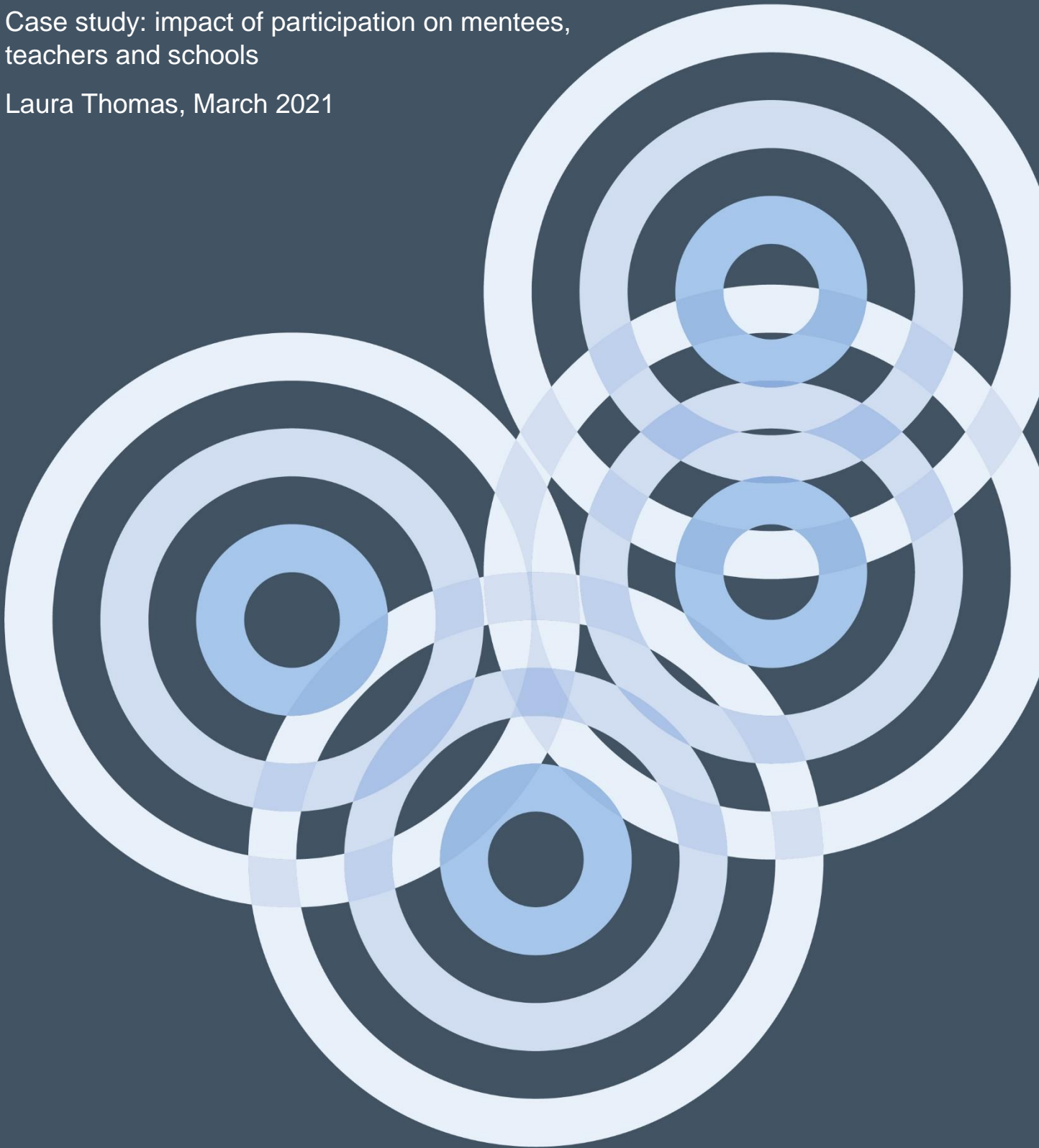


# Physics Mentoring Project Prosiect Mentora Ffiseg

Case study: impact of participation on mentees,  
teachers and schools

Laura Thomas, March 2021



## *Introduction*

This case study focusses on the experiences of schools who have taken part in the Physics Mentoring Project since 2019 and those who are currently taking part in the online mentoring programme in Spring 2021. It summarises the impact participation has had on mentees (Year 9, 10 and 11 pupils) and teachers. This includes the positive impact participation has on mentees in terms of the uptake of Physics A-level (female pupils in particular), their confidence levels around their own capabilities and awareness of the connection physics has to the world around them and potential careers.

