IntuitionLabs

INTUITIONLABS / RESEARCH & PRACTICAL GUIDANCE

Pharma AI Training Programs: Curriculum Design & ROI

> Build practical AI for pharma and biotech with IntuitionLabs. We help life-science teams turn complex information and workflows into useful software, governed knowledge systems and AI tools.

Published by IntuitionLabs · 2026-04-14 · pharma ai training · artificial intelligence · curriculum design · pharmaceutical upskilling · roi measurement · data science education · skills gap

Original article: https://intuitionlabs.ai/articles/pharma-ai-training-program-curriculum-roi



In this article

1. Executive Summary
2. Introduction and Background
3. The AI Opportunity in Pharma
4. The Skills Gap and Strategic Imperative
5. Curriculum Design for Pharma AI Training
6. Educational Modalities and Tools
7. Tools and Technologies for Training
8. Evaluating and Measuring ROI of AI Training
9. ROI Frameworks and Metrics
10. Data Collection and Attribution
11. Case Studies: Pharma Companies Upskilling in AI
12. Measuring Return on AI Training Investment
13. Discussion: Implications and Future Directions
14. Conclusion

Executive Summary

The pharmaceutical industry stands at an inflection point. Advances in AI – from generative language models to deep learning for drug design – promise to revolutionize drug discovery, clinical development, manufacturing, and commercialization. Strategy& (PwC), in a report published March 26, 2024, projected a potential **$254 billion in additional annual operating profit worldwide by 2030**, conditional on a high degree of industrialization of AI use cases. However, these gains will only be realized if the workforce is **AI-ready**. A growing body of evidence shows that pharmaceutical organizations currently face a severe AI/digital skills gap: nearly half of pharma executives cite a shortage of specialized digital talent as a top barrier to transformation (www.fiercepharma.com). At leading firms, this has spurred ambitious upskilling initiatives. For example, John Kell's March 2025 reporting stated that more than 56,000 Johnson & Johnson employees had taken a generative-AI course required before employees could use the technology; AstraZeneca launched a company-wide AI literacy program with tiered certifications (12,000 employees certified as of 2025) (www.astrazeneca.com); and Merck reported more than 50,000 employees regularly using its internal generative-AI platform, GPTeal, in Kell's March 2025 account.

This report provides an in-depth guide for designing an AI training program tailored to pharmaceutical teams. We begin with the background of AI's promise in pharma and the critical *skills gap* challenge (www.fiercepharma.com) (www.itpro.com). We review evidence and expert opinions on *why* pharma must upskill now, including industry surveys and case examples. We then outline **Curriculum Design**: the knowledge and skills that training should cover (foundations, data science, domain-specific AI, generative AI, AI ethics, etc.), role-based customization, learning modalities (e.g. bootcamps, online courses, microlearning), and examples of potential modules (see Table 1). We discuss **Tools and Platforms** supporting training: from

AI-powered learning management systems (LMS) and virtual labs to microlearning apps and immersive simulations (see Table 2). We illustrate how to integrate hands-on practice using real datasets (e.g. biological, clinical) and AI tools (Python, TensorFlow, NLP libraries, etc.).

A major section details **Measuring ROI** on AI training. We describe robust evaluation frameworks: from Kirkpatrick's levels of training evaluation to Phillips' ROI methodology. We highlight both *quantitative metrics* (exam scores, completion rates, performance improvements, time/cost savings, error reductions) and *qualitative indicators* (employee engagement, adoption rates). For financial evaluation, include benefits that can credibly be converted to money and report intangible outcomes separately (ROI Institute). We include a sample ROI calculation worksheet to demonstrate how to quantify benefits and costs (www.jarmatrixpharma.com).

Throughout, we ground recommendations in **evidence and expert opinion**. We cite recent surveys (e.g. Define Ventures' July 2025 findings: 70% of surveyed pharma leaders viewed AI as an immediate priority, rising to 85% among the top 20 companies), research studies, and interviews/articles with industry leaders. We review **Case Studies** from top pharma companies: Johnson & Johnson, Merck, AstraZeneca, Novartis, etc., each illustrating different approaches (e.g. company-wide mandates, role-specific labs, gamified certifications). We also draw on analogous insights from broader L&D practice (e.g. effective microlearning techniques (www.slideshare.net), tying learning to quality metrics (www.pharmaceuticalprocessingworld.com)).

