



# Innovations for Building Implementation Science Capacity among Researchers and Policymakers: The Depth and Diffusion Model

Sophia M. Bartels<sup>1</sup> · Van Thi Hai Hoang<sup>2</sup> · Giang Minh Le<sup>2</sup> · Nguyen Thu Trang<sup>2</sup> · Quintin Forrest Van Dyk<sup>1</sup> · Teerada Sripaipan<sup>1</sup> · Laura Limarzi Klyn<sup>1</sup> · Irving F. Hoffman<sup>3</sup> · Suzanne Maman<sup>1</sup> · William C. Miller<sup>4</sup> · Vivian F. Go<sup>1</sup> · Le Thi Huong<sup>5</sup>

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## Abstract

**Background** While many interventions have reduced transmission of HIV or increased access to HIV care, fewer have been scaled-up or sustained. Implementation science (IS) maximizes the population-level impact of interventions, but globally, knowledge about IS among researchers and policymakers is limited, particularly in low and middle-income countries. This gap can be addressed through an innovative IS training model, the Depth and Diffusion Model, that can be used to build implementation science capacity to increase equity in the distribution of global implementation science training programs.

**Methods** In the Depth and Diffusion Model, *depth* creates an in-country institution as a leader in IS research and training; diffusion ensures the spread of fundamental IS knowledge across universities and governmental agencies throughout the country. We are using the Depth and Diffusion Model in the Vietnam Implementation Science Advancement Program (VISA), a case study of applying this model in practice. VISA's goals are to: (1) initiate the Hanoi Medical University Implementation Science Program; (2) develop IS knowledge and research capacity among four universities in Vietnam; and (3) cultivate IS capacity among Vietnamese policymakers and health program leaders.

**Discussion** The Depth and Diffusion Model is being used to efficiently scale-up IS knowledge among researchers and policymakers, while fostering collaboration to increase impact of research and policies. By the end of VISA, HIV-related IS capacity will be well-established in Vietnam, demonstrating how the Depth and Diffusion Model can be a blueprint for adoption of IS research and practice in a country with limited previous IS capacity.

**Keywords** Implementation Science · Capacity Building · HIV · Global Health · Vietnam

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✉ Sophia M. Bartels  
sophiamb@ad.unc.edu

<sup>1</sup> Department of Health Behavior, The University of North Carolina Gillings School of Global Public Health, Chapel Hill, NC, USA

<sup>2</sup> Department of Epidemiology, Hanoi Medical University, Hanoi, Vietnam

<sup>3</sup> Division of Infectious Disease, Department of Medicine, The University of North Carolina Gillings School of Global Public Health, Chapel Hill, NC, USA

<sup>4</sup> Department of Epidemiology, The University of North Carolina Gillings School of Global Public Health, Chapel Hill, NC, USA

<sup>5</sup> Institute for Preventive Medicine and Public Health, Hanoi Medical University, Hanoi, Vietnam

In recent years, we have witnessed a rapid increase in the development of HIV-related evidence-based interventions (EBIs) to reduce HIV transmission, such as Treatment as Prevention and pre-exposure prophylaxis (PrEP), (Cohen et al., 2011; Grant et al., 2010) and increase linkage to care, including seek, test, treat, retain and option B+ (Higgins et al., 1991; Schouten et al., 2011). However, many EBIs have not been taken to scale widely or effectively. Limited communication between researchers, policymakers, and health program leaders around EBIs and implementation barriers, such as HIV-related stigma, overburdened health facilities and providers, and lack of resources and political will (Miller, 2001; Rotheram-Borus et al., 2000), impedes implementation. We must address these issues if EBIs are to achieve their full potential on combatting the HIV epidemic (Kilbourne et al., 2007).

A key tool for addressing these challenges is implementation science (IS). Implementation science is defined as “the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services” (Eccles & Mittman, 2006). IS has been used widely to identify barriers to EBI implementation and to assess the feasibility, effectiveness, and cost-effectiveness of different strategies to deliver EBIs (Go et al., 2016; Kemp et al., 2019; Kempf et al., 2015). IS is essential to maximize the impact of EBIs in addressing the global HIV/AIDS epidemic.

However, IS knowledge and research capacity are limited worldwide, especially in resource-limited settings. During the roll out of an IS trial in Vietnam (Miller, 2001), the researchers observed a lack of understanding of the goals and purpose of an IS trial, as IS was a new concept to the academics, Ministry of Health officials, and staff across all levels of the national and provincial health departments with which they were working. This gap demonstrates a critical need to develop IS capacity among academics, policymakers, and program leaders. From this gap, we were motivated to develop an IS training program that could be shared regionally and globally to maximize the impact of HIV-related and other global health EBIs.

Vietnam is an ideal setting for expanding IS capacity in Southeast Asia. The Vietnamese HIV epidemic is multifactorial, with a substantial burden of HIV infection in people who inject drugs (PWID) and men who have sex with men (MSM). Despite Vietnam’s political commitment and national efforts to meet the UNAIDS’ 95-95-95 goals (95% of people living with HIV know their HIV status, 95% of people diagnosed with HIV are on antiretroviral therapy (ART), and 95% of people on ART are virally suppressed) (UNAIDS, 2016), the coverage of HIV services among key populations remains lower than the global average (UNAIDS, 2020). Structural barriers to HIV service implementation include the lack of a national mandate, staff reluctance to take on additional tasks without compensation (Go et al., 2016), stigma towards key populations, and a limited number of key population-friendly services (Nguyen et al., 2019; Philbin et al., 2018).

Additionally, as of 2023, Vietnam is home to 15 NIH-funded studies focusing on HIV, making it a prime location for disseminating state-of-the-art findings. However, without the capacity building required to develop and maintain a supportive landscape for IS, the impact of many of these studies will last only the duration of their funding period, and true population-level impact may be significantly delayed or inhibited altogether (Brownson & Jones, 2009). The training of Vietnamese academics, policymakers, and program leaders in the foundations of IS, as well as efforts

to build strong political will for the strategic implementation of interventions, are imperative to the success of future IS efforts and ultimately achieving the goal of bringing effective HIV interventions to scale in Vietnam.

