ASTI Submission

STEM in Second-Level Schools

Oireachtas Committee on Further and Higher Education, Research, Innovation and Science

March 2023

Introduction

The ASTI welcomes the opportunity to contribute to the current review of STEM education by the DFHERIS Oireachtas Committee. Education policy is fundamental to all areas of government policy and it vitally important that legislators engage with the teaching profession on both policy development and implementation. STEM policy has a particularly significant status in overall education policy in that it is foundational to wider state policies for economic growth. In an era characterised as one of transitions, education at all levels assumes major importance. Skill shortages, the spread of AI and other digital technologies, the emergence of new forms of work -trends described as the Fourth Industrial Revolution - require governments to ensure that strong policies are in place to ensure that school leavers have the knowledge and skills to work and flourish in fast-changing environments. [1]

However, the mission of education can never be reduced to a purely utilitarian focus on human capital formation. At its core, education is a social mission which aims at ensuring the wellbeing of individuals and societies. Teachers have frequently expressed concern when education policy is framed only in economistic terms. Such an approach not only undermines legislative and other statements of educational values and objectives; it is totally contrary to teachers' beliefs and their understanding of the work of schools.

In this submission, the ASTI will highlight some of the key issues and trends currently impacting on STEM education at second-level. It will not address aspects of the National STEM Education Implementation Plan 2022 – 2026 but, rather, focus on wider systemic trends impacting on STEM education in schools. [2]

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[1] https://www.oecd.org/cfe/regionaldevelopment/Audretsch(2018)DevelopingStrategiesForIndustrialTransition.pdf

[2] https://www.asti.ie/document-library/asti-submission-stem-education-implementation-plan-2022-2026/

Observations on STEM education in Ireland

STEM education in Ireland is set out in the STEM Education Policy Statement 2017 to 2026 and is delivered in the context of the STEM Education Implementation Plan 2022 to 2026.[3] The Policy is premised on four pillars: nurturing learner engagement and participation, enhancing teacher capacity, supporting STEM education practice and using evidence to support STEM education. STEM policy is realised in terms of subjects as part of the curriculum and in terms of many curriculum enrichment activities such as BT Young Scientist, SciFest, Spiders' Digital Awards, etc. At Departmental level, working groups have been established to drive specific aspects of the STEM Implementation Plan including the Arts Advisory group, Gender Balance Advisory Group and the Education Business and Industry Group.

Internationally, Irish 15-year-olds' are consistently among the highest performers in Maths and Science in the OECD's PISA reports. In Ireland the proportion of students deemed as low achievers in science and Maths is 17% and 15% respectively compared to the OECD average of 23%. While these trends provide a strong knowledge base for uptake of STEM subjects in senior cycle, progress towards reaching subject-uptake targets remains slow. The percentage of students taking STEM subjects at senior cycle which includes the physical sciences of Chemistry and Physics, the technological subjects of Technology, Design and Communication Graphics, and Construction Studies, the applied sciences of Agricultural Science and Home Economics, remains stable. Moreover, according to the most recent Departmental report, strong differences remain in the percentages of girls and boys when it comes to STEM, particularly when biology is excluded. [4]

From the ASTI's perspective, From the ASTI's perspective this slow progress towards meeting targets of subject uptake and gender balance and wider inclusion goals is attributable to wider systemic problems in second level education. These are elaborated on below.

[3] https://www.gov.ie/en/policy-information/4d40d5-stem-education-policy/

[4] https://www.gov.ie/en/publication/055810-education-statistics/#latest-statistical-reports

Key systemic issues impacting on STEM education

Under-investment in education

Investment in second-level education has for a number of years been ranked as the lowest in the OECD. The most recent OECD Education at a Glance report confirmed that Ireland invested 1% of GDP in second-level education compared to the OECD and EU averages of 1.9%. This translates into lower expenditure per pupil which was US$10, 383 compared to OECD average of US$ 11,400 (and EU average of US$11,673). [5] Under-investment in education means schools do not have enough resources, including human resources, to carry out their mission, provide curriculum choice, and meet their wider social goals of inclusion and equity. The alarm bells on this appalling investment record were trenchantly sounded by IBEC in response to the 2021 OECD Report: "*Investment in education and skills is the cornerstone of a strong and dynamic economy and society. Talented people, the availability of key skills, and the ability to connect with education through lifelong learning and research activity are a positive feature of Ireland's competitive offering."*[6]

Under-investment in schools is particularly impactful on class size. ASTI commissioned research in 2020 found that Research carried out by the ASTI in 2020 found that the majority of Junior Cycle classes are above the EU and OECD class size averages [7]. This means many students are not getting the attention they deserve.