Finally, we discuss **Implications and Future Directions**. Key themes include the need for continuous learning pipelines (beyond one-off training), embedding AI and change-management into corporate culture, ensuring regulatory compliance training for AI, and the long-term shift to an AI-augmented workforce. We highlight the strategic importance of measuring and communicating training ROI to secure ongoing investment. Recommendations stress cross-functional collaboration (L&D, IT, compliance, R&D) and building "learning ecosystems" that adapt as AI technology evolves.

By synthesizing data, case studies, and best practices, this report equips pharmaceutical leaders and training professionals with a comprehensive roadmap for building an effective AI training program—covering curriculum, delivery tools, and ROI measurement—to drive real business and clinical outcomes.

Introduction and Background

The AI Opportunity in Pharma

Artificial intelligence (AI) and machine learning (ML) are poised to **transform pharmaceutical science and operations**. Recent advances—such as DeepMind's AlphaFold for protein folding and generative models for molecular design—have shown that AI can tackle fundamental R&D challenges. AI is increasingly applied across the **drug value chain**: target identification, compound optimization, predictive toxicology, biomarker discovery, adaptive clinical trial design, and beyond. For example, ML algorithms can triage patient subpopulations for trials or analyze real-world data for post-market safety. Moreover, tools like large language models (e.g. GPT) can draft regulatory documents, summarize literature, or assist in medical writing.

The *business rationale* for AI in pharma includes potential gains in operations, R&D, commercial activities, and enabling functions. In its March 26, 2024 report, Strategy& projected **$254 billion in additional annual operating profit worldwide by 2030**, assuming extensive industrialization of AI use cases. This is a conditional projection, rather than an observed industry result.

However, realizing this potential hinges on the workforce. Industry surveys identify AI/digital skills shortages as barriers to adoption. For instance, a GlobalData survey reported that **49% of pharmaceutical executives** see a digital skills shortage hindering transformation (www.fiercepharma.com). In its May 2019 survey release, the Pistoia Alliance reported that **44% of respondents** cited lack of skills as a barrier to AI/ML adoption.

The skills gap has become a boardroom concern. Define Ventures' July 2025 report found that 70% of surveyed pharma leaders considered AI an immediate priority, rising to 85% among the top 20 companies. AstraZeneca's April 2025 account describes training that gives employees practical AI knowledge while emphasizing responsible and ethical use. The FDA's January 2025 draft guidance is not for implementation and contains nonbinding recommendations. It proposes a risk-based framework for assessing AI-model credibility in a particular context of use when AI produces information or data supporting regulatory decisions about drug safety, effectiveness, or quality. Training can help teams understand these recommendations. In PwC's 2017 survey of 10,000 people in the UK, Germany, China, India and the US, 74% were ready to learn a new skill or retrain to remain employable, while 37% believed automation put their jobs at risk.

In sum, the global pharma industry faces a mandate to **transform its talent base**. The remainder of this report examines how to build an effective AI training program for pharmaceutical teams – specifying what to teach (curriculum), how to deliver it (tools and modalities), and how to prove its value (ROI measurement). We draw on the latest data – surveys, industry reports, and case studies – to offer a deep, practical guide.

The Skills Gap and Strategic Imperative

Pharma's slow adoption of AI at scale is often traced to *people and process issues*, not just technology. Industry surveys underscore persistent capability shortages. A 2024 GlobalData/FiercePharma survey of 109 biotech/pharma leaders found **skills shortage** to be the #1 transformation challenge, cited by 49% of respondents (www.fiercepharma.com). This outstripped concerns like funding or siloed operations. Larger companies reported even more acute gaps, likely because their broader operations (R&D, manufacturing, global launches) require diverse tech skills (www.fiercepharma.com). GlobalData's analysis noted that talent scarcity "continues to be a pressing issue for pharmaceutical companies" with "no quick solution" (www.fiercepharma.com).

Beyond surveys, evidence of need is seen in investment patterns. KPMG's April 2026 release on its Q1 2026 AI Pulse survey reports findings for UK business leaders: skills gaps and risks such as data privacy and cybersecurity were cited as barriers to demonstrating AI-related ROI (46%). It also reports that 61% were upskilling or reskilling their workforce, or planning to do so. This is cross-industry evidence, not a pharma-specific survey. Define Ventures' July 2025 release reported that **85% of executives were increasing AI investments**. This shift makes sense given the tangible early wins on offer. For example, Aizon's Recordati case study reports that implementing its AI-driven manufacturing solution increased yield by **1.5% within three months**, reducing **cost of goods sold (COGS) by 2%**. Similarly, Takeda's 2024 CEO letter described AI/ML proofs of concept for risk classification and deviation summaries in manufacturing and quality control.

Anecdotally, many companies have seen rapid ROI from targeted training: a scenario-based compliance training yielded a **35% drop in process deviations** at one site, saving ~$280k annually (www.jarmatrixpharma.com).

These examples illustrate the *opportunity cost* of inaction. If a trained AI model can pay for itself in weeks, then failing to train staff is a risk. Conversely, upskilling drives innovation: AstraZeneca's CDO notes that by "future-proofing" employees in AI, the company aims to compress drug discovery timelines and deliver therapies faster (www.astrazeneca.com). As industry leader Maciej Szymaszek of AZ put it, AI "opens tremendous transformative business opportunities—bringing value, improving efficiency, and enabling innovation" (www.astrazeneca.com). To capture such gains, companies must rapidly build "an AI-ready workforce" through intentional training strategies.

Curriculum Design for Pharma AI Training

Designing an AI training curriculum for pharmaceutical teams requires balancing **foundational data/AI skills** with **domain-specific knowledge** and compliance. The goal is to equip scientists, engineers, and support staff with enough technical capability to leverage AI tools *fluently* in their work, while also grounding them in the ethical and regulatory constraints of pharmaceuticals. Key principles include:

- **Role-based customization:** Training must match learners' roles (R&D, clinical, quality, commercial etc.). Data scientists in pharma need advanced ML modeling skills plus drug-domain context, whereas lab technicians might need only basic AI literacy and an understanding of specific applications (e.g. image analysis for pathology). Senior leaders need awareness of AI strategy and risk management. We recommend developing separate learning paths or modules for major function-groups (www.pharmaceuticalprocessingworld.com) (pharmaconsulting.ai).
- **Curriculum layers:** A typical program might have layered offerings. For example:
- **Core Modules:** General AI fundamentals (statistics, Python/R programming, ML concepts, data visualization).
- **Specialized Tracks:** Domain-relevant topics (e.g. chemoinformatics, bioinformatics, medical imaging analysis, NLP for clinical text) and advanced AI (deep learning, generative models, ML Ops).
- **Regulatory & Ethics:** Training on GxP-quality practices for AI (data integrity, model validation), FDA/EMA AI guidelines, data privacy (HIPAA/GDPR), and AI ethics in healthcare (pharmaconsulting.ai) (maxlearn.com).
- **Soft Skills & Change Management:** Data literacy, critical thinking, and "bilingual fluency" – the ability to collaborate with both IT and business teams. Case studies in AI project governance and cross-functional teamwork are valuable (pharmaconsulting.ai) (www.cdomagazine.tech).
- **Hands-On Projects:** Embed practical exercises throughout – see below.
- **Modular content and microlearning:** The curriculum should allow bite-sized learning. Life sciences professionals often juggle multiple responsibilities, so "microlearning" – short modules or flashcards – can reinforce retention. Plan refresher activities and measure retention in the intended workforce. Murre

and Dros's 2015 forgetting-curve replication studied one participant relearning lists after intervals from 20 minutes to 31 days; it does not establish a universal one-week workplace-training loss rate. AI-powered platforms can automate this: for instance, refresher quizzes on compliance standards or coding exercises. Modules should explicitly tie to job tasks (e.g. using a small dataset of assay results to build a predictive model) and be updated regularly as science evolves (www.pharmaceuticalprocessingworld.com) (www.slideshare.net).

- **Integration with workflow:** Training should not occur in isolation. Wherever possible, embed learning into actual workflows. For example, integrate data analysis challenges into ongoing projects, or conduct workshops at lab sites. Veeva's model suggests linking training tasks to quality events: when an SOP changes, trigger a microlearning review of that SOP for relevant staff (www.pharmaceuticalprocessingworld.com). Learning-in-the-flow-of-work ensures relevance: one study notes effective training happens when content meets learners at point-of-need on the job (www.pharmaceuticalprocessingworld.com).

With these principles, a sample curriculum outline might include:

- **Foundations of Data Science:** Statistics, probability, data structures. Basic coding (Python, R) and tools (e.g. Pandas, NumPy).
- **Machine Learning Fundamentals:** Regression/classification, clustering, model evaluation. Hands-on use of ML libraries (Scikit-learn) on simple pharma datasets (e.g. predicting compound activity).
- **Domain Bioinformatics/ Cheminformatics:** Introduction to biochemical data, genomics, compound databases. Techniques like sequence analysis, molecular docking, QSAR modeling.
- **AI in Drug Discovery:** Deep learning for molecule generation; case study of AlphaFold. Using generative models to propose lead compounds.
- **Clinical Data Analytics:** ML for patient stratification, electronic health record (EHR) data mining, real-world evidence.
- **NLP for Pharma:** Text mining for medical literature, summarizing clinical trial protocols, automating adverse event reporting.
- **Quality & Manufacturing:** Predictive maintenance of equipment, process anomaly detection, simulation of manufacturing processes with digital twins.
- **RegTech & Compliance:** AI tools for regulatory writing, ensuring traceable AI outputs, cybersecurity for AI models.
- **Generative AI & Chatbots:** Safe use of LLMs (e.g. ChatGPT) in pharma contexts – prompts engineering, hallucination mitigation, data privacy (pharmaconsulting.ai).
- **Analytics Tools & Platforms:** Training on cloud ML platforms (AWS SageMaker, Azure ML), version control (Git), and experiment tracking (MLflow).
- **Ethical/Governance Issues:** AI ethics case studies; "do's and don'ts" of vendor tools (pharmaconsulting.ai); aligning with company AI Principles (e.g. AstraZeneca's published ethics guidelines).

Table 1 (below) illustrates a hypothetical modular curriculum for an AI training program in pharma.

Curriculum Component	Topics & Activities
Foundational Data Skills	Statistics & probability; Python/R programming; data visualization. Exercise: analyze small assay dataset (Excel to Python).
Machine Learning Basics	Supervised & unsupervised learning (regression, classification, clustering); feature engineering. Activity: build/predict simple model.
Domain AI Applications	Bioinformatics (genomics, protein structures); cheminformatics (molecular descriptors); clinical data analysis. Projects: simulate trial endpoints; analyze sequence data.
Generative AI	Large Language Models (LLMs) for clinical trial design, ChatGPT prompts for literature search; generative chemistry models for molecules. Hands-on: fine-tune a small LLM on medical abstracts.
Regulatory & Compliance	GxP requirements for data and software; FDA/EMA AI guidance (validation, transparency); data privacy/ethics. Case study: EMA AI guidelines (Jan 2026).
Quality & Manufacturing	AI in manufacturing (predictive maintenance, digital twins); QA automation (CAPA analysis); process simulation. Workshop: use ML to predict batch yield.
Commercial & Marketing	AI for market segmentation, sales forecasting; digital marketing analytics. Example: cluster HCP prescribers, CRM data analysis.
Soft Skills/Change Mgmt	Data-driven decision-making mindset; cross-functional collaboration; change leadership. Role-play: AI adoption business case.
Practical Projects	Real-world challenges (drug repurposing hackathon, AI in pharmacovigilance) using curated pharma datasets.
Tools Training	Hands-on with AI/ML libraries (TensorFlow, PyTorch, spaCy for NLP); cloud platforms (AWS, Azure); Jupyter notebooks.
Assessment & Certification	Quizzes/exams for core modules; capstone project presentations with tangible metrics improvements.

Table 1. Example curriculum framework for an AI training program in pharmaceutical teams.

The curriculum should also define **learning outcomes** aligned with corporate goals. For instance, tying modules to strategic objectives (what Kent Malmros terms a “bill of learning” tied to quality goals (www.pharmaceuticalprocessingworld.com)). If a goal is “reduce data entry errors by 90%,” then modules on data validation and automation could be linked to that metric. This alignment makes it easier to later measure impact.

Educational Modalities and Tools

Multiple delivery methods should be blended for maximum effect. Common approaches include:

- **Instructor-led Bootcamps and Workshops:** Multi-day intensive courses (on-site or virtual) focusing on hands-on skills. These can accelerate learning through live coding sessions, group projects, and expert Q&A. Bootcamps can integrate cross-functional teams (e.g. pairing a data scientist with a lab scientist)

to foster collaboration. In practice, leading pharma firms have run internal bootcamps; for example, Merck offered developer bootcamps of “half a day to 10 days” as part of its GPTeal upskilling (dailythebusiness.com).

- **E-Learning Platforms:** Self-paced online courses (via Coursera, edX, or an internal LMS). Many MOOCs now cover healthcare AI. Pharma-specific courses (some by Novartis, University programs) can complement. Using an LMS allows tracking completion and quiz results for ROI analysis. AI-driven LMS (with adaptive learning paths and chatbot support) can personalize the experience (www.slideshare.net). In a June 2024 announcement, LinkedIn Learning reported that 76% of learners said its AI-powered coaching had helped them build skills.
- **Microlearning and Gamification:** Short interactive modules delivered via mobile apps or portals. These target just-in-time learning (e.g. a 5-minute explainer video on an AI concept, followed by a quick quiz). AI can power chatbots or virtual assistants that answer on-demand questions. Gamified elements (badges, leaderboards) boost engagement, especially in a culture shift toward ongoing learning (www.slideshare.net).
- **Simulation and Immersive Training:** Consider VR or AR exercises for complex tasks, such as practicing an AI-enabled manufacturing process without using production equipment. Link each exercise to a specific quality goal and evaluate its results. A training-design article by Kent Malmros recommends connecting training to quality objectives.
- **Peer Learning and Communities of Practice:** Encourage sharing of AI insights across the organization. This could take the form of internal “AI guilds” or forums where practitioners post solutions, or hackathons bringing teams together. Some companies incorporate AI content into leadership training or mentorship programs. AstraZeneca, for example, created an “AI community of learners” with content in 12 languages to foster company-wide learning (www.astrazeneca.com).
- **Hands-on Projects:** Critical for cementing skills. Design real projects (drug screening pilots, predictive models for quality checks, etc.) into the training. Data challenges or Kaggle-like competitions on proprietary or open datasets can motivate. For instance, Novartis has run hackathons unlocking new uses of internal data. Ensure projects have clear objectives (improve a metric or validate an idea) and present outcomes to management.

Throughout, **continuous learning** should be emphasized. AI is rapidly evolving: training curriculum must be refreshed frequently (introducing latest models, tools, case studies). Rather than a one-time course, successful programs (e.g. J&J’s) build **“learning ecosystems”** where resources, documentation, and follow-up sessions are always available (www.cdomagazine.tech). Maintaining internal AI trainers or “AI champions” can help sustain momentum.

Tools and Technologies for Training

An effective training program relies on the right **training tools/platforms**. These range from general learning-management solutions to advanced AI-driven systems. Some key categories include:

- **Learning Management Systems (LMS) and Portals:** Core platforms to host courses, track progress, and report on metrics. Examples include corporate LMS (Moodle, Cornerstone, SAP Litmos), or enterprise platforms (Coursera for Business, Udemy for Business). Modern *AI-powered LMS* can automate role-based assignment and personalize content. For instance, an AI-LMS can analyze an employee's background and performance to recommend specific modules (predictive analytics for learning paths) (www.itpro.com). Other features: automated compliance tracking (alerting when certifications expire), and integration with HR systems.
- **Interactive Authoring Tools:** Software for creating e-learning content (Articulate Storyline, Adobe Captivate). These often include templates for quizzes and simulations. AI-assisted authoring tools can auto-generate quiz questions or translate content. In pharma, having templates pre-validated for regulatory topics saves time.
- **Virtual Classrooms/Web Conferencing:** Tools like Zoom, Microsoft Teams with breakout rooms for remote workshops. Many training events (especially post-2020) use hybrid models, blending in-person demos with remote participants.
- **Simulation and VR/AR Platforms:** As noted, immersive tech can train on complex procedures. Platforms like Strivr or VXR Fit allow building VR modules (though careful validation is needed for GMP compliance). Augmented Reality apps (e.g. Microsoft HoloLens) can overlay instructions on equipment during training.
- **AI Tutors and Chatbots:** Virtual assistants that answer learner questions 24/7. For example, some companies deploy ChatGPT-like agents limited to vetted pharmacopeia content, or build a knowledge base chat from Q&A sessions. These can remind learners of upcoming modules or clarify concepts interactively.
- **Data Science/Jupyter Notebooks:** Training often requires coding practice. Cloud notebook environments (JupyterHub, Google Colab, Databricks) allow learners to run Python/R code without local setup. These can be preloaded with example pharma datasets (molecule libraries, clinical trial data). Existing Azure Lab Services users should transition their workflows to another Microsoft service or Microsoft partner solution by June 28, 2027. Hands-on labs using notebooks are indispensable for teaching ML.
- **Collaborative Platforms:** Tools like Git/GitHub for code sharing, Slack/MS Teams channels for L&D community, and internal wikis (Confluence) for documenting best practices. Collaborative tools ensure knowledge is captured and shared beyond one-off courses.
- **Content Repositories:** Central libraries of videos, slide decks, datasets. For example, a corporate "AI knowledge base" might store recorded lectures, reading lists, annotated data sets, and tool configuration guides. Having a go-to resource reduces duplication of effort.
- **Analytics and Reporting Dashboards:** To measure progress, tools must provide dashboards. This might be part of the LMS or an HR Analytics platform. Key metrics include completion rates, test scores, time spent per module, and post-training performance data. Advanced setups can track whether trained staff actually use AI tools (via system logs) and correlate to business outcomes.

Table 2 outlines sample tools by category.

Tool Category	Example Platforms/Tools	Purpose / Use Case
Learning Management (LMS)	Cornerstone, SAP Litmos, Moodle, Degreed, Coursera for Business	Manage courses, track completion/certification, role-based assignment
Microlearning Apps	Axonify, Grovo, EdApp (with AI features)	Deliver short, on-demand learning modules and quizzes
Virtual Classroom	Zoom, Microsoft Teams, Cisco Webex	Instructor-led remote training, group workshops
Authoring Tools	Articulate 360, Adobe Captivate, Elucidat	Build interactive e-learning lessons (videos, quizzes, scenarios)
Collaborative Tools	Slack/MS Teams, GitHub, SharePoint	Peer learning, code sharing, L&D communities, project collaboration
Data Science Environments	Jupyter Notebook, Google Colab, Databricks, AWS SageMaker	Hands-on ML labs, coding exercises with pharma datasets
AI Assistants/Chatbots	ChatGPT (with enterprise limits), IBM Watson Assistant	Personalized Q&A, tutoring on demand, FAQs in pharma context
VR/AR Platforms	Strivr, VXR Academy, Microsoft HoloLens	Simulated labs, equipment training, safety procedures
Analytics Dashboards	Power BI, Tableau, LMS built-in analytics	Monitor training KPIs (scores, ROI metrics), usage tracking
Content Repositories	Confluence, SharePoint, internal LMS libraries	Store recorded sessions, documents, code examples

Table 2. Sample categories of tools and platforms for implementing an AI training program.

Together, these tools support a **scalable training ecosystem**. For example, Johnson & Johnson built an AI-driven learning platform (a “learning experience platform”) so that all 150,000 employees can explore career paths and skills (www.cdomagazine.tech). This included integrating AI (e.g. automated skill gap analysis and recommendations) directly into their job catalog. Such sophisticated infrastructures – though not strictly required for a starter program – illustrate how enterprise-grade tools can personalize and scale learning.

Evaluating and Measuring ROI of AI Training

Any large training investment must demonstrate value. Training ROI goes beyond completion certificates; it should translate into measurable **performance gains** for the company. In pharma, this includes both financial and non-financial benefits: faster drug development, higher quality, reduced errors, and enhanced innovation. Drawing on well-established evaluation frameworks, we outline how to quantify the return on an AI training program.

ROI Frameworks and Metrics

A common approach is to adapt Kirkpatrick's four levels of training evaluation (Reaction, Learning, Behavior, Results) along with Phillips' ROI calculation (www.jarmatrixpharma.com) (www.itpro.com). At each level, specific metrics or data can be collected:

1. **Reaction (Satisfaction):** Immediately post-training, gather feedback via surveys. Metrics: *percentage of positive ratings*, qualitative comments. Did participants find the content relevant and engaging? Though not an ROI metric itself, high satisfaction is often correlated with learning uptake (www.jarmatrixpharma.com).
2. **Learning (Knowledge Gain):** Use assessments to measure how much participants learned. Metrics: *pre-and post-test scores*, assignment grades, certification pass rates. For example, compare pre-training and post-training quiz scores on AI concepts. Many programs award digital badges or certificates when passing, providing quantifiable learning achievement data.
3. **Behavior (Application):** Evaluate whether employees apply new skills on the job. This requires collecting data over weeks/months. Metrics: *usage logs* (e.g. frequency of AI tool use, number of real projects initiated), manager observations, and self-reported adoption. Surveys of supervisors can ask whether trainees are incorporating AI methods into their work. Work samples (e.g. number of automated reports generated instead of manual) can be tracked. For instance, AstraZeneca tracks how many employees progressed through their competency tiers (Bronze/Silver/Gold) and what projects they undertook (www.astrazeneca.com).
4. **Results (Business Impact):** Tie training to tangible business outcomes. Here, metrics are context-dependent: reduced process cycle times, cost savings, revenue uplift, quality improvements, or risk avoidance. Examples: improvements in drug screening yield, faster regulatory submissions, or fewer compliance issues. One must establish baseline values for such metrics to measure improvement. In our case studies, there are illustrative results: training-driven improvements in onboarding time (reducing rep ramp-up by 5 weeks, saving ~$15k per rep (www.jarmatrixpharma.com)), and declines in quality deviations (35% fewer investigations (www.jarmatrixpharma.com)).

After quantifying Benefits at Level 4, **ROI (Level 5)** is calculated:

ROI (%) = (Total Training Benefits − Training Investment) / Training Investment × 100

This Phillips ROI methodology requires attributing how much of the business gain is due to training (versus other factors). For example, if a manufacturing efficiency improved, credit only the portion plausibly linked to staff learning. Conservative assumptions are recommended.

Example ROI Calculation

The following is **hypothetical arithmetic, not a measured AI-training outcome**. Assume total training costs of $100,000 and separately attributable annual monetary benefits of $280,000 from avoided deviations, $50,000 from productivity, and $50,000 from reduced turnover. Under these assumptions, benefits total $380,000 and ROI = ($380,000 − $100,000) / $100,000 × 100 = 280%. These are assumed inputs, not verified savings.

JAR Matrix's aseptic-processing example describes scenario-based eLearning; it does not identify an AI or VR intervention. Validate attribution and avoid overlapping benefit categories before using a similar calculation in a business case.

An analogous example comes from intercultural training. RW3 CultureWizard's Pfizer case study describes a program for a California vaccine sales and marketing team and reports that Pfizer's analytics team calculated $7.50 for every $1 spent on the solution. This vendor-reported case is not an AI-training ROI benchmark. Table 3 outlines metrics to track for an AI training program.

Evaluation Level	Sample Metrics	Data Sources
Reaction	Course satisfaction (%)	Post-training surveys
Learning	Score improvements (exam pass rate, avg. pre/post test)	LMS quiz results, certificates achieved
Behavior	% of trainees applying AI on job (self-report)	Surveys, usage logs in AI tools
	Increase in AI tool usage (e.g. models deployed)	System logs, project records
	% of employees reaching competency levels (e.g. Bronze→Silver etc)	Internal certification data (www.astrazeneca.com)
Results	Productivity metrics (e.g. % reduction in task time)	Performance KPIs, process metrics
	Quality metrics (e.g. deviations/CAPA issues)	Compliance reports (reduced incidents)
	Cost savings (e.g. reduced outsourcing, scrap, rework)	Financial reports, budget variances
	Revenue impact (e.g. faster product launch)	Business KPIs, time-to-market data
ROI (Financial)	Calculated ROI % (benefits - cost)/cost	Finance L&D analysis (www.jarmatrixpharma.com)
Intangible (Engagement)	Employee engagement scores, retention rate	HR surveys, turnover statistics

Table 3. Sample ROI metrics across evaluation levels for an AI training program.

Data Collection and Attribution

Collecting the above metrics requires integrated tracking. An effective approach is to baseline metrics *before* training, then measure changes after implementation. For instance, if average cycle time for data processing or report generation is known pre-training, any decrease post-training can be partly credited to new skills. Tools can automate some data collection (e.g. using LMS analytics for reaction/learning data, or BI dashboards for project metrics