



Research article

Protocol for designing and evaluating an undergraduate public health course on sexual and reproductive health at a public university in California

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ABSTRACT

Introduction: Comprehensive sexuality education (CSE) is associated with positive sexual and reproductive health (SRH) outcomes, including increased contraceptive use, lower rates of unintended pregnancy and prevention of sexual violence. However, implementation of and requirements for CSE vary across the United States which can negatively impact students, both during and beyond high school, including among college students.

Methods: and Analysis: This paper describes the research protocol for a multi-staged approach for designing, implementing and evaluating an SRH course for up to 60 undergraduate students at a public university in California. Before the class is offered, we will conduct 20 in-depth interviews with current students, educators and course design experts to learn from their experiences and seek their guidance on course design. To evaluate the course, enrolled students will complete a pre-course and a post-course survey before and after class is taught, to assess students' attitudes and values relevant to educational concepts and the format and delivery of the course and its modules and activities. Approximately 20 students will take part in an in-depth exit interview, after completing the course, to gather perceptions about how the course impacted their knowledge and behavior. The goal is to refine materials for future in-person course offerings and develop a prototype for a fully online version of the course.

Discussion: This study introduces a novel university-level course to provide young adult students comprehensive, evidence-based education on sexual and reproductive health from a public health perspective. The program leverages existing CSE efforts, enhancing them with academic rigor, inclusive content and digital inclusion. This approach, inclusive of diverse sexual orientations, content on pleasure and sexual violence prevention, aims to fill existing gaps in university curricula and also set a new standard in CSE. The project's innovative and multidisciplinary design offers a model for broader impact within a large public university system and beyond.

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1. Introduction

Comprehensive sexuality education (CSE) is a key component of promoting healthy relationships and overall well-being among young people, but it remains one of the most controversial, unresolved, and often unaddressed pedagogical challenges, globally [1–3]. Across cultures, including throughout the United States (U.S.), discussions around sex are often deemed taboo, perpetuating shame and silencing meaningful educational discourse on sexual intimacy, sexual embodiment, and sexual health. Stigma, and other barriers to provision of CSE have created considerable gaps in young people's knowledge about sexual and reproductive health and rights (SRHR) [4,5].

CSE refers to a rights-based teaching approach “to equip young people with the knowledge, skills, attitudes and values they need to determine and enjoy their sexuality—physically and emotionally, individually and in relationships. It views sexuality holistically, as a part of young people's emotional and social development” [6]. According to the Sexuality Information and Education Council of the United States (SIECUS), CSE is broader than just the prevention of disease or pregnancy, it addresses the socio-cultural, biological, psychological, and spiritual dimensions of sexuality through the provision of information. CSE also addresses feelings, values, and attitudes and focuses on developing healthy communication, shared decision-making, and critical-thinking skills [7].

Research suggests there is substantial value in introducing CSE in schools at an early age (e.g., age 5 years) and providing it to youth throughout the course of their physical, emotional, and social development. An impact analysis of sex education policies in 39 U.S. states found that states where students were exposed to sexuality (sex and/or HIV/STD) education that provided accurate information on contraception had lower rates of sexually active youth and higher rates of contraception use (among sexually active youth), compared to states that required abstinence content [8]. Multiple studies with adolescents and young adults in the U.S. have found CSE is associated with increased odds of contraceptive use among both females [9] and males [10]. A quasi-experimental analysis of federal funding for CSE in public and private schools found more CSE led to a greater than 3% reduction in the teen birth rate [11]. Further, a systematic review revealed that school-based CSE goes beyond addressing sexual and reproductive health outcomes. It also has potential to lower homophobia and homophobic-related bullying, increase understanding of gender and gender norms, improve knowledge and skills necessary for healthy relationships, build child sex abuse prevention skills, and reduce incidents of dating and intimate partner violence [12].

While evidence supports the value of schools providing CSE, it is currently only required by law in five U.S. states. Some form of sex education is required in 29 states and the District of Columbia, and education on HIV and other sexually transmitted infections (STI) is required in 38 states. Among these states (i.e., where sex education or HIV/STI instruction is required), laws in 30 of these states mandate schools to emphasize the importance of abstinence and laws in 16 require that schools provide abstinence-only sex education [6,7]. The debate over CSE versus abstinence-only education has grown, particularly in regions with conservative sexual health education policies. Research increasingly supports the effectiveness of CSE in promoting safer sexual behaviors and decision-making, showing it reduces rates of STIs and unintended pregnancies more effectively than abstinence-only programs [13]. CSE offers a holistic view of sexual health, addressing emotional, social, and ethical dimensions, unlike abstinence-only education, which can leave gaps in young people's understanding of complex sexual relationships [12].

The lack of sexuality education in some systems is associated with increased adolescent vulnerability, including higher risks of sexual violence and a limited understanding of consent. School-based CSE has been shown to reduce dating violence, homophobia, and bullying, while enhancing relationship-building skills [12]. These insights are crucial for policymakers, especially in conservative areas, highlighting that CSE's role extends beyond disease and pregnancy prevention to fostering responsible sexual behaviors. In contrast, abstinence-only approaches, though prevalent in conservative areas, are less effective. Analysis shows that states with abstinence-focused education have higher rates of sexually active youth and lower contraception use than states with more comprehensive education [8]. This underscores the need for sexual education to address a broader range of experiences, equipping young people with knowledge beyond abstinence. Educational institutions, especially in conservative settings, should align their sexuality education programs more closely with the proven benefits of a comprehensive approach.

