



July 7, 2020

James D. Fielder, Jr., PhD
Secretary
Maryland Higher Education Commission
6 N. Liberty Street, 10th Floor
Baltimore, MD 21201

Dear Dr. Fielder:

On behalf of Provost Sunil Kumar, Dean Ellen MacKenzie and our Bloomberg School of Public Health, I write to request your review and endorsement of the enclosed proposal. The School of Public Health proposes a new **PBC in Rigor, Reproducibility, and Responsibility in Scientific Practice**.

The attached proposal has been drafted by Rosemary Morgan from the Department of International Health. The program is sponsored by three departments: The Departments of International Health, Population, Family and Reproductive Health, and Health, Behavior, and Society. The program has been reviewed and approved by the JHSPH Committee on Academic Standards and the School's Advisory Board is supportive of this new program.

The proposed program is consistent with the Johns Hopkins mission and the State of Maryland's Plan for Postsecondary Education. The proposal is fully endorsed by The Johns Hopkins University.

A business check for the review of this proposal has been sent to the Commission. Should you have any questions or need further information, please do not hesitate to contact Natalie Lopez at (410) 516-6430 or nlopez13@jhu.edu. Thank you for your support of Johns Hopkins University.

Sincerely,

A handwritten signature in black ink, appearing to read "Janet Schreck".

Janet Simon Schreck, PhD
Associate Vice Provost for Education

cc: Dr. Sunil Kumar
Ms. Natalie Lopez

Enclosures



Cover Sheet for In-State Institutions

New Program or Substantial Modification to Existing Program

Institution Submitting Proposal	
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Each action below requires a separate proposal and cover sheet.

New Academic Program	Substantial Change to a Degree Program
New Area of Concentration	Substantial Change to an Area of Concentration
New Degree Level Approval	Substantial Change to a Certificate Program
New Stand-Alone Certificate	Cooperative Degree Program
Off Campus Program	Offer Program at Regional Higher Education Center

Payment Submitted:	Yes No	Payment Type:	R*STARS Check	Date Submitted:
Department Proposing Program				
Degree Level and Degree Type				
Title of Proposed Program				
Total Number of Credits				
Suggested Codes	HEGIS:		CIP:	
Program Modality	On-campus		Distance Education (<i>fully online</i>)	
Program Resources	Using Existing Resources		Requiring New Resources	
Projected Implementation Date	Fall	Spring	Summer	Year:
Provide Link to Most Recent Academic Catalog	URL:			
Preferred Contact for this Proposal	Name:			
	Title:			
	Phone:			
	Email:			
President/Chief Executive	Type Name:			
	Signature: <i>Sunil Kumar R</i>			Date:
Date of Approval/Endorsement by Governing Board:				

Revised 6/13/18

**The Johns Hopkins University
Bloomberg School of Public Health
Proposal for
R³ Certificate Program in Rigor, Reproducibility, and Responsibility in Scientific Practice**

A. Centrality to Institutional Mission Statement and Planning Priorities

1. Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.

The Johns Hopkins University Bloomberg School of Public Health (JHSPH) proposes a Post-Baccalaureate Certificate Program on Rigor, Reproducibility, and Responsibility (R³) in Scientific Practice. The certificate program emphasizes research practice applicable, introductory graduate level training in epistemology, logic, ethics, as well as quantitative and communication skills. The program specifically addresses the “3R” core norms of good scientific practice, applied across the health and science disciplines, which include fundamental and trans-disciplinary application skills in:

- Rigor, critical thinking and objectivity in scientific conduct
- Reproducibility through appropriate, quantitative research methodology
- Responsibility of scientists toward the research community and society

The mission of the JHSPH is the improvement of health through discovery, dissemination, and translation of knowledge and the education of a diverse global community of research scientists and public health professionals. This new certificate program enhances this mission by producing graduates who will be:

- Broadly trained advocates of good research practice who think science from first principles.
- Skilled in scientific reasoning, logic and ethical decision making across the disciplines.
- Creative in complex problem solving by employing rigorous and reproducible research methods.
- Versed in communications with experts and the public on a wide range of science topics.
- Committed to enhancing the trust in science in local, national and global communities.

The program is designed for part- or full-time JHU graduate students (either online or on campus) who wish to earn a graduate-level certificate in advanced, trans-disciplinary research skills. Participants will value the program's specific focus on the philosophical underpinnings that form the fundamental framework of how science works, thereby keeping a broad perspective in mind that allows them to understand the principles underlying good scientific practice research from the bench science to the public health disciplines.

The program is proposed to commence in term 1 of academic year 2020/2021 and will require successful completion of a minimum of 18 credits of didactic course work, in addition to a capstone paper (no extra credit requirements).

2. Explain how the proposed program supports the institution's strategic goals and provide evidence that affirms it is an institutional priority.

The proposed program advances the Johns Hopkins University's *Ten by Twenty* vision, as well as the JHSPH Strategic Plan, in a number of significant ways.

- By formally teaching critical thinking and good investigative practice, offered to full and part-time students in flexible online or on-campus formats, the program will contribute to making the JHSPH a global leader in reforming graduate education.
- Through its interdisciplinary nature, the program supports the integrative efforts among the JHSPH departments and JHU divisions.
- Inclusion of R³ concepts into a wide selection of graduate programs at the JHSPH is an explicit aim of the JHSPH's strategic plan (<https://www.jhsph.edu/about/strategic-plan/index.html>, "The Power of Education").
- The flexible structure of the program will allow its addition to a range of different graduate programs who need to fulfill advanced Rigor and Reproducibility training requirements by federal funding agencies.
- Emphasizing written and oral communications training across the science disciplines and with lay audiences, the program will contribute to nurturing a strong community among students and experienced practitioners, as well as members of the public.
- One of the core values of the program is the responsibility every scientist should feel toward society, which manifests in the program's strong, practical ethics orientation.
- The national and worldwide echo following recent publications of the R³ educational concept that forms the basis for the certificate program helped advance the impact of the JHSPH and University as a whole.
- Through its rigorous self-evaluation concept and commitment to continuous revision and improvement, the program aspires to a top rank among national graduate certificate programs and thus supports the educational mission of the JHSPH and the JHU overall.