This IS gap in IS knowledge and capacity will be addressed by an IS training program, the Vietnam Implementation Science Advancement Program (VISA). The goal of this paper is to describe the innovative Depth and Diffusion Model, which is the foundation of VISA, and to use VISA as a case study of how the Depth and Diffusion Model can be applied to rapidly develop a cadre of policymakers and researchers trained in IS. While global capacity building efforts have been ongoing for decades with many examples of successful programs (Bloomfield et al., 2016; Dawson et al., 2014; Schwartz et al., 2021), the core components of these efforts have rarely been published (Akiba et al., 2019). Here, we describe the Depth and Diffusion Model to serve as a blueprint for others’ capacity building efforts to maximize the impact of HIV-related EBIs globally. Please note that we use the term “global health training program” to refer to capacity building efforts in low and middle-income countries (LMICs) that are grounded in long-standing collaborations and are driven by local researchers and policymakers’ capacity building needs and interests.

## The Depth and Diffusion Model

The Depth and Diffusion Model is built on the principle that an impactful global health training program must achieve two simultaneous goals. First, the program must develop a cadre of professionals with sufficient expertise in the specific topic (e.g., implementation science) to conduct meaningful research *and* train others. Second, the program must help distribute knowledge of the topic to the relevant pool of practicing public health professionals.

In the Depth and Diffusion Model, *depth* is created by training a critical mass of researchers at a local institution through training of existing faculty with expertise in related fields in implementation science and simultaneously providing a few students with doctoral training abroad, with the expectation that they will return to their home country to add additional implementation expertise to the growing local IS hub. *Diffusion* is developed by training faculty at multiple institutions in the core elements of implementation science, supporting curriculum development in implementation science in these same institutions, and, critically, training policymakers and program leaders in the core elements of IS. Diffusion is enhanced by facilitating communication between academic faculty and policymakers/program leaders, which is currently a major barrier to evidence-based

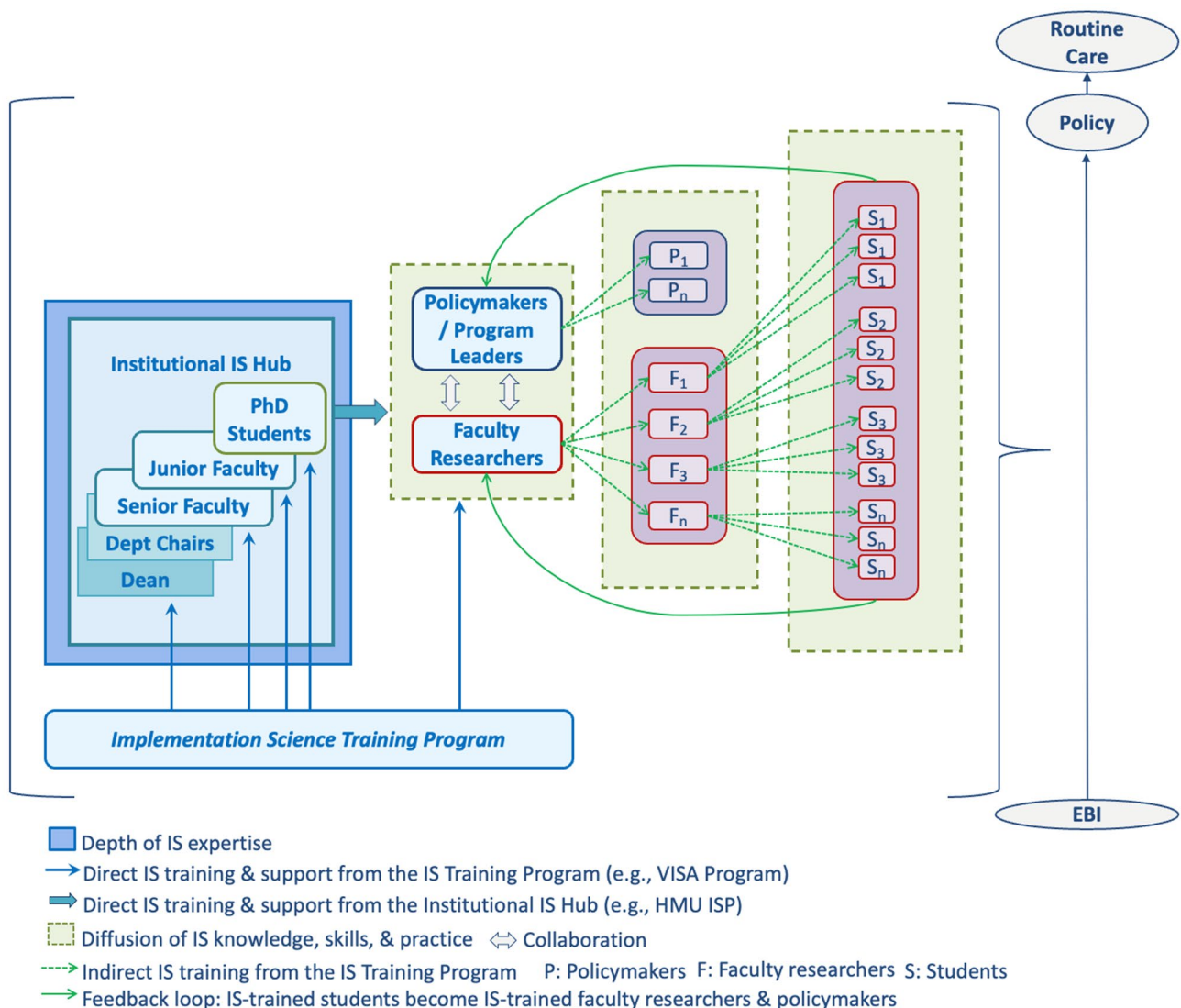
policymaking and practice-based evidence-generation (Andermann et al., 2016).

