

**Teachers’ Union of Ireland (TUI) response to the invitation of the**

**Department of Education to make a submission on the topic of the**

**“*STEM Education”.***

**(January 2022)**

**Introduction**

The TUI represents teachers, lecturers and staff (21,000+) in Education and Training Boards (ETBs), voluntary secondary schools, Community and Comprehensive (C&C) schools, Youthreach, institutes of technology and technological universities and those working in out of school services.

**Background**

Ireland has an internationally acknowledged, high-performing education system and a respected teaching profession (Teaching Council, 2010; OECD, 2013; DES, 2018a; OECD, 2015a; NAPD, 2016; Comhairle na nOg, 2017; Growing Up in Ireland, 2017; IPSOS MRBI Trust in the Professions Survey, 2017; Boyle, 2017; Boyle, 2019; Scanlon & McKenna, 2018; EU Commission/EACEA/Eurydice, 2018; Kantar Millward Brown, 2018; EU Commission, 2018; EU Commission, 2019a; EU Commission, 2019b; Social Progress Initiative, 2018; United Nations Development Programme, 2018, Irish Survey of Student Engagement 2018; HEA, 2019a; Coolahan, 2017; Eivers, 2019; CSO, 2019; McKeown et al., 2019; CSO, 2020; OECD, 2020a; Eurofound, 2020; McNamara et al., 2020; Clark & Kavanagh, 2021; OECD, 2021; CSO, 2021) despite spending relatively little on education (OECD, 2015b; SJI, 2018, NERI, 2018, OECD, 2019a; UNDP, 2019; OECD, 2021) and experiencing historic underinvestment (DES, 2018b). Indeed, citizen satisfaction with the education system in Ireland is the highest of any of 22 European countries studied by Boyle (2018) whilst parent satisfaction with the Irish education system was the second highest out of fifty-six countries in Clerkin et al. (2020).

It is also worthwhile noting that 2019 data (OECD, 2019b) shows that both citizen satisfaction with the education system, and the economic return to the taxpayer of investment in education, are both extraordinarily high in Ireland compared to international norms. An Ipsos MRBI survey in 2019 found extraordinarily high levels of public trust in teachers, much higher than for journalists, Gardai, civil servants, politicians, business leaders, social media influencers, bankers or even the “ordinary person in the street” (Irish Times January 31st, 2019). ESRI (2020) found very high levels of trust of young people in the Irish education system.

Ireland has a very young population (Eurostat, 2015; Government of Ireland, 2019; DCYA, 2020). In 2008, we had the second highest proportion of 10–14-year-olds in the European Union (CSO, 2009). The high birth rate in Ireland (CSO, 2017; Eurostat, 2017; Government of Ireland, 2019) indicates that the population of young people is likely to remain high for the foreseeable future. The DE (2021a) has estimated that the student population in post-primary will rise by approximately seven thousand students per year until reaching a peak enrolment of c.408k in 2024/25. In this context, it is not sufficient to suggest that a world-class child centred society can be achieved with inadequate resources of time, money or personnel.

**Importance of STEM Education**

Every subject and programme has intrinsic value. The post-primary curriculum should continue to be broad-based as this best prepares learners for life and active citizenship, and best anticipates an ever-changing society where complex challenges, global and personal, abound. From time to time, certain disciplines may be considered especially important – by governments or employers. However, such perceived hierarchies are often transient. Reform of Senior Cycle must be inclusive and cater for all students and their varied talents. Having said that, it is clear from recent testimony to the Oireachtas Committee on Education, Further and Higher Education, Research, Innovation and Science (November 30th 2021) that STEM is important to the labour market. However, we must value STEM education at the same time as valuing all areas of study.

It should be noted that Ireland has the highest level of STEM graduates of any member of the EU (CSO, 2021).

