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# Sex and fertility education in England: an analysis of biology curricula and students' experiences

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**ABSTRACT**

Sex and fertility education is essential to enable people to make informed choices. School is an important source of education, so we examined the current curriculum relating to sex and fertility education in England and compared it with students' accounts of their experiences. We analysed the Awarding Body GCSE science and biology specifications (for 14–16 year-olds) and the A-level biology specifications (for 16–18 year-olds), as these related to relationships, sexuality and fertility. An online survey was conducted with 221 16–17 year-old school students to evaluate their views about their sex and fertility education. We found significant variation between the specifications of the Awarding Bodies at both GCSE and A level. Most of the specifications specify sexually transmitted infections (STIs), hormonal aspects of reproduction and contraception. In the school survey, students indicated that topics such as puberty, contraception and STIs were more likely to be learnt in school. However, topics such as endometriosis, menopause and miscarriage were more likely to be learnt outside school. From both our curriculum analysis and student survey we conclude that there are significant gaps in the curriculum with many important topics being neglected.

**KEYWORDS**

Sex education; fertility education; secondary schools; student experience; biology curriculum

## Introduction

Sex and fertility education is important if people are to be empowered to make informed choices about their sexual and reproductive lives (Goldman 2012). School sex education remains controversial in many countries for cultural reasons. Where it does take place, it is often characterised by two worries – the worry of unwanted pregnancy and the worry of acquiring sexually transmitted infections. But school sex education should also build self-esteem and reduce the likelihood of exploitation (Author) and it should be reconceptualised as sex and fertility education. The frequent media portrayal of unrealistic fertility in older people, inadequate fertility education during school and relatively low success rates with assisted reproductive technology (ART) all contribute to some people 'missing their chance' to have children (Littleton 2012; Author et al.), something that is bitterly regretted by very large numbers of people. In order to optimise people's contraceptive behaviour and fertility planning, an understanding of both the reproductive cycle and basic physiology of fertility is required (Author et al.). Furthermore, puberty and sexual development are universal transitions for young people, and many feel inadequately prepared for their first sexual experience (Tanton et al. 2015). This study analysed

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the way in which sex and fertility education are included (or not) in the biology curricula in England for 14–18-year-olds and 16–17-year-old students' accounts of their experiences of sex and fertility education.

### *Relationships and sex education*

The World Health Organization (WHO) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) both acknowledge the importance of good quality sex education (WHO (World Health Organization Regional Office for Europe and BZgA) 2010; UNESCO 2018). The recommendation is to start in early childhood and progress throughout life (WHO (World Health Organization Regional Office for Europe and BZgA) 2010; UNESCO 2018). Sex education should support and protect sexual development, while teaching young people the skills required to enjoy their sexuality and have safe, healthy relationships (WHO (World Health Organization Regional Office for Europe and BZgA) 2010). Several United Nations conventions have included good-quality sex education as a human right (Roseman and Miller 2011; European Expert Group on Sexuality Education 2016), as healthy sexual development is an important developmental milestone for young people. Accurate sex education is necessary to protect young people from exploitation or abuse, as well as negative sexual health consequences such as unintended pregnancy and sexually transmitted infections (STIs) (Breuner et al. 2016). Despite this, in 2013 the Office for Standards in Education, Children's Services and Skills (Ofsted) reported that the Personal, Social and Health Education (PSHE) teaching was inadequate or needed improvement in 40% of English schools (Ofsted 2013). (A glossary of educational terms used in the English school system is provided in Appendix 1.)

Sweden was the first European country to include sexuality education in its curriculum, in 1955 (European Expert Group on Sexuality Education 2016). In 2000, the Department for Education and Employment in England published guidelines on sex and relationship education for the first time (Department for Education and Employment 2000). The three main elements within the 2000 guidance were: attitudes and values; personal and social skills; and knowledge and understanding. The focus was the avoidance of 'risky' sexual behaviours and their consequences, rather than empowering young people to take control of their decisions relating to lifestyle and family planning. Specific topics in the 2000 guidance included puberty, menstruation, STIs and HIV/AIDS, contraception and abortion.

The 2000 guidance remained unchanged for nearly 20 years, until the Department for Education called for evidence to improve this curriculum in December 2017. This change was prompted by a 2014–15 House of Commons Education Committee PSHE (Personal, Social and Health Education) Inquiry for which one of us was Specialist Advisor; this resulted in the Children and Social Work Act 2017 which required that Relationships and Sex Education (RSE) be made mandatory in secondary schools (Department for Education 2017; UK Government 2017). As of September 2020, a new RSE and Health Education curriculum is compulsory for all primary (5–11 year-olds) and secondary (11–16 or 11–18 year-olds) schools in England. The new regulations make Relationships Education mandatory in primary schools, and RSE mandatory at secondary school level (Department for Education 2021). However, parents have the option to withdraw their child from secondary school RSE, though not once the child reaches the age of 15.

There are many misconceptions about sex education which may make parents reluctant to permit their children's engagement in this curriculum. These misconceptions include the idea that educating young people about sex and sexuality leads to an earlier sexual debut and more risky sexual behaviour. In fact, high-quality RSE programmes delay sexual debut, increase contraceptive and condom use, reduce the rates of teenage pregnancy and abortion and decrease the prevalence of STIs (Macdowall et al. 2015; European Expert Group on Sexuality Education 2016). Comprehensive

sex education has also been shown to enable young people to develop healthy, meaningful relationships, and is the most promising intervention for reducing risky sexual behaviour in young people (Rabbitte and Enriquez 2019).

### The biology curriculum

The school biology curriculum provides an opportunity to teach young people about their bodies. However, in a number of countries, too many young people are still leaving school with significant gaps in their understanding of fertility and reproduction (Sydsjö et al. 2006; Bunting, Tsibulsky, and Boivin 2013; Lundsberg et al. 2014; Daniluk and Koert 2015; Hampton and Mazza 2015; Hadjichambis et al. 2016; Kudesia, Chernyak, and McAvey 2017).