In Fig. 1 we demonstrate how depth and diffusion are developed: moving left to right, we show how the training program contributes to the creation of a local implementation science program (depth) by training PhD students, Junior Faculty, and Senior Faculty in implementation science and actively engages department chairs and the dean, which together provide IS training and support to policymakers/program leaders and faculty members within institutions and universities across a country (diffusion). Diffusion of IS continues as these faculty members incorporate IS into their respective universities, teaching implementation science to students who eventually will become policymakers/program leaders and faculty members with knowledge and skills in implementation science. This creates a feedback loop of implementation science knowledge dissemination.

The ultimate goal of the training (noted on the far right of Fig. 1) is to facilitate the translation of EBIs into policy, and in turn, into routine care.

## Model Rationale

Traditionally, in many global health training programs, either (1) a few students are sent overseas (to the US typically) for training in master's (MS, MPH) and PhD programs (Ramaswamy et al., 2020) or (2) formal training programs or centers are established at a local university (Ramaswamy et al., 2020). As the *sole focus* of a training program, the first model is inefficient: few students benefit, the cost is high, and it will take a long time to build enough local IS expertise to have widespread impact. These programs fail to acknowledge the potential for quality in-country training,



**Fig. 1** Depth & diffusion model translation of EBIs into policy and routine care

capitalizing on existing master's and PhD degrees offered in many LMICs. Given that few PhD or master's programs in LMICs currently have IS concentrations (Ramaswamy et al., 2020), these programs are prime targets for an efficient IS global health training program.

While the second global health training model may produce locally trained MPH and doctoral graduates, it fails to recognize that many existing professionals in LMICs can also benefit from tailored in-country training (outside of a formal master's or PhD degree) in a new field to rapidly expand knowledge and capacity. Tailored training of these professionals could facilitate the spread of implementation science resources and training across more people (Beidas et al., 2022). Thus, the Depth of Diffusion Model is a hybrid and extension of the two models, allowing us to train PhD students in a new area of expertise while also developing IS capacity among in-country policymakers and program leaders.

Additionally, the translation of research into practice, the main goal of implementation science, requires communication and partnerships (Haines et al., 2004; Panisset et al., 2012). IS researchers require engagement with stakeholders to conduct meaningful research, and policymakers who want to implement new programs with rigor and fidelity often benefit from consultation with the academics that have assessed those programs (Andermann et al., 2016). But in many settings, researchers and policymakers complete their work in silos, with little communication (Brownson et al., 2006). Policymakers and academic faculty are rarely together in the same spaces, and when they do share space, they often lack a common language for intervention translation and implementation (Choi et al., 2005). This failure to communicate impedes evidence-based policymaking and practice-based evidence-generation, further inhibiting the scale up of effective, urgently needed health interventions.

To address this communication gap, government-academia partnerships are needed. In effective government-academia partnerships, decision makers become actively involved in the research process, which is termed “engaged scholarship” (Van de Ven & Johnson, 2006) or “partnership research” (Solberg et al., 2010). This approach is ideal for effective policy identification, implementation, and evaluation, particularly in public health. While the need for greater researcher-policymaker engagement and co-knowledge production and the need for greater inclusion of policymakers in implementation science capacity building programs both in high-income countries and LMICs have been elucidated (Davis & D'Lima, 2020), few models to guide enactment of these partnerships and programs have been developed (Williamson et al., 2019). Thus, the goal of the Depth and Diffusion Model is to efficiently expand IS research capacity in a country and to ensure that researchers, policymakers,

and program leaders have a fundamental understanding of IS principles.

## Case Study: The Vietnam Implementation Science Advancement Program

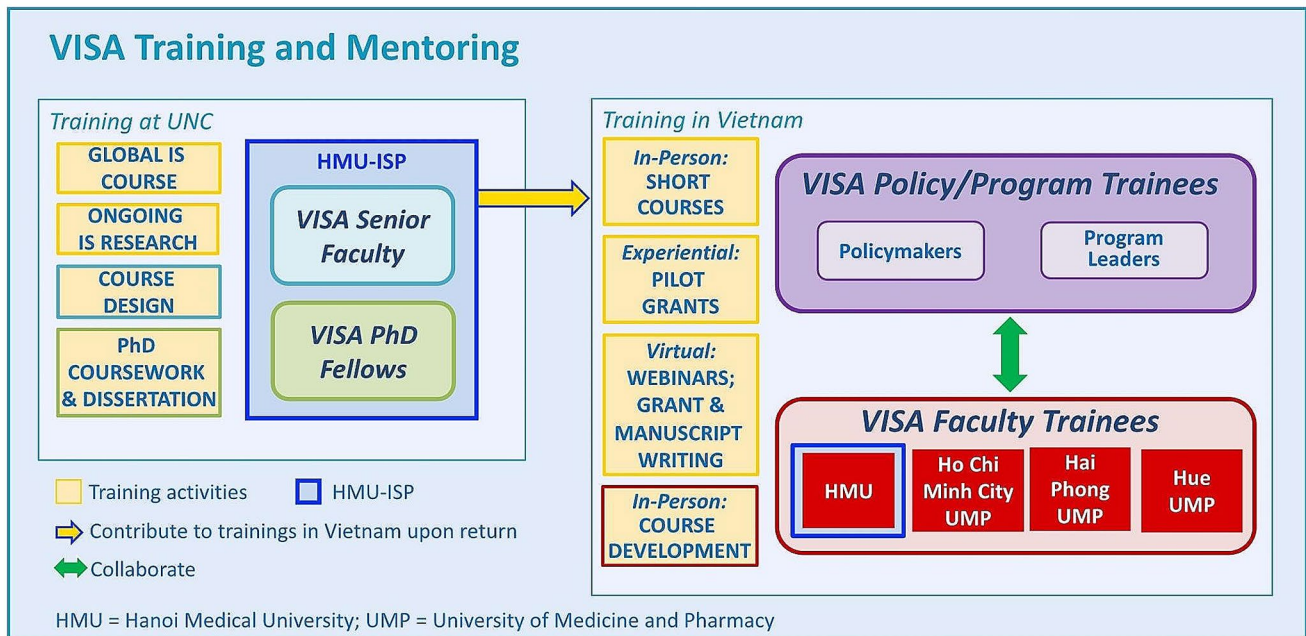
The Vietnam Implementation Science Advancement Program (VISA) serves as a case study of the Depth and Diffusion Model and how this model can be applied to expand IS capacity across a country (see Fig. 2 for an overview of the VISA D43 training program's use of the Depth and Diffusion Model). As part of this case study, we will outline VISA's participating institutions and program administration, training components, and evaluation and will highlight some of the program's successes, challenges, and lessons learned.