**Learner Engagement**

Learner engagement with STEM is very high in post-primary, FET and higher education. Schools, colleges of further education and the IoT/TU sector play a key role in this. An indication of the high level of engagement is shown in the following numbers of students who took Leaving Certificate Higher Level exams in STEM subjects in 2019:

Applied Maths 1988

Physics 6583

Chemistry 8244

Phys/Chem 464

Agricultural Science 6605

Biology 27063

Engineering 4765

Constriction Studies 7896

Technology 1695

DCG 4566

Maths 18153

It is interesting to note that DE (2021b) found that in 2020 90% of male sixth year students took one or more STEM subjects (excluding Maths) compared to 86% of female sixth year students. The gap is considerably wider when we look at the proportion of sixth year students who took two or more STEM subjects (excluding Maths). In that case 58% of male students and only 34% of female students took two or more STEM subjects. Much of the gap is explained by the fact that 83% of female sixth year students took one or more foreign languages in 2020 compared to just 66% of their male peers.

The TUI notes the current uncertainty about the future of the combined Phys/Chem course and would welcome confirmation from the DE that this course, which is popular especially with small schools which do not have enough students to provide two separate courses, will continue into the future.

The high level of engagement is testimony to the fine work done by teachers and lecturers in encouraging curiosity and critical thinking in education. It is also facilitated by the fact that students in Ireland traditionally take approximately seven Leaving Certificate subjects, thereby enabling a broad range of study. It would be a mistake for the forthcoming Senior Cycle review to reduce the range of subjects choices available to students. Indeed the TUI believes that schools should be resourced to provide a greater range of overall subjects and subject levels so that students, especially in small DEIS schools, can have as much choice of subjects and levels as students in large fee-paying schools, within the overall framework of approximately seven subjects for examination purposes. High levels of engagement are also facilitated by the roll-out of new subjects to the Senior Cycle curriculum such as Computer Science. The TUI cautions against too much emphasis being placed on the ability and willingness of the business/science community to support schools. Whilst very welcome, such support is often conditional on commercial interests being met. It is also often only available to some schools in some areas. This is not equitable or reliable for all schools.

**Teacher Capacity**

It is vitally important that CPD be provided to teachers by the DE and its agencies. Whilst CPD provided by other organisations is welcome, it often comes ‘with strings attached’ in the form of commercial interests either directly or indirectly. Furthermore, pedagogical improvement is facilitated by CPD being provided by qualified teacher educators within school time so as to enable meaningful engagement amongst participants.

Schools rely on support agencies, especially when working with students experiencing crisis. However, schools often find it difficult to access support, as the agencies themselves are under pressure. Most schools make every effort to create an inclusive environment for all learners, regardless of background or aptitudes. Targeted investment - especially more teachers to reduce class size - would greatly assist this effort. The depletion of middle management posts (since 2009) has resulted in a damaging reduction in supports for students. The DES has itself described the current paucity of middle management posts as “unsustainable” (DES, 2018c). The extra teachers provided to schools during the COVID-19 crisis should be retained to enable schools to provide subject and programme choice at the appropriate levels and to ensure student well-being.

There is widespread recognition of a teacher supply crisis. Student numbers in both post-primary and further and higher education are expected to rise significantly in the coming years (DES, 2018d; DES, 2012) thereby increasing the need for a supply of qualified and well-paid teachers and lecturers. The TUI has long made clear that the evidence points to discriminatory pay rates being responsible for this (see TUI (2018) for example). In the STEM area, the DE itself has recognised a difficulty of ‘out of field teachers’ (DES, 2016).

**Senior Cycle Review**

The TUI hopes that the forthcoming NCCA report on Senior Cycle review will provide useful guidance in relation to progression pathways for students, as well as outlining conducive conditions for implementation such as resourcing of schools through time allocation. It will also hopefully provide greater visibility for vocational educational routes and courses.

Senior Cycle subjects are continually evolving. Most already have an additional component of assessment, involving project, oral or practical work - set, administered and examined by the SEC. The TUI has been involved in the updating of subject specifications through its involvement in the NCCA. Indeed the TUI has strongly supported the current updating of specifications in the sciences, whilst also noting the dangers of making courses too large. The TUI has called for some second component assessments to take place during fifth year, thereby reducing the pressure in sixth year.