3. Provide a narrative of how the proposed program will be adequately funded for at least the first five years of program implementation.

JHSPH sets aside a portion of its tuition revenue each year as part of its budgeting process to fund the development of new programs and new courses. In addition, the tuition revenue from enrollments in the courses in any program is used to cover the instructional costs of the program before any excess is used for other JHSPH efforts. If a new program finds that its instructional costs are greater than the tuition revenue, funds are allocated from elsewhere in the overall JHSPH budget as well as from the Katharine E. Welsh Endowment Fund. This endowment is situated within the Department of Molecular Microbiology & Immunology and serves to support the R³ Center for Innovation in Science Education which harbors the certificate program. Together, these measures will serve to cover the startup program's costs in case of shortfalls during the first five years. Additional information is in Appendix C.

4. Provide a description of the institution's commitment to:

a) Ongoing administrative, financial, and technical support of the proposed program.

JHSPH's ongoing administrative, financial, and technical support for this program is reflective of the 100 years this school has been supportive of public health programs

that have educated many generations and individuals all over the world. JHSPH does a careful program viability study for new programs based on prospective student enrollment, in addition to addressing global health concerns. The proposed program would receive the same sort of administrative, financial, and technical support as the other academic programs in JHSPH's portfolio.

b) Continuation of the program for a period of time sufficient to allow enrolled students to complete the program.

JHSPH is committed to providing all enrolled students the opportunity to complete the degree program, including under circumstances of low demand. Programs are evaluated by the departments and determinations are made as to whether they should continue to admit students. If a program ceases to admit new students, the school remains committed to see the current student through their program of study.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general.

Major problems with graduate level education today, across many disciplines, include overspecialization in a narrow area of knowledge without proper grounding in fundamental competencies such as critical thinking, logical reasoning, ethics and communication. Shortcomings in education may also contribute to some of the problems in science, engineering, and health, e.g. poor reproducibility, shoddy literature, and the rise in retracted publications (Bosch, Casadevall, 2017).

Graduate level education that addresses the eminent rigor and reproducibility problems in the sciences, as well as the frequent lack of pre-professional career skill training (e.g. in communication skills), is now a requirement in pre- and post-doctoral training grant applications to the National Institutes of Health and the National Science Foundation. Moreover, the integration of competencies into STEM graduate education that originate from the humanities (such as critical thinking skills that build on the philosophical foundations of science) has been recently recommended by the National Academies of Sciences, Engineering and Medicine (NASEM, 2018).

Evidently, educational programs that fill these gaps are important for the future of human progress in health and science. More broadly applicable skills put practitioners across all disciplines into a position to think beyond the borders of their narrow specialties and successfully tackle the big problems humanity faces today, and in the future, such as climate change, pandemics, violence, etc. The challenge is to offer targeted, modular and flexible additions to existing graduate programs to help produce more broadly trained scientists, capable of thinking and conducting science from first principles without adding extensively to the curricular density in current graduate programs or even lengthening the time to degree.

Bosch G, Casadevall A. 2017. mBio 8:e01539-17. <https://doi.org/10.1128/mBio.01539-17>

NASEM (National Academies of Sciences, Engineering, and Medicine). 2018. doi: <https://doi.org/10.17226/24988>.

The program addresses the problems above as it:

- Constitutes a concise certificate program that focuses on the essential principles and norms of good scientific practice, including Rigor, Reproducibility and Responsibility;
- Can be completed all online within one year;
- Has a modular structure that can be flexibly added to existing programs;
- Contains coursework that has been successfully implemented at the JHSPH through the R³ Center for Innovation in Science Education (R³ISE, jhsp.edu/r3gsi) that is serving graduate students of numerous programs and divisions, ranging from the natural, life, health, and social sciences, as well as engineering at Johns Hopkins.

The program will prepare aspiring science and health practitioners, researchers, policymakers, and scholars to take on the highly complex public health, science, and health care challenges that emerge daily. Graduates of the program will be equipped to drive the responsible development of new knowledge and novel ways of saving lives and improving health to further progress across the disciplines in science, engineering, health and medicine, in their local communities, in Maryland, and beyond.

2. Provide evidence that the perceived need is consistent with the Maryland State Plan for Postsecondary Education.

The 2017-2021 Maryland State Plan for Postsecondary Education articulates three goals for postsecondary education: 1.) Access: Ensure equitable access to affordable and quality postsecondary education for all Maryland residents. 2.) Success: Promote and implement practices and policies that will ensure student success. 3.) Innovation: Foster innovation in all aspects of Maryland higher education to improve access and student success. The proposed program addresses each of these goals.

The Bloomberg School of Public Health aims to prepare highly trained scientists and healthcare professionals to work in organizations where they can contribute to the public health needs of society. The proposed program is intended to meet the growing need for skilled professionals trained in the integration of in vivo and in vitro tools in assessing the risk associated with environmental exposures in Baltimore, the State, across the country, and beyond. This is consistent with Goal 3 (Innovation) of the State Plan.

By allowing students to complete the program either full-time or part-time, access is provided to those who wish to enter this field as well as those currently working in it who wish additional training. The online format allows part-time students to pursue the degree even if their work schedules do not permit onsite class attendance. Additionally, students who move away from the Maryland region will still be able to complete the program, thus supporting the State Plan's innovation and completion goals (Goals 2 & 3).

The JHSPH Student Affairs office is a resource to counsel prospective students on funding. In addition, the Financial Aid Office provides assistance with federal and private loans and federal work study (Goal 1).

