Genesis Mission

U.S. DEPARTMENT of ENERGY | Office of Science

Genesis Mission Request for Information (RFI): Mobilizing Talent for the Genesis Mission and Developing an American Workforce to Advance Artificial Intelligence for Science and Engineering

RFI Number: DE-SC-26-016

Issue Date: January 16, 2026

Response Due: March 4, 2026

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About the RFI

On Jan. 16, 2026, the U.S. Department of Energy (DOE) posted a Request for Information (RFI) on Mobilizing Talent for the Genesis Mission and Developing an American Workforce to Advance Artificial Intelligence (AI) for Science and Engineering with a response due date of March 4, 2026. The Department sought input from a wide variety of stakeholders to these questions:

1. How can DOE catalyze research collaborations between DOE National Laboratories, universities, and industry to meet the goals of the Genesis program?
2. How can DOE incentivize partnerships between universities, DOE National Laboratories, industry, and philanthropic organizations to 1) establish new training paths for bachelor's and master's degrees focused on dual competencies in AI and scientific/engineering disciplines and 2) provide innovative experiences to prepare doctoral students and post-doctoral associates for careers in AI for science?
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9. What components are needed to prepare graduate students and post-doctoral students for successful careers at the nexus of AI and science?
10. How could partnerships between DOE, universities, and industry provide new training opportunities for students to best prepare them for private and public sector jobs?
11. What type of experiential opportunities are needed to complement classroom instruction to best prepare students for future jobs?
12. How many American bachelor's and master's degree students could be trained in a steady state program at your institution? How could the program be scaled across the nation?

13. How could community colleges and other educational institutions contribute and be included in this pipeline?

Scale of the responses

DOE received over 270 distinct responses to the RFI, spanning nearly as many distinct institutions across universities, private industry, philanthropic organizations, professional societies, and other not-for-profit groups. Altogether the assembled responses provided the Department with over 1,100 pages of material.

Summary synthesis methodology

The summaries assembled here represent a fast analysis intended to provide Departmental leadership and program staff with an overview of the responses.

DOE Office of Science staff used Department-approved AI tools and human editorial judgment to assemble the summaries presented in this document. The team aimed to preserve the dynamic range of recorded ideas by using carefully scripted AI prompts to probe the submissions and by using human judgment to highlight particularly distinctive or innovative responses. The summaries are parsed by the questions listed on the previous page.

The Department intends to continue analysis and consideration of many of the high-quality responses received as it formulates the Genesis Mission workforce and engagement strategy.

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Full RFI Text

DEPARTMENT OF ENERGY

Request for Information (RFI) on Mobilizing Talent for the Genesis Mission and Developing an American Workforce to Advance Artificial Intelligence (AI) for Science and Engineering

<u>THIS IS A REQUEST FOR INFORMATION (RFI) ONLY</u> for the purpose of conducting market research and does not constitute a solicitation or a promise to issue a solicitation. Responses are voluntary and will be used to inform strategic planning, program design, and future funding mechanisms.

AGENCY: Office of Science, Department of Energy. RFI Number: DE-SC-26-016

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SUMMARY: AI-driven innovation is a key national priority for ensuring American science and technology (S&T) dominance, economic growth, and national security. AI will transform a broad range of occupations spanning the nation's industrial, government, educational, and research and development sectors. Recently, the Trump Administration Executive Order 14363, "Launching the Genesis Mission", announced a focused, coordinated national effort to unleash a new age of AI-accelerated innovation and discovery. Led by the Department of Energy (DOE), the Genesis Mission will mobilize DOE's National Laboratories, industry, and universities to harness the nation's leading capabilities in high-performance computing, next-generation quantum computers, and artificial intelligence (AI) to revolutionize science innovation in this nation. The Genesis Mission will double the productivity and impact of American science and engineering in a decade, leading to new industries and highly skilled jobs, and addressing some of the most challenging problems of this century. To prepare American students for future careers in these areas requires formulation of new training approaches, as noted in Executive Orders 14277 and 14278 (April 2025), "Advancing Artificial Intelligence Education for American Youth" and "Preparing Americans for High-Paying Skilled Trade Jobs of the Future." Additionally, a section entitled "Training a Skilled Workforce for AI Infrastructure" in the "America's AI Action Plan" (July 2025), calls for Federal Government agencies to support this workforce transformation.

The goals of the Genesis Mission require rapid mobilization of the full capabilities of our nation's S&T enterprise and tightly coordinated efforts across DOE and its National Laboratories, universities, industry, and philanthropic organizations. Further, a workforce of 100,000 American scientists and engineers will need to be trained over the next decade to lead the world in AI-powered science innovation and applications. DOE seeks input on innovations for forging partnerships between DOE, institutions of higher learning, industry, and philanthropic organizations to meet these challenges. In addition to research partnerships, this effort will include establishing an AI for Science and Engineering pipeline at the undergraduate and master's levels focused on dual competencies in AI and a scientific/engineering discipline that will feed into rapidly expanding private and government sector jobs, as well as advanced degree educational programs. Further, this effort will include expanded training and research experiences for graduate students and post-doctoral associates to both contribute to the goals of the Genesis Mission and prepare for future careers in academia, National Laboratories, government, and industry, with dual competencies in AI and science.

Input is sought from a wide variety of stakeholders, including:

- Educational institutions interested in partnering with DOE, private industry, and philanthropic organizations to form highly collaborative research teams to meet the aggressive goals of the Genesis Mission and establish new curricula and experiences for training bachelor's and master's level students in AI for Science and Engineering to prepare the future AI workforce, as well as research experiences as part of doctoral and post-doctoral associate training.
- Industrial institutions of all sizes interested in partnering with universities and DOE to advance science and technology needed for the Genesis Mission and to define training requirements and support training to prepare a future American workforce.
- Philanthropic organizations interested in supporting AI for Science and Engineering research and student training.
- Think tanks and other research organizations.

Questions:

1. How can DOE catalyze research collaborations between DOE National Laboratories, universities, and industry to meet the goals of the Genesis program?
2. How can DOE incentivize partnerships between universities, DOE National Laboratories, industry, and philanthropic organizations to 1) establish new training paths for bachelor's and master's degrees focused on dual competencies in AI and scientific/engineering disciplines and 2) provide innovative experiences to prepare doctoral students and post-doctoral associates for careers in AI for science?
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13. How could community colleges and other educational institutions contribute and be included in this pipeline?

DOE reserves the right to use any information submitted by, or obtained from, an interested party in any manner DOE determines appropriate. Interested parties should not include any classified, business confidential, or proprietary information in their responses. DOE will have unlimited rights in all submitted information. DOE looks forward to engaging with the community, industry, academia, and other interested parties in a transparent and collaborative manner throughout the process.

Confidential Business Information: Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Submission Instructions: Responses should not exceed five pages, including attachments or cover letters. Please include the names of the organization and the point of contact. Responses should be submitted electronically to AIResearchandTrainingInput@science.doe.gov include "Developing an American Workforce to Advance Artificial Intelligence for Science and Engineering" in the subject line of the email.

FOR FURTHER INFORMATION CONTACT: Questions may be addressed to the DOE Office of Science through AIResearchandTrainingInput@science.doe.gov.