Thirteen states in the U.S. lack specific requirements for sex education or HIV/STI instruction to be age-appropriate, medically accurate, culturally responsive, or evidence-based. Further, while 9 states have policies that include affirming sexual orientation instruction on LGBTQ identities or discussion of sexual health for LGBTQ youth, six states explicitly require instruction that discriminates against LGBTQ people [14].

Lack of exposure to CSE can have far-reaching impact, affecting people beyond high school, including those who go on to college, university or other institutions of higher education (IHE). One study found that receiving pre-college sex education with lessons on how to say no to sex significantly reduced the likelihood of experiencing sexual assault during the undergraduate years [13]. Several additional studies have found that many undergraduate students have limited knowledge about SRHR, bodily autonomy, sexual harassment and sexual violence (SHSV), and the boundaries of sexual consent (especially in the context of drug and alcohol use) [15, 16]. Low levels of SRHR knowledge have been associated with increased risk for SHSV and intimate partner violence. SHSV, in turn, is associated with higher risks of post-traumatic stress disorder, major depressive disorder, and substance misuse [17].

While colleges and universities may provide courses or programs related to sexuality education, CSE is not universally offered at IHEs in the U.S. Instead, it is more common for sexual health and wellness resources, counseling services, and student organizations to address aspects of sexuality education on college campuses. Common shortcomings with these forms of programming are that they tend to be limited in dosage and catered toward specific student demographics, for example, student-athletes or members of the Greek life system [18].

Offering CSE to students at IHEs holds value because this is a key period for young adults to explore and establish their sexual identities. Many students enter university with substantial gaps in SRHR knowledge, often resulting from the limited scope of

secondary sex education, which typically focuses on abstinence-only approaches [14–16]. Universities offer a unique setting for a more mature and comprehensive exploration of SRHR, addressing complex topics like gender norms, relationship dynamics, and cultural impacts on sexual health. Given the diverse backgrounds of the university student body, a university-level course can provide a tailored, sophisticated approach to SRHR, bridging knowledge gaps and equipping students with the skills to navigate their sexual and relational lives responsibly.

Despite the potential benefits of offering CSE to college and university students, few IHE campuses have leveraged academic settings as an avenue for education and prevention programming focused on interdisciplinary exploration of SRHR topics, sustained student engagement with material, and peer-to-peer education. This said, some notable successes have been observed at institutions such as the University of Washington and Temple University. At both, faculty have offered interdisciplinary courses exploring human sexuality in the departments of Psychology, and Gender, Sexuality, and Women’s Studies, respectively, finding enormous success with student interest and participation [19,20].

To leverage the strengths of the university infrastructure and address gaps and inconsistencies in incoming undergraduate students’ levels of SRH knowledge, we are conducting a research project to develop, implement and evaluate a comprehensive sexuality education class specifically designed for college students at the University of California, Los Angeles (UCLA). This course will be taught over the 10 weeks of an academic quarter and will include both in-person and online components. All teaching materials will be developed and assessed collaboratively by a multi-disciplinary team of faculty and students from the UCLA Jonathan and Karin Fielding School of Public Health and professional instructional designers from the UCLA Online Teaching and Learning Initiative.

2. Methods and Analysis

2.1. Project goals for design, teaching and digital inclusion

This project aims to design, pilot test (through implementation and evaluation) and refine a 10-week course on public health perspectives of sexual and reproductive health for first year undergraduate students at UCLA.

The purpose of the course is to provide medically accurate, evidence-based information about the cognitive, emotional, physical, and social aspects of sexuality, reproduction and agency. It aims to equip students with knowledge, skills, and attitudes that will empower them to: realize their health, well-being, and dignity; develop respectful social and sexual relationships; consider how their choices affect their own well-being and that of others; and understand and ensure the protection of their rights throughout their lives. The course will address reproductive anatomy, key biological changes during puberty and throughout the life course, sexual biology, fertility and sexual and reproductive problems/disorders. Learners will explore benefits of delaying sexual intercourse while focusing primarily on provision of information about normal reproductive development, contraception (including long-acting reversible contraception methods) to prevent unintended pregnancies, as well as barrier protection to prevent (STI). SRHR topics will be explored on a global and local level, with an emphasis on sexual and reproductive health from a life course perspective. Issues such as fertility, sexual healthcare, intra- and interpersonal relationships, and sexual violence will be covered. Additionally, we will introduce specific public health research methods tailored to address sexual and reproductive health. These methods will encompass quantitative and qualitative research techniques, policy analysis, and program development strategies, all geared towards effective implementation and evaluation in the field of sexual and reproductive health.

