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How Successful Are Women in Physics in Ireland?

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Abstract. Data on gender and physics in Ireland at school, third level (which includes institutes of technology and universities), and in research are presented.

OVERVIEW

Girls typically comprise 25% of the annual Leaving Certificate physics cohort [1]. While their numbers are low, they tend to outperform boys. In 2016, for example, 48% of girls obtained A or B grades in the higher-level paper, compared with 44% of boys; the percentage of girls getting an F or who were ungraded was 2% compared to 4% of boys.

At third level, the numbers of women taking physics at the undergraduate level has increased to 25% [3]. At the postgraduate level, the percentage of women has reached 30%. However, this level of participation is still below that for chemistry and biology.

A similar picture of success is noted when looking at success rates in grant applications to the Irish Research Council [2]. During the period 2013–2016, women comprised 23% of applicants in physics, and their success rate was 29%, compared to an overall success rate of 20%. This situation is significantly different from that in other subject areas—e.g., in chemistry applications, women make up 41% of applicants and have a success rate of 29%, compared with an overall success rate of 25%. The picture is even more stark in history, where women comprise 59% of the applicants and have a success rate of just 10%, compared with 15% overall.

Given the success of women in physics, the question must be asked: Why do more girls not take the subject at school level? A 2015 report from Accenture [4] sought answers to this question and noted that the influence of parents was significant in this area, with a parental lack of knowledge of opportunities in science, technology, engineering, and mathematics (STEM) being an issue. The Institute of Physics and Dublin City University is addressing this particular aspect by adopting a whole-school approach to gender issues, including running career sessions with parents. Out of 118,000 people working in STEM in Ireland in 2013, only one-quarter were female. The Irish government is now focused on the underrepresentation of women at all levels in STEM, and a National Review of Gender in Irish Higher Education Institutions report [5] was published in June 2016. Several other reports have been commissioned, and these have shown that the participation rate of women in physics, in particular, is lower than average. Underlying causes such as unconscious gender bias in academia need to be investigated. The Irish Research Council has set a requirement that funding will be awarded only to higher-level institutions that have achieved an Athena Swan Award. This requirement is due to come into effect in 2019. While these initiatives will take time to have an effect on the overall numbers of females in physics, it is important to benchmark the current situation.

SECOND-LEVEL PARTICIPATION

Girls are very successful when they study physics at second level, as shown in Fig. 1. Although just one-quarter of the students are girls, in 2016, 48% achieved an A or B grade, and overall only 2% failed the subject. When looking at the number of girls taking Leaving Certificate in physics, it is important to consider the school environment. In second-level schools, the number of teachers [6] who are qualified as physicists is low. At the lower secondary level, the Junior Certificate, only 16.6% of the teachers are qualified as physicists, compared to 51% qualified as biologists. It is at this level that the students become interested in all the sciences, and as there are so few physicists, it has a low uptake at the upper secondary or Leaving Certificate level. Is it possible that this has a larger effect on girls than boys?

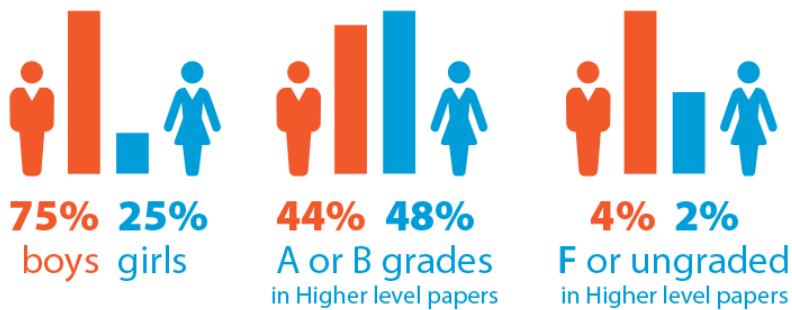


FIGURE 1. Statistics for second-level physics students in 2016.

At the Leaving Certificate level, the number of qualified teachers is even lower, at 6.7%, and therefore it is difficult to find a qualified teacher for the subject. There is the added problem of 22.5% of schools not offering Leaving Certificate physics in 2016, although this situation has improved slightly since 2014, when it was 25.5% of schools. These issues have been recognized in the recent STEM in the Irish Education System Report [7] and are being addressed with recommendations to redress the proportions of qualified teachers in biology, chemistry, and physics.

In the 2015 Accenture Report [4], 56% of girls identified parents as the main influencers in subject choice at Leaving Certificate level. Of the parents interviewed, 68% were not well informed on STEM careers. In order to develop interest in studying physics among girls, the Institute of Physics and Dublin City University are investing in a pilot program taking a whole-school approach that involves parents in the six project schools.

THIRD-LEVEL PARTICIPATION

The numbers of female students taking physics at third level (that is, at institutes of technology and universities) has risen from 18% in 2013 to 25% in 2015. In 2016, women accounted for 21% of final-year physics students, indicating that the aggregate value for 2016 probably shows a further increase (see Fig. 2). This is a significant rise, although the numbers still fall behind those for chemistry and biology. The postgraduate-level numbers are promising: 30% of the students are now women. This is an increase of 7% in the past 4 years. For example, in 2015, female postgraduate students at Dublin Institute of Technology accounted for 59% of the total [8]. This is evidence that when the correct motivation and research topics are available, female students will engage, and with the correct support, this could be mirrored at undergraduate level.

Initiatives to engage females in physics have been key to increasing the participation of women, and the statistics presented in Fig. 3 show evidence of this increase, especially at postgraduate level. Ireland is a strong physics nation, with over 160,000 people working in physics-based industries in 2016 [9], which provide opportunities for highly skilled jobs for women.