Many important human biology topics are covered in schools in England across the 5–16 age range (the mandatory age for school education). However, Littleton (2012) criticises the biology curriculum in schools in England for giving the impression that conception is likely to result from sexual intercourse. This is an unrealistic portrayal of human fertility, one that does not acknowledge the decline that comes with advancing age and the fact that a significant proportion of men and women need medical assistance if they are to have children. Littleton (2012) also criticises the conflicting messages in biology education and sex education. Biology education tends to emphasise the menstrual cycle and hormones, while sex education appears intended to scare young people about STIs and unwanted pregnancies.

### Fertility education

Fertility and reproductive planning are often missing from sex education. Evidence suggests that significant gaps exist in young adults' understanding of fertility, family planning and ART (Rovei et al. 2010; Daniluk and Koert 2015; Mogilevkina et al. 2016), with school sex education often giving the impression that having a baby is easy (Littleton 2012). This message can generate misconceptions which lead to people being unable to realise their family goals later in life. In developed countries globally, there is a trend to delay childbearing which leads to a higher prevalence of infertility and reliance on ART (Daniluk and Koert 2015). People may have fewer children than they initially intended or miss out on having children altogether. Pregnancies later in life can also be associated with increased medical risk for both mother and baby (Daniluk and Koert 2015).

While some of the reasons people delay starting a family relate to personal goals, financial planning or cultural expectations, there is also evidence that many of these decisions are based on an inadequate understanding of the fertility lifespan (Daniluk and Koert 2015). There appears to be a common misconception whereby people believe that ART can be relied upon to have a baby and this technology can compensate for the age-related fertility decline (Daniluk and Koert 2015). While many of the factors influencing family planning decisions relate to personal priorities, it is important that a lack of accurate information is not contributing to these decisions. It is essential that people develop an understanding of fertility and ART at an early enough age to make informed decisions (Daniluk and Koert 2015).

As far back as 2005, the American College of Obstetricians and Gynaecologists pointed out that optimising a person's health and understanding about pregnancy and conception is an important part of preconception care (American College of Obstetricians and Gynecologists 2005). A 2014 study in the United States found that 40% of women aged 18–40 had concerns about their fertility; however, two thirds were not aware of the fertility implications of STIs, obesity or irregular periods, 20% were unaware of the effect that ageing has on fertility and 40% did not understand the menstrual cycle (Lundsberg et al. 2014). Almost 60% of the women surveyed mistakenly believed that sexual intercourse should be timed after ovulation if trying to conceive and a further 30% were not sure how intercourse timing affects the chance of conception. The data showed that younger

participants (18–24 years) had poorer knowledge relating to fertility, including ovulation and conception, while women aged 25–40 were more likely to believe common misconceptions or myths relating to reproduction.

Preconception health in both men and women can significantly impact the health of their children (Barker et al. 2018; Fleming et al. 2018; Stephenson et al. 2018). Negative sexual health outcomes such as HIV, other STIs and unintended pregnancy also cause significant cost to the national health systems (Ponsford et al. 2018).

Fertility education interventions have been shown to improve fertility knowledge and decrease planned ages of childbearing among young adults (Wojcieszek and Thompson 2013). However, with only a single education intervention these findings do not persist long-term (Daniluk and Koert 2015). This supports the notion that fertility education needs to begin early in life and be reiterated throughout young adulthood.

### *Aims*

This study aimed to evaluate the current biology curricula relating to sex and fertility education for 14–16 year-olds – at GCSE (General Certificate of Secondary Education) – and 16–18 year-olds – at A level (Advanced Level) – in England and to determine the experiences that 16–17-year-old students have of their sex and fertility education. The eventual intention is to use the results of this study to improve sex and fertility education, by developing comprehensive, holistic teaching guidelines to aid educators in teaching these issues. Previous studies have not analysed the curricula in relation to students' experiences of their sex and fertility education. The current curricula provide the starting point for improvement, so it is important to have a comprehensive understanding of what is currently being taught. By asking students' opinions about sex and fertility education, we can improve, develop and implement higher quality education.

## Methods

### *Biology curricula*

The analysis of the curricula was conducted using the most recently published specifications for science and biology at GCSE and biology at A level for the three Awarding Bodies that dominate the 14–18 GCSE and A level market in England. The subject specifications are publicly available online and were accessed through the website of each Awarding Body. Each specification for science and biology at GCSE and biology at A level was carefully examined for topics relevant to relationships, sexuality and fertility. In effect, we therefore used standard content analysis and this information was compared to the Key Stage National Curriculum which defines what must be included in the education for 14–16 year-olds in England. Similarly, the National Guidance for RSE was evaluated.

### *School survey*

A 47-item online survey was designed by the research team using their professional knowledge of the field and the published literature. A pilot version of the survey was validated using individual interviews with five students over Zoom or Microsoft Teams. A total of four schools were recruited – one though personal contact and three via an on-line discussion forum for biology teachers. The four schools came from four different counties throughout England; two (one of which was all girls) were fee-paying; the other two were mixed sex and non-fee-paying. The final survey (Supplementary Appendix 1) was written in English and information about accessing it was distributed to year 12 (16–17-year-old) students in the participating schools by one or more teachers within each school. This year group was chosen as we are interested in what students have learnt by the end of their mandatory education (years 1 to 11), and their experiences of this

education. Following demographic questions about the participants, the remainder of the survey addressed: their experience with sex and fertility education, both in and outside school; whether they discuss sex and fertility with their parents; their understanding of fertility; and their future plans for a family.

The survey and its use were approved by the xxxx Research Ethics Committee (ID Number: xxxx). The survey was completed online by students using the Qualtrics research tool. Before starting the survey, all participants provided informed consent. Data were collected anonymously and there were no risks anticipated for participants. Published findings do not identify individuals or schools.