### Program Overview

The overall goal of the VISA is to build HIV-related IS research capacity and applied implementation skills to ensure effective scale-up of EBIs in Vietnam. VISA is funded by the Fogarty Institute of the National Institutes of Health as a D43 training grant. The *lead United States-based institution* (where out-of-country IS training is held) is the University of North Carolina (UNC) at Chapel Hill. UNC has been a leader in HIV-related research for 30 years and is an established center for IS with multiple NIH-funded research projects and D43 awards. The *depth institution* for VISA is Hanoi Medical University (HMU). HMU is a leader in research and education in Vietnam and has previously led similar research capacity building training efforts. The existing talent at HMU in research generally and the substantive area (e.g., HIV) specifically is critical to lay the foundation for building depth. Additionally, UNC and HMU have a more than decades-long HIV and implementation research partnership in Vietnam.

The *diffusion academic institutions* for VISA were chosen because they reflect strong medicine and public health universities in Vietnam and are geographically spread throughout the country. These institutions include: (1) Ho Chi Minh City University of Medicine and Pharmacy (HCMUMP), located in the economic capital of the country, (2) Hai Phong University of Medicine and Pharmacy (Hai Phong UMP), located in the northeastern coast of Vietnam, and (3) Hue University of Medicine and Pharmacy (Hue UMP), located in central Vietnam. The *diffusion policy institutions* include the Vietnam Authority for AIDS Control (VAAC), Ministry of Health, Provincial Centers for Disease Control, and program organizations (e.g., PATH). These institutions





**Fig. 2** Application of the depth and diffusion model

were chosen for their leadership in setting and implementing HIV-related programs.

## Program Administration

VISA is administered by an Executive Committee, Steering Committee, and Training Advisory Committee (TAC). The *Executive Committee* is responsible for all elements of program administration and committee members share leadership responsibilities. The Executive Committee members include the program's two co-directors (one UNC-based, one HMU-based), an additional faculty member from Vietnam (HMU), and a fourth US-based member. The *Steering Committee* ensures that VISA content aligns with the needs of each participating institution and assists each institution to integrate IS into its research activities and curriculum. The committee includes a representative from each university, the Executive Committee, and the Curriculum Director. Finally, the role of the *TAC* is to review the activities and performance of VISA. The TAC comprises four senior leaders—two from Vietnam and two from the US. Program decisions are made by consensus of the Executive Committee with Steering Committee input.

The D43 is also supported by 24 US and Vietnam-based faculty members (including teaching and mentorship faculty) with expertise in HIV-related topics, IS, curriculum development, and mentorship. Faculty's expertise and methodological areas include, but are not limited to, PrEP, stigma, HIV, sexually transmitted infections (STIs), mixed

methods, and biostatistics. They also have experience in professional development, including mentor training, scientific writing, and proposal writing. The teaching faculty contribute to teaching, course development, trainee selection, and mentorship for pilot study development and implementation.

Having provided an overview of the VISA D43 program and described its administration, we will now highlight the program's training components including how depth and diffusion are established. The VISA program was developed collaboratively by UNC, HMU, HCMUMP, Hai Phong UMP, and Hue UMP. These institutions conducted a needs assessment and held a series of virtual meetings to develop the training program plan. They designed the IS research and training activities to complement existing activities at each of the four Vietnamese universities. During this formative work, they also identified potential faculty participants and IS curriculum gaps to be addressed through VISA.

## Establishing Depth

The first goal of the VISA D43 is to initiate the Hanoi Medical University Implementation Science Program (HMU-ISP) over five years; the HMU-ISP serves as the hub for all VISA activities. The program is directed by the Chair of Epidemiology at HMU, who has previous implementation science and HIV research and teaching experience, and by the HMU Dean of the School of Preventive Medicine (Multiple Principal Investigator). To create a critical mass of implementation science-oriented faculty, eight additional

faculty are being trained through VISA. These faculty include two Senior Faculty, four Faculty Trainees, and two early career faculty who will receive PhD training in a residential PhD program at UNC (VISA PhD Fellows).

### Senior Faculty

The VISA Senior Faculty are two current faculty members at HMU who were immersed in a two-month intensive IS training program at UNC to expand their areas of expertise to HIV-related IS. They were nominated by HMU faculty leadership and selected by the Executive Committee. Criteria considered in their selection included their grant and publication record, expressed commitment to IS, and a position within HMU that allowed them to contribute to the HMU-ISP. At UNC, their training combined coursework in implementation science and research methods and involvement with ongoing implementation science studies. They also received instruction related to teaching and course design, and tailored mentorship (Table 1).