JHSPH offers an array of services for the continued success of the student learner. These services include career counseling, 1:1 (student:faculty) academic advising, disability services, mentored research and mentored practicums in the areas of public health (Goal 2).

Typically, part-time students with full-time jobs who enroll in JHSPH programs represent a broader range of diversity than students in full-time programs. In targeting part-time students, the proposed certificate program addresses the Access goal (Goal 1) in the State Plan.

Similarly, the proposed program is consistent with Goal 3, innovation, which articulates Maryland's aspiration to be "a national leader in the implementation of creative and diverse education and training opportunities that will align with State goals, increase student engagement, and improve learning outcomes..."

Additionally, the program, through the preparation of highly qualified individuals engaged in risk assessment, contributes to the economic growth and vitality goal (Goal 3) by providing life-long learning to scientists and health professionals so they can maintain the skills they need to succeed in the workforce.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

1. Describe potential industry or industries, employment opportunities, and expected level of entry (ex: mid-level management) for graduates of the proposed program.

The competencies conveyed in the certificate program are deliberately broad, critical thinking and fundamental research skills that will help prepare graduates for a wide range of professional activities in health, science and engineering. Essentially, these are skills that do not expire (NASEM 2018), in contrast to highly specialized, subject matter knowledge that can be looked up on the world wide web and is often outdated shortly after it is taught. Over the past decades, fundamental skill training has disappeared more and more from post-baccalaureate education due to the deluge of detailed subject matter course work that predominate the majority of graduate curricula. However, from experience as professionals and earlier research by higher education organizations (e.g. Council of Graduate Schools (2020); McLaughlin et al. (2019), we know that critical thinkers with a solid understanding of how to evaluatively integrate the available knowledge, and utilize it to conduct good science are needed in every aspect of society: academia and industry, public service, community work and non-profit, policy and government, communication or writing. Consequentially, the demand for individuals with widely applicable reasoning, ethical decision-making and creative problem-solving competencies is continuously increasing. Program graduates are thus expected to take leading roles in interdisciplinary positions that tackle the big problems and global crises that our society is facing today.

NASEM (National Academies of Sciences, Engineering, and Medicine). 2018. doi: <https://doi.org/10.17226/24988>.

Council of Graduate Schools (2020). <https://cgsnet.org/understanding-career-pathways>

McLaughlin JE, Minschew LM, Gonzalez D, Lamb K, Klus NJ, Aubé J, et al. (2019). PLoS ONE 14(9): e0222422. <https://doi.org/10.1371/journal.pone.0222422>

2. Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program.

The JHSPH R³ Center for Innovation in Science Education (R³ISE) that offers the courses constituting the certificate program, has received multiple requests from students, program directors and educators across the divisions at Johns Hopkins asking to make structured skill training pertaining to the norms of good scientific practice available in the form of a certificate. The aim of the proposed certificate program is thus to provide interested JHU students with the desired educational format, support existing training programs, as well as thesis advisors in their mentoring efforts to produce well rounded science, engineering and health professionals. Some R³ISE course modules on communications, ethics and scientific error analysis skills have already been successfully included into other Johns Hopkins graduate programs, such as the JHSPH Master of Public Health as well as the JHMI PhD program in Cellular and Molecular Medicine. Importantly, R³ISE program offerings have been frequented by masters, doctoral and post-doctoral students from numerous programs and departments at Johns Hopkins. By the time of this application, R³ISE courses have served over 700 learners from the JH Schools of Public Health, Medicine, Engineering and Arts and Sciences.

3. Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next 5 years.

Course evaluation surveys and other assessments suggest that the competencies conveyed in R³ISE course experiences provide graduates with enhanced skill sets that contributed to their self-perceived confidence levels addressing complex scientific, ethical and communication problems. Through anecdotal, unsolicited student feedback by email and professional portals such as LinkedIn, we learned that several of our former course participants attributed parts of their pre-professional development and later success in their professional activities to a deeper understanding of scientific processes through the philosophically-reflective thinking training in the R³ISE courses they took during their graduate studies. These notions are corroborated by employer-based survey results (McLaughlin et al. (2019); Council of Graduate Schools (2020) and earlier calls from leading voices in graduate education, national institutions, and federal funding organizations, that asked to broaden the competency training in graduate science education through addition of didactic and experiential education in communication, integrative and cognitive skills that stem from the humanities (e.g. Leshner (2014); Gould (2015); Daniels (2015); Hitchcock (2017); Bosch & Casadevall (2017); NASEM (2018); Payne et al. (2019); Koroshetz (2020).)

Leshner AI. 2014. *Science* 349: 349.

Gould J (2015). 528, 22–25 doi:10.1038/528022a

Daniels R (2015). *PNAS* 112(2), pp. 313-318

Hitchcock et al. *eLife* 2017;6:e32715. DOI: <https://doi.org/10.7554/eLife.32715>

Bosch G, Casadevall A. 2017. *mBio* 8:e01539-17. <https://doi.org/10.1128/mBio.01539-17>

NASEM (National Academies of Sciences, Engineering, and Medicine). 2018. doi: <https://doi.org/10.17226/24988>.

Payne S, Maxon M, Casadevall A, Lanier M. (2019). *American Academy of Microbiology Colloquia*.

McLaughlin JE, Minshew LM, Gonzalez D, Lamb K, Klus NJ, Aubé J, et al. (2019). *PLoS ONE* 14(9): e0222422. <https://doi.org/10.1371/journal.pone.0222422>

Council of Graduate Schools (2020). <https://cgsnet.org/understanding-career-pathways>

Koroshetz WJ (2020). *eLife* 2020;9:e55915 DOI: 10.7554/eLife.55915

4. Provide data showing the current and projected supply of prospective graduates.

Historical data from other JHSPH certificate programs suggest that the average part-time student will complete the program within 12-18 months. Based on our experience with existing R³ISE course offerings and participant communications we estimate about 15 students to graduate in 2022, and 20-30 annually in subsequent years.