### *Data analysis*

For this article, the responses to four questions from the survey were analysed:

Question 11: Which of the following topics have you been **taught in school**? – *Select all options that apply. If you are not sure, please leave it blank.*

- ☐ Sexually transmitted infections (STIs) – including HIV/AIDS
- ☐ Contraception
- ☐ Puberty
- ☐ Menstrual cycle
- ☐ Ovulation
- ☐ When a woman is most likely to get pregnant in her menstrual cycle.
- ☐ Pregnancy
- ☐ Fertility
- ☐ Infertility
- ☐ In vitro fertilisation (IVF)
- ☐ Miscarriage
- ☐ Abortion – Termination of pregnancy
- ☐ Menopause
- ☐ FGM (Female genital mutilation)
- ☐ Endometriosis
- ☐ Polycystic ovarian syndrome (PCOS)
- ☐ Surrogacy
- ☐ Egg freezing
- ☐ Donor egg
- ☐ Donor sperm
- ☐ Lifestyle factors (nutrition, exercise, etc.)
- ☐ Preimplantation genetic diagnosis (testing the embryo for genetic disease)
- ☐ Genome editing (changing the genes of a human embryo)
- ☐ Making eggs and sperm from stem cells
- ☐ Artificial wombs
- ☐ I have not been taught about any of the above at school
- ☐ Are there any comments you would like to add?

Question 12: Have you learnt about any of these topics **outside school**? – *Select all options that apply. If you are not sure, please leave it blank.*

- ☐ Sexually transmitted infections (STIs) – including HIV/AIDS
- ☐ Contraception
- ☐ Puberty

- ☐ Menstrual cycle
- ☐ Ovulation
- ☐ When a woman is most likely to get pregnant in her menstrual cycle.
- ☐ Pregnancy
- ☐ Fertility
- ☐ Infertility
- ☐ In vitro fertilisation (IVF)
- ☐ Miscarriage
- ☐ Abortion – Termination of pregnancy
- ☐ Menopause
- ☐ FGM (Female genital mutilation)
- ☐ Endometriosis
- ☐ Polycystic ovarian syndrome (PCOS)
- ☐ Surrogacy
- ☐ Egg freezing
- ☐ Donor egg
- ☐ Donor sperm
- ☐ Lifestyle factors (nutrition, exercise, etc.)
- ☐ Preimplantation genetic diagnosis (testing the embryo for genetic disease)
- ☐ Genome editing (changing the genes of a human embryo)
- ☐ Making eggs and sperm from stem cells
- ☐ Artificial wombs
- ☐ I have not been taught about any of the above at school
- ☐ Are there any comments you would like to add?

Question 13: If you have learnt about any of these topics outside of school, where did you learn about them? – *Select all options that apply.*

- ☐ Parents/Family members
- ☐ Friends
- ☐ Boyfriend/Girlfriend
- ☐ Doctor
- ☐ Internet
- ☐ Social media
- ☐ Books
- ☐ Religious leaders
- ☐ Social clubs
- ☐ Community members
- ☐ TV and/or films
- ☐ Other – please give details

Question 30: How do you think we can improve sex and fertility education in schools? *If you have nothing to write, please state 'None'.*

### *Quantitative data*

The responses to questions 11, 12 and 13 were analysed by quantitative methods, using IBM SPSS Statistics Version 27.0.1.0. Microsoft Excel for Mac version 16.50 and IBM SPSS Statistics were used to draw the graphs.

### *Qualitative data*

The responses to question 30 were analysed using qualitative methods as it was an open-text question. The main themes in students' responses were identified using thematic content analysis as described by Green and Thorogood (2004). Codes were identified, which were then combined into sub-themes and finally into themes. Instances of coding that proved problematic were discussed within the author team until agreement was reached.

## Results

The three Awarding Bodies in England that set the examinations which are taken by the overwhelming majority of GCSE and A-level students are the Assessment and Qualification Alliance (AQA), Edexcel, and Oxford, Cambridge and RSA (OCR). For the purposes of this study, we are particularly interested what students were expected to know at age 16, so the focus is on GCSE level. However, the A-level specifications were also examined for completeness.

The topics included in the curriculum specifications are shown in Table 1 (GCSE) and Table 2 (A level). All teaching specifications for biology were examined, as Awarding Bodies are allowed to have more than one specification at both GCSE and A level. In particular, at GCSE level, students can take Single, Double or Triple Science, gaining, respectively, one, two or three GCSEs. In reality, the more capable in science the student is judged by their teachers to be, the more likely they are to take Triple Award Science (where they are graded separately for Biology, Chemistry and Physics).

### *GCSE curricula*

At GCSE level in England, the hormonal control of the menstrual cycle, contraception and ART are all taught within the human reproduction section of the biology curriculum. The level of detail varies and ART teaching is often only in the specifications intended for more capable students. STIs are used as examples of communicable diseases, and pregnancy does not feature in the GCSE specifications in England other than as a consequence of contraceptive failure.

**Table 1.** Topics included in the key stage 4 national curriculum for science and the science and biology GCSE specifications for each awarding body as they relate to relationships, sexuality and fertility.

| Topic | National Curriculum Science Key Stage 4 | AQA | Edexcel | OCR |
|---|---|---|---|---|
| STIs (as examples of communicable diseases) | ✓ | ✓ | ✓ | ✓ |
| HPV and cervical cancer | | | | ✓ (Biology only) |
| Hormonal aspects of reproduction | ✓ | ✓ | ✓ | ✓ |
| Hormonal and non-hormonal contraception | ✓ | ✓ | ✓ | ✓ |
| Menstrual cycle | | ✓ | ✓ | ✓ |
| Hormonal changes of puberty | | ✓ | | |
| ART | | ✓ | ✓ | ✓ |
| Socioemotional considerations in ART | | ✓ | | |
| Antenatal genetic screening, including amniocentesis | | | | ✓ |

AQA *GCSE Biology (8461)*, 2016 https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF, *GCSE Combined Science: Synergy (8465)*, 2019 https://filestore.aqa.org.uk/resources/science/specifications/AQA-8465-SP-2016.PDF, *GCSE Combined Science: Trilogy (8464), 2019* https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF; Edexcel *GCSE (9–1) Biology*, 2016 https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_Biology_Spec.pdf, *GCSE (9–1) Combined Science*, 2016 https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf; OCR *Twenty First Century Science Biology B J257*, 2020 https://www.ocr.org.uk/Images/234595-specification-accredited-gcse-twenty-first-century-science-suite-biology-b-j257.pdf, *GCSE (9–1) Gateway Science Biology A J247*, 2020 https://www.ocr.org.uk/Images/234594-specification-accredited-gcse-gateway-science-suite-biology-a-j247.pdf, *GCSE (9–1) Twenty First Century Science Combined Science B J260*, 2020 https://www.ocr.org.uk/Images/234597-specification-accredited-gcse-twenty-first-century-science-suite-combined-science-b-j260.pdf, *Gateway Science Combined Science A J250*, 2020 https://www.ocr.org.uk/Images/234596-specification-accredited-gcse-gateway-science-suite-combined-science-a-j250.pdf.