## *Increasing the uptake of physics in Wales*

The Physics Mentoring Project was established to address key issues in relation to the study of physics in Wales. In particular, the uptake of Physics A-level in Wales has been significantly lower than Biology or Chemistry A-levels. The split between the three subjects has been fairly static in recent years (2017-2019) with around 40% of science A-level entrants taking biology, 35% chemistry and 25% physics<sup>1</sup>. The difference between subjects is more pronounced when the uptake by gender is examined: over 60% of the biology cohort is made up of female pupils, whereas chemistry is closer to an even split of male and female pupils. The proportion of female pupils taking Physics A-level has grown in recent years, from 18.5% in 2017 to 24% in 2019 but there is still more that can be done to encourage them to choose the subject<sup>2</sup>.

## *The Physics Mentoring Project*

Led by Cardiff University, the Physics Mentoring Project is a collaboration between Welsh universities. It is working to address the issues around the uptake of physics in Wales and does this by providing mentoring opportunities for school pupils across the whole of Wales.

The project links STEM undergraduate and postgraduate role models with schools. These mentors work with a small group of pupils over six weeks to deliver personalised sessions. Mentees are chosen by the schools with guidance provided by the project. They are pupils who have the potential to go on and complete a Physics A-level but who are unsure about whether or not to choose it. This could be for many reasons: perhaps they don't see how physics is relevant to them, how useful it could be in their future career or they lack confidence about whether or not they would be able to cope with the course.

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<sup>1</sup> [Welsh examination results](#)

<sup>2</sup> [UK physics A-level entrants by gender and by nation 2001–18](#)

Using the theory of Science Capital as a basis<sup>3</sup>, the emphasis of the mentoring programme is on opening the mentees' eyes as to how physics connects to so many things in their lives. Mentors undertake a comprehensive programme of training to prepare them for working with mentees. The weekly session content is tailored by the mentors in response to the mentees' own experiences and interests, making physics relevant to them. Using this approach, mentors can share their own experiences and journey through school and into university. Teachers have been impressed by the mentors' *“enthusiasm, communication skills and professionalism.”*

Mentees who have taken part so far have been from Years 9, 10 or 11. In year one, the project worked with nine schools and in year two this increased to fourteen schools across Wales, both in urban and rural areas.

#### *Impact on mentees<sup>4</sup>*

Teachers have been very positive about the wide-ranging benefits of participation, they have commented that Physics Mentoring Project can *“increase the enjoyment and awareness of all the different aspects within physics”*.

Following participation in mentoring there has been an increase in the numbers of mentees intending to take Physics A-level:

	Pre-participation	Post-participation	Change
Year 1	16%	28%	+12%
Year 2	5%	43%	+38%

Table 1. Proportion of mentees reporting that they are “definitely” or “probably” going to take Physics A-level

In general, it has been found that participation in the mentoring programme improves all mentees' impressions of physics, regardless of whether they go on to choose it. Another area of impact is around science careers and again, a positive change is seen following participation in the mentoring programme:

	Pre-participation	Post-participation	Change
Year 1	34%	41%	+7%
Year 2	46%	59%	+13%

Table 2. Proportion of mentees reporting they are “definitely” or “probably” considering a STEM career

<sup>3</sup> Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2015). “Science capital”: A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. *Journal of Research in Science Teaching*, 52(7), 922-948

<sup>4</sup> Thomas, L. & Rushton, E.A.C. (2020). [Physics Mentoring Project/Prosiect Mentora Ffiseg Final Evaluation Report.](#)

There are of course many influences on why pupils choose Physics A-level and consider STEM careers, therefore in addition to the mentees, the project surveyed pupils in the wider year group who hadn't been selected for the mentoring programme. It was found that over the same period, there was no change in intentions to take Physics A-level amongst non-participating pupils in the same schools. This indicates participation in the project is an influencing factor.