D. Reasonableness of Program Duplication

1. Identify similar programs in the State and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.

At present, and to the best of our knowledge, there are no schools in Maryland or that currently offer a comparable, graduate level certificate program in applied, good investigative practice training based on epistemology, logic, ethics, as well as quantitative and communication skills that broadly applies to students across the life and health sciences as well as engineering. Outside of Maryland, institutions such as the University of Pittsburgh and Boston University offer classic Philosophy of Science degree programs that, however, have a strongly theoretical orientation and target a different audience (masters and doctoral degree seeking students).

2. Provide justification for the proposed program.

The program will provide fundamental, yet practice-applicable and cross-disciplinary training in rigorous scientific practice, a foundational understanding of reproducible research methodology, and an attitudinal commitment of a science practitioner's responsibility toward the research community and society. Such knowledge and skills will serve as the basis for this certificate program, which can enhance students' abilities to serve as impactful change agents in academia, industry, other private or non-profit sectors, public service or government positions, or to obtain promotions in positions already held. The program will be grounded in real-world challenges, informed by leading edge scholarship, with a diverse faculty of the leading experts in the field and a student body bringing lived experiences to the classroom.

E. Relevance to High Demand Programs at Historically Black Institutions (HBIs)

By definition, an appropriate student for the program would apply after attending and completing a baccalaureate degree at any undergraduate institution, including any of Maryland's Historically Black Institutions. The proposed program would not directly affect the implementation,

maintenance, uniqueness, identity or mission of these institutions.

Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBI'S.

To the best of our knowledge, there are currently no known similar programs in any of the Historically Black Institutions in Maryland. We believe the Program would not impact on the uniqueness and institutional identities and missions of HBIs.

G. Adequacy of Curriculum Design and Delivery to Related Learning Outcomes (as outlined in COMAR 13B.02.03.10)

1. Describe how the proposed program was established and describe the faculty who will oversee the program.

As the school prepares to respond to new Council on Education in Public Health (CEPH) requirements, we recognized that this program. The faculty are primarily members of the Department of Molecular Microbiology & Immunology. The faculty have produced leading research in biomedicine, biophysics, adult education and science philosophy, while generating scholarship and educating the next generation of leaders in interdisciplinary research and communication skills, committed to sound scientific practice. See Appendix B for a list of faculty-associated with this program.

2. Describe educational objectives and learning outcomes appropriate to the rigor, breadth and (modality) of the program.

Educational Objectives:

- a. Discuss the nature and philosophical foundations of applied health and life science using cross-disciplinary and integrative, critical thinking
- b. Examine the fundamental importance of rigorous research approaches, reproducible methodology and responsible conduct in scientific practice

Student Learning Outcomes:

Upon completion of the program, students will be able to:

- a. Analyze research strategies, techniques, and data in the light of the norms of good scientific practice
- b. Formulate constructive critique of the research presented in the interdisciplinary primary literature
- c. Explain the basics of hypothesis testing, data analysis and visualization in science
- d. Apply fundamental logic and ethics considerations to observational and experimental approaches to study current problems in science and society
- e. Differentiate how causality is established among the scientific disciplines
- f. Appraise how limitations of causal inference can be mitigated in research and practice
- g. Describe the sources of error in scientific practice as well as approaches for error reduction

- h. Evaluate the impact of errors in discovery and innovation
- i. Apply evidence-based strategies to craft clear and concise, written communications.
- j. Employ rhetoric and storytelling to strengthen the communication's impact.
- k. Recognize the critical role of scientists in society

Explain how the institution will:

a) Provide for assessment of student achievement of learning outcomes in the program

JHSPH's Center for Teaching and Learning has a staff of Instructional Designers that assist faculty in the design and delivery of their courses. These Instructional Designers assist the faculty in preparing learning assessments (projects, papers, exams) that are linked to the program and course learning outcomes. These assessments are graded by the instructors and the students' grades reflect their knowledge of the matter.

b) Document student achievement of learning outcomes in the program

Grades are kept in a gradebook in the school's CoursePlus system and grade distributions are shared with the department chairs and the Committee on Academic Standards (CAS). If learning outcomes are not met in a given year, the program is expected to address these issues for the next offering.

3. Provide a list of courses with title, semester credit hours and course descriptions, along with a description of program requirements

A full course listing, with course titles, credits and descriptions, is provided in Appendix A.

Program Requirements

Students will be required to successfully complete a minimum of 18 didactic credits plus 3 credits for a capstone paper.

Table 1: Curriculum Overview

Course Number	Course Title	Credits	Required / Elective	Online Term	Campus Term
	Introduction to Online Learning	0	Required	Any	-
PH.550.860	Academic & Research Ethics	0	Required	Any	-
REQUIRED COURSES: Students must complete all of the below (12 credits)					
PH.260.700	How do we know? Theory & Practice of Science	3	Required	1	3
PH.260.701	Anatomy of Scientific Error	3	Required	2, 4	4
PH.260.705	Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences	3	Required	3	
PH.260.844	Causation	3	Required	4	2
ELECTIVE COURSES: Students complete at least 6 credits in elective coursework, choosing from the list below					

PH.260.704	Critical Dissection of the Scientific Literature	3	Elective	1	3
PH.260.710	Communications Practice for Health Science Professionals	3	Elective	2	4
PH.260.715	Unleash your Writing Superpower	3	Elective	2	-

Discuss how general education requirements will be met, if applicable.

Not applicable

4. Identify any specialized accreditation or graduate certification requirements for this program and its students.

Not applicable

5. If contracting with another institution or non-collegiate organization, provide a copy of the written contract.

Not applicable

6. Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and cost and payment policies.