RESEARCH GRANT APPLICATIONS

During the period 2013–2016, the overall success rate for grant applications to the Irish Research Council (Fig. 4) in physics in Ireland was 20%. Of those applications, only 23% were submitted by women, with 29% of these being successful.

This is significantly different from other subject areas. For example, in chemistry, women make up 41% of applicants and have a success rate of 29%, compared with an overall success rate of 25%. The picture is even more stark in history, where women comprise 59% of applicants and have a success rate of just 10%, compared with 15% overall.

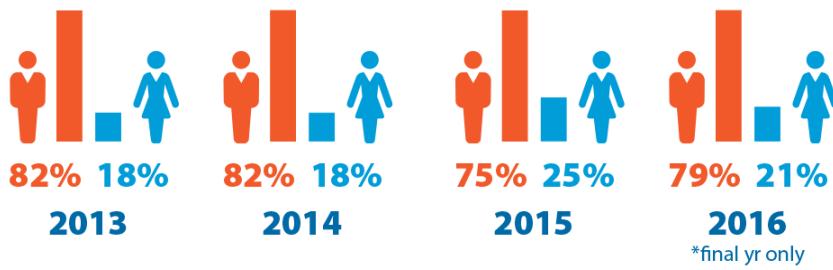


FIGURE 2. Statistics for undergraduate physics students at Irish universities, 2013–2016.

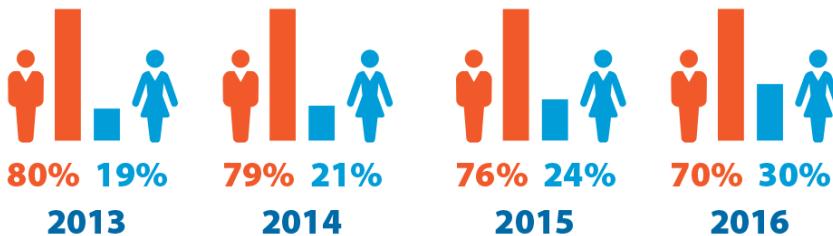


FIGURE 3. Statistics for postgraduate students in Ireland, 2013–2016.

FEMALE PARTICIPATION IN ACADEMIA

The National Review of Gender in Irish Higher Education Institutions report [5] published in June 2016 captured the statistics related to female participation. In higher education, women at the lecturer level account for 52% of the workforce, but less than 19% of women hold senior academic posts. It is interesting to note that despite having the two female presidents of Ireland coming from senior academic roles in the university sector, no woman has held the position of president of an Irish university.

Following a successful legal challenge to being denied a promotion [10], the spotlight has been focused on the lack of women at the higher levels in Irish higher education institutions (HEI). This has led to initiatives to rectify this underrepresentation. Athena Swan was launched in Ireland in 2015, and five HEIs have been awarded Institutional Athena Swan Bronze Status since then. There are two HEI physics departments that have achieved Juno Supporter status, and two who are Juno Practitioner Departments. In December 2016, the Irish Research Council set an Athena Swan Bronze Award as an application requirement for receiving research funding, and other funding agencies are setting similar requirements. In order to give all HEIs time to achieve an Athena Swan Award, this requirement is due to come into effect in 2019. While these initiatives will take time to have an effect on the overall numbers of women in physics, it is important to benchmark the current situation.

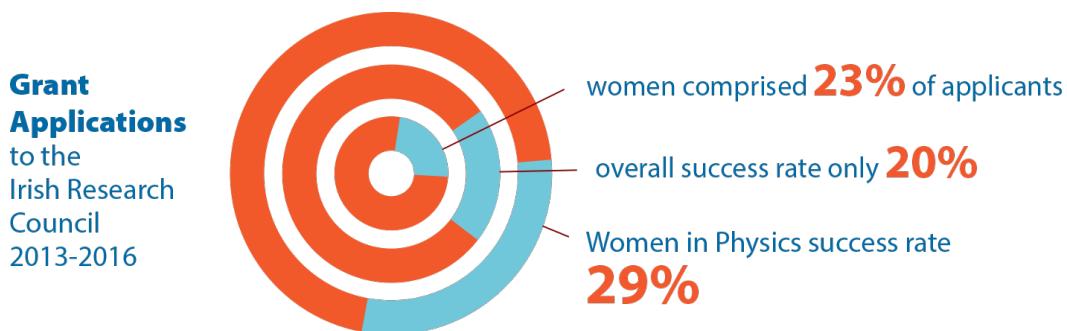


FIGURE 4. Irish Research Council Physics Grant Applications for years 2013–2016 [2].

CONCLUSIONS

Women in Ireland are very successful when they study physics. Given that the number of women remains stubbornly low, Ireland is suffering economically by not harnessing the potential of these women.

Girls first encounter physics at school, and therefore it is important to increase the number of role models to show them that successful careers are available. Engaging with the schools and the parents to educate girls on their options with physics is critical, and this is being addressed by the Institute of Physics and Dublin City University.

It is encouraging to see that the overall number of female postgraduate students has hit 30%, and Dublin Institute of Technology has shown that over 50% is achievable. Making sure that this is sustainable is key, and can be done by showing where the 30% go and by maintaining the upward pipeline, ensuring that women who are at an early career stage see role models at the higher levels in academia and industry. Setting goals, such as achieving Athena Swan or Juno Awards, is focusing HEIs on the representation of females in academia and should in time provide the necessary role models at senior levels.

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