In addition to large class size, under-investment results in schools not having sufficient teachers to provide a wide curriculum choice, which results in gender differences in STEM uptake – as evidenced in the 2023 Departmental Education Indicators Report. Compared to 94% of boys' schools, only 82% of girls' schools provided biology, chemistry and physics. Worryingly, this figure drops to 66% in mixed schools. [8] Similarly, the percentage of girls' schools offering a STEM subject other than maths or a science at senior cycle is 68% compared to 95% of boys' schools – the figure for mixed schools is

[5] https://www.asti.ie/news-campaigns/latest-news/oecd-education-report-ireland-in-last-place-for-investment-in/

[6] https://www.ibec.ie/connect-and-learn/media/2021/09/17/ireland-cannot-become-complacent-with-investment-in-education

[7] https://www.asti.ie/document-library/class-size-and-the-physical-environment-in-our-schools-the/

[8] https://assets.gov.ie/212247/a97b6e7c-92bb-4039-938f-1eda1736fb99.pdf

87%. While other factors are at play in terms of gender take-up and attitudes to science, the ASTI is firmly of the view that the rigid model of teacher allocation to schools is a significant factor.

Under-investment impacts on all aspects of school accommodation but particularly on the number of science laboratories and the adequacy of facilities therein. While the ASTI does not have up to date data, science teachers constantly report that their schools do not enough science laboratories while the total absence of laboratory technicians in Irish schools means that a considerable portion of their time is taken up with non-teaching tasks. The emphasis on practical assessment and experimental work in the new junior cycle specification has resulted in significantly increased workloads for science teachers.

Crisis in teacher supply

The ongoing crisis in teacher supply is central to any discussion about STEM education policy. Teachers have extreme difficulties in recruiting and retaining teachers across all STEM subjects. ASTI research in 2022 confirmed that Maths was among the top three subjects experiencing shortages of teachers. [9] This crisis is attributable to multiple factors, chief among which is the declining attractiveness of teaching as profession. National and international research is unanimous on the causes of this global trend: workload, comparative remuneration, innovation overload, the intensification of working life and poor working conditions, including physical environments cumulatively impact on graduates perceptions on teaching as a lifelong career. [10]

In the Irish context, ASTI research has consistently demonstrated that workload, compounded by innovation overload and the intensification of working life, is the major source of dissatisfaction among teachers about their working lives.[11] The introduction of unequal pay austerity measures in 2010 has proved deeply corrosive to the attractiveness of teaching as a career. Another negative factor is the cost of the 2-year PME which is negatively impacting on diversity in the profession.

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[99] https://www.asti.ie/document-library/asti-red-c-survey-april-2022-supporting-teachers-supporting/

[10] https://www.csee-etuce.org/en/resources/policy-papers/4912-raising-the-status-and-improving-the-attractiveness-of-the-teaching-profession-2022?_cldee=P5yTACRjXxWnNszmGNIEreGS46MNTdfaJRTdv-HBGEM&recipientid=account-7a819b0ff39bdb11a8460003ffb721cc-67201c13afbf4cb1801cc99fa6a703ea&esid=556061ed-89a0-ed11-aad0-6045bd8952f1

[11] https://www.asti.ie/news-campaigns/latest-news/urvey-finds-increased-work-demands-impacting-teachers-job-satis/

A particularly worrying finding from current ASTI research is that over two-thirds of teachers stated that more a key cause of current supply problems is better remuneration in other sectors. A similar proportion referenced emigration due to the housing crisis.[12] Given the aggressive recruitment campaigns for teachers in Australia and the Middle East, policy makers must be concerned that many of these teachers will not return to Ireland for some time – if at all.