JHSPH's CoursePlus system <https://courseplus.jhu.edu/core/index.cfm/go/home/> contains all the course offerings including a course description, requirements, nature of faculty/student interaction, assumptions about technology competence and skills, and technical equipment requirements. These details are listed on the syllabus for a course. All program related information (degree requirements, learning management systems, academic support, financial aid, records, and policies) can be found on the School's web site <https://www.jhsph.edu/> and in the Academic Prospectus https://www.jhsph.edu/admissions/how-to-apply/prospectus-request/pdf/2019-2020_prospectus.pdf

7. Provide assurance and any appropriate evidence of advertising, recruiting and admissions materials will clearly and accurately represent the proposed program and the services available.

The JHSPH web site <https://www.jhsph.edu/> contains the same marketing, recruiting and admission materials that are used in print. The Academic Prospectus https://www.jhsph.edu/admissions/how-to-apply/prospectus-request/pdf/2019-2020_prospectus.pdf is also available in interactive PDF form. We are transparent with students on requirements, services and policy at time of admission through the life cycle of a student to alum.

H. Adequacy of Articulation

Not applicable.

I. Adequacy of Faculty Resources (as outlined in COMAR 13b.02.03.11)

- 1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of faculty with appropriate type, terminal degree title and field, academic title/rank, status, (fulltime, part-time, adjunct) and the course(s) each faculty member will teach (in this program).**

See Appendix B for a representative list of faculty who will teach in the proposed program. Each faculty are distinguished and experienced professionals and all have advanced degrees, many with multiple doctorates. Greater than 70% of the faculty are full time. They have produced leading research in the fields of public health, biomedicine, and philosophy of science and application. While continuing to generate path-breaking scholarship, they are educating the next generation of leaders committed to critical thinking in science and the “3R” values of good, cross-disciplinary practice through Rigorous research, Reproducible methods and Responsible scientific conduct. The majority of the faculty have research programs funded by international and nongovernment agencies as well as the U.S. government. Together, hundreds of manuscripts have been published in peer reviewed journals by the faculty who are teaching in our program. Program faculty have also served on committees that are responsible for funding, regulation, and education. Overall, many are considered to be the leading experts in their field of study.

- 2. Demonstrate how the institution will provide ongoing pedagogy training for the faculty in evidenced-based best practices, including training in a. Pedagogy that meets the needs of students, b. the learning management system and c. Evidenced-based best practices for distance education, if distance education is offered:**

The School’s Center for Teaching and Learning (CTL) supports faculty in the design, development and delivery of courses and supports the teaching experience. CTL offers workshops and 1:1 faculty consultations on topics such as course consultations, Faculty and TA development and using CoursePlus. Such workshop topics include: using Case Studies and Case Examples, Getting the Most Out of Your Live Talk, Using the Course Management System to Its Fullest Potential in the Education Process and Authentic Assessment.

CTL has a staff of Instructional Designers that are assigned to faculty developing or teaching a course. Instructors receive direct support and guidance from the instructional designer and the multimedia staff, which may take the form of course design, course production support, and audio and video recording support. CTL supports faculty in the refinement of the course by updating content and the quality of the students’ educational experience.

J. Adequacy of Library Resources (as outlined in COMAR 13B.02.03.12)

The book collections at the Johns Hopkins University number almost two and one-half million volumes, selected to support the studies of all departments and divisions of the University. The William H. Welch Medical Library collects current scholarly information, primarily electronic, which supports the research, clinical, administrative, and educational needs of its clients. The collection covers health, the practice of medicine and related biomedical and allied health care disciplines, public health and related disciplines, nursing, research literature, methodological literature, reviews or state-of-the-art reports, and

in-depth, authoritative analyses of areas influencing biomedicine and health care. The library's emphasis is on providing materials at point of need. As a result, the collection includes more than 7,200 electronic journals, more than 400 databases, and more than 13,000 e-books. The library has staff members assigned to each department to aid in research and best practices for library services.

K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment (as outlined in COMAR 13B.02.03.13).

- 1. Provide an assurance that physical facilities, infrastructure and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences. If the program is to be implemented within existing institutional resources, include a supportive statement by the President for adequate equipment and facilities to meet the program's needs.**

JHSPH has 26,567 square feet of classroom and student study space. Each classroom has a computer and LCD projector. The School has robust student support services, including a fully staffed information technology team and over 1000 computers located in computer labs and throughout main buildings for student use. The central computing resource for the School, the Office of Information Technology (IT), provides students with reliable computing infrastructure, location, and device independence, and critical software tools. Additionally, an enterprise service desk offers support for faculty, staff, and students. Assistance is provided over various channels, including phone, desktop, and FIPS 140-2 compliant remote-control support. Customer satisfaction is monitored and benchmarked against other higher educational institutions and industries. For this program, no additional facilities, infrastructures or laboratory or computer resources will be required.

- 2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to: a) an institutional electronic mailing system, and b) a learning management system that provides the necessary technological support for distance education.**

- a) All JHU students receive an Office 365 account including email capabilities (built on Outlook Live), as well as 25GB of online storage, and collaboration, blogging, photo-sharing, event-planning, instant messaging, and other tools. The email account is accessible from a variety of browsers on both the PC and Mac, including full support for Internet Explorer, Firefox, and Safari.
- b) Courses can be taken through JHSPH's CoursePlus course management system. These technologies are supported by the Center for Teaching and Learning (CTL) and the university's IT infrastructure and provide password-protected online course sites and community management systems that enable ongoing collaborative exchange and provide convenient channels for synchronous and asynchronous learning. Johns Hopkins is also outfitted with suitable technical and professional staff and a help desk to provide technical assistance to the students taking online courses. All of the student services such as application processes, course registration, bookstore, ID service, and advising are

currently provided online as well.

L. Adequacy of Financial Resources with Documentation (as outlined in COMAR 13B.02.03.14)

See Appendix C for detailed financial information.