STEM should be an element of the report particularly in the context of SEC second component assessment. It is disappointing that the DE previously demurred from providing significant funding for second component assessment in STEM (State Examinations Commission, 2018). It should however be noted that not all subjects necessarily benefit from having a second component of assessment. Each subject needs to be looked at on its own needs.

Meaningful curricular provision must be made for students with SEN/AEN who took Level 1 or Level 2 learning programmes for Junior Cycle and who wish to proceed to Senior Cycle education. No subject or programme should be seen as only accessible to certain ‘types’ of student.

**Apprenticeships**

The TUI strongly welcomes the greater focus on the value of apprenticeships recently and particularly welcomes recent announcements by Minister Harris of an expansion of apprenticeship places. It is also noteworthy that apprenticeships now extend up to level 10 on the NFQ. As part of this long sought and positive development the IoT/TU sector is playing a key role in supporting young people to access HE whilst also working in a paid job.

**Emergency Remote Teaching and Learning (ERTL)**

In post-primary, third level, and further and adult education settings, TUI members engaged in ERTL for extended periods since March 2020. For many members, ERTL continued throughout for prolonged periods.

ERTL has been demonstrated to involve enormous, unsustainable educational, technical and workload challenges. Due to a range of issues, some students experience very significant difficulty in continuing to engage in education once it has been removed from the physical setting of the school, college or centre. The importance of the shared classroom environment and of the personal relationships and interactions at the heart of good educational practice cannot be overstated and their loss cannot be replaced. TUI members witnessed the impact of economic pressures on student engagement, not least in the great difficulties faced by some families and households in adapting their homes into suitable learning spaces in spite of their best efforts. The lack of appropriate devices and broadband access, both for educators and students, presented and continue to present severe limitations on what is possible, as do the lack of training and technical support. Learning resources, lesson plans and teaching strategies must be replaced or rewritten creating massive workload issues. All educational interactions become more time-consuming and more likely to need repetition and reinforcement. Feedback and assessment take place in new settings and formats, many needing to be newly created and taking significantly more time and work by educators. ERTL proved to be particularly challenging for under-represented student groups.

**Investment in the Education System**

Irish teachers and lecturers continue to provide a first-class education service to learners of all abilities against the backdrop of significant additional challenges.  The findings of the OECD Education At A Glance 2021 report make clear that educators have been carrying out their work in a sector that is chronically and disgracefully under-resourced by international standards. With a range of current and future challenges, an adequately-funded education system must be seen as central to the country’s future, and Government must urgently commit to redressing the damage of years of cutbacks and neglect.

The key statistic in the report shows that of the countries for which figures are provided, none spend a lower proportion of national wealth on education than Ireland’s (3%). At second level, the situation remains particularly dire, with Ireland’s spend (1.1%) the lowest of the 36 countries for which figures are provided, trailing unacceptably far behind the OECD and European averages (both 1.9%).  

Recent experiences related to the pandemic have made clear just how many schools and classrooms are unfit for the requirements of modern education.   It is students from disadvantaged backgrounds who suffer the most from inadequate education budgets, and the ongoing failure to invest sufficiently must be viewed as a continued attack on the most vulnerable in communities around the country. 

It is important to note that in 2019 Ireland only spent 0.9% of GDP on tertiary education, compared to 1.4% in the OECD (OECD, 2019a). The ratio of students to teachers in Irish tertiary education is also very significantly above both the OECD and EU averages (OECD, 2020b). The funding deficit, even aside from anything to do with Covid-19, will get worse in coming years as, student numbers are estimated by the DES to rise by almost thirty thousand in tertiary education in the next ten years (DES, 2018d). As shown in OECD (2021), the ratio of students to teaching staff has increased from 20:1 to 23:1 this year, which is vastly higher than the OECD and European averages of 15:1. This is a clear indictment of the ongoing political refusal to address the sector’s funding crisis. It is also a serious problem for student outcomes as “larger classes are associated with significantly lower grades” and the impact is especially severe in STEM subjects and for “students from a disadvantaged background” (Kara et al., 2021: 1, 2).