In terms of addressing the lower proportion of female pupils taking Physics A-level, there are a range of findings:

- When the impact on female mentees has been reviewed, in response to whether they intend to take a Physics A-level, they were more likely to be in the “unsure”/“probably won't”/“definitely won't” categories than male pupils.
- Following the mentoring programme there was a greater proportion of females making up the “definitely will” and “probably will” categories in response to whether they intended to take Physics A-level: there was an increase of 22% for females and 14% for males when compared with the pre-mentoring intentions.
- A large increase in the proportion of female mentees indicating an interest in a science-related career (“definitely” or “probably” will) was observed: 29% pre-participation compared with 48% post-participation. Amongst female pupils who did not participate in the mentoring programme there was a drop of 8% in those interested in a science-related career during the same time period.

In addition to the impact on the uptake of Physics A-level, there are a range of benefits of participating for mentees, including:

- Opportunity to work in smaller groups.
- Improved communication and problem-solving skills.
- Increased confidence in their own abilities.
- Increased awareness of the opportunities available to them in terms of future study and careers.

One important aspect of impact of participating in the project, is the increase in confidence of the mentees. This has been reported by mentees as being something they've developed as they've discovered how relevant physics is to them. Once selected, the group of mentees feel special with part of this confidence boost coming from their teacher selecting them to participate and showing their belief in the mentees' abilities.

For schools, there is of course the positive impact on the intentions relating to Physics A-level and science careers of the pupils taking part, but there are other wider benefits, including:

- Increased profile of physics within the school community.
- Opportunity for professional development of teachers supporting the project.
- The development of a relationship with a university.

In terms of the schools who have been involved so far, not all offer Physics A-level as pupils may go to a local college and the teachers supporting it have been from the wider science department and don't necessarily teach physics at GCSE or A-level.

### *The Physics Mentoring Project in 2021*

In order to continue supporting schools in their efforts to increase the uptake of Physics, the Physics Mentoring Project has re-oriented the mentoring programme to be delivered online. Mentors have undertaken extensive training in order to prepare for working online with pupils.

In the current model, a pair of mentors work with a group of up to 12 mentees and there can be multiple groups per school. Sessions take place online using platforms such as Microsoft Teams and are interactive. Mentees are encouraged to respond and take part in the discussions via the chat function and activities such as quizzes and polls are used to vary the involvement. The mentors work together to lead the sessions and there continues to be a high level of personalisation, with the first session focussing on hobbies and interests and how they relate to physics.

Sessions with mentors have been running for two or three weeks but the feedback so far has been positive.

- Mentees and teachers have felt the sessions have been fun and the mentees have enjoyed being able to talk to the mentors.
- In a short space of time mentors have been able to begin building a relationship with the mentees. This is shown in the mentees' willingness to share information about their personal interests and future aspirations.
- Mentees have been able to get a sense of where studying physics can take them from mentors who are close to them in terms of age and who can relate to the pressures they feel and choices they are making.

In terms of time commitment, teachers participating this year feel that it is very manageable. Teachers will spend time promoting the opportunity to colleagues and pupils before selecting who participates. They will then liaise with mentors to set up the six sessions and then host each one as the sessions are held within the schools' own IT systems. However, all of the preparation for the sessions is undertaken by the mentors and teachers are there to observe. The project is offering schools flexibility around how to make the mentoring programme work for them. For example, there is a long window for when the six sessions need to be completed by. They can start anytime and should be completed by early July 2021 ahead of an online celebration event for all participating schools.

## *Conclusion*

The Physics Mentoring Project provides opportunities for schools to develop their pupils' aspirations and intentions in relation to physics through a six-week programme of mentoring led by STEM undergraduate and postgraduate students. The current model is delivered online and has been very successful at engaging pupils and maintaining the ethos of the face-to-face delivery. Sessions focus on the pupils' own interests and experiences, with the mentors tailoring the content to make it relevant to them. A positive impact on pupils is seen in relation to their confidence levels and their intentions around taking Physics A-level and going on into science careers.



Ondata Research

Ondata Research LTD 10 Douglas Terrace, Stirling, FK7 9LL  
info@ondata.org.uk www.ondata.org.uk 07887920426

Company number: SC621169 (Registered in Scotland)