M. Adequacy of Provisions for Evaluation of program (as Outlined in COMAR 13B.02.03.15)

1. Discuss procedures for evaluating courses, faculty and student learning outcomes.

As part of the program design and approval process, student learning outcomes and assessments have been aligned with the academic goals of the School and approved by the School's Committee on Academic Standards. Student course evaluations, conducted at the end of each term, provide feedback about both courses and faculty. The evaluations include questions addressing the course overall, the instructor and the assessments of learning.

The program committee consisting of Dr. Arturo Casadevall (Chair, Department of Molecular Microbiology & Immunology), Dr. Alan Scott (Vice Chair for Education, Department of Molecular Microbiology & Immunology) and Dr. Gundula Bosch (Director, R³ Center for Innovation in Science Education) will meet annually to assess course evaluations and other feedback provided by students, faculty and other stakeholders in the program. Program level evaluation activities will include an annual assessment of program inputs, processes and outputs to generate a report on program applicants and admitted students, course enrollment, faculty participation, pedagogical innovations and program accomplishments/recognition.

Evaluation of student learning and achievement will focus on the early identification of students' goals/objectives and individualized learning outcomes; students' acquisition of knowledge and skills and the degree to which the program is fostering students' achievement of the degree competencies. The Educational Program Committee in the department reviews student course evaluations and will reach out to program faculty when problems arise.

The program committee also reaches out to the internship advisor for evaluations. Adjustments to the program will be made accordingly. Finally, post-degree professional and academic accomplishments of graduates will also be tracked.

2. Explain how the institution will evaluate the proposed program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost effectiveness

The procedures that will be used to evaluate these matters are noted in section M.1. The department Chair, working closely with administrative staff and the Associate Dean for Education, will routinely evaluate performance and initiate corrective action plans, if necessary.

N. Consistency with the State's Minority Student Achievement Goals (as outlined in COMAR13B.02.03.05).

Any student meeting the admissions requirements can apply to the program, which will work to help all accepted students improve their workplace competitiveness and reach their professional goals, an aim consistent with the State's minority student achievement goals.

O. Relationship to Low Productivity Programs Identified by the Commission:

Not applicable.

P. Adequacy of Distance Education Programs (as outlined in COMAR 13B.02.03.22)

1. Provide affirmation and any appropriate evidence that the institution is eligible to provide Distance Education.

JHSPH has decades of experience administering successful online courses and programs. This program will be supported in the same way our other programs are supported. JHSPH's Center for Teaching and Learning (CTL) has the instructional knowledge and staff to support our faculty and successful student learning.

2. Provide assurance and any appropriate evidence that the institution complies with C-RAC guidelines, particularly as it relates to the proposed program:

- a) Online learning is appropriate to the institution's mission and purposes:

Refer to Section A.1 in the main body of the proposal.

- b) The institution's plans for developing, sustaining, and if appropriate, expanding online offerings are integrated into its regular planning and evaluation processes.

JHSPH has a commitment to online teaching as demonstrated by the resources of its Center for Teaching and Learning, which provides course development, instructional, and technical support to new and current faculty.

- c) Online learning is incorporated into the institution's systems of governance and academic oversight.

At JHSPH, any new proposed academic program is subjected to a review by the School's Committee on Academic Standards, a faculty body with representation from all departments and school-wide programs. If approved by the Committee, the proposal is then forwarded to the School's Advisory Council, comprised of the School's leadership and Department Chairs, for review and approval. Once approved at the School level, new programs must be approved by Johns Hopkins University, which reviews new online program proposals using the same systems of governance and academic oversight as for new on-site programs. Before being shared with the deans of all JHU academic divisions, all proposals must first undergo a review by internal academic bodies, including discussions of fit with the School's mission, program viability, program rigor, instructor quality, and redundancy with existing programs. Once a program is launched, its courses will enter the course evaluation system. Students in all JHSPH courses complete a course evaluation. These evaluations ask students to reflect on the course structure, the course content, and the instructor's performance. Summary reports are reviewed by the faculty member, the program chair, and the JHSPH administration to determine whether changes are necessary.

- d) Curricula for the institution's online learning offerings are coherent, cohesive, and comparable in academic rigor to programs offered in traditional instructional formats.

The courses for this program may be taken in traditional format or online. Both fulltime and part-time (online) students will be held to same academic standards required to

complete the program, including the internship. The program is composed of courses that are appropriately sequenced to ensure students have the adequate background for courses that are required later in the program.

All online courses adhere to CTL's course development process with support from experienced instructional designers. Online coursework follows well-established curriculum development standards, tailoring delivery methods, content, and assessments to learning objectives. The electronic portfolio will be used to assess students' achievement of program competencies.

- e) The institution evaluates the effectiveness of its online learning offerings, including the extent to which the online learning goals are achieved, and uses the results of its evaluations to enhance the attainment of the goals.

As part of the online course design process, course assessments are required to be aligned with stated courses learning objectives. The proposed program will incorporate authentic assessments that demonstrate students' application of learned skills. Program faculty have experience with developing individual and collaborative assessments for measuring the acquisition of relevant knowledge and skills through online learning.

- f) Faculty responsible for delivering the online learning curricula and evaluating the students' success in achieving the online learning goals are appropriately qualified and effectively supported.

Online programs are supported by CTL, which offers a number of opportunities and resources for faculty instructors and teaching assistants to become more familiar with online teaching and best pedagogical practices. In addition to maintaining an extensive catalog of resources on teaching and learning via an online Teaching Toolkit, CTL regularly offers events, workshops, and one-on-one office hours to introduce and provide updates on the latest advances in teaching technology and pedagogy.

Prior to teaching their first courses, all new online instructors are required to participate in training that conveys, among other things, principles of best practices for online education.

The Bloomberg School, through CTL, maintains an innovative course management system and provides faculty support and training for online education through a staff of more than 30 individuals who specialize in instructional design, audio production, technical writing, web development, production management and quality control.