During the academic term, students in this class will be guided through an exploration of topics such as reproductive health, sexual diversity, consent, sexual violence prevention, and the social, cultural, and psychological aspects of human sexuality. Before, during and after the course offering, we will conduct iterative research to evaluate the course development and implementation process, to assess effectiveness, identify areas for improvement, and contribute to the advancement of sexuality, sexual and reproductive health and rights education in higher education. Our goals extend beyond just measuring how well students absorb and understand the course content (i.e., through traditional testing and evaluation). We will also examine how students learn about these topics and what materials and methods most effectively help them achieve their academic goals, and develop the skills needed to determine and enjoy their sexuality—physically and emotionally, individually and in relationships. Through this research, valuable insights can be gained to inform future efforts in enhancing CSE in college settings and bridging the existing gap in knowledge and resources.

Project goals are informed by principles drawn from the fields of educational design, evidence-based teaching and digital inclusion

Table 1
Design, teaching and digital inclusion goals.

Educational Design Goals	Evidence-based Teaching Goals	Digital Inclusion Goals
<ul style="list-style-type: none"> • Determine when technology does and does not support learning, when it impedes the learning process, and how to best integrate technology into learning. • Incorporate educational technologies (e.g., teaching-and-learning software and hardware) and theories and practices to create a learning environment that boosts student outcomes and engagement and participation in class. • Develop fully online course to be availed to students across multiple campuses. 	<ul style="list-style-type: none"> • Create educational materials that are based on scientific evidence about sexual and reproductive health. • Collect and analyze data and other information to assess student outcomes, class engagement and participation. 	<ul style="list-style-type: none"> • Develop materials and lesson plans that consider the importance of digital accessibility and universal design, integrity, and privacy. • Ensure digital content and multimedia assets are accessible to all learners, regardless of ability. • Use the Who’s in Class? Tool to build an environment that is inclusive of and accessible to all students [21].

and are shown in Table 1.

There are two intended outcomes of this project. First, we aim to develop a prototype of the course to be offered as part of the core curriculum (either as a required or elective course) in the Public Health Major Program for undergraduate students at UCLA. Second, we aim to develop an online version of the course to be offered through the UC cross-enrollment system which allows students across all nine UC undergraduate campuses to search for and enroll in cross-campus online courses.

2.2. Project design

We will follow a sequential, multi-staged approach that employs the use of mixed research methods to design, implement and pilot test this course. At the end of the project, we intend to have two products. The first will be a set of refined materials for the in-person course to be continuously offered at UCLA (including lesson content, assessments, learning activities, multimedia elements, supplementary resources, instructor’s guides, etc.). The second product will be a prototype (i.e., a preliminary version) of the materials for UC Online. This will provide a visual representation of the fully remote course structure, content, and instructional design and serve as a blueprint for the development process, showcasing the organization of modules, learning objectives, sample content, assessments, and interactive elements.

All work for this project is done collaboratively by a multi-disciplinary team of faculty and students from the UCLA Jonathan and Karin Fielding School of Public Health Department of Community Health Sciences and professional instructional designers from the UCLA Online Teaching and Learning Unit. The study received ethical exemption from the Institutional Review Board (IRB) from UCLA’s Office of Human Research Protection Program (OHRPP), classified as exempt under federal regulations governing human subjects research (Protocol ID: IRB#23-000822). Detailed ethical considerations are discussed in the ‘Ethics and Dissemination’ section (Section 4) below.

To design, develop and evaluate this course, we borrow and adapt components from Vahey and co-authors’ *Evidence-Based Curriculum Design Framework* (EBCD) [22] which includes four phases for creating a learning blueprint to establish learning goals, design learning activities and identify work products needed to promote and assess learning. The EBCD Framework [22] integrates approaches from multiple preceding frameworks, encompassing strategies for developing research-based curricula [23] as well as methods for integrative learning design (Bannan-Ritland, 2003)[24]. We follow all four phases of the EBCD Framework including informed exploration, design enactment, implementation research and broadening impact [22]. Across all phases, we are making adaptations – as required – to meet the needs of our students and educators and the overarching UCLA campus community, and to achieve our educational design, evidence-based teaching and digital inclusion goals. Further, we have added a fifth phase, which we call “online design enactment,” which allocates the time that will be needed to adapt and develop all teaching materials and learning resources for the fully online version of the course. This process will leverage design advantages and resources specific to online learning, such as flexibility, multimedia resources, interactivity, adaptive learning, access to vast digital resources, simulations, collaborative tools, learning analytics, mobile learning, and gamification. Goals of the online design enactment phase will be to capitalize on these features to enhance student engagement, personalize content, allow for collaboration, and improve accessibility of the learning experience. Fig. 1 displays the design, implementation and assessment process.