This two-month intensive experience and ongoing mentorship and support built a strong foundation among the Senior Faculty to contribute to future IS research and teaching. Within nine months of this experience, the two VISA Faculty Fellows have prepared one IS-focused NIH grant proposal and developed three implementation science courses/modules: (1) Implementation Science for the Master's Degree of Epidemiology Programs (both Vietnamese and English programs); (2) IS in Global Health for physicians who attended training to receive a Diploma in Health Care Management; (3) Implementation Science for the International Master's Degree of Public Health.

### Faculty Trainees

Four HMU faculty are participating in the first round of activities designed to expand IS knowledge in Vietnam. These faculty have previous training in public health. By participating in in-country IS activities, they are expanding their understanding of IS and will be able to contribute to future research and teaching, helping to establish the HMU-ISP. These in-country activities are described in detail below.

### PhD Fellows

To ensure that Vietnam has rapid access to scholars with deep expertise in IS, a core component of the VISA includes doctoral training (in Epidemiology or Health Behavior) at UNC for two Vietnamese students. The PhD fellows were recruited using an HMU internal announcement and nomination by HMU leadership. The Executive Committee and Curriculum Director selected the candidates based on their potential to succeed at UNC, including their academic performance, research experience, interest in IS, and commitment to developing IS in Vietnam. Each candidate applied to the PhD program at UNC and was reviewed by the admissions committees with respect to the strength of other applicants. The VISA PhD Fellows are spending their first 2.5 years of doctoral training at UNC completing core course requirements, IS courses, and an IS-focused dissertation proposal. Their training at UNC will also include working as a research assistant on one of two ongoing IS studies to develop their knowledge and skillset in conducting IS research. The VISA PhD Fellows also assist with the short course trainings and workshops that are part of the diffusion element of the model. After completing required coursework and defending their proposal at UNC, they will return to Vietnam to complete their doctoral dissertation in IS. The fellows will be mentored by a UNC advisor and in-country advisor at HMU who will act as their primary mentor on their return to Vietnam.

### IS Diffusion

IS research requires cooperation and coordination between academic IS researchers, policymakers, and program leaders. To ensure the success of IS in Vietnam, our training is focused on these three goals: (1) initiating IS research capacity and education at four health science universities in Vietnam, (2) developing IS capacity among Vietnamese policymakers and health program leaders to encourage translation of HIV research into practice, and (3) fostering communication between academic faculty and policymakers/program leaders to facilitate IS in the future. To achieve the first goal, we are training 12 faculty members (VISA Faculty Trainees) from the four participating universities,

**Table 1** VISA D43 senior faculty activities

Type of activity	Activity
Course Design	Course Design Institute with the UNC Center for Faculty Excellence to design an IS course for the HMU-ISP
Coursework	Classes in Implementation Science in Global Health and in other IS-related methodological and topical areas
Implementation Science Research	Participation in four global ongoing NIH-funded IS studies to learn how IS research is conducted
Mentorship	Bi-weekly mentorship meetings with the UNC-based VISA leadership and periodic meetings with other experts in IS and HIV research at UNC

including four from HMU. For the second goal, we are training 12 policymakers or program leaders (VISA Policy/Program Trainees). For the third goal, we will train VISA Faculty and Policy/Program Trainees together, fostering partnerships between academia, government, and non-governmental agencies to bridge the gap between academia, policy, and practice.

VISA Faculty Trainees are selected after an open call for applications at each of the universities. The VISA Faculty Trainee applicants are then nominated by leaders at each university to ensure the trainees fulfill the university's IS needs. The VISA Policy/Program Trainees are selected from governmental and non-governmental organizations with active HIV-related programs in Vietnam. The Steering Committee reviews applications and selects trainees based on their HIV-related experience, interest in applying IS principles to their work (for policymakers/program leaders), interest in teaching an IS course (for faculty), and potential for future collaborative work in IS.

### Diffusion: Research Capacity

The VISA Policymaker/Program Leader and Faculty Trainees receive training in two foundational areas: (1) HIV-related IS knowledge and skills and (2) research training in HIV-related IS. The training involves a combination of short courses, virtual webinars, and experiential learning through development and implementation of a pilot IS study. Trainees learn about HIV-related IS through a week-long short course in IS (Table 2). Implementation models and frameworks that are taught during the short course

include the Consolidated Framework for Implementation Research, Conceptual Model of Implementation Research, and the ERIC Discrete Implementation Strategy Compilation (Damschroder et al., 2009; Powell et al., 2015; Proctor et al., 2011). For interested trainees, an optional five-day Advanced IS Course is also offered. The advanced course will include topics such as implementation mapping, de-implementation, and adaptive designs. The trainees also attend ten monthly webinars from leaders in the IS field focusing on topics such as organizational climate, policy in IS, learning collaborations and systems science approaches, and economic evaluation in D&I.

The research portion of training for the Policymaker/Program Leader and Faculty Trainees includes an IS grant writing course (see Table 3), a pilot IS project, and a manuscript writing course, which is optional for policymakers/program leaders (Table 4). Trainees also attend a project leadership and management course that covers topics like the basics of project management, quantitative and qualitative data collection and methods, and IRB/regulatory issues.

The IS proposal writing course provides both didactic instruction on grant writing and the opportunity to work in teams of at least one Faculty and one Policymaker/Program Leader trainee to develop a one-year pilot grant. The pilot grant proposals are supported by at least one Vietnamese mentor and one US-based mentor. The trainee teams draft and submit an NIH-style proposal for their pilot project. The applications are reviewed by the Executive Committee and two external reviewers, using the NIH scoring system for proposals. The pilot projects are awarded up to \$20,000 per award.