- g) The institution provides effective student and academic services to support students enrolled in online learning offerings.

The Bloomberg School maintains numerous web-based resources to inform prospective students on the information they may need as an online student. These resources include the JHSPH website www.jhsph.edu and the [Course Catalog](#). These resources offer detailed programmatic information, academic support services, financial aid, costs, policies, etc. and specific information for online learning. As new online students are admitted and enrolled, they receive timely emails with important information to help them prepare to become an online student. These emails include information on technical requirements, available academic support services, and a required orientation course (IOL) for new online students.

JHSPH online students have access to the following academic support services:

Academic advising. Students are assigned an advisor when accepted. Students work individually with the advisor to develop a course of study that meets the requirements of the program and the career goals of the student. The advisor regularly contacts the students to check on progress and answer questions. Courses that deviate from the program plan and have not been approved by an adviser may not count toward degree requirements.

Library services. Students have online access to the William H. Welch Medical Library and the Milton S. Eisenhower Library on the Homewood campus. The interlibrary loan department allows students access to resources at any other university in the nation. The University's library system provides easy access to a wide selection of electronic information resources, including an online catalog, and numerous electronic abstracting and indexing tools. Many of the databases are accessible remotely. Librarians are available to assist students remotely and the library maintains an extensive web site to take visitors through all its services and materials.

Disability Support Services. The Johns Hopkins University is committed to making all academic programs, support services, and facilities accessible to qualified individuals. Students with disabilities who require reasonable accommodations can contact the JHSPH Disability Services' Senior Director.

Career Services. The Career Services Office at the Bloomberg School helps students, alumni, faculty, staff, and employers navigate the world of public health jobs.

Johns Hopkins Student Assistance Program. The Johns Hopkins Student Assistance Program (JHSAP) is a professional counseling service that can assist students with managing problems of daily living. Stress, personal problems, family conflict, and life challenges can affect the academic progress of students. JHSAP focuses on problem solving through short-term counseling. Accessing the service is a simple matter of a phone call to arrange an appointment with a counselor. Online students contact the service by phone for consultation and are directed to the appropriate resource or office. JHSAP services are completely confidential. The program operates under State and federal confidentiality legislation and is HIPAA compliant.

Transcript Access. Students may view and print unofficial transcripts at any time. Official transcripts will be mailed upon request of the student at minimal charge.

Student Login IDs. The University issues each student a Johns Hopkins Enterprise ID (JHED ID) and the School issues a JHSPH ID. The JHED ID grants students a JHU email address and secure access to many online services including course registration, bill payment, official grades, library services, and the online learning platform CoursePlus. Students are also issued a JHSPH ID that provides access to the School's intranet (My JHSPH) where students can locate additional resources including research and administrative tools as well as the School's policy and procedures manual.

- h) The institution provides sufficient resources to support and, if appropriate, expand its online learning offerings.

JHSPH has a commitment to online teaching as demonstrated by the resources of its Center for Teaching and Learning, which provides course development, instructional, and technical support to new and current faculty. See Appendix C for detailed financial information regarding the proposed program. If additional sections of a courses are needed to support the program, the department will offer an additional section.

Each year during the budget development period, additional resources such as faculty, staffing, teachings assistants and other instructional needs are taken into consideration with program growth. In turn, the CTL will devise budgets to increase personnel for the following fiscal year if needed to support the online course growth.

- i) The institution assures the integrity of its online offerings.

The Higher Education Opportunity Act (HEOA) enacted in 2008 requires that an academic institution that offers distance education opportunities to students 1) has a process established to verify that the student who registers is the same student who participates in and completes the offering and receives academic credit for it, 2) has a process established to verify that student privacy rights are protected, and 3) has a process established that notifies the student about any additional costs or charges that are associated with verification of student identity. In JHSPH programs, the following actions have been taken to satisfy these requirements: 1) students may only enter the academic website for the online courses they take by providing the unique student ID and password assigned after admission, 2) all FERPA privacy rights are preserved by limiting access very specifically in the University student information system to only those permitted by law to have access to restricted student information, and 3) there are no additional costs assessed to the student for the measures we use to verify student identity.

As referenced all new JHSPH students are enrolled in a mandatory Academic Ethics and Research course -- a zero-credit, zero-tuition course that is geared towards helping students avoid behaviors linked to plagiarism, cheating and other violations of academic integrity.

Appendix A

Course List and Descriptions

PH.550.860 Academic & Research Ethics (0 credits)

Examines academic and research ethics at JHSPH in a series of online interactive modules. Focuses on information about the academic ethics code and responsible conduct of research at the School. Explores issues of academic integrity such as proper ethical conduct and referencing, and discusses violations such as plagiarism and cheating, relative to case studies that illustrate situations faced by students and faculty in the academic setting. Addresses topics that include responsible conduct of research, authorship, data management, data ownership, guidelines for professional conduct, research fraud or scientific misconduct, federal and institutional guidelines related to research using human and animal subjects and ethical issues involving vulnerable subjects in research.

Prerequisite: None

PH.260.700 How do we know? Theory & Practice of Science

Examines the nature and philosophical foundations of science using an interdisciplinary approach that emphasizes critical thinking and storytelling; discusses the principles of good scientific practice – rigor, reproducibility and responsibility (the 3R's) - by exploring revolutionary discoveries in the life, public health and natural sciences; elaborates the relationship between theory, practice and serendipity in scientific discovery, and concludes with a discussion of the role of scientists in society.

Prerequisite: None

PH.260.701 Anatomy of Scientific Error

Examines sources of error in scientific practice (misconduct or honest mistakes, methodological or systematic errors). Presents real-world examples to analyze errors that cause problems in science across the disciplines. Introduces methodological and mathematical approaches to error reduction. Explores the review- and retraction mechanisms for journal articles and grants as methods of science self-correction. Discusses historic and contemporary cases where errors constitute sources of innovation.