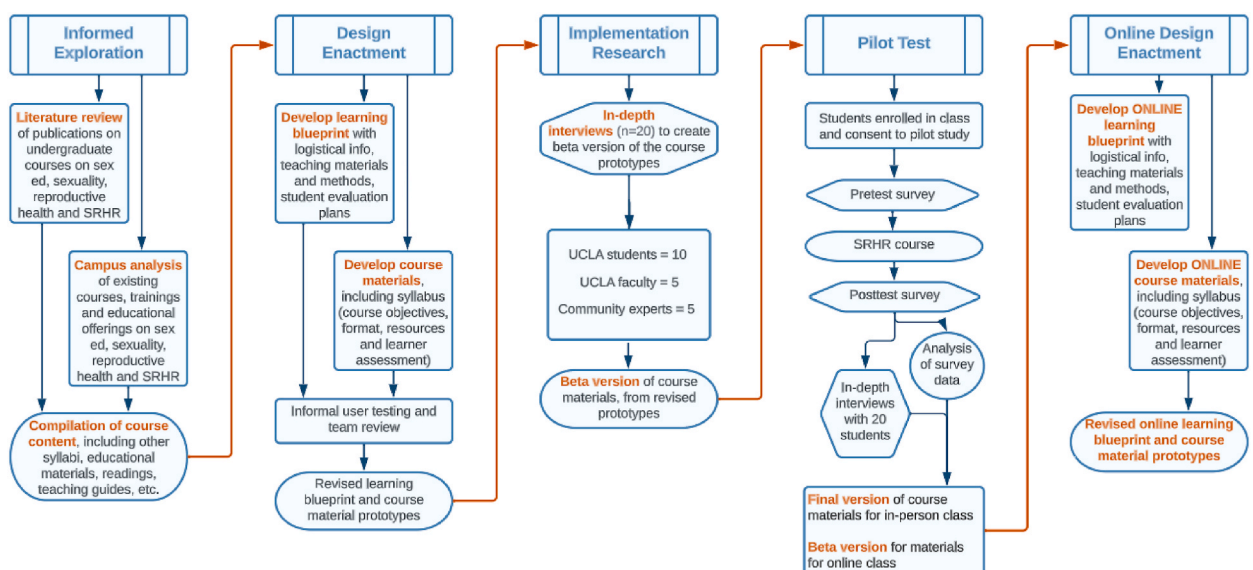


Fig. 1. Design, implementation and assessment process.

2.3. Project Timeline

This is a 12-month project, work for which started in March 2023, that will run through February 2024. All activities are organized within five phases, that are shown in Fig. 2.

2.4. Project activities, participant involvement and analysis, by phase

2.4.1. Phase 1: informed exploration (March–May 2023)

The informed exploration phase has been completed. Between March and May 2023, we conducted a literature review of peer-reviewed publications and technical reports about the design, conduct and/or assessment of undergraduate courses on sexual education (sex ed), sexuality, reproductive health and SRHR. Additionally, we conducted a thorough analysis of relevant resources on the UCLA campus, such as descriptions of existing courses (on sex ed, sexuality, reproductive health and SRHR). We searched for (including by directly contacting faculty and lecturers) available syllabi, materials from formal and informal trainings and other educational offerings on campus, such as seminars and workshops done by special interest groups. All phase 1 work was done by the team members from the UCLA School of Public Health.

2.4.2. Phase 2: design enactment (June 2023)

In June 2023, we gathered information to develop a learning blueprint and course material proofs of concept to support the design and enactment of the course and demonstrate its feasibility. All phase 2 work was done by team members from the UCLA School of Public Health, in close collaboration with the instructional design professionals from the UCLA Online Teaching and Learning Unit.

Through independent effort and group brainstorming, we reviewed information provided by colleagues and educators, lessons from our own classroom experiences, and results from recent study findings. All information was synthesized to develop proofs of concept. The learning blueprint proof of concept contains academic requirements (such as completing the institutional course approval process and officially listing the course with the registrar), logistical information (e.g., schedule of classes and key dates and deadlines), information on teaching materials and methods to be used to help individuals achieve their academic goals (taking into account that different students have different learning styles), and methods of student evaluation.

Course material proofs of concept include the syllabus (which outlines learning objectives and outcomes), lesson topics and format, learning resources (including required readings), digital and non-digital activities, plans for learner assessment and a course website. The Canvas Learning Management System (LMS) is used to develop a course website, incorporating essential components (e.g., the syllabus detailing course objectives and expectations, a schedule of assignment and assessment dates, list of course readings), as well as customized technological elements (developed by the UCLA Online Teaching and Learning experts).

After the syllabus was developed, the team conducted informal user testing with members of our lab at the School of Public Health and available stakeholders (such as lecturers, teaching assistants, students) to uncover issues or gaps in the syllabus or instructional plans. Information gathered during user testing was used to revise the course prototypes and create updated versions for implementation research in the next phase. Specifically, we conducted a thorough review of the feedback obtained during informal user testing and made revisions based on the identified issues or gaps. We implemented an iterative planning process (engaging stakeholders and subject matter experts in collaborative brainstorming and decision-making) and an iterative design process (to allow for targeted revisions and testing of each updated version). Pilot testing was done with a small group, to gather feedback for further improvements. Data were analyzed and integrated into the course design, and evaluation and refinement will be ongoing.