**Table 2** VISA D43 short course in Implementation Science agenda

Course module	Day	Content	Interactive lab
<i>HIV EBI</i>			
Weighing the evidence	1	Identifying & weighing the evidence-base. How much is needed for scale up? Research & policy perspectives	<i>Debate:</i> does the selected intervention have enough evidence for scale-up?
Translating research to practice	1	Nuts and bolts of how government policy can be informed by scientific research	<i>Group:</i> Exercise to simulate translation of a research finding of choice into policy
PrEP	1	Mode: injectable, daily tablet Adherence: stigma, risk perceptions	<i>Group:</i> PrEP rollout for Vietnam
HIV and STIs in MSM	1	Impact of Treatment as Prevention and PrEP on STIs; key STIs in MSM; Stigma in MSM	<i>Group:</i> What EBIs are ready for scale-up in MSM?
<i>Implementation Science &amp; HIV</i>			
Introduction to IS	2	Introduction to implementation science. Define key implementation terms.	<i>Group:</i> Select topic; Identify gap & EBI <i>Deliverables:</i> 3–4 slides; 2–3 paragraphs
IS conceptual models	3	Assess barriers and facilitators for scale up using implementation science frameworks and models	<i>Group:</i> Identify conceptual model; Describe setting readiness, barriers & facilitators <i>Deliverables:</i> 3 slides, 3 paragraphs
IS strategies	4	Identify implementation science strategies to address barriers	<i>Group:</i> Choose implementation strategy; Justify experience with setting <i>Deliverables:</i> 2–3 slides; 2–3 paragraphs
Design & evaluation of IS studies	5	Introduce hybrid designs. Detail research design and methods, including cluster-randomized and step-wedged designs. Define implementation outcomes and analysis plan	<i>Group:</i> Detail research design, methods, measures, analysis plan, & policy environment <i>Deliverables:</i> 3–4 slides; 3–4 paragraph

**Table 3** VISA D43 IS proposal writing course content

Topic	Session	Content	Assignment
Research Question, Specific Aims	1	Clarifying the question to writing clear, concise, specific aims	Specific Aims
Specific Aims Revised	2	Try, try again. Revising aims	Revised Specific Aims
Approach: Study Design	3	Selecting the best study design	Study Design
Approach: Methods	4	Measuring outcomes: Qualitative, Quantitative and Mixed approaches	Methods
Approach: Data Collection	5	Sampling, recruitment, retention, analysis	Data Collection
Timeline and Budget	6	Writing a feasible timeline and budget	Timeline and Budget

**Table 4** VISA D43 manuscript writing course content

Topic	Session	Content	Assignment
Manuscript elements	1	Overview of manuscript elements: Abstract, Introduction, Methods, Results, Tables/Figures, Discussion	Review of good IS papers
Writing skills	2	Telling the story, improving flow	Draft methods & tables/figures
Writing skills	3	Using words effectively	Draft results
Writing strategies	4	Time management and other strategies to ensure writing gets done	Draft introduction
Editorial process & selecting journals	5	How journals work	Draft discussion and abstract
Peer review	6	Reviewing for your colleagues & journals	Peer review of draft

**Table 5** VISA D43 implementation science course design training (VISA faculty only)

Topic	Day	Content	Interactive lab
Teaching principles for adult learners	3	Overview of adult learning	<i>Group:</i> Discussion of how we learn best
Use of learning objectives for course development	3	Good practices for teaching & course development	<i>Group:</i> Discussion of translating the didactics into practice
Course content-IS and HIV-related elements	4	Key content for a basic implementation science course; overview of HIV-related content	<i>Group:</i> Discussion of content priorities
Syllabus development/plans for assessment	4	Syllabus content; matching lectures/exercises with appropriate assessment	<i>Group:</i> Discussion of approaches to assessment. What works in Vietnam?
Readings & initial lesson plan(s)	5	Identification of types of readings; develop lesson plan for at least 1 class	<i>Group:</i> Peer review of lesson plans

## Diffusion: IS Curriculum Development

As a relatively new field, IS training is nearly non-existent in Vietnam. To address the absence of IS training, VISA incorporates curriculum development for the faculty trainees to encourage the faculty to teach an IS course in their respective universities. The Faculty Trainees receive specific training in IS curriculum development (Table 5). After completing the short course, each Faculty Trainee will work with their VISA mentors to take their course from concept to completion. Finally, a VISA Senior Faculty from HMU-ISP will visit each VISA D43 diffusion institution to assist trainees with course implementation.

## Diffusion: IS Dissemination

After four years of implementation of VISA, we will host a Research Dissemination Conference to showcase the work of the VISA trainees. The conference will bring together the Faculty trainees, Policymaker/Program Leader trainees,

key academics, and representatives of the core HIV-focused governmental and non-governmental agencies in Vietnam. The conference will allow us to address several goals, including reinforcement of the importance of IS to attendees who were not directly participants in VISA. In addition, VISA participants in different cohorts will have the opportunity to meet each other and share key findings from their training and pilot study research. By highlighting each of these components of the program in tandem, the conference will highlight successes and future opportunities for the program, demonstrating the potential for continued evolution of implementation science curriculum and practice in Vietnam.

## Program Evaluation

The VISA program evaluation is designed to provide short- and long-term assessments of program effectiveness and to generate critical data for program modification in response to these assessments (Table 6). The evaluation is tailored



to the specific activities and needs of each trainee group and assesses success in achieving both depth and diffusion. The results of the ongoing program evaluation are shared with the Steering Committee and TAC annually to improve future trainings.

For the VISA Senior Faculty, an interview-based evaluation of the VISA took place at the end of their two-month visit at UNC. They were asked to identify strengths and areas for improvement in their training. VISA PhD Fellows participate in annual end-of-year interviews with the Executive Committee to assess successes and challenges in the PhD program and how the VISA can support Fellows to overcome these challenges. After each training activity, the VISA Faculty and Policymaker/Program Leader Trainees evaluate the activity's strengths and weaknesses. Finally, each year, we conduct an anonymous evaluation of VISA, allowing trainees to confidentially voice any concerns.