**Table 2.** Topics included in the A-level biology specifications for each awarding body as they relate to relationships, sexuality and fertility.

| Topic | AQA | Edexcel | OCR |
|---|---|---|---|
| HPV vaccination and the prevention of cervical cancer | | | ✓ |
| Menstrual cycle | | | ✓ |
| Ethical considerations in ART | | | ✓ |
| Male and female reproductive anatomy | | | ✓ |
| The process of fertilisation | ✓ (As part of 'sexual reproduction in mammals') | | ✓ |
| Process of oogenesis and spermatogenesis | | ✓ | ✓ |
| The use of monoclonal antibodies in pregnancy testing | | | ✓ |
| The effect of age on the female and male reproductive systems | | | ✓ |
| Antenatal genetic screening, including amniocentesis | | ✓ | |
| Ethical concerns with genetic screening | | ✓ | |
| Preimplantation genetic diagnosis | | ✓ | |

AQA *AS and A-Level Biology (7401 and 7402)*, 2017 https://filestore.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF; Edexcel *Pearson Edexcel Level 3 Advanced GCE in Biology A (Salters-Nuffield) (9BN0)*, 2015 https://qualifications.pearson.com/content/dam/pdf/A%20Level/biology-a/2015/specification-and-sample-assessment-materials/9781446930885_GCE2015_A_BioA_spec.pdf; *OCR A Level Biology A H420*, 2020 https://www.ocr.org.uk/Images/171736-specification-accredited-a-level-gce-biology-a-h420.pdf, *A Level Biology B (Advancing Biology) H422*, 2020 https://www.ocr.org.uk/images/171714-specification-accredited-a-level-biology-b-advancing-biology-h422.pdf.

## *A-level curricula*

At A level, there is generally less teaching of relationships, sexuality and fertility-related topics than at GCSE. Furthermore, there is considerable variation between the Awarding Bodies (Table 2). For example, the Edexcel specification includes genetic screening and preimplantation genetic diagnosis, as well as the social and ethical implications of such tests.

## *Relationships and sex education curriculum*

The National Guidance for RSE (Department for Education 2021) includes relationships, sexuality and fertility teaching and has been compulsory in all English secondary schools from September 2020. Each school is responsible for developing its own RSE policy according to this guidance.

## *School survey*

The survey questions all required a response which means that participants could stop answering questions at any time but could not skip questions and continue answering later ones. For this reason, the number of responses decreased slightly as the survey progressed. A total of 244 year 12 students participated in the survey, of whom 242 students consented, and 201 students answered the final question.

### *Quantitative results*

The quantitative data were analysed to ascertain which topics students reported learning in and outside school.

*Demographics.* The demographics of the survey participants are shown in Table 3. Most students identified as female (69%) and heterosexual (73%). 52% had no religion or belief and the most common religion was Christianity (24%). The most common ethnicity was White British (69%) followed by Asian/Asian British – Indian (8%). Most students did not identify a disability (69%) though 13% reported mental health difficulty. The majority had studied Triple Science at GCSE (73%). Most were not studying a science at A level (55%).

**Table 3.** Demographic characteristics of survey participants.

| Demographic categories | Number of participants (%) |
|---|---|
| **Gender** | n = 232 |
| Female | 161 (69) |
| Male | 62 (27) |
| Trans male | 1 (0) |
| Trans female | 0 (0) |
| Non-binary | 4 (2) |
| Not specified | 2 (1) |
| **Sexual orientation** | n = 232 |
| Heterosexual | 169 (73) |
| Homosexual | 15 (7) |
| Bisexual | 32 (14) |
| Pansexual | 3 (1) |
| Other | 8 (4) |
| Preferred not to say | 5 (2) |
| **Religion or belief** | n = 201 |
| None | 104 (52) |
| Buddhist | 2 (1) |
| Christian | 49 (24) |
| Hindu | 12 (6) |
| Jewish | 2 (1) |
| Muslim | 5 (3) |
| Sikh | 1 (0) |
| Spiritual but no particular religion | 18 (9) |
| Other religion | 6 (3) |
| Prefer not to say | 2 (1) |
| **Ethnicity** | n = 207 |
| White – English/Welsh/Scottish/Northern Irish/British | 143 (69) |
| White Irish | 4 (2) |
| White – Gypsy or Irish Traveller | 0 (0) |
| Any other white background | 10 (5) |
| Black/Black British – African | 4 (2) |
| Black/Black British – Caribbean | 1 (1) |
| Any other Black/African/Caribbean background | 0 (0) |
| Arab | 0 (0) |
| Asian/Asian British – Indian | 17 (8) |
| Asian/Asian British – Pakistani | 2 (1) |
| Asian/Asian British – Chinese | 8 (4) |
| Asian/ Asian British – Bangladeshi | 0 (0) |
| Any other Asian background | 3 (2) |
| Mixed ethnic background | 14 (7) |
| Any other ethnicity | 0 (0) |
| Prefer not to say | 1 (1) |
| **Disability** | n = 226 |
| No disability | 155 (69) |
| Sensory impairment | 2 (1) |
| Physical or mobility impairment | 0 (0) |
| Specific learning difficulty or disability (e.g. dyslexia) | 12 (5) |
| General learning disability (cognitive) | 7 (3) |
| Mental health difficulty | 30 (13) |
| Long term illness or health condition | 6 (3) |
| Autism spectrum disorder | 5 (2) |
| Other | 2 (1) |
| Prefer not to say | 7 (3) |
| **GCSE science course** | n = 232 |
| Double Science | 56 (24) |
| Triple Science | 169 (73) |
| Other | 7 (3) |
| **A-level subjects** | n = 232 |
| Biology | 58 (20) |
| Chemistry | 65 (22) |
| Physics | 33 (11) |
| Applied science | 8 (3) |
| None of the above | 128 (55) |