2.4.3. Phase 3: implementation research (July–September 2023)

Phase 3 involves implementation research to create a beta version of the course prototypes, to be pilot tested during phase 4 with UCLA students in the Fall quarter of the 2023–2024 academic year. All work is done by the faculty-student team members from the

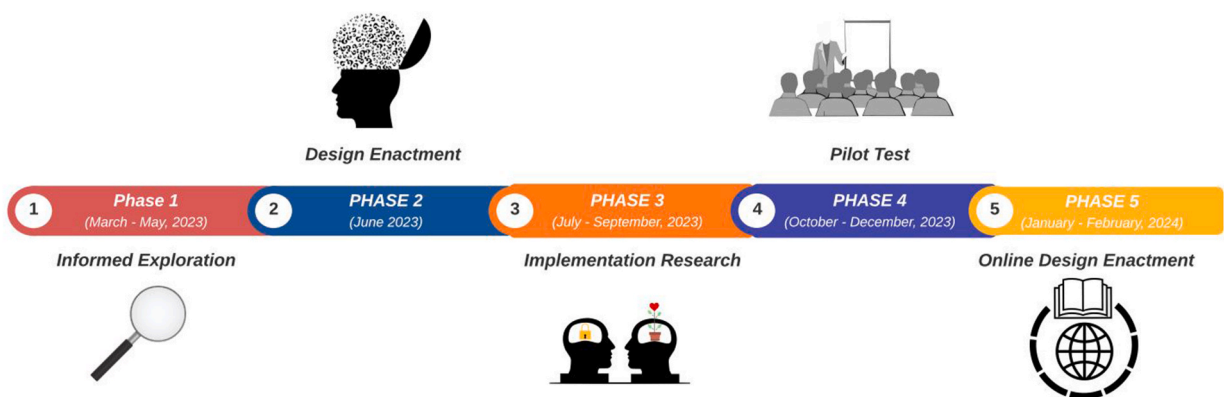


Fig. 2. Project timeline (March 2023–February 2024).

UCLA School of Public Health, Methods were informed by elements of the *Design-Based Implementation Research* (DBIR) approach which expands on traditional educational design and policy research to include methods to develop and test innovations to improve teaching and learning, both in and beyond the classroom [25]. The DBIR approach aims to address common educational challenges, including that not all programs will be successful across different educational settings, and some programs are at risk for failing when resources and skills are inadequate [26]. Though the majority of IHEs in the U.S. offer undergraduate sexual education courses – many of which are considered to be comprehensive, according to the National Sex Education Standards developed by the American Association for Health Education and the American School Health Association – enrollment in these courses is relatively homogeneous in terms of student gender identity and academic major [27–29]. Students opting not to enroll in these courses frequently reported that they were unaware of the course, had sufficient knowledge of sexuality, or that the course did not fulfill a university or major requirement [28]. Male undergraduate students were especially likely to report that they believed they already knew enough about sexuality. Male students' feelings about the social acceptability of enrolling in a course like this may also be a determining factor; several IHE courses saw male enrollment jump when courses were made available online, offering more privacy and anonymity [28]. Given the confluence of factors influencing student interest and enrollment, we felt the DBIR framework was ideal for this project.

The goal of phase 3 is to prepare for initial implementation of the course at UCLA by sharing the prototypes (developed in phase 2) with current UCLA students, UCLA experts, and community experts and seeking their feedback. Given the DBIR framework's emphasis on iterative, collaborative design [25], we opted for qualitative research due to its intrinsic iterative nature, which involves continuously designing research tools, collecting and promptly refining and updating methods and tools [30].

Phase 3 involves the conduct of 20 in-depth interviews with four participant types, to learn from their experiences and seek their guidance, as current UCLA students, IHE educators and teaching and course design experts. Upholding the DBIR principle of including multiple stakeholders' perspectives [25], we will interview people from multiple disciplines, both from the UCLA and the local community.

2.4.3.1. Recruitment of research participants. We will conduct interviews with twenty participants from four distinct categories.

- **UCLA Staff and Faculty:** Approximately five interviews will be conducted with UCLA staff and faculty members who are engaged in teaching or supporting undergraduate and/or graduate level courses on sexual health, sexuality, reproductive health and intimate and family relationships. The inclusion criteria for these participants are their current involvement in relevant teaching or support roles at UCLA, and their willingness to participate in an in-depth interview. We will exclude those who do not have a direct role in these specific areas or are unable or unwilling to take part in the study. This strategy is intended to gather comprehensive insights from both educators and support staff, enriching our understanding of the educational landscape in these critical topics.
- **UCLA Students:** Ten interviews will be conducted with UCLA undergraduate students from different programs and at different stages of their education. We will recruit UCLA undergraduate students based on a diverse academic background and their stage in education, utilizing campus-wide announcements and department collaborations. Participants must be full-time UCLA students, over 18, and willing to give informed consent. We will exclude non-UCLA students, those under 18, and anyone unable or unwilling to consent or commit to the interview process. This approach ensures a representative sample while adhering to ethical standards of research.
- **Community Experts:** We will interview five experts from other California-based higher education institutions, who teach and/or do research on sexual and reproductive health. For recruitment, we will target individuals from various California-based higher education institutions who are actively involved in teaching and/or research on sexual and reproductive health. The inclusion criteria for these experts include a proven academic or professional background in sexual and reproductive health, current affiliation with a higher education institution in California, and willingness to participate in an in-depth interview. We will exclude individuals who lack direct experience in these areas, are not affiliated with a higher education institution in California, or are unwilling to participate in the study. This approach aims to ensure a breadth of expert knowledge and insights while maintaining a focused and relevant participant pool.

