the learning process when adopted in the STEM classroom. This came to the forefront particularly during lockdown when learners had little choice but to embrace the digital learning tools available out there to help them attain the learning outcomes of their courses. These technologies can be readily employed in the STEM classroom be it face-to-face or online for example 3-D anatomical models of the human body or its molecular structures. This lack of Technology Enhanced Learning tools in the STEM classroom is down to funding and with sufficient funds the STEM classroom can be transformed to a digitally rich environment where the learner has at their disposal the world of STEM ready to come to life (in a way) at their finger-tips.

Government funding will have to trickle down to the STEM classroom to allow for devices to be readily available for STEM learners.

Tablets have been made available and other technological devices to learners but not enough to ensure the STEM classroom is not without. These devices are usually shared amongst other departments in the schools, this system has not proved effective in the past as the STEM classroom is not always guaranteed devices for lesson being delivered.

RECOMMENDATION

1. Government funding to update the STEM classroom by better integrating technology - **devices such as tablets, science kit models etc. incorporated into the STEM classroom.** This propels learners into real-life STEM platforms while acquiring the skills to navigate the technologies.
2. **Funding from industry** – to provide useful technology for the STEM classroom- laptops/tablets etc. Schools could reach out to local industry encouraging commitment from industry to participate by sharing expertise, donating devices and facilitating access to appropriate platforms. This would work as industry is always looking for avenues to work with their local community to integral development. Government policy could also encourage and incorporate such networking between local schools and industry.
3. In terms of infrastructure **a STEM centre in each local community would develop engagement.** The contribution of Science Foundation Ireland to this nationwide project would help cement its foundation in each Irish county. This type of infrastructure would prove invaluable to the community informing and involving citizens who in turn become STEM literate about scientific breakthroughs.

EVALUATION CRITERIA

- It is predicted by 'Ireland's Future Talent - A Charter for Irish Universities' that by 2030 learners in Irish university will increase by 25,000, of these it is hoped strategies like The SENSE Project will inspire learners to pursue STEM professions. This Charter highlights investment as a requisite in creating 'an increasingly digital and flexible learning environment' also outlining that 'decaying infrastructure' needs to be refurbished.

It is envisaged that 15% will engage in STEM courses including both women and people with special learning needs.

3. Limited Continuous Professional Development for STEM Teachers

PROBLEM STATEMENT
<p>Continuous Professional Development (CPD) for STEM teachers is limited - Third Level Institutions and Industry can be involved in CPD events for STEM teachers and facilitate learning events where communities of practice can flourish.</p>
RECOMMENDATION
<p>Creating Continuous Professional Development whose theme is best practice in teaching STEM modules and forming a Communities of Practice.</p> <ol style="list-style-type: none"> 1. Higher Institutions can partake in delivering CPD workshops as a STEM outreach activity for teachers. This would work if teachers were encouraged to take the opportunity and were given the time to participate by School Management. 2. Communities of practice can be encouraged by schools themselves organising meetings where each school hosts STEM communities of practice events every 6 months, STEM teachers can discuss and reflect what practices have worked best. This gives the opportunity for teachers to share resources and information on best practice. 3. CPD webinars as stated in ‘STEM Education Implementation Plan 2017–2019’ – these would provide information on STEM teaching best practice where teachers can engage within the flexibility of their own time restraints which would increase the potential for their adoption. Creating online discussion forums where STEM teachers can share experiences would prove beneficial to this web approach.
EVALUATION CRITERIA
<ul style="list-style-type: none"> • Better trained teachers result in more engaging lessons and a higher degree of learners who are captivated by STEM subjects. This recommendation foresees a greater number of learners wanting to pursue a STEM career (20%) as they would feel at ease, their self-efficacy in STEM would reduce psychological barriers i.e. students’ own misconceptions of their abilities to succeed in STEM.