We will also hold two interim program evaluations with review by the TAC in years three and five to assess the program's status and effectiveness, respectively. For these reviews, we will solicit feedback from each participating university on the overall impact of VISA and the effectiveness of HMU-ISP. We will also survey all trainees since the inception of the program to assess the impact of the training program on their career trajectory. The TAC will use these data to critique and improve VISA. At program completion, the Steering Committee will lead a debriefing session

to obtain feedback from all trainees attending the Research Dissemination Conference regarding the perceived strengths and weaknesses of VISA.

### VISA Status, Successes, Challenges and Lessons Learned

During the first year of the training program, we identified and began training our first cohort of PhD fellows, Senior Faculty, and Faculty & Policymaker/Program Leader trainees. In April 2021, we recruited our first VISA PhD Fellow from HMU to apply to the PhD program in the Department of Epidemiology at UNC. With guidance from the leadership team, the trainee prepared her application and was accepted into the program, which began in Fall 2022. A second PhD Fellow was accepted into the Department of Health Behavior at UNC and began training in Fall 2023.

In April 2021, we selected two Senior Faculty Fellows to visit UNC for in-depth training in IS and course development. Before arriving at UNC, both fellows joined monthly implementation science study calls, attended a virtual fieldtrip to a local non-profit conducting HIV and implementation science research, and participated in a cross NIH-funded regional D43 panel at the 2021 Triangle Global Health Conference on the topic of "Changing frameworks of global health practice for marginalized populations to address inequities in HIV testing and care in Vietnam and

**Table 6** Core elements of the VISA training program

Aim	Trainees	Training content	Training activities	Measures of success
<i>Training at UNC</i>				
1	VISA Senior Faculty	1. IS research training 2. IS curriculum development 3. Applied IS	1. IS in Global Health (HBEH 784) 2. Institute for Course Design 3. NIH-funded IS research at UNC 4. Mentorship	<b>Short term:</b> 1. Completed HBEH 784 2. Completed Course Design Institute 3. Developed IS syllabus for HMU 4. # Research meetings attended <b>Long term:</b> 5. # Peer-review articles published 6. # Conference abstracts presented 7. # External grants submitted
	VISA PhD Fellows	1. IS-focused degree	PhD program at UNC 1. Coursework & comprehensive exam 2. Proposal writing & defense 3. Dissertation	<b>Short term:</b> 1. Passed courses & qualifying exams 2. Completed PhD degree <b>Long term:</b> 3. # Peer-review articles published 4. # Conference abstracts presented 5. # External grants submitted
<i>Training in Vietnam</i>				
2	VISA Faculty Trainees	1. IS research training, applied IS	1. Short courses: IS/EBIs, project management, course development	<b>Short term:</b> 1. # Pilot grants completed 2. # People trained
3	VISA Program/Policy Trainees	2. EBIs in HIV 3. Project management 4. Course development 5. Grant writing 6. Manuscript writing	2. Pilot studies 3. Webinars 4. Grant & manuscript writing courses 5. Advanced IS course (optional)	<b>Long term:</b> 3. # Peer-review articles published 4. # Conference abstracts presented 5. # External grants submitted 6. # IS courses/programs developed 7. # of students enrolled in new courses

Thailand.” The Senior Faculty Fellows arrived at UNC in February 2022 and began their in-person IS training. At UNC, they met with faculty experts in topics ranging from HIV to implementation science to course development, attended virtual fieldtrips to local non-profits working in IS, participated in multiple workshops and trainings (topics included: literature reviews, abstract and grant writing, project management, and course design), audited quantitative and qualitative methods courses, and presented their research as part of the Global Health Visiting Scholars Symposium and at the Asia-Pacific AIDS & Co-Infections Conference (APACC).

We have held two rounds of competitive applications for our VISA Faculty and Policymaker/Program Leader Trainees, including interviews with the VISA Steering Committee. Across our two cohorts, out of 45 applicants, 24 were selected: 13 policymakers/program leaders and 11 faculty members. Faculty members were recruited from the HCMUMP, HMU, and the NIHE, while policymakers/program leaders were recruited from the South Vietnam HIV and Addiction Technology Transfer Center, CDC Hanoi, and Ho Chi Minh CDC. Each Cohort was divided into 3 groups based on topic of interest and position to ensure a mix of faculty and policy/program leaders in each group. These groups were then paired with 1–3 faculty mentors from UNC and HMU to guide the group through pilot proposal development, implementation, and manuscript writing. Time demands of the pilot proposal development and implementation have proven to be a challenge for some trainees. We would suggest that future training programs consider offering trainees stipends for compensation of time spent on their pilot projects.

For their first training activity, both cohorts of trainees participated in two introductory implementation science journal clubs, monthly webinars, and an intensive five-day course that served as an introduction to IS. This short course was hosted in Vietnam with virtual presentations by US-based researchers (for the first cohort) who were unable to travel due to the COVID-19 pandemic. To date, Cohort 1 trainees have also completed a virtual grant proposal writing course, a project management course, successfully submitted pilot proposal grants, implemented and evaluated their pilot projects, drafted a scoping review on their respective topics, and are finalizing a first draft of an initial manuscript. Cohort 2 Fellows have additionally attended a virtual grant-writing workshop and completed a draft of their pilot proposal grant, which is currently under review by the executive committee.

Based on feedback from Cohort 1, we made a few adjustments for Cohort 2. These included an earlier grant proposal draft in the form of a concept note, which was reviewed by the executive committee, and additional written IS course

materials to support their grant writing. Throughout the course of the program, our executive committee has met on a bi-weekly basis with rare exceptions. This has enabled close monitoring of group progress and the ability to quickly respond and adapt when challenges arise. Program decisions are made collaboratively between all faculty, and HMU colleagues frequently provide ideas and recommendations to adjust the program, which are adopted by the committee.