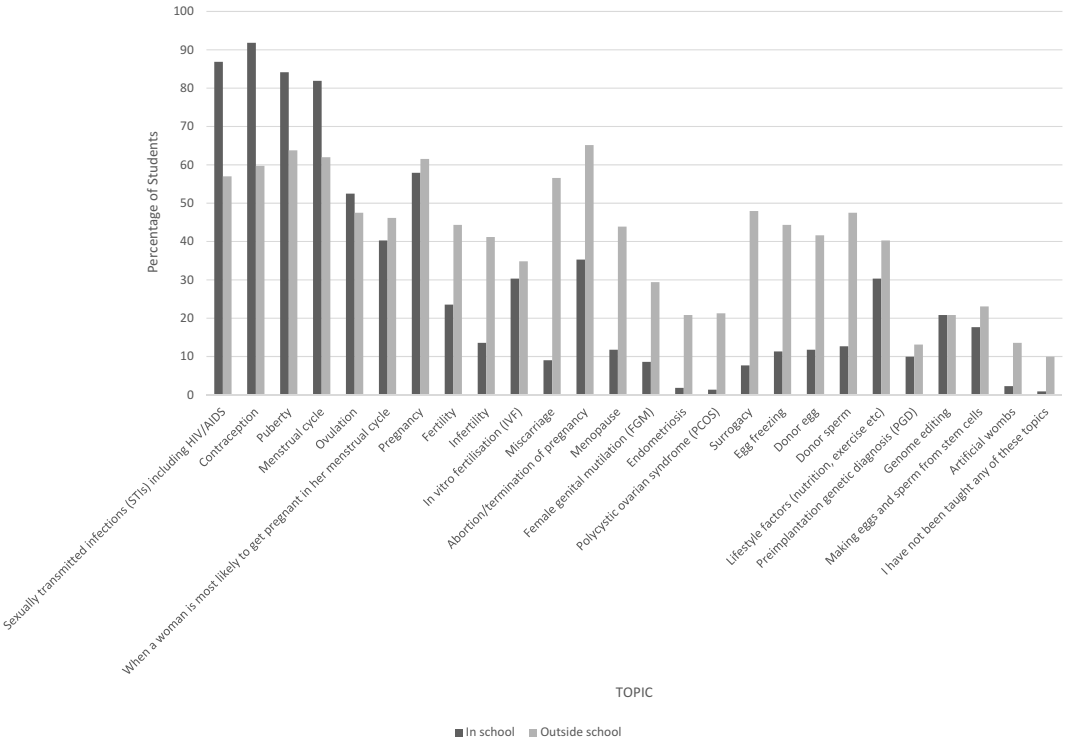


**Figure 1.** Comparison of which topics students reported learning about in and outside school. Presented as a percentage of the students who reported learning each topic.

***Sources of sex and fertility education.*** Questions 11 and 12 asked students to select what they had learnt in and outside school from a list of 25 topics. Question 13 asked students where they had learnt about topics outside of school. 221 students answered these three questions and Figure 1 shows how likely each topic was to be learnt about in school or outside of school.

Some topics, notably puberty, the menstrual cycle, contraception and STIs, were more likely to be learnt in school. However, topics such as endometriosis, menopause, miscarriage and polycystic ovarian syndrome (PCOS) were more likely to have been learnt outside school. Abortion was the most common topic learnt outside school, followed by puberty. The most popular sources of sex education outside school were the internet (69%) and social media (62%) (Figure 2).

## *Qualitative results*

Two hundred students answered the question 'How do you think we can improve sex and fertility education in schools?'; 80 wrote 'none' or 'I don't know' and 120 students provided their opinion about how sex and fertility education can be improved.

Through the analysis of student responses, six themes became apparent: LGBTQ+ (lesbian, gay, bisexual, transgender, queer and others) inclusivity; topic variety; logistical improvements; attitudes towards sex; gender equality; and applicability to real life.

***LGBTQ+ inclusivity.*** Students of all genders and sexual orientations reported wanting more inclusive sex education; however, these responses were more common among LGBTQ+ students. Students expressed a desire for sex education that is applicable to people of all genders and sexual orientations:

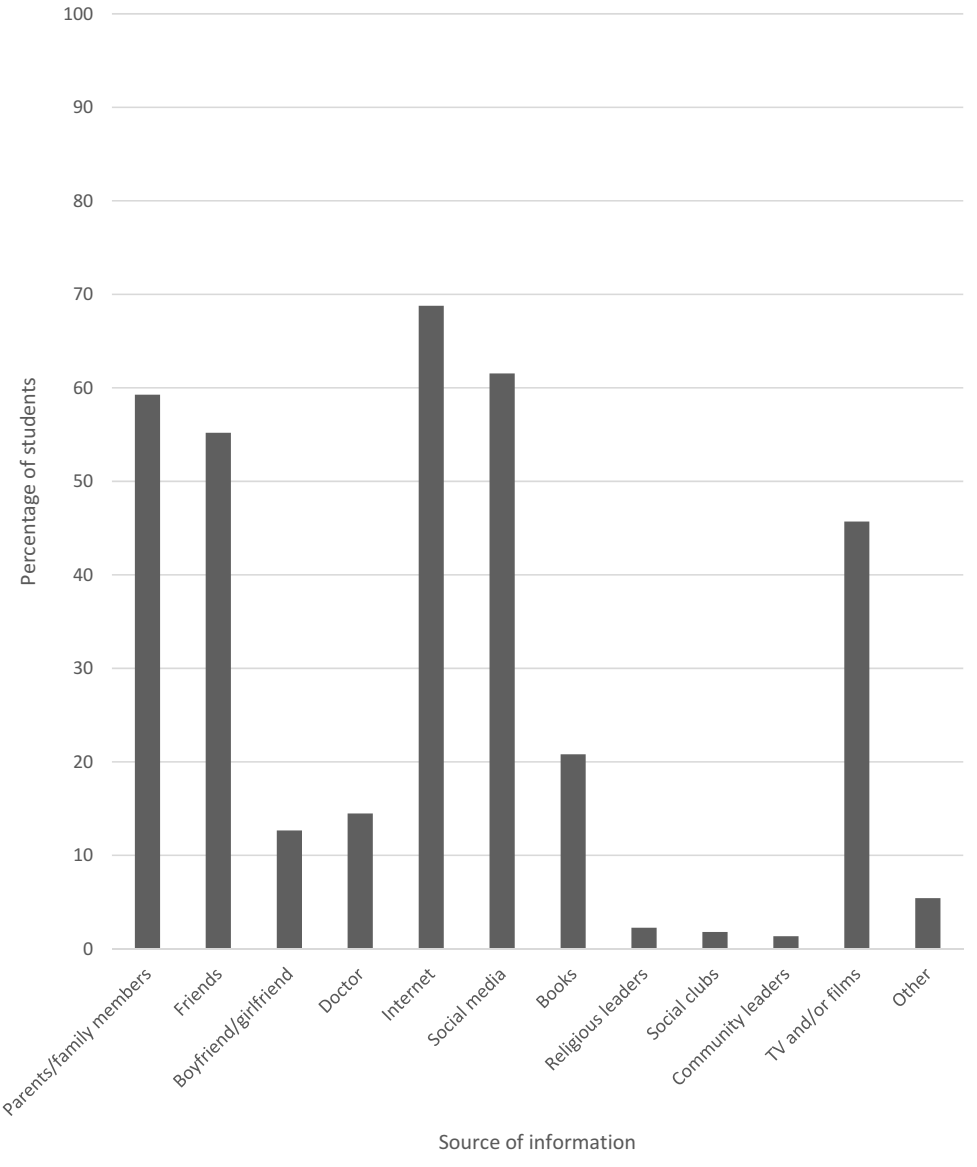


**Figure 2.** The sources students reported learning from if they had learnt about a topic outside school. Presented as the percentage of students who reported learning from each source.

> There needs to be more emphasis on LGBT sex and relationships - I don't think we have learnt anything! (Female, queer)

> I think we need to be taught about safe sex practices for the LGBTQ+ community. (Female, bisexual)

Inclusion of teaching about intersex and asexual people was suggested, as well as how same-sex couples, and transgender or non-binary individuals could have a family. There was a feeling that contraception education, especially, is very heteronormative:

> We are always shown how to put a male condom on and never anything else, which steers people away from homosexuality – one reason I was ashamed of my sexuality. (Female, bisexual)

> Have more education around homosexual relationships etc. (Male, homosexual)

***Topic variety.*** It was clear that many students perceived the variety of topics taught during sex education to be insufficient. Suggested topics to be added included: fertility, infertility and ART; consent; female sexual pleasure; menopause; pornography; abortion; sexuality; miscarriage; PCOS; endometriosis; hereditary conditions that may prevent people having children; pregnancy; labour and delivery; the postpartum period; what to do in the event of an unwanted pregnancy; contraception and how to access it; STIs; gender affirmation; puberty; the menstrual cycle; women's health in general; rape culture; erectile dysfunction and masturbation (especially female masturbation). The students also asked for an acknowledgement of the fact that people with physical or mental illnesses or disabilities might have specific sexual and reproductive health needs:

> . . . giving girls a broader understanding of things like menopause and ovulation as opposed to just contraception and pregnancy. (Female, sexuality unspecified)

> Give more talks on things that rarely get covered but are still a big part of one's sex life during their lifetime or that they will see around them, such as porn, abortions, consent, sexuality, etc. (Female, bisexual)

Consent was commonly mentioned. Several students specifically said they did not like the way consent is currently taught using the tea analogy:

> consent needs to be covered better – no 'tea' analogy, simply stating what is and isn't okay (e.g. being pressured by boyfriend, girlfriend, etc.). (Female, heterosexual)

> Do not use the tea analogy when teaching consent, explain that any unenthusiastic response is a 'no' and teach non boys to ask for consent too. (Female, sexuality unspecified)

Students expressed the importance of acknowledging that not everyone wants to have children in the future. They also wanted to learn more about the way age can affect people's prospects of having children:

> Not assuming every girls want kids or every guy either, not assuming things from people, not pressuring anyone into having sex, kids or anything like that. More awareness about the pressure sex brings to teenagers especially. (Female, heterosexual)

> in terms of fertility I think it's important to raise awareness that both men and women's reproductive cells will worsen in quality and therefore it's easier to get pregnant at a younger and age and that it may lead to a healthier pregnancy. (Female, bisexual)

***Logistical improvements.*** Students provided logistical suggestions for improving sex education. These included: having more frequent lessons; directing content at the correct age and developmental level; having consistent sex education throughout schooling and making sure information is provided to students before they need it (e.g. teaching about puberty and menstruation before it happens). Other suggestions included: bringing in external experts to teach these topics so that students are less embarrassed to talk to them or ask questions; having smaller group sessions to encourage active participation; and starting from a young age and progressing sex and fertility education in an age-appropriate manner:

> make it more normal for people to talk about, talking about it in smaller groups, people (mainly boys) are less likely to take it as a joke. (Female, heterosexual)

> provide more session about it – i've only had about 2 hours TOTAL of sex education. (Female, heterosexual)

***Attitudes towards sex.*** The students expressed the importance of normalising talking about sex, reducing stigma and challenging negative attitudes towards sex and sexuality. Several students felt they were told to avoid having sex and were not taught about sex as an important, beneficial part of a person's overall wellbeing. Students wanted teachers to be more open to talking about sex and to make the topic less 'taboo' for young people:

> Stop treating sex for pleasure like an evil thing, especially for women. (Female, bisexual)

> Make it less taboo and more open- reduce the shame in it. (Female, heterosexual)

> There's got to be open discussions about these matters. But of course it has to be pitched at the right level – probably year 11 or later. Below that I think people will both find it embarrassing and not yet be in a position to have considered having children with any real seriousness. (Male, bisexual)

***Gender equality.*** Gender equality was extensively mentioned, both in terms of what is taught and who it is taught to. Students pointed out that all genders should be taught the relevant biological and social facts for everyone, not just their own gender. They also requested that sex education move away from a male-centric point of view. Students wanted less blame and shame applied to women regarding unplanned pregnancy and abortion and more discussion about female pleasure. They also requested that male students be taught about pregnancy, periods, miscarriages and abortions. Societal gender roles and expectations were also mentioned as something that should be discussed:

> As a girl, I know there is still a lot of sexism around this topic, with certain boys belittling what women may have to go through regarding pregnancy and abortions etc. (Female, heterosexual)

> . . . teach children that is it both parents responsibility of the child and that a man can be the stay at home dad. (Female, pansexual)

***Applicability to real life.*** Students criticised the lack of real-life applicability when it came to their sex education. They felt that topics were taught theoretically, without making them relevant to real-life situations. Students wanted to be taught things that could help them later in life and not just the science behind reproduction. They also felt that telling students not to have sex before a certain age or making them scared of having sex was unhelpful. They wanted realistic, useful information to prepare them for the future:

> Don't focus of the science side as much but instead what actually happens in real life so we're not clueless when it comes to it. (Female, heterosexual)

> Talking about issues we will face as young girls. We receive too much detail especially in younger years about STD/I's and scare us away from sex. Students need to be taught more relevant things e.g. what is consent, rape culture, how to get contraceptives. (Female, bisexual)

## Discussion

This study was conducted to examine the current curriculum relating to sex and fertility education in England and to compare it with students' accounts of their experiences.

The more young people understand their bodies, as well as the dynamics of healthy sexual relationships, the more empowered they will be to make safe, informed sexual and reproductive decisions. Ideally, young people would begin their adult life with an understanding of healthy relationships, sexual health and its long-term implications, fertility and reproduction, including female fertility decline, infertility, ART and the ideal and latest times for childbearing, as well as the importance of preconception care, a healthy pregnancy and long-term effects on their children. It is also important that young people understand conditions and transitions they might experience in later life, including endometriosis, PCOS, menopause and infertility.

School is an important source of sex education for young people (Barrense-Dias et al. 2020). Identifying the gaps in knowledge among young people, including common misconceptions, allows the development of a comprehensive and appropriate sex and fertility education curriculum. This education would ideally be taught both in biology lessons and the RSE programme.

Given the findings of our analysis of the GCSE science and biology specifications, our findings that topics such as puberty, the menstrual cycle, contraception and STIs were more commonly learnt in school than outside of school are unsurprising. These topics are included in most Awarding Body specifications. Infertility, in the context of ART, is in a number of the specifications; however, endometriosis, PCOS, menopause and miscarriage are not mentioned and students were predominantly learning about these topics outside school. These topics are important given their prevalence within the adult female population. Almost every woman will experience menopause, while approximately 10% of women suffer from endometriosis (Rogers et al. 2009) and somewhere between and 6% and 26% from PCOS (Lauritsen et al. 2014; Rao, Broughton, and LeMieux 2020). Furthermore, approximately 10–24% of known pregnancies end in miscarriage (NICE 2019). Our results suggest that school sex education in England is not adequately preparing young adults, especially females, for challenges they might face during their adult lives.

The students in our study had numerous suggestions for what should be included in sex education. Many of these topics (e.g. fertility, preconception health and pregnancy) have a biological basis so would be best taught in biology lessons, by specialist teachers. Psychosocial topics (e.g. consent, pornography, rape culture and accessing contraception) might be better suited to the RSE curriculum. Some topics would ideally be discussed in both RSE and biology lessons as there are both scientific and psychosocial concepts involved.

Many of the responses the students gave to our survey are consistent with wider literature from Europe and North America. A recent study found that Dutch students were unhappy with the quality of their sex education (Cense, de Grauw, and Vermeulen 2020). As in England, sexuality education is mandatory in the Netherlands; however, there are no set teaching specifications, and the delivery of the subject is dependent on the teacher. On average, Dutch students rated their sex education as 5.8/10 (Cense, de Grauw, and Vermeulen 2020).

Our findings demonstrate that even students who are not directly marginalised by heteronormative sex education recognise LGBTQ+ inclusivity as an important issue and want improvement. Elia et al. (2015) describe US sex education as 'mostly heteronormative, sex negative, ableist and discriminatory' (Elia et al. 2015, 106). LGBTQ+ students are often excluded from sex education programmes that ignore minority sexuality or gender identities and healthy relationships among LGBTQ+ people (Bishop et al. 2021; Kantor and Lindberg 2020). Perhaps unsurprisingly, LGBTQ+ students have been found to be less likely to be satisfied with the quality of their sex education (Cense, de Grauw, and Vermeulen 2020).

Our finding that students want more topics included in sex education is consistent with the wider literature. For instance, Tanton et al. (2015) found that young people aged 16–24 wanted more information from school, health professionals or parents about contraception, STIs and psychosexual concerns.

Our participants mentioned pornography as a topic they want included in sex education. Evidence suggests that pornography is an important source of sex 'education' which is used to fill gaps in formal sexuality education (Goldstein 2020). This is particularly relevant for young people who belong to sexual minorities, as sex education is not tailored to their needs (Albury 2014). While pornography may benefit sexual minority groups by allowing them to see their own sexual preferences or behaviours on screen (Kubicek et al. 2010), it has been widely criticised for the way it portrays heterosexual sex and reinforces gender inequalities (Albury 2014).