Investment in the further education and training sector also needs to be addressed. Priorities in the Programme for Government can only be adequately addressed if accompanied by additional funding. Areas such as Youthreach, adult literacy, post-leaving certificate programmes etc have for too long been a ‘Cinderella’ of the system. Over 15% of Ireland’s 18-24 year-olds are neither employed nor in education (NEETs), according to the latest OECD data. This represents a large proportion of young people and our publicly-funded further and adult education sector should be appropriately resourced to provide options to this cohort of the population.

**Covid-19**

The current pandemic has clearly shown the extraordinary lengths staff and management in all sectors of the education system will go to support their students. However, it has also shown the level of historic under-investment that the system is trying to cope with. The TUI welcomes the funding which the DE, and DFHERIS, has put into the system. However, more will clearly be needed as the pandemic continues into 2022. The issue of technology and the digital divide is just one example. Providing laptops to students is a start but does not resolve the problem of the digital divide and it does nothing to solve the difficulty of poor access to broadband services especially in rural areas.

In April 2021, the TUI carried out a survey of its third level members. Key findings of the survey of over 1,500 members included:

* 71% do not believe that the enhanced teaching/staffing allocation provided as a result of COVID-19 has been sufficient to meet requirements
* 95% said their work is somewhat or significantly more difficult compared to twelve months ago
* From a list, respondents identified ‘More physical space’, ‘Smaller class groups’ and ‘more teachers’ as what they would most like to see to counter the workplace risk of COVID-19
* 52% do not believe that most students have the required ICT facilities to participate in remote learning should schools be required to close for a period

All the above have a particular influence on students coming from higher education access under-represented groups.

All Irish society is acutely conscious of the impact of COVID-19 and its attendant losses in life, health, and employment. We must guard against losses in the social and cultural fabric that binds our nation together. In which connection, the work of TUI members, both in education and as trade unionists, is vital. Indeed, the crisis highlights the centrality of public service and collective effort to any well-ordered society. The TUI earnestly hopes that those newly awakened to this reality do not soon forget it. For our part, we pay tribute and thanks to fellow public servants, in healthcare, policing and education most particularly, and indeed to all workers engaged in the provision of essential services. TUI members have risen magnificently to the challenge of maintaining education of the highest standard. Education is our greatest equalising and unifying endeavour and in the face of enormous difficulties our members have continued to inspire curiosity and imagination, to release potential and to unfold opportunities and possibilities. The TUI will beware of any complacent, or indeed malign, assumption by Managements or Government that the extraordinary efforts made by school staff in response to the emergency form a template for future work. We will ensure that our no-precedent stipulations, and the written assurances from Government, Departments and Managements to the same effect, will be honoured. ERTL was indeed only an emergency measure. This has been acknowledged by the Minister for Education in her address to TUI Congress in April 2021.

**National obsession with third level progression**

Any reform of Senior Cycle must cater for all students and their unique talents. At present, the range of levels across all Senior Cycle programmes caters for a wide breadth of academic ability. The Leaving Certificate Applied (LCA) facilitates students who may not otherwise have remained in school while the Leaving Certificate Vocational Programme (LCVP), with its practical elements and second components, fosters key skills. Future reform must not marginalise or exclude any cohort of learners; it must be inclusive in nature. This means the ability to engage in STEM education as well as all other forms of education. This means meaningful investment in school buildings and classroom technology.