Teacher professional learning needs to be supported

Career-long learning is the key to quality in the teaching profession. Teacher professional learning takes place in multiple spaces ranging from in-school peer learning to accredited higher education qualifications. As Ireland is no longer part of the quinquennial OECD Teaching and Learning International Survey (TALIS), we do not have strong empirical or comparative data on aspects of Irish teachers' professional learning. The Education Research Centre (ERC) found that second-level teachers had experience of multiple forms of learning but that this did not necessarily include what is described as deeper learning activities such as residential workshops, lesson study, action research, team teaching, mentoring/coaching, or Professional Learning Communities. [13] Instead, the dominant model is the 'transmission model' wherein information is provided to teachers in once-off or short sessions on new curriculum. Increasingly, the Department of Education is providing this model outside of teachers' working time. This is unacceptable and is undermining teachers' wellbeing.

The major constraint on participation in deeper learning activities is time. Teachers have very little spare time for learning due to workload which averages at a 40+ hour-week. [14] The current teacher supply crisis is also key in reducing opportunities for learning as teachers cannot be released from school due to lack of substitute teachers.

Nurture learner engagement and participation requires coordination and time

Learner engagement is at the heart of learning. Cultivating and reinforcing this engagement is at the core of teaching. It is simultaneously a task for the individual teacher and the wider school community. This applies across all subject and programme areas. One of strengths of Irish second level schools is

[12] ASTI Red C research on teacher recruitment, retention and supply will be published in April 2023

[13] https://www.erc.ie/wp-content/uploads/2022/09/ERC-TPL-Phase-2-Report-Sept-2022.pdf

[14] https://www.asti.ie/document-library/teachers-work-work-demands-and-work-intensity-march-2018/

the commitment by teachers and schools to curriculum enrichment programmes such as Young Scientist Exhibition, Young Social Innovators, School Green Flag, CIF School Challenge, Take Action for Climate Change, EcoUNESCO, etc. However, teachers' commitment to these activities cannot be taken for granted. ASTI research has frequently found evidence that workload and other duties such as supervision and substitution is eroding any spare time that teachers have. Schools should have dedicated coordinator posts to strengthen these enrichment programmes both within and outside the curriculum.

Quality guidance counselling service in schools

Career guidance and counselling is fundamental to supporting learner engagement and in making subject choices. The Framework for Junior Cycle locates this service as one of the pillars of the wellbeing programme. However, the restoration of guidance posts in schools post-2009 austerity cuts has not kept pace with demand or demographic growth. As noted in its 2019 Review of the Career Guidance, research among guidance counsellors suggests that initial consideration of career choices usually occurs during the Junior Cycle.[15] The importance of the availability of adequately staff Guidance Counselling service in schools cannot be overstated. It is of particular significance for subjects which are highly gendered or perceived as difficult, or both. STEM subjects fall within these categories.

Strengthen school leadership capacity

Quality school leadership is central to the achievement of all education policy goals. The number of leadership posts in schools must be increased to strengthen the leadership capacity for leading teaching and learning. Quality school leadership promotes a culture of improvement, collaboration, innovation and creativity in learning and ensures that school policies and practices align to embed national policy objectives such as those in the STEM Education Policy.

Conclusion

Phase 3 of the STEM Education Policy Statement is focused on implementation. This phase of education policy is the most critical, the most challenging and depends, above all, on the professionalism of teachers. The latter is not simply a matter of quality and standards in teacher education. Far too little attention is given in Irish education policy to that other dimension of teacher

[15] https://assets.gov.ie/24951/dffde726604b451aa6cc50239a375299.pdf

professionalism, namely, teachers' working conditions. As has been reiterated above, these are increasingly experienced as negative by teachers and, cumulatively, undermine the attractiveness of teachers as a profession. Workload, work intensification, lack of professional time, unequal pay, poorly resourced and overcrowded schools and, increasingly, the key issue for many teachers, a complete lack of attention in education policy to teachers' wellbeing, are impacting on teachers' response to curriculum change, demands for innovation and upskilling. The role of the ASTI as a teachers union is to communicate these concerns, to advocate that they be addressed and to engage with the policy makers to this end.