Q1. How can DOE catalyze research collaborations between DOE National Laboratories, universities, and industry to meet the goals of the Genesis program?

Summary

To catalyze research collaborations for the Genesis program, DOE should establish structured, mission-aligned ecosystems that integrate National Laboratories, universities, and industry as co-equal partners. This action involves establishing shared project roadmaps, fostering personnel exchange and joint appointments, streamlining administrative processes, and leveraging existing collaboration structures within scientific domains. Key strategies include implementing tiered partnership models, creating challenge-driven research consortia, and investing in shared and co-designed AI platforms and data infrastructure. DOE should promote open-source tools and standardized data infrastructure to facilitate wider participation and accelerate scientific progress. A huge challenge is the systemic integration of AI into scientific and engineering workflows.

Innovative Ideas (respondents named in parentheses)

- **Tiered Genesis partnership model:** Planning grants, multi-institutional research awards (e.g., AI Cooperative Research and Development Agreement [CRADA] + Model), and translational challenge awards, all requiring participation from a DOE National Laboratory, university, and industry partner. (Texas A&M University; Hamilton/Leiden; Virginia Tech; The Broad Institute of MIT and Harvard University)
- **Challenge and innovation hubs:** Hub-and-spoke model centered around shared research infrastructure and cloud laboratories. (University of Notre Dame; Radiant Creative Group; Northeastern University; MIT Media Lab; Ginkgo Bioworks)
- **Personnel exchange and integration:** Bridge staff, joint appointments, professor of practice, rotating residencies, overcoming cultural differences. (Howard University; Thrivner; Texas State University; University of San Francisco; Lawrence Berkeley National Laboratory; University of California, Berkeley; National Energy Research Scientific Computing Center; Florida State University; Facility for Rare Isotope Beams/Michigan State University)
- **Streamlined processes:** Template intellectual property and data-rights playbooks, unclassified high-performance computing sandboxes, platform generalizability. (Florida International University; University of Alabama; Lila Sciences)
- **"Fail fast and fail often":** Seeding many different exploratory, pilot, and demonstration projects in parallel, where DOE can act as research matchmaker. (University of Utah)
- **Importance of Responsible AI:** Critical need to integrate Responsible AI (RAI) education into curricula, focusing on ethics, bias screening, data provenance, governance, and transparent scientific practices. Embedding secure and trustworthy AI principles from the outset. (Huston-Tillotson University and Savannah

River National Laboratory; Hack The Box; Rutgers University–New Brunswick; Virginia Tech; Texas A&M University)

Other

- **"Tribal AI Resilience Technician" credential:** Leveraging real-world AI deployments in mission-critical emergency response as "living classrooms" for students from Tribal Colleges and Universities. (Meta IQ Services)
- **Role of regional orchestrators/neutral brokers:** Critical role of state-authorized sector catalysts or "neutral brokers" in orchestrating regional innovation ecosystems, mitigating institutional friction and aligning IP requirements. (Massachusetts Technology Collaborative)
- **Documenting negative results:** Value of learning from negative results. (Texas State University)
- **Problem-focused cohorts:** Moving beyond static memoranda of understanding to active; implementing innovative and dynamic efforts such as semester-long problem-solving cohorts; leveraging models like Hacking for Defense to directly feed real-world Genesis Mission challenges into university classrooms. (BMNT)
- **Fusion as a core pillar of the Genesis Mission:** The U.S. fusion energy mission as a central technology for the Genesis Mission, has existing public-private partnerships. (Commonwealth Fusion Systems)
- **Hardware shared service layer:** Advantages of shared services for automating configuration, debugging, and maintenance of heterogeneous multi-vendor systems. (Cosmic Labs Technologies Inc.; University of Wisconsin–Madison)
- **Small business partnerships:** Creating an AI talent pipeline. (Akiak Technology)
- **Mechanisms to handle sensitive data:** Concept of "Verifiable AI Infrastructure" using hardware-attested confidential computing environments, AI passports for cryptographic attestation, and open verification standards; enabling multi-party research without compromising confidentiality or intellectual property. (Lucid Computing)
- **Industry-led subcontracted research at National Laboratories:** Placing industry in the driver's seat for initiating and directing research. (Princeton Satellite Systems)

Q2. How can DOE incentivize partnerships between universities, DOE National Laboratories, industry, and philanthropic organizations to 1) establish new training paths for bachelor's and master's degrees focused on dual competencies in AI and scientific/engineering disciplines and 2) provide innovative experiences to prepare doctoral students and post-doctoral associates for careers in AI for science?

Summary

To incentivize partnerships and cultivate a dual-competency AI workforce, DOE should prioritize holistic funding for the entire talent pipeline, from curriculum development to post-doctoral placements. This action involves creating structured, experiential learning opportunities embedded within real-world scientific challenges at National Laboratories and industry, alongside robust mentorship and clear career pathways. Many respondents emphasized making workforce development a central, scored deliverable in funding mechanisms and aligning incentives across all participating entities.

Innovative Ideas

- **Funding the full talent pipeline:** Curriculum development awards, undergraduate scholarships, master's traineeships, graduate fellowships, postdoctoral transition awards, and paid internships/co-ops at DOE labs and in industry. (Virginia Tech; Palantir; University of Chicago; Florida A&M University)
- **Dual-competency graduate fellowships:** Funding fellowships requiring students to work at the intersection of AI and a scientific discipline, with rotations at a National Laboratory, and "Third Competency"–Human-AI Teaming or the ability to work effectively as a human-AI team, including knowing when AI output is reliable and how to maintain independent judgment or training in product commercialization. (University of Notre Dame; University of Wisconsin–Madison; North Carolina; ARM Inc.; BMNT)
- **"π-shaped people" and interdisciplinary talent:** There is an acute need for interdisciplinary, "π-shaped people" with deep understanding in two fields (e.g., AI and domain science) to address significant bottlenecks in areas like molecule design and genome interpretation. (Carnegie Mellon University, Oregon, AMD)
- **"Training AI scientists where the data lives":** Model where students are trained in AI and biological data science directly within a data-intensive user facility or are "forward-deployed." (University of California, Merced; Joint Genome Institute at Lawrence Berkeley National Laboratory; Palantir)

Other

- **Scholarship for service model:** Fund students' education in exchange for a commitment to work at a National Laboratory or designated public-sector role upon graduation, similar to the National Science Foundation's (NSF's) CyberAICorps Scholarship for Service. (University of Maine)
- **Micro-credentials:** Develop credentials (e.g., "AI for Materials," "AI for Grid") that articulate into bachelor's and master's degree pathways. (Howard University; Innodata Inc., University of Arizona)
- **Genesis fellowship match:** Provide matching funds for philanthropic and industry-sponsored fellowships, especially for lab-based summer internships, K–12 talent, Young Scholars programs. (University of Colorado Boulder; Foundation for American Innovation; American Physical Society)
- **Doctoral rotational residencies and "teaching hospital" models:** Provide hands-on experience with secure, energy-efficient AI systems in highly regulated, persistent multi-year environments. (Northwestern University; University of North Carolina at Charlotte; Accelerate Science Now; Innodata Inc.; University of Georgia; Florida International University; Tennessee Tech University; Tryfacta Inc.)
- **The "middle skill" gap:** Identify and enable merging critical roles such as "AI technician" (maintaining hardware and data pipelines for autonomous laboratories), "data shepherds" (curation of AI-ready scientific datasets), "applied AI engineers" or professionals who can bridge the gap between AI researchers and domain scientists. (Computing Resource Association and Computing Community Consortium; National Academy of Engineering; Texas A&M University/Savannah River National Laboratory)
- **Reimagining the STEM Ph.D. for innovation**: Current science, technology, engineering, and mathematics (STEM) Ph.D. programs are too slow and narrow. DOE should partner labs and industry for project-based research. (Foundation for American Innovation)

Q3. What attributes might attract undergraduates to programs that offer dual-competency degrees?