It is worth highlighting that the excessive focus on CAO points is not a flaw of the current Senior Cycle itself. As noted above, it is an unfortunate by-product of our national obsession with progression to third level, an obsession that distorts the true meaning of education and invites unfair and invalid comparisons between schools. This creates particular difficulties for the LCA programme. It is also noteworthy that much political and media discourse focuses on progression to STEM in higher education rather than recognising the excellent provision available, in STEM and other areas, in the FET sector generally. Apprenticeships, both new and traditional, and a particular example of how labour market focused provision can work alongside education in its broadest sense, and be provided by both the FET and HE sectors.

**Benefits of Higher Education Generally**

According to the CSO (2018), Ireland has higher than average rates of third level attainment, and they have increased significantly between 2005 and 2015. In 2015, 52% of Irish 25–34-year-olds had completed third level education, compared with the OECD average of 42%. Overall, levels of third level attainment for Irish 25–64-year-olds have increased from 29% in 2005 to 43% in 2015 (OECD figures are 27% to 35% respectively). Entry rates (the proportion of people who are expected to enter third level during their lifetime) are also significantly higher in Ireland than across the OECD as a whole (81% vs 59% OECD for a Bachelor’s Degree).

CSO Statistics (CSO, 2018) show that graduates from Irish higher education institutions experience relatively high rates of employment. In 2011, a CSO study noted that the unemployment rate for higher education graduates was 7%, and this compared with 18% for those with a post-Leaving Certificate qualification and 14% with a higher secondary education. Similarly, the employment rate for higher education graduates was 81%, compared with 64% for those with a post-Leaving Certificate qualification and 65% for those with higher secondary education only. Based on 2016 Q4 CSO Quarterly National Household Survey data, the unemployment rate for those with higher education was 3.7%. The figure was 9.2% for those with an upper secondary education and 12.7% for those with a lower secondary education. As with the OECD as a whole, Irish graduates have lower unemployment and higher employment rates than those without a third level qualification; and employment rates for graduates are in line with OECD averages (CSO, 2018). The same CSO report (2018) found that the earnings advantage for third level education in Ireland was higher than the OECD average in 2015: on average third level graduates in Ireland earned 66% more than those with just an upper secondary education, compared to a differential of 60% across the OECD.

### In a study in Ireland, Indecon (2019) found that the estimated net graduate premium (to the individual) of an undergraduate degree is €106,000 (€118k male and €96k female). The additional net graduate premium (over and above degree) for a taught Masters is €40k (Male €36k, female €44k) and €116k for a Ph.D. (€118k for a male and €115k for a female). For a representative student completing a full-time undergraduate degree the net Exchequer benefit is estimated at €62,000 (male €75k, female €51k), on average per graduate. There is a strong and clear economic argument for significant Government investment in higher education in all subject areas.

**Distinctive Features of the IoT/TU Sector**

According to Erskine, S. & Harmon, D. (2020: 11), “Institutes of Technology appear to be more willing to recognise competences and experiences outside of education than Universities in admitting students to their programmes.” Erskine, S. & Harmon, D. (2020: 55) also notes that “students in Institutes of Technology appear to get along better with their teaching staff than students in Universities. Similar patterns emerge for part-time students over full-time students, and for postgraduates over undergraduates”.

DES (2019) has stated that in 2017 there were 16,649 part-time students in university, and 23,452 part-time students in IoTs. Hence part-time students are significantly more likely to attend the IoT/TU sector as universities have 1.33 times the number of all students overall compared to the IoT/TU sector (HEA, 2017). Part-time education is an important entry point to HE for students from under-represented groups especially mature students.

According to Liston et. al. (2018), IoTs have more male entrants than female (in contrast to the situation in the universities). Guidance education is important before and during all stages of education. On average 14% of students do not progress from one year of their course to the next. The rates are especially high in Level 6 and Level 7, and in the IoTs. However, there is no statistical difference in non-progression in the IoTs vis-à-vis the universities when you adjust for the more diverse student population in the IoTs. The strongest predictor of non-progression is prior educational attainment. Access to comprehensive guidance support, in school/FE/HE and community settings, can reduce the levels of non-completion of HE courses by students.