Targeted sampling will be used to recruit participants. Email messages will be sent to individuals identified during phase 1 as potential participants in each of the four categories. Each email will introduce the study, explain why we are contacting that particular individual and invite them to participate in an in-depth interview. Potential participants will be asked to speak with a research assistant during a short (approximately 5 min) Zoom or phone call to determine eligibility and, as appropriate, to schedule a date, time and location for an in-depth interview.

2.4.3.2. Qualitative interview procedure. Data collection will either be done remotely (via Zoom) or in-person, on campus or at an alternative location that is accessible to both the interviewer and the participant. All interviews will be done in a setting where privacy can be ensured (i.e., where no one can overhear what is being said and where the discussion will not be interrupted). All participants will provide written informed consent to participate in the study and to have their data collection session be audio recorded. On average, interviews will take 60 min and participants will be ensured that they can stop at any time. All participants will receive a US\$ 25 Visa gift card in compensation for their time.

Aims of the implementation research are: (1) to understand what, why, and how the proposed course structure, content, delivery and assessment will work in the “real world” undergraduate setting; and (2) to assess the effectiveness, feasibility, and appropriateness of online instruction strategies. Data will be used to identify areas for improvement that can be used to inform instructional design

decisions to enhance the learning experience and outcomes for students.

A semi-structured guide will be used to conduct the interviews. It will include open-ended questions and prompts to allow participants to freely express their thoughts and opinions about UCLA students' past CSE experiences and what they believe are the specific needs, preferences, and diverse perspectives of undergraduate students, as they relate to sexual and reproductive health and rights. Insights will also be gathered on participants' perceptions of approaches for online CSE and SRHR teaching approaches, such as online activities and situations that are designed to facilitate learning through the completion of tasks.

Task-based learning has its roots in educational approaches for teaching language through the use of communicative tasks [31]. More recently, task-based learning has become a commonly used approach for teaching and learning activities in U.S. medical schools [32]. For the online components of the proposed new UCLA course, we hope to use task-based scenarios to promote active and experiential learning by engaging students. During qualitative interviews with students, we will seek their feedback to shape activities that accurately represent students' real-world experiences related to SRHR. These insights will guide us in creating relevant, engaging online course tasks that resonate with the actual challenges students face, ensuring a more effective and experiential learning process.

2.4.3.3. Qualitative data analysis. Analysis will be done collaboratively by the School of Public Health research team members. First, interviews will be audio-recorded and transcribed, verbatim. Transcripts will be redacted to remove personal identifying information and uploaded to Dedoose version 4.1.2. A thematic analysis approach will be used to code the data and identify emergent themes and subthemes [33]. This process will involve all transcripts being read to identify emergent themes, topics, ideas, concepts, and terms. The research team will discuss the codes that emerge and agree on categories for organizing them, including groups of broad conceptual codes that need to be further refined into sub-codes. Next, a coding tree will be developed to create an analytic blueprint of the relationship between the codes that emerged during the review of transcripts. Then, each transcript will be coded by at least two reviewers. The research team will have continuous meetings to iteratively revise the codes. The faculty lead will review and sign off on all themes and help solve discrepant codes that the team is unable to reach consensus on to ensure inter-rater reliability.

Transcripts from interviews with students will be explored to understand their perceptions of and recommendations on the syllabus, course content and teaching approach. Transcripts from interviews with all other participants will be analyzed to learn from their experiences with SRHR instruction and design and to understand their suggestions for the course implementation and student assessment. Findings from the formative research will be used to develop the course learning blueprint which will be pilot tested during phase 3.

2.4.4. Phase 4: pilot test of beta version of course prototype (October–December 2023)

The goal of phase 4 of the EBCD framework is to revise the beta course materials into final versions, with the intent of “broadening impact” [22]. To this end, we will conduct a pilot study to assess student learning, the amount of time learners needed for each module and activity, how learners engaged with the material, their levels of understanding of instructions for activities and exercises and how students felt about the flow and balance of the course. The pilot test will evaluate the effectiveness of the course in meeting its stated learning objectives, assess the functionality of the course's assessment tools, and ascertain the instances where technology both supported and did not support the learning process.

A pretest–posttest design (with no control group) design using quantitative and qualitative methods will be used to pilot the course. All participants will be asked to complete a quantitative pre-course survey questionnaire to assess baseline knowledge of key course concepts they will study during the term. Measures will be included to assess students' attitudes and values relevant to course concepts, opinions about course format and delivery, and its modules and activities, and perceptions of use of technology for learning. On completion of the 10-week course, participants will complete a post-course survey that assesses the same knowledge, attitudes and perceptions. The post-course survey will also assess feedback on the course design, content and how and where improvements can be made.

A subset of student participants will be invited to take part in an in-depth qualitative exit interview, one month after completing the course. The goal of the qualitative interviews will be to gather students' perceptions about how the course impacted their knowledge and behavior, both independent from and on top of prior sexual education they completed. Qualitative inquiry will also be used to explore students' recommendations for how the course could be improved for subsequent offerings at UCLA, how to best integrate technology into learning and how the instructors can best adapt the course into a fully online format.