It is essential that young people grow up with a sound understanding of consent, as the lifetime risk of rape, or attempted rape, for women worldwide is 20% (Welch and Mason 2007). Consent is a challenging topic to teach and needs to be taught in the context of wider social norms which often undermine female autonomy or support sexual violence (Jozkowski 2015; Hubach et al. 2019; Bragg et al. 2021). Our study revealed that students are often unhappy with how the concept of consent is currently taught, using the 'cup-of-tea' analogy (https://www.youtube.com/watch?v=cT4gym83QJc). This analogy has become a common way in England of explaining consent to young people. The idea is that you would not force or pressure someone to drink a cup of tea and it

is equally inappropriate to force or pressure someone to have sex. This highlights the importance of ensuring that educational tools are fit for purpose and must be evaluated to determine their desirability and impact with particular target audiences.

The students in our study made logistical suggestions about how sex education could be improved. Their request for more frequent RSE lessons is consistent with the literature relating to psychology and learning. The spacing effect describes the influence that repetition over time has on the strength of memory (Gluckman, Vlach, and Sandhofer 2014; Smith and Scarf 2017). There is evidence that repetitions of information that are more spaced-out result in stronger memories than those which are close together (Smith and Scarf 2017).

Pound et al. (2017) aimed to identify best practice in terms of RSE in the UK. They concluded that good sex education programmes start in primary school and are interactive and age-appropriate. They also emphasised the importance of a safe teaching environment. Author et al. found that adolescents wanted fertility education taught in school; they also wanted sufficient time for discussion and questions. These findings are consistent with ours that students want sex and fertility education to start early and progress in an age-appropriate manner.

Our participants' responses were consistent with Littleton's (2012) suggestion that focusing only on the negative consequences of sexual behaviour is unrealistic and unhelpful. Students requested that sex education focus more on the positive aspects of sex. They criticised the way that teaching often seems designed to make them scared of sex, which is consistent with other UK and international literature (Pound et al. 2017; Kantor and Lindberg 2020).

Gender equality was important to our participants. In Pound et al. (2017), some female students preferred single-sex classes, while male students wanted mixed classes. The students in our study emphasised the importance of moving sex education away from a male-centric point of view and wanted all students to learn about social and biological issues that are sometimes only taught to girls. Our participants also emphasised the gender inequality that exists in how blame is applied to unplanned pregnancies and gender role expectations in family responsibilities.

The students in our study wanted realistic information to prepare them for real-life situations, rather than just the science of reproduction. Author et al. () investigated the feasibility of using artistic interventions to educate young adults about fertility and found that, while the students engaged with the art workshops, it was the artists' personal stories that they appreciated in terms of education, rather than the art itself. Pound et al. (2017) found that participants emphasised the importance of taking a 'life-skills' approach to education.

Several studies have examined the association between sources of sex education during adolescence and sexual health outcomes in young adulthood (Macdowall et al. 2015; Tanton et al. 2015; Barrense-Dias et al. 2020). Adults who cited school as their primary source of sex education are more likely to be older at first sexual experience and less likely to participate in risky sexual practices or have had an STI (Macdowall et al. 2015). Among women, citing school as the primary source of sex education is also associated with a lower chance of having experienced non-volitional sex, abortion or distress relating to sex (Macdowall et al. 2015). This evidence illustrates the importance of formal sex and fertility education as part of the school curriculum, as supported by the WHO (World Health Organization Regional Office for Europe and BZgA) (2010) and UNESCO (2018). Author et al. () found that most of the young adults in their study agreed that fertility education should be taught in schools, with fewer thinking that the internet, home and the media were also valuable sources of education.

Opponents to school-based RSE often argue that it is parents' responsibility to teach young people about sex (Macdowall et al. 2015; Barrense-Dias et al. 2020). In 2015, only 7% of British men and 14% of women aged 16–24 reported their parents as their main source of sex education (Tanton et al. 2015). A recent Swiss study found that only 19% of their sample cited school as their main source of sex education during adolescence (Barrense-Dias et al. 2020). In line with UK data, the same study found that young adults who cited school as their main source of sex education had lower rates of STIs, while those who learnt about sex from their friends had the highest rates (Barrense-Dias et al. 2020). Approximately 60% of the students in our study reported learning about

sex- and fertility-related topics from their parents or family members and approximately 55% from their friends. However, we did not ask students to report their main source of information, but simply where they learnt about topics. Existing studies (Macdowall et al. 2015; Tanton et al. 2015; Barrense-Dias et al. 2020; Author et al.), as well as our data, suggest that collaboration between parents and schools is important for delivering high quality sex education.

## Conclusions and recommendations

We have found significant gaps in the current sex and fertility education curricula in England. Many young people are leaving school with inadequate understanding of concepts that have important implications for their sexual and reproductive health. Our findings show that English 16–17-year-old students identify a number of deficiencies in their sex and fertility education. In particular, students want RSE to acknowledge gender and sexual diversity, be inclusive, be age-appropriate, be taught regularly throughout formal schooling and come from a 'sex-positive' perspective.

There have been many initiatives globally to improve sex and fertility education (Mason-Jones et al. 2016; Oringanje et al. 2016; Author et al.). In the UK, the Fertility Education Initiative (FEI) was founded in 2016 and aims to improve fertility awareness through the delivery of fertility education (Author et al.). The goal is to introduce reliable resources for teachers, parents, young people and health professionals to enable everyone to make informed reproductive health choices. A group of global experts on sex and fertility education have recently formed an International Fertility Education Initiative to evaluate knowledge and build tools for fertility education (Author et al.). In England, the Sex Education Forum (https://www.sexeducationforum.org.uk) works to embed quality relationships and sex education in schools and elsewhere.

Ideally, school sex and fertility education would involve a comprehensive and holistic programme taught in both science and RSE classes and would provide young people with accurate information to prepare them for later life. We hope that the results of our study can be used to improve sex and fertility education for young people.

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Joyce Harper is author of the book Your Fertile Years and provides education on reproductive health to companies (Reproductive Health at Work).

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