Finally, we have benefited from collaboration with other D43 training programs in the region. Trainees from other D43 training programs have attended our webinar series, and Fellows in our program have participated in the CHIMERA D43 training program’s abstract mentoring program for the Asia-Pacific AIDS & Co-Infections Conference. Our trainees will also have the opportunity to participate in the UJMT LAUNCH D43 training program’s regional scientific workshop hosted at HMU in May 2024, where they will be able to share their research, hear about cutting edge topics like artificial intelligence in public health research, network with other trainees and faculty from the region, and receive additional practical training in key research skills. Overall, despite travel challenges due to COVID-19, and the time commitments required of the program, the VISA D43 program has been very successful at beginning the process of expanding IS capacity in Vietnam (see Fig. 3 for a timeline of study activities).

## Discussion

The Depth and Diffusion Model is an innovative approach to global health training. While traditional global health training programs have often been based around providing a few individuals with doctoral degrees overseas or developing capacity within a local institution, the Depth and Diffusion Model centers around bringing together and training academics and policymakers in institutions across a country. This model facilitates the rapid and efficient scale-up of IS knowledge and provides direct experience in IS research collaboration to faculty members and policymakers/program leaders. Depth is created by ensuring that an institution is established as an in-country leader in IS research and education. Diffusion ensures that the concept of IS is taught in multiple universities and shared with key governmental and non-governmental agencies. The engagement of policymakers with faculty members addresses one of the largest barriers to evidence-based policy and practice: the common problem that policymakers and researchers have different mentalities, speak different languages, and may have different ideas about what constitutes evidence (Choi et al., 2005). Taken together, this model provides a blueprint for

Study Activity	2021				2022				2023				2024				2025				2026
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
<b>VISA Senior Faculty</b>																					
Coursework at UNC			■	■	■	■															
<b>VISA PhD Fellows</b>																					
Fellow 1 Coursework at UNC						■	■	■	■	■	■	■	■								
Fellow 1 Dissertation Work															■	■	■	■	■	■	■
Fellow 2 Coursework at UNC											■	■	■	■	■	■	■				
Fellow 2 Dissertation Work																			■	■	■
<b>VISA Faculty and Policy/Program Trainees</b>																					
Cohort 1 IS Short Course					■																
Cohort 1 Webinars					■	■	■	■													
Cohort 1 Grant Writing					■																
Cohort 1 Project Management							■														
Cohort 1 Manuscript Writing													■								
Cohort 1 Pilot Studies									■	■	■	■	■	■							
Cohort 1 & 2 Course Development																	■				
Cohort 2 IS Short Course										■											
Cohort 2 Webinars										■	■	■	■	■							
Cohort 2 Grant Writing										■											
Cohort 2 Project Management															■						
Cohort 2 Manuscript Writing																■					
Cohort 2 Pilot Studies														■	■	■	■	■	■		
Cohort 1 & 2 Advanced IS Course																					■
Dissemination Conference																					■

Fig. 3 VISA D43 activity timeline

efficient adoption of IS in a country or region with little previous IS capacity and the interest in advancing it.

As discussions have started to come to the forefront about the need for dismantling and reimagining global health education (Gichane & Wallace, 2022), it is important to think through how capacity building programs in LMICs can be best designed as partnerships between HIC and LMIC institutions to both build in-country capacity and capitalize on the growth and learning opportunities presented for

faculty in both regions as a result of their collaborative work together. The Depth and Diffusion Model prioritizes building capacity for IS education and research, with the goal that future IS education will be delivered by in-country leaders, rather than by US-based faculty. Through this emphasis, global implementation science knowledge production and application can become more equally distributed (Abimbola et al., 2021).

This change is essential given that the theories, models, and frameworks (TMFs) that are the basis of implementation science have largely been developed in HICs and applied in LMICs with minimal adaptations (Bartels et al., 2022; Dearing et al., 2017). While perspectives from LMICs only recently started to be incorporated into these TMFs (Means et al., 2020), there is a need for more implementation science TMFs originating from LMICs that center these voices and experiences. Thus, through building local implementation science capacity and diversifying the centers of implementation science knowledge production the Depth and Diffusion Model could be used as a tool to decolonize global implementation science research and increase equity in future north-south research partnerships (Khan et al., 2021). This model also lays a foundation for reducing supremacy in global health practice, specifically by building local expertise in implementation science among researchers and policymakers, empowering local leaders to set the future agenda for global implementation research (Abimbola & Pai, 2020).

The case study of VISA shows the potential value of applying the Depth and Diffusion Model to global health education and capacity building. VISA has demonstrated preliminary success and continued momentum toward achievement of three main outputs: (1) a program for implementation science at a major university; (2) faculty trainees based in three additional universities across Vietnam with newly developed expertise in IS and curricula in hand for courses in their own universities; and (3) policymaker/program-oriented trainees familiar with the fundamentals of IS and with experience in conceptualizing and carrying out an IS project.

The goal of the Depth and Diffusion Model is to rapidly scale-up capacity for implementation science research and practice, by developing depth in a central institution and diffusing IS knowledge to academics and policymakers/program leaders throughout a country or region. The model's emphasis on bringing together policymakers and researchers allows for greater communication between these two groups, with the goal of increasing the translation of research findings into policy. We used the VISA D43 as an example of how the Depth and Diffusion Model is being employed to expand implementation science knowledge and capacity throughout Vietnam. By the end of VISA, we will have furthered HIV-related implementation science capacity in Vietnam among the public health workforce. IS depth is being developed at HMU and IS diffusion is occurring within three additional universities and several public health agencies across Vietnam. In the long-term, we hope that the VISA will help to reduce the burden of the HIV epidemic in Vietnam and can serve as a model for future

IS-focused training throughout LMICs and low-resource settings globally.

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## Statements and Declarations

**Ethical Approval/Consent** This is a description of a capacity building model so neither ethical approval nor informed consent was required.

**Competing Interests** The authors have no competing interests to declare that are relevant to the content of this article.

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