2.4.4.1. Recruitment of research participants and data collection procedures

2.4.4.1.1. Pre- and post-course survey participants. All students who register for the course (up to 60 students) through the UCLA online registrar will be invited to participate in the pilot study. Students who accept the invitation will be asked to provide written consent to complete the pre-course survey and to be contacted (later in the academic term) about completing a post-course survey at the end of the term, and about taking part in a qualitative interview (to be administered after the quarter has terminated). Each student survey participant will be provided with an information sheet that provides them full details about the study timeline and all procedures. Students will be assured that their participation in the study (or if they decline to take part, it) will have no impact on their academic course evaluation (i.e., it will not affect their grade, negatively or positively).

2.4.4.1.2. Qualitative exit interview participants. Midway through the course, students will be invited to participate in a qualitative exit interview to be scheduled approximately one month after the course has ended (in the first or second week of January 2024). Students will be provided with a secure online link they can use to sign up if they are interested in participating in a qualitative interview. We will initially enroll up to 20 student participants, a number informed by our previous research experiences, to ensure a

diverse and manageable dataset. Recognizing the importance of data saturation in qualitative research, our approach is flexible, and we are prepared to adjust the number of interviews if initial analysis indicates that saturation has not been achieved. We will continuously assess the emerging data for new themes or information, and the decision to extend interviews will be based on whether additional insights continue to arise. This adaptive strategy ensures a comprehensive understanding of student experiences while maintaining the rigor and credibility of our research findings. The point at which data saturation is determined will be documented in our research findings to maintain transparency. All interview participants will be interviewed by a team researcher, either remotely (via Zoom) or in-person (on campus) at an accessible and convenient location, where privacy can be ensured. The location for interviews will be determined collaboratively between the participant and the research team during an initial brief call. Participants will be offered a choice of locations, including private campus rooms, quiet public spaces, or secure online settings, to ensure their comfort and the confidentiality of the interview. Research assistants will guide participants in choosing a suitable and convenient location, emphasizing the importance of a conducive environment for effective data collection. We estimate that interviews will take approximately 60 min. This estimation is based on our previous experiences with similar studies and the anticipated scope of the interview topics. However, we acknowledge the dynamic nature of qualitative interviews and the variability in their length. As such, we will ensure that participants are informed that this duration is an approximate estimate and that each interview will be allowed to proceed at its natural pace. Our research team is prepared to allocate additional time as needed, allowing participants the flexibility to fully express their thoughts and experiences without feeling constrained by time. All participants will provide written informed consent to participate in the study and to have their data collection session audio recorded.

A semi-structured guide will be used to gather students' perceptions of how the course impacted their knowledge and behavior, and how it could be adapted to online format. Students will be asked, "Did this course enhance your knowledge?" which will be followed by open-ended questions, such as "How did the course enhance your knowledge and understanding of SRHR?" and "In what ways did it influence your behavior, attitudes, or actions?" and "How would you feel about taking this same class in an entirely online format?" and "How might an online format impact your engagement, interaction, and overall learning experience?" and "What challenges do you think you might face if we transitioned this class to an online learning environment, and what strategies could we implement to address those challenges?"

2.4.4.1.3. Ongoing student activities to assess design, teaching and digital inclusion goals. Multiple activities will be done with students to assess achievement of design, teaching and digital inclusions goals (as shown in [Table 1](#)). In addition to pre- and post-assessments of how technology is impacting learning and how students perceive digital accessibility and universal design, we will establish online forums and discussion boards for students to share their experiences and insights about using technology for learning. Students will also complete exercises to share their experiences with different technology tools and discuss how each tool influenced their learning process.

To assess student perceptions of the course's educational technologies, short, online surveys will be administered (bi-weekly) to students to gather their opinions on the usefulness and challenges of specific technologies. Additionally, using the in-built data analytics features of the Canvas LMS, we will track students' engagement and performance with technology tools.

We will use the "Who's in Class?" tool [\[21\]](#), developed to create inclusive learning environments, acknowledge student diversity, and proactively address barriers to academic success. Students will answer a series of questions on topics such as financial capabilities, first-generation status, and expectations for inclusivity, using an anonymous virtual platform. Data will help the instruction team understand students' backgrounds and challenges so they can make informed decisions about how to foster an inclusive and supportive classroom environment.

2.4.4.2. Data analysis. Quantitative data will be analyzed using basic descriptive statistical methods. We will estimate pre-post changes in knowledge, attitudes and behaviors using χ^2 and paired t-tests, as appropriate. To estimate the change in objective knowledge, we will use a logistic generalized linear mixed model to account for the correlation between an individual's responses to the same question at different time points (e.g., at baseline and final follow-up). We will use Spearman's rho correlations to describe the relationship between subjective and objective knowledge.

The qualitative data analysis procedures will be the same as described in section [2.4.3.2](#) (above). Transcripts from interviews will be explored to understand students' experiences in the class, their perceptions of the modules and activities, their opinions about the topics and ideas covered and their recommendations on how to improve the teaching approaches and learning materials.

2.4.5. Phase 5: online design enactment (January–February 2024)

During the final phase of our project, we will adapt and develop lesson plans, teaching materials and learning resources for the fully online version of the course. All phase 5 work will be done by the faculty-student team members from the UCLA School of Public Health, in close collaboration with the instructional design professionals from the UCLA Online Teaching and Learning Unit.