HEA (2019c) has found that 15% of graduates from IoTs attended DEIS schools compared to just 8% of university graduates. 7% of IoT graduates attended fee paying schools compared to 13% of university graduates.

According to Thorn (2018), the IoTs have 22% of their students registered as flexible learners (part-time, distance and e-learning) compared to 17% for the universities. The distinction comes in terms of socio-economic class: 31% of students in the institutes come from the non-manual, semi-skilled or unskilled group compared to 21% in the universities (Thorn, 2018).

As stated in Phulphagar & Kane (2020: 2)

“Over half of students enrolled in Institutes of Technology receive a SUSI grant…while between 35% and 45% of students in universities receive a SUSI grant.”

HEA (2019b) has found that 100% of universities have many more ‘affluent’ students than ‘disadvantaged’ students. In the case of the IoTs the same figure is just 29%.

Collins et al. (2020: 16) stated that

“Academics in the non-university sector do more teaching than their counterparts in the university sector. While academics in the non-university sector in Ireland spend less time on research than their counterparts in the universities, they outperform the European average for their sector in this regard.”

This means that staff in the IoT/TU sector have less time to provide one-to-one support to students.

According to HEA (2017), there were 222,618 enrolments in higher education in Ireland in 2015/16. Universities had 1.73 times the staff of the IoT sector despite having only 1.33 times the number of students.

**Recommendations**

The TUI would like to make the following recommendations to the DE and indeed also the DFHERIS:

* There needs to be more staff and smaller staff-student ratios in all sectors of the education system.
* Exchequer funding of the education system must be dramatically increased, starting with a gradual move, over three years, upward towards the international average for investment in education as a percentage of GDP.
* Greater recognition of, and visibility of, the FE sector is vital due to the essential role it plays in supporting under-represented groups to access levels 5 and 6 of the NFQ, and also frequently then accessing levels 7 and 8 of the NFQ.
* Additional staffing of guidance services in schools, FE colleges, HE institutions and in the Adult Guidance Service would be helpful.
* The combined Phys/Chem course in Leaving Certificate should continue to exist.
* The Points System needs to be reformed.
* More progression pathways should be recognised.
* The NCCA Senior Cycle review report should be published as soon as possible.
* More teacher CPD should be available within school time.
* Covid supports to schools should continue.
* There needs to be restoration of the quantum of middle management post which existed a decade ago, and also to be adjusted upward to account for the larger number of students in post-primary now.

**Ends**

**David Duffy (Education/Research Officer, TUI),** [dduffy@tui.ie](mailto:dduffy@tui.ie)**, 01 4922588**

**Glossary**

AEN Additional Educational Need

CAO Central Applications Office

C&C Community and Comprehensive

CPD Continuing Professional Development

CSO Central Statistics Office

DCG Design and Communications Graphics

DCYA Department of Children and Youth Affairs (Now DCEDIYA)

DE Department of Education

DEIS Delivering Equality of Opportunity in Schools

DES Department of Education and Skills (Now DE)

DFHERIS Department of Further and Higher Education, Research, Innovation and Science

ERTL Emergency Remote Teaching and Learning

ESRI Economic and Social Research Institute

ETB Education and Training Board

EU European Union

FET Further Education and Training

GDP Gross Domestic Product

HE Higher Education

HEA Higher Education Authority

ICT Information and Communications Technology

IoT Institute of Technology

LCA Leaving Certificate Applied

LCVP Leaving Certificate Vocational Programme

NAPD National Association of Principals and Deputy Principals

NCCA National Council for Curriculum and Assessment

NERI Nevin Economic Research Institute

NFQ National Framework of Qualifications

OECD Organisation for Economic Co-operation and Development

SEC State Examinations Commission

SEN Special Educational Need

SJI Social Justice Ireland

STEM Science, Technology, Engineering and Maths

TU Technological University

TUI Teachers’ Union of Ireland

UNDP United Nations Development Programme

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