Prerequisite: None

PH.260.705 Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences

Provides a broad introduction to interdisciplinary, scientific reasoning using current problems from science and society. Explores the fundamentals of basic probability and statistics using real-world datasets from a variety of basic science disciplines. Introduces data analysis and visualization in the natural and biomedical sciences. Explains the importance of computational and quantitative methods for hypothesis testing in science, technology, and daily life.

Prerequisite: None

PH.260.844 Causation

Acquaints students with fundamental ideas and historic theories about causation. Discusses how cause and effect relationships govern biomedical and public health research. Compares how sub-disciplines of the biomedical and public health sciences approach causation using concrete case examples. Addresses limitations of causal inference in biomedicine and public health. Examines strategies to mitigate the limitations of causal inference.

Prerequisite: None

PH.260.704 Critical Dissection of the Scientific Literature

Challenges the classical format of a journal club by preparing students to critically evaluate literature across the science disciplines. Acquaints students with concrete applications of the 3 R's of good scientific practice: rigor, responsibility, and reproducibility. Discusses techniques for effective research literature analysis and evaluation. Emphasizes in-depth understanding of journal article preparation, data evaluation, and the context of conclusions and discussion points within a given research field.

Prerequisite: None

PH.260.710 Communications Practice for Health Science Professionals

Introduces students to current trends in presentation design and delivery. Focuses on narrative-oriented thinking to improve information dissemination. Emphasizes clarity and simplicity in communication practice in multiple settings, targeting both lay and interdisciplinary expert audiences.

Prerequisite: None

PH.260.715 Unleash your Writing Superpower

Introduces a system of planning, organization, writing and revision. Emphasizes the importance of defining the message, audience and purpose for any piece of writing. Illuminates the basic elements of good writing. Focuses on clear, concise and persuasive writing. Explores the use of rhetoric and storytelling to maximize a piece of writing's impact. Emphasizes best practices in various forms of writing.

Prerequisite: None

Appendix B

Faculty Lead(s)*	Rank	Discipline	Status	Course/number	Degree
Casadevall, Arturo	Professor	Molecular Microbiology & Immunology	Full-Time	How do we know? Theory & Practice of Science PH.260.701 Causation PH.260.844	PhD, MD
Bosch, Gundula	Senior Scientist	Molecular Microbiology & Immunology	Full-Time	How do we know? Theory & Practice of Science PH.260.701 Anatomy of Scientific Error PH.260701 Communications Practice for Health Science Professionals 260.710	PhD, MEdHP
Hardwick, J. Marie	Professor	Molecular Microbiology & Immunology	Full-Time	Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences PH.260.705	PhD

Wear, Margaret	Assistant Scientist	Molecular Microbiology & Immunology	Full-Time	Critical Dissection of the Scientific Literature PH.260.704 Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences PH.260.705	PhD
Markle, Janet	Assistant Professor	Molecular Microbiology & Immunology	Full time	Causation	PhD
Simpson, Brian	Instructor	Molecular Microbiology & Immunology	Part-time	Unleash your Writing Superpower PH.260.715	MPH, MA

TABLE 1: RESOURCES:					
Resource Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	0	0	0	0	0
2. Tuition/Fee Revenue (c + g below)	\$184,950	\$190,500	\$196,200	\$202,050	\$208,050
a. Number of F/T Students	0	0	0	0	0
b. Annual Tuition/Fee Rate	0	0	0	0	0
c. Total F/T Revenue (a x b)	0	0	0	0	0
d. Number of P/T Students	15	15	15	15	15
e. Credit Hour Rate	\$1197	\$1233	\$1270	\$1308	\$1347
f. Annual Credit Hour Rate	10	10	10	10	10
g. Total P/T Revenue (d x e x f)	\$184,950	\$190,500	\$196,200	\$202,050	\$208,050
3. Grants, Contracts & Other External Sources	0	0	0	0	0
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 – 4)	\$184,950	\$190,500	\$196,200	\$202,050	\$208,050

2. Resources are primarily part time tuition revenues. On average, we expect 12 students to matriculate into the program. The cost of the per credit tuition cost subject to a 3% increase each year. Tuition will be the only resource to support the revenue to this program.

TABLE 2: EXPENDITURES:					
Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b + c below)	\$128,000	\$138,020	\$142,160	\$146,426	\$150,818
a. # FTE	1	1	1	1	1
b. Total Salary	\$100,000	\$103,000	\$106,090	\$109,273	\$112,551
c. Total Benefits	\$28,000	\$35,020	\$36,070	\$37,153	\$38,267
2. Admin. Staff (b + c below)	0	0	0	0	0
a. # FTE	0	0	0	0	0
b. Total Salary	0	0	0	0	0
c. Total Benefits	0	0	0	0	0
3. Support Staff (b + c below)	\$19,200	\$20,703	\$21,324	\$21,963	\$22,623
a. # FTE	.3	.3	.3	.3	.3
b. Total Salary	\$15,000	\$15,450	\$15,914	\$16,391	\$16,883
c. Total Benefits	\$4,200	\$5,253	\$5,410	\$5,572	\$5,740
4. Equipment	0	0	0	0	0
5. Library	0	0	0	0	0
6. New or Renovated Space	0	0	0	0	0
7. Other Expenses	0	0	0	0	0
TOTAL (Add 1 – 7)	\$147,200	\$158,723	\$163,484	\$168,389	\$173,441

1. Full-time faculty salaries prorated to be equivalent to one FTE with a 3% increase in salary each year. Fringe benefit rate of 28% for Year 1(COVID-19 FB) and 34% thereafter.
2. Support Staff effort at 30% in coordinating the program with a 3% increase in salary each year. Fringe benefit rate of 28% for Year 1(COVID-19 FB) and 34% thereafter.