Using information gathered during the prior phases of data collection, analysis and synthesis, we will develop proofs of concept for the online teaching materials. These will include the syllabus (which will outline learning objectives and outcomes, lesson topics and format, learning resources and digital and non-digital activities), development of synchronous and asynchronous educational experiences, selection of digital and non-digital platforms and plans for learner assessment.

3. Discussion

The project we have introduced in this paper aims to advance sexual and reproductive health education among young adults, by

developing a comprehensive, full-term university course. This approach represents a significant departure from the fragmented and episodic sexual health trainings that are most commonly offered to students at the university-level. By embedding our sexual and reproductive health education program within the academic curriculum, we seek to provide structured and in-depth education on sex and relationships, reproductive health and choice, pleasure and sex-positivity and overall health and well-being. Additionally, we are integrating public health perspectives with a strong focus on digital inclusion and evidence-based content.

While diverse CSE initiatives already exist across university campuses in the U.S., they predominantly consist of brief workshops, seminars, online modules and peer group activities [34–36]. Although beneficial, these offerings vary widely in terms of content and accuracy. Further, they often lack continuity, depth and effectiveness [37]. Our project stands out as it is structured as a full-term, credit-bearing course, offering a holistic and immersive educational experience. This design allows for a comprehensive exploration of sexual health topics that go beyond the scope of typical CSE programs.

Our program builds upon the foundation laid by existing CSE efforts, enhancing their impact by providing a more sustained and academically rigorous approach. The incorporation of digital tools, like the "Who's in Class?" application [21], reflects a commitment to creating a learning climate that is inclusive of and accessible to everyone in our diverse student body. This integration of technology not only enhances learning engagement but also prepares students to navigate the complexities of sexual health in a digital age.

To further meet the diverse needs of our students, we closely aligned our curriculum development approach with current research evidence on how to design sexual health education that is truly inclusive and comprehensive. For instance, our approach was influenced by a study that emphasized the dual responsibility of colleges and students in promoting sexual health [38], highlighting the important role colleges should play in providing resources and support for sexual health, which is a key aspect of our program. Our design was also informed by research that underscored the need for sexual health education to be inclusive and comprehensive, particularly for LGBTI + youth [24]. Our curriculum reflects this need by incorporating content on diverse sexual orientations, reproductive health needs and desires of gender nonconforming people, sex-positivity and pleasure, and violence prevention. By grounding our curriculum in these findings, we aim to provide a supportive and inclusive educational environment that addresses the sexual health needs of all students.

While our program is ambitious in its scope, it is not without limitations. Being a pilot initiative, its current application is limited to UCLA, which might not fully capture the diversity of experiences across the broader UC system, or beyond. Resource constraints may affect the depth of course development, and the potential for selection bias in qualitative interviews could influence the representativeness of feedback. Furthermore, technological accessibility, particularly for the online version of the course, remains an ongoing challenge.

The strength of our approach lies in its comprehensive and multidisciplinary nature. Our program engages a wide array of stakeholders, from experts in pedagogy and educational technology, to faculty and students, fostering a rich and diverse learning environment. The course's academic rigor, combined with its focus on practical applicability, sets a new standard for CSE in higher education. It promises to equip students with a nuanced understanding of sexual health that encompasses its physical, emotional, social, and ethical dimensions.

This project paves the way for future initiatives in sexual health education at the university level. Its success could inspire similar programs across other universities, contributing to a more informed and health-conscious student population. The insights gained from this pilot can guide the development of CSE curricula that are adaptable to various educational settings and student demographics.

In conclusion, our project represents a significant advancement in the field of sexual health education. By providing a comprehensive, full-term academic course on sexual and reproductive health, we are not only filling a gap in current university offerings but also setting a precedent for future educational programs. We believe our initiative has the potential to make a lasting impact on students' understanding and approach to sexual health, thereby contributing to their overall well-being and the betterment of our society.

4. Ethics and Dissemination

All research materials for this study have been reviewed and approved by an IRB at the UCLA Office of Human Research Protection Program (HRPP) to ensure the safety and welfare of all research participants. The IRB determined that this study is exempt from further review under the federal regulations governing human subjects research (45 CFR 46.104(d)(1)) because it involves only educational practices and poses minimal risk to participants (Protocol ID: IRB#23–000822). As such, the study has been granted exemption status, and all procedures will be conducted in accordance with the IRB-approved protocol.

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Data availability statement

This manuscript is a protocol paper, to which data sharing is not applicable. Datasets have not yet been generated or analyzed for the current study. Upon completion of data collection and analysis, the datasets generated will be available from the corresponding author on reasonable request, subject to compliance with applicable privacy laws, ethical guidelines, and institutional regulations. We estimate that all data will be available by June 2024, after the conclusion of the study.

CRedit authorship contribution statement

Jennifer A. Wagman: Writing – original draft, Project administration, Methodology, Funding acquisition, Conceptualization. **Victoria Gresbach:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Samantha Ann Cheney:** Writing – review & editing, Project administration. **Mark Kayser:** Writing – review & editing, Methodology. **Paul Kimball:** Writing – review & editing, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e28503>.

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