Summary

Analysis Procedure:

The responses for question 3 were read, summarized, and recorded by two program managers. Of 230 submissions, 36 responses did not address question 3. Five submissions were duplications. To reduce data complexity, the program managers identified 44 categories for answers to question 3. To bin the entries according to the identified categories, a matching algorithm based on fuzzy logic was used to bin over 1,700 entries. The built-in fuzzy matching routine in Power Query uses the Jaccard similarity algorithm with the similarity threshold of 0.5 and excludes double entries. Note: Percentages refer to percentage of the total responses (950).

Program Managers' Analysis:

Survey respondents endorse programs that offer clear value propositions that connect undergraduate training to long-term job opportunities and financial support for training, with 7% suggesting guarantees of employment, placements, or interviews. Most responses (65%) expect clear career prospects to entice undergraduates into training, particularly when branding is supported by published role maps, salary benchmarks, long-term earning potential, and a sense of a day-in-the-job. For some, value derives from skills and connections that hedge against unemployment, or frameworks that support domestic retention of top domestic and international students. Implicitly, respondents envision preparation for entry-level positions, and/or advanced roles. Financial incentives are noted in 39% of the responses, such as scholarship support, paid research internships and co-ops, post-graduate loan forgiveness or service-linked models (cf.ROTC). Some responses (13%) note easy curricular navigation as important to avoid the financial disincentive of increased time-to-degree.

Survey respondents also endorse programs that reduce barriers to participation. Some responses (12%) specify that training should be accessible across academic stages, disciplines, institutional types, locational origins, and abilities. Other responses (7%) praise transfer-friendly on-ramps and short-cycle training opportunities, such as bootcamps, that allow for rapid ramp-ups of knowledge, which would result in the ability for emerging domain experts with limited skills in AI to contribute to research. A few (2%) responses indicate that these programs will need to evolve alongside AI technologies. Some respondents indicate that rapid training of large numbers of undergraduates with dual-competency degrees would require the conversion of fragmented training, research, and hiring efforts into a more coherent, scalable, effort. To this end, survey responses mention flexible credentials (23%), such as minors, certificates, and stackable credentials, competency-based assessments (9%), training embedded in domain science classes (13%), and/or accelerated BS/MS degrees (3%). While a few submitters go so far as to suggest the creation of specific entities to coordinate standards (2%), most suggestions are compatible with the idea that standardized models could, in principle, tag content in domain pathways with AI-relevant competencies so that it's possible to reassemble domain and AI modules into integrated pathways and deploy stackable micro-credentials that ladder into degrees. In principle, this would create a portable demonstration of capability and standardize signaling for use in hiring. Ultimately, it is seen as important that a breadth of undergraduate students be able to efficiently and accurately communicate capabilities obtained through the porous training environment.

Most survey responses (77%) indicate a critical need for hands-on research experiences, sometimes via in-course project-based or experiential learning, or capstones, but with many (44%) specifying intensive research, such as internships or industry cooperatives. Key attributes of exposure vary across respondents. Some (18%) encourage activities to raise awareness prior to college or early in college, with progressive immersion and sustained engagement. Others specify a need for research that can be done locally (1%), as many students are place-bound and cannot travel far for long periods of time. Most (65%) see research that has clear mission-relevance as giving undergraduates an enticing sense of meaning or purpose, with others stating that value can arise from entrepreneurship opportunities (2%) or translation of basic to applied research (2%). Often, efforts appear intended to mirror authentic AI-for-science workflows, and/or real-world work. For some respondents, students must generate public-facing research portfolios that reflect the capabilities of each undergraduate. These portfolios develop skills, showcase student abilities to potential employers, accelerate onboarding at future jobs, help trainees and employers to identify good fits, and motivate the associated training.

Some respondents reference "evidence-based methods" for effective undergraduate training and retention. Among these are strategies to help undergraduates build relationships, such as those involving cohort communities (13%) that provide a sense of scientific belonging and identity, near-peer mentors (10%), and/or domain experts (10%), from universities, National Laboratories, or industry. Support is voiced for frequent, individualized advising (1%).

Implicit in responses is a distinction between broadly targeted and more specialized training missions. For undergraduates interested in more advanced opportunities, motivation may result from unique access to resources (26%) and/or prestigious signals (13%). In these cases, examples of specialized access could enable them to work with otherwise inaccessible user facilities, datasets, or industrial designs. Alternatively, they might secure competitive research experiences, co-author publications or patents, or win an award during a hackathon. Ultimately, undergraduate aspirations vary as do motives that reinforce program attractiveness and retention.

Innovative Ideas

- Evidence to suggest a scalable training model for entry-level individuals. (Siemens)

Other

- A respondent suggests that AI could be used to identify students at risk of dropping out, and prompt human intervention.

Q4. Beyond funding, what other opportunities could DOE, including its National Laboratories and user facilities, bring to these partnerships?

Summary

Analysis Procedure:

The responses for question 4 were read, summarized, and recorded by two program managers. Of 230 submissions, 39 responses did not address question 4. Five submissions were duplications. To reduce data complexity, the program managers identified 14 categories for answers to question 4. To bin the entries according to the identified categories, a matching algorithm based on fuzzy logic was used to bin over 1,700 entries. The built-in fuzzy matching routine in Power Query uses the Jaccard similarity algorithm with the similarity threshold of 0.5 and excludes double entries. Note: Percentages refer to percentage of the total number of responses (704).

Program Managers' Analysis:

The most frequently mentioned opportunity that DOE could bring to these partnerships is access to infrastructure: 45% of entries fell under this category. The most mentioned access category is the access to data (15.2%). Respondents highlight that the large datasets from DOE National Laboratories are trustworthy and curated. Many respondents also point out unique access to specialized data (e.g., data from neutron scattering or light sources). Access to instrumental infrastructure is the second most common category (14.3%). This category mainly refers to access to light and neutron sources, as well as specialized instrumentations through other user facilities, like the nano science centers. This access category is closely followed by the category describing access to high-performance computing (HPC), including access to exascale supercomputers (13.9%). A small fraction of entries (0.4%) also reference access to quantum computing or quantum technology.

Many survey responses highlight research experiences and training at the DOE National Laboratories as an important opportunity (13.8%). Research experiences include internships and summer research opportunities for students at all stages of their career as well as long-term fellowships or visitor programs for researchers in academia or industry. Training opportunities include in-person and virtual workshops as well as hosting student AI competitions and hackathons. Respondents highlight the exposure to multidisciplinary teams in a state-of-the-art laboratory setting.

Mentorship and expertise knowledge at the DOE National Laboratories is another important opportunity (9.7%). Mentorship includes shared mentoring of students as well as supervised exchange programs. Expertise knowledge is often seen as a service to the broader community, for example sharing of procedures or help with data collection and analysis.

Respondents also highlight the role DOE National Laboratories play in collaborations (7.4%). This includes traditional research collaborations with researchers at the laboratory as well as collaborations through joint educational efforts. The integration of students and external researchers into DOE mission-relevant projects is seen as similarly important (7.2%). The opportunity for students to contribute to “real-world” high impact challenges, including AI challenges, is seen as an especially important opportunity to positively influence workforce development. The use of AI tools and infrastructure is also mentioned frequently (7.1%). This category is very broad and includes open AI models for use and retraining, agentic AI, and AI workflows for domain-specific applications.

A large fraction of respondents sees an opportunity for DOE to play a substantial role exercising authority to define standards and rules for sharing. This category includes standards for data and workflows, benchmarking and validation procedures for AI models, safety protocols to ensure quality, reliability, and trustworthiness of AI tools, as well as guidelines for sharing data. Several responses highlight the importance of a federated effort.

Additional responses list opportunities in the following categories. Outreach activities to the public and to schools as well as active involvement with curriculum development are seen as an opportunity to positively influence workforce development (1.8%) along with access to autonomous laboratories and/or digital twins (1.1%) and attractiveness for students to obtain special credentials or security clearance through their work at a National Laboratory. Here the prestige and excellence of the DOE National Laboratories is emphasized in this context.

Innovative Ideas

- No innovative ideas have been identified. Ideas and concepts are rather mainstream and follow general approaches in workforce development. Most entries list activities which are already ongoing at DOE or are started in connection with the Genesis Mission, including the American Science Cloud as well as the Model Consortium.

Other

- Most respondents see access to infrastructure as a unique and specialized asset of DOE National Laboratories, which clearly indicates DOE’s leadership role in the Genesis Mission.

Q5. In addition to classroom and research training, what other contributions could universities make to support these partnerships?

Summary

Universities offer a wide range of contributions to support partnerships beyond traditional classroom and research training, primarily focusing on fostering interdisciplinary collaboration, developing robust talent pipelines, and serving as innovation hubs. A key theme is the universities' role as neutral conveners, bringing together diverse stakeholders such as National Laboratories, industry, and even competitors to share ideas and collaborate on significant technical challenges. This convening role extends to hosting workshops, seminars, and summits to align partners and facilitate collaboration.

In addition, universities are instrumental in talent pipeline development by creating flexible degree structures, interdisciplinary programs, and experiential learning opportunities. They facilitate faculty-lab residency exchanges, engineer-in-residence programs, and industry-supported fellowships to transfer practical knowledge and align academic research with operational challenges. Universities also implement credit-bearing co-ops, practicums, and capstone projects where students work on real-world problems with industry and National Laboratory partners. Many institutions emphasize K–12 outreach, bridge programs, and community college partnerships to cultivate early interest and diversify the talent pool, particularly from rural communities.

Universities also serve as innovation ecosystems and testbeds, facilitating the translation of research into impact and accelerating commercialization. This includes technology transfer offices, incubators, startup accelerators, alumni networks, and industry engagement programs. They provide physical and virtual infrastructure, such as lab facilities, sandboxes for hands-on experience, and high-performance computing/AI/data hubs, which can complement partners' capabilities and serve as regional training hubs. Universities also contribute by developing and disseminating open educational resources, modular curricula, and stackable credential programs that can be adopted nationally, thus accelerating workforce scaling.

Beyond these core areas, universities contribute by developing governance frameworks and responsible AI standards, fostering human-centered learning and mentorship, and providing evaluation and impact assessment for continuous program improvement. They are also recognized for their ability to integrate emerging AI methods into scientific domains and for their expertise in materials characterization and manufacturing tools. Universities, particularly those with deep community roots, also play a crucial role in public engagement and promoting the social acceptance of AI-driven technological changes. Finally, they provide institutional stability and long-term infrastructure that can sustain partnerships beyond individual grants or personnel changes.

Innovative Ideas

- **Sandbox for hands-on experience:** The University of Oregon (UO) is positioned, with industry support, to stand up a sandbox (testbed), critical for giving students hands-on experiences with datasets, models, and devices for in-class and out-of-class AI projects. UO envisions the sandbox connected to Oregon State University through the state of Oregon's fiber network, Link Oregon (linkoregon.org), and connected to the Genesis Mission through connections already existing in its Oregon Advanced Computing Institute for Science and Society (blogs.uoregon.edu/oaciss). (University of Oregon)
- **Open Learning Initiative:** Universities provide institutional ecosystems that support curriculum development, faculty learning communities, and interdisciplinary coordination to expand AI dual-competency training. They can host summer institutes, professional development workshops, and shared governance structures that allow faculty to co-design and iteratively improve AI-integrated materials. They can also develop open, versioned curricula that can be replicated across institutions. One example is Carnegie Mellon University's (CMU's) Open Learning Initiative (OLI), which can be used as the platform to create and disseminate AI-literacy modules in collaboration with other educational institutions. OLI designs, delivers, and improves courseware—highly interactive textbook replacements designed to support students while providing an instrumented laboratory to advance learning science. Over the past decade, CMU's OLI courseware has enrolled over 5 million independent learners, and the materials have been used to support academic classes with more than 600,000 enrollments in credit-bearing contexts. The broader OLI community includes thousands of educators and authors. Two-year institutions can co-design AI-integrated courses, participate in cross-institution research networks, and serve as a transfer pipeline into four-year, dual-competency programs. (Carnegie Mellon University)

Other

- **Four areas of importance:** Risk buffering, in which universities provide low-risk environments to test AI methods, workflows, and governance frameworks before lab or commercial deployment; social acceptance testing, in which multidisciplinary student communities evaluate usability, trust, and readiness of AI tools before broader release; strategic research alignment, in which regional hub universities coordinate mission-aligned mappings of AI expertise across institutions, connecting university capacity with DOE priorities; and facility engagement and pipeline expansion, in which universities facilitate faculty and student engagement with DOE labs and coordinate regional participation through extension networks. (University of Arizona)

Q6. Beyond funding, what types of contributions could industry and philanthropic organizations make to enhance partnerships and enrich the experiences of the students?

Summary

Industry and philanthropic organizations can make a number of contributions beyond funding to enhance partnerships and enrich student experiences in the Genesis Mission. These contributions include providing real-world problem settings, access to proprietary datasets, computing clusters, and cutting-edge software.

Industry partners can offer authentic problem sets and, when appropriate, access to proprietary datasets. These resources allow students to work on challenges of genuine industrial relevance, moving beyond theoretical academic examples. This ensures that student work is grounded in operational needs and can be tested and validated in practice. Likewise, industry can provide the same access to research challenges on-site through internships, co-ops, and capstone projects.

Companies can offer computing resources, hardware, software licenses, and specialized tools that accelerate research and student training. This includes access to multi-cloud computing credits, Graphics Processing Units (GPUs), Tensor Processing Units (TPUs), and quantum systems. The partnership among universities and industries would serve all parties positively.

Industry practitioners can contribute through adjunct instruction, mentorship programs, guest lecture series, and participation in technical advisory boards. These contributions ensure that training materials reflect current best practices and emerging technologies. Industry partners can collaborate directly with universities to co-design curricula, ensuring that academic programs align with workforce needs and continuously adapt to evolving industry demands. They can also provide real-time feedback on graduate preparedness. Industry can also provide clear job pipelines and hiring pathways to help reduce student uncertainty about career prospects and strengthen the talent pipeline.

Philanthropic organizations can partner with universities to apply AI to challenges aligned with their own mission areas, thereby shaping real-world problem contexts for student learning. They can facilitate connections between institutions and provide neutral convening power to align stakeholders around shared workforce development goals. These organizations can also support high-risk pilot efforts, curriculum prototyping, and independent evaluations that might not fit traditional funding models.

Innovative Ideas

- **Coordinated, national-scale collaboration:** Strategic partnerships with industry can provide students and researchers with rapid access to state-of-the-art AI technologies and emerging best practices. Such partnerships can also inform curriculum development at universities while ensuring that tools used in coursework align with those deployed at scale within the national research environment. A coordinated, national-scale collaboration will offer an efficient mechanism to extend these partnerships across a broad set of institutions, enabling equitable access to cutting-edge technologies and shared infrastructure. In addition, the collaboration can serve as a structured interface between the universities, DOE laboratories, and industry partners. In particular, it will facilitate internships which allow students to transition seamlessly between academic research and applied settings. (arXiv)

- **Workforce and training opportunities:** Industry can provide internships, domain-specific datasets, deployment feedback, and exposure to operational constraints, while philanthropic organizations can help scale workforce initiatives and support inclusive access to training opportunities. Structured internship programs focused on dual AI–engineering competencies and targeted symposiums coordinated between industry and academia would benefit workforce readiness by enabling networking access, ensuring students gain practical exposure while contributing meaningfully to industry innovation. A recent example is the Energy Breakthroughs Symposium GE Vernova organized at MIT that facilitated a day of research-driven discussion focused on critical energy technology. This model brought together faculty, students, and GE Vernova leaders for thematic sessions, featured speakers, and networking for specific topics, including AI for engineering. (GE Vernova Advanced Research)

Other

- Responses to question 6 were quite uniform across industry and universities, all suggesting that industry and philanthropic partners can provide real-world case studies, non-financial resources, and subject matter expertise to strengthen and guide university activities.

Q7. In addition to AI, which scientific and engineering disciplines are well-suited for this dual-competency training approach?

Summary

Disciplines that involve (i) complex systems, physical laws, modeling and simulation, data workflows, instrumentation, use of open source codes, and pattern recognition; (ii) high-performance computing, data-intensive analysis, data-driven discovery, large-scale, high-dimensional simulation, and experimental data; and (iii) costly experimental cycles, improved safety and reliability while lowering operational and maintenance costs, critical decision making, tight experiment-theory loops, operating under real-world constraints; and that need (iv) reduced iteration time, optimization, real-time monitoring, digital twins, prediction, control, and design; and (v) accelerated progress, discovery, productivity, and enhanced security are very well-suited for a dual-competency approach that pairs AI with strong domain knowledge across science and engineering. From an industry perspective, the highest-value dual-competency pairings are those where AI is already producing measurable productivity gains or where near-term breakthroughs are anticipated.

Innovative Ideas

- **Materials chemistry and chemical engineering:** Dual-competency training is particularly well suited for disciplines where experimental complexity and data intensity intersect. Materials chemistry and chemical engineering are natural anchors because metal-organic frameworks (MOFs), metal-organic polyhedra (MOPs), and composite synthesis require control over reaction chemistry, thermodynamics, and transport phenomena while simultaneously generating structured data for AI integration. (Oregon State University**)**
- **AI and quantum information science:** An emerging opportunity for dual-competency training lies at the intersection of AI and quantum information science (QIS). Advances in quantum technologies increasingly depend on the ability to analyze complex experimental data, optimize device performance, and accelerate materials discovery—areas where AI and machine learning methods can significantly enhance progress. (University of Colorado Boulder)
- **Plasma and fusion science:** Disciplines characterized by complex systems, high-dimensional data, and tight experiment-theory loops are particularly well suited, including plasma and fusion science. These fields benefit disproportionately from AI-accelerated design-build-test-learn cycles and align directly with multiple Genesis challenge areas. (MIT)
- **Energy systems engineering:** Disciplines characterized by large-scale computational needs, complex data workflows, and systems-level integration are especially well suited for this dual-competency approach, including energy systems engineering. Such fields rely heavily on simulation-intensive workflows, high-volume data analysis, and optimization across interconnected systems—areas where the

integration of AI can substantially accelerate discovery, design, and deployment. (University of North Carolina at Charlotte)

Other

- N/A

Q8. What components are needed for an effective dual-competency degree program to best prepare students for successful careers at the bachelor's level? At the master's level?

Summary

At the bachelor's degree level, the focus is on building a strong foundation in both core disciplines and AI basics, emphasizing problem-solving, critical thinking, and communication, all while integrating hands-on, project-based learning experiences like internships and capstone projects to foster technical fluency and applied understanding alongside an awareness of ethical AI. As students advance to the master's level, the programs deepen into specialized, domain-oriented AI applications, advanced research, and scientific software engineering, with a strong emphasis on synthesizing knowledge through significant theses or capstone projects, often co-mentored by industry or National Laboratory experts, and incorporating advanced concepts like scientific machine learning and generative AI while still prioritizing ethical considerations and real-world problem-solving in robust computing environments. Across both levels, successful programs consistently highlight the critical importance of interwoven curricula, extensive practical application, strong industry collaboration, and the development of adaptable problem-solvers.

Innovative Ideas

- **Building robust scientific code:** Scientific software engineering moves beyond "Jupyter Notebook scripting" to building robust, reproducible scientific code (version control, CI/CD), including skills to utilize agentic software development for fast prototyping, while focusing on avoiding hallucinations and errors and ensuring secure coding. (Princeton Plasma Physics Laboratory)
- **Cross-discipline learning:** A strong dual-degree program for undergraduates and master's level students includes not only coursework in multiple areas, but opportunities for students to learn to think interdisciplinarily, e.g., structured interdisciplinary team projects requiring integration across majors. Also necessary are opportunities to learn and practice essential skills including communication and mentoring (both up and down), as well as opportunities for students to engage in reflection on their experiences applying these skills. (MIT Plasma Science and Fusion Center)
- **Targeted curriculum design:** Dual degrees, especially at the undergraduate level, face tight credit and prerequisite constraints. Efforts to reduce course loads can risk weakening one or both areas of competence, potentially harming program quality and reputation. Careful curriculum design is therefore essential to ensure graduates are genuinely strong in both fields. At the master's level, students can pivot from a single discipline to AI or combine both. To maintain rigor, universities

may need to require targeted undergraduate prerequisites to close knowledge gaps, even if these do not count directly toward the degree. (Ericsson)

Other

- N/A

Q9. What type of experiential opportunities are needed to complement classroom instruction to best prepare students for future jobs?

Summary

Graduate and postdoctoral training for successful careers at the nexus of AI and science requires a comprehensive approach that integrates deep domain expertise with advanced AI methods, emphasizing practical, real-world experience. Key components include robust mentorship, access to cutting-edge infrastructure and data, and explicit training in the responsible, reproducible, and translational aspects of AI research. The overarching sentiment is that these trainees need to be equipped not just to use AI tools, but to critically engage with them, adapt them to complex scientific problems, and translate discoveries into impactful applications.

Integrated Research and Training Environment

- **Immersive Research Experiences:**
    - Embedded AI projects within production scientific workflows. (USQCD Collaboration)
    - Direct integration into Qualcomm robotics (QRB) enabled National Laboratory workflows, allowing students and researchers to contribute to real Genesis Mission problems rather than simulated ones. (Quantum Machines)
    - Applied research across universities, DOE laboratories, and industry, supported by AI apprenticeships, internships, and rotational placements in mission areas like fusion, nuclear systems, and materials science. (Radiant Creative Group)
    - Leveraging multi-institutional collaboration as the "institution" to involve universities and DOE labs. (COHERENT Collaboration)
    - Participating in multiple research projects including thesis or dissertation work to apply skills in real-world scientific problems. (USQCD Collaboration)
    - Extended research experiences at DOE National Laboratories, where students develop, test, and validate AI-driven automation workflows in controlled but realistic environments. (Cosmic Labs Technologies Inc.)
    - Access to industry advisory panels and flexible, multi-disciplinary research environments. (Virginia Commonwealth University)
- **Foundational Knowledge and Critical Thinking:**
    - Foundational machine learning, statistics, computational systems, with a focus on *why* AI methods work. (University of Illinois Urbana-Champaign)

    - Exposure to the philosophy and history of science to ensure graduates can navigate the ethical and epistemological dimensions of AI-powered research with rigor and context. (University of Illinois Urbana-Champaign)
    - Ability to critically evaluate AI outputs, assess validity and reliability, and use AI as a tool for disciplined inquiry rather than passive reliance. (Texas Tech University)
    - Preparation combining deep AI and computational foundations with robust domain expertise, plus experience adapting models to practical scientific applications. (NSF AI Institute Virtual Organization)
- **Advanced AI and Computational Skills:**
    - Deep expertise in both advanced AI methods and a well-grounded scientific or engineering discipline. (Texas Tech University)
    - Training in large-scale computing, distributed simulations, GPU-accelerated AI models, and multi-cloud workflows. (Rescale, Inc.)
    - Competencies in reproducibility, data governance, and AI safety in safety-critical systems. (MIT Plasma Science and Fusion Center)
    - Understanding of large language models (LLMs) and machine learning with real-world experience and thorough domain-specific knowledge, including problem domain definition and ground truth data creation. (RadiaSoft LLC)
    - Fluency in using tools like MLflow for experiment tracking and model versioning in a federated environment. (University of Central Florida)

Professional Development and Leadership

- **Multi-Sector Mentorship and Collaboration:**
    - Joint university-laboratory supervision. (Analytical Mechanics Associates)
    - Triad co-advising (faculty + lab + industry) with shared milestones; building leadership in team science and stakeholder translation. (Innodata)
    - Dual-advisor mentorship models spanning AI and domain science. (MIT Plasma Science and Fusion Center)
    - Co-advising doctoral model: primary domain advisor and an AI/data science co-advisor, with mandatory lab or industry rotation. (University of Virginia)
    - Exposure to industry opportunities through a formal network of industry mentors to provide career advice and bridge to private-sector employment. (Princeton Plasma Physics Laboratory / Princeton University)
- **Reproducibility, Governance & Ethics:**
    - Training in reproducibility, data governance, and AI safety in safety-critical systems. (MIT Plasma Science and Fusion Center)

    - Requirement for reproducible research packages (data provenance, code, evaluation harnesses, experiment logs) and explicit scientific validity checks. (Innodata)
    - Structured preparation in governance, responsible AI, regulatory strategy, and implementation science. (Association of Public and Land-Grant Universities)
    - Education on data privacy and AI ethics and safety, including understanding bias, fairness, accountability, and limitations of AI. (RadiaSoft LLC)
- **Translational Skills:**
    - Familiarity with commercialization processes, including intellectual property, startup formation, and fundraising. (Analytical Mechanics Associates)
    - Exposure to the problem-translation workflow, determining how scientific computing and sparse tensor workloads interact with analog computing systems. (University of Notre Dame)
    - Training in team leadership, project execution, and innovation management. (Northwestern University) Entrepreneurial Research Fellowships to bridge the “valley of death” between fundamental research and commercialization. (Princeton Plasma Physics Laboratory / Princeton University)
    - Training in academic to laboratory pipeline with cutting-edge methods and shared research assets. (NSF AI Institute Virtual Organization)
- **Career Pathways:**
    - Career mobility via residencies, hub showcases, and portfolio-based hiring artifacts aligned to DOE competencies. (Innodata)
    - Structured transition roles post-graduation to reduce professional instability and retain trained talent. (University of Illinois Urbana-Champaign)
    - Leadership roles in collaborative software and data projects. (USQCD Collaboration)

Q10. How could partnerships between DOE, universities, and industry provide new training opportunities for students to best prepare them for private- and public-sector jobs?

Summary

Partnerships between DOE, universities, and industry are seen as crucial for creating new training opportunities that effectively prepare students for both private- and public-sector jobs. The core strategies involve embedding students directly into operational environments, co-designing curricula with industry input, providing diverse experiential learning opportunities, and establishing clear career pathways with recognized credentials. These collaborations aim to build a workforce with practical, transferable skills, deep understanding of operational realities, and clear career pathways into diverse professional environments.

Work-Integrated Learning and Immersive Experiences

- **Embedded Participation-within-Work:** Shift from preparation-before-work to participation-within-work by embedding students in active DOE-aligned projects with defined responsibilities and real operational experience. (University of Illinois Urbana-Champaign)
- **Rotational Training Models:** Enable students to move between universities, National Laboratories, infrastructure operators, and technology companies through jointly supervised projects tied to operational needs. (University of Georgia)
- **Practical Experience with Real Systems:** Expose students to large-scale datasets, novel algorithms, AI model frameworks, and advanced infrastructure across National Laboratory and commercial environments. (Analytical Mechanics Associates)
- **Industry-Funded Fellowships:** Create industry-funded fellowships placing students at National Laboratories for three- to six-month rotations. (Cosmic Labs Technologies Inc.)
- **“Earn While You Learn” Model:** Enable students to get practical experience while undergoing training, potentially in a DOE lab, company, or university. (Georgia Tech)
- **Cloud-based Environments:** Jointly design programs that use a common, cloud-based environment (e.g., Rescale) to integrate curriculum, research, and experiential learning, allowing students to complete coursework at home while doing labs and capstones in DOE-curated workspaces. (Rescale, Inc.)
- **Real Operational Data:** Foster training opportunities that expose students to applied scientific environments and advanced semiconductor and engineering research environments within existing ecosystems like the Albany NanoTech. (University at Albany)

Curriculum Co-Design and Standardization

- **Employer-Driven Curriculum:** Partnerships should co-design curricula and competency frameworks with employers and labs, embedding work-integrated learning as a standard program element. (Texas A&M University-Corpus Christi)
- **Alignment with Industry Needs:** Curriculum co-design workshops to align skills with hiring needs. (USQCD Collaboration)
- **Stackable Credentials:** Develop standardized micro-credentials recognized by both National Laboratories and industry partners, serving as extended job interviews. (Florida International University)
- **Community College Articulation:** Community college articulation agreements to create pathways into advanced AI-for-energy-and-mobility careers. (University of Georgia)

Mentorship and Professional Development

- **Rotational Residencies:** Rotational residencies for doctoral students and post-doctoral associates into lab-informed research rotations that combine advanced modeling, evaluation, and applied problem solving. (New Jersey Institute of Technology)
- **Dual-Mentorship Models:** Dual-mentorship models across universities, labs, and industry, exposing learners to scientific research, mission-driven environments, and industry-relevant challenges. (University of Illinois Urbana-Champaign)
- **Practitioners in Residence:** Universities create roles for "Practitioners in Residence"—experts from National Laboratories or industry who can teach practical, project-based courses. (Computing Research Association)

Additional Emergent Themes and Insights

- **AI as an Ecosystem, Not Just a Tool:** AI is an ecosystem encompassing algorithms, HPC infrastructure, data systems, and domain-specific applications. This perspective emphasizes the need for training to cover the entire breadth of AI, not just isolated tools. (University at Albany)
- **"Science of AI" as a distinct field:** "AI for Science" and "Science for AI" are distinct but related domains. This implies a need for training that not only applies AI to scientific problems but also contributes to the fundamental advancement of AI itself, drawing insights from scientific processes. (NSF AI Institute Virtual Organization)
- **Bridging the Awareness Gap:** There is a significant "awareness gap" between what AI systems can accomplish and what the broader scientific workforce understands. The PAIDEIA training framework is designed to bridge this gap by integrating AI into every stage of the research workflow, not just as a superficial tool. (Illinois Institute of Technology)

- **The “Last Mile” Problem (Deployment):** Two institutions specifically address the “last mile” problem of translating research and innovation into deployed, operational technologies, emphasizing hands-on experience with real-world constraints and systems. (GE Vernova Advanced Research, Cosmic Labs Technologies Inc.)
- **Emphasis on Skilled Trades in AI Infrastructure:** Two institutions emphasize the critical, often overlooked role of skilled trades (electricians, HVAC technicians, etc.) in building and maintaining AI infrastructure, integrating these roles into the broader AI workforce pipeline through certification programs and apprenticeships. (Siemens, Data Center Coalition)
- **Transparent and Reproducible Research:** Several institutions highlight the importance of training in reproducibility, data governance, and version control for AI models and data, to ensure trustworthiness and scientific rigor. (USQCD Collaboration, RadiaSoft LLC, University of Virginia)
- **National Security Focus:** Explicitly tie AI workforce development to national security goals, emphasizing the need for a skilled workforce to maintain and advance U.S. technological leadership. (Radiant Creative Group, Case Western Reserve University)

For questions 9 and 10, some responses stand out as unusual or at odds with the general consensus.

Q9. Experiential Opportunities – Emphasis on Hardware-Aware AI

Direct Engagement with Memory Technologies: While many responses broadly call for "hands-on experience" or "real-world problems," the University of Illinois Urbana-Champaign and University of Notre Dame specifically highlight the critical importance of hands-on experience with emerging and conventional memory technologies (like Resistive Random-Access Memory [RRAM] and Processing-in-Memory [PIM] systems). This level of hardware-aware AI experience, including device characterization and compute kernel implementation, is a much more granular and specialized focus than most other submissions, which tend to discuss AI models and HPC at a higher level of abstraction. (University of Illinois Urbana-Champaign, University of Notre Dame)

Q10. Training Capacity and Scaling – Industry Partner as a Primary Scaler

Scaling through Mentorship and Co-development by Industry: Unlike most university responses that detail their institutional capacity for student enrollment and then propose scaling via hub-and-spoke models, A&I Solutions, Inc. positions itself not as an institution with direct enrollment capacity, but as an entity that supports training through co-op placements, mentorship, and curriculum co-development. They state their contribution to scaling is through mentoring 10 to 20 students per year, and that national scaling requires a consortium of industry partners collectively committing to student engagement. This is distinct from the university-centric scaling models that focus on academic program expansion. (A&I Solutions, Inc.)

Q11: What type of experiential opportunities are needed to complement classroom instruction to best prepare students for future jobs?

Summary

A move toward deeply integrated, structured, and paid experiential learning is essential to prepare students. Indeed, experiential learning may be a bottleneck for scaling, as the primary constraint in producing a mission-ready workforce is the limited number of high-quality, mentored experiential placements.

These opportunities should immerse students in authentic, real-world environments—such as DOE National Laboratories and industry partner sites—where they can work on complex, mission-driven problems. Effective experiential programs must go beyond simple internships to offer students genuine responsibility on projects that have a measurable impact, thereby building accountability and a deep understanding of the scientific and operational context. The goal is to cultivate a new generation of professionals who are not only technically proficient but also adept at interdisciplinary collaboration and ethical problem-solving in high-stakes environments.

Innovative Ideas

- **Flipping the classroom:** A “flipped classroom” methodology that forces students to engage directly with end-users (like warfighters or energy grid operators) to deeply understand their problems before attempting to build solutions. (Stanford, BMNT)
- **Moving beyond the theoretical:** Creation of simulated enclaves, creating “mission-like” experiences that move beyond theoretical exercises. Time-bounded “challenge sprints” where students work in teams to solve real problems with genuine datasets and operational constraints. (University of Kansas, Joint Computer Technologies and Training Management and Christopher Newport University, University of Washington)
- **Building a robust workforce:** Creation of an AI technicians program, designed to bridge the gap between AI scientists and the end-users who will deploy and maintain the systems. This focus on creating skilled technicians who can support the full AI life cycle is a practical and scalable approach to building a robust national workforce. (Carnegie Mellon University)
- **Holistic exposure to all sectors:** Student exposure to the entire research, development, and deployment AI-enhanced pipeline. They gain an understanding of fundamental research in an academic setting, mission-driven application at a National Laboratory, and product-focused execution in industry. This holistic perspective is invaluable for creating future leaders who can effectively navigate and collaborate across all three sectors. (University of Washington, among others)

Other

- **Integrate, don't isolate:** The strongest proposals integrate experiential learning directly into the curriculum as for-credit or required co-op programs and link it to multi-sector partners from the outset.
- **"Hands-on" must mean "Responsibility-on":** A critical takeaway is that the most effective experiential learning gives students genuine responsibility. Their work should contribute to real codebases, datasets, or operational decisions, building accountability in a way simulations cannot.

Q12: How many American bachelor's and master's degree students could be trained in a steady state program at your institution? How could the program be scaled across the nation?

Summary

Most institutions proposed a training capacity of 500 students or less per year, and 14 institutions proposed a training capacity of 1,000 or more students per year. Commonly proposed methods from universities included leveraging existing undergraduate and graduate degree program infrastructure with modular courses that could be "stacked" onto existing formal certificates and developing new dual-competency curricula within specific science and engineering domains.

Consortia of universities were proposed, as well as intensive summer schools/bootcamps. The largest capacity proposals were for on-demand AI/data science courses and scalable cloud-based environments. Most scalability proposals included some variant of "hub-and-spoke" training. The university-led hub-and-spoke model (where a lead university creates and distributes content) and the industry-led "commercial-off-the-shelf (COTS) backbone" model (where a company provides a cloud platform for training) are two sides of the same coin.

While many institutions present strong individual components, a few stand out for offering comprehensive, well-structured plans that address both training capacity and a credible strategy for national scaling. These institutions move beyond just stating numbers and detail an operational model for achieving their goals.

Innovative Ideas

- **Scalable training framework:** Leverage advanced online programs for a robust and scalable capacity to train thousands of students annually in a "X+AI" compositional curriculum to create stackable certificates and blended degrees in a mature, scalable framework demonstrating a clear, actionable plan for national impact. (University of Illinois Urbana-Champaign, Georgia Tech, University of Texas at Austin)
- **From program to movement:** Reaching a goal of 100,000 trainees requires a decentralized, self-replicating "movement" rather than a top-down, centralized program. This involves using "train-the-trainer" models and empowering local chapters at universities and community colleges to deliver the curriculum. (OpenTeams, Purdue University)
- **"Project Atomizer":** This program involves deconstructing existing courses into modular, competency-tagged content. This content can then be reassembled into hyper-personalized learning pathways and stackable micro-credentials. This is the core mechanism that provides the flexibility needed to engage university students,

upskill working professionals, and rapidly adapt programs as technology evolves. (Arizona State University)

- **Bridge between DOE labs and industrial partners:** Florida International University's proposal is distinguished by its focus on “franchising” its successful FIU-Applied Research Center (ARC) model. ARC already serves as a bridge organization through their workforce pipeline cooperative agreement connecting DOE programs with academic and industrial partners. ARC could scale this role to support the Genesis Mission nationally. (Florida International University)

Other

- **Scaling has an infrastructure challenge, not a content problem:** A dominant theme, particularly from industry and online-first institutions, is that the bottleneck to national scaling is not a lack of AI curriculum. The challenge lies in the absence of a shared national infrastructure—a “digital glue”—to deliver, credential, and track training consistently across dozens of labs, universities, and industries. (Rescale, Coursera, Georgia Tech)
- **The model is more important than the institution:** Several responses notably from non-academic organizations argue that DOE’s focus should be on building replicable models and infrastructures rather than just individual institutions. (Luminary Labs, EY Government Services)
- **Capacity is constrained by mentors and experiential slots, not classroom seats:** A program that scales nationally renders moot traditional measures of institutional capacity. The true constraint on scaling the pipeline is the number of students who can be placed in meaningful, mentored, hands-on experiential learning roles (internships, co-ops, capstones). National scaling depends on creating more of these high-value opportunities, not just more courses. (University of Arizona, Georgia Tech)

Q13: How could community colleges and other educational institutions contribute and be included in this pipeline?

Summary

The Genesis Mission demands AI proficiency and science/engineering domain expertise from operation to basic research. A tiered approach that integrates technical credentials, dual-competency undergraduate degrees, advanced master's programs, and doctoral research could create a scalable national pipeline. In addition to providing an affordable entryway to learn introductory-level AI courses and the necessary science foundations, community colleges and technical institutions play an important role in scaling up a regional and national AI workforce by expanding access to a wide variety of talents geographically and economically, including K–12 and non-traditional students, existing workers, and veterans. Community colleges can strengthen their technical credential programs by partnering with industry to identify and teach skills and a knowledge base for industry-recognized certifications in AI operations and infrastructure support. Furthermore, being part of a vertically integrated pipeline, these institutions can provide stackable credentials aligned with Genesis Mission domains, combined with 2+2 structured articulation agreements and partnerships with research universities, to help build transfer routes into bachelor's and master's programs. An effective coordination and partnership between community colleges and relevant institutions should be established to enable smooth transitions through the pipeline.

Innovative Ideas

- **Co-designing open-source curriculum:** A collaborative approach by research universities and DOE National Laboratories to develop and share open-source AI-for-science curricula. Community colleges adapt and deliver this content locally, potentially leading to DOE-issued micro-credentials. (State University of New York at Stony Brook, OpenTeams, Applied AI Society, Luminary Labs, Gosh, Solaiman, Hugging Face, University of Pennsylvania, University of Illinois at Chicago, North Carolina State University, Texas A&M University's Department of Computer Science and Engineering/Cybersecurity Center)
- **Regional collaboration/consortia with DOE National Laboratories:** Integrating R1 universities, community colleges, and other regional institutions into a unified talent pathway through expanding research funding for AI-enhanced hubs (community college or a DOE lab as the hub), shared lab access and resources to prepare students for roles in data management and HPC research. (Texas A&M University, ACS, University of Virginia, Texas Tech University, Texas State University, University of Arizona).
- **Train-the-trainer**: Professional development programs to equip community college faculty with the knowledge and skills to deliver AI-enabled laboratory instruction. DOE-funded summer institutes and "train-the-trainer" models are examples to expand faculty capacity at community colleges. (ACS, Huston-Tillotson University in

collaboration with Savannah River National Laboratory, Meharry Medical College's School of Applied Computational Sciences).

Other

There were no responses directly from community colleges, only from organizations who had experience working with them and four-year universities. Therefore, the inputs reflect an external perspective that may not have a full capture of the current status and potential capabilities or limitations of community colleges.

- **Focus on the "technician layer":** DOE should prioritize funding mechanisms leveraging National Laboratory research environments for community college-focused training programs, thereby ensuring that the "technician layer," the workers who maintain AI infrastructure, manage scientific data pipelines, and operate experimental facilities, is developed alongside the doctoral and post-doctoral talent that often receives the most programmatic attention. (University of Illinois Urbana-Champaign, University of Notre Dame, State University of New York at Stony Brook, Michigan State University, Siemens)
- **DOE lab leadership in outreach:** Treat educational engagement as mission-critical; ensure exposure is aspirational and research-facing, not framed as contractor labor pipelines. (University of Arizona)
- **"Lost Einsteins":** Community colleges are often the only advanced mathematics option available to talented students in rural and low-income communities—the students Raj Chetty and colleagues' research identifies as most likely to be "Lost Einsteins." (Carina Initiatives and the Polynera Fund)
- **Community colleges central to workforce preparation:** The 2017 consensus study report *Building America's Skilled Technical Workforce* provides a framework for understanding how the Genesis Mission can address questions related to curriculum design, experiential learning, and community college integration (Q8, Q9, Q11, and Q13). These findings suggest that DOE could further Genesis Mission goals by prioritizing modular credential pathways that integrate AI tools and data competencies into technician education, while strengthening partnerships with community colleges as central hubs of workforce preparation. (National Academies of Sciences, Engineering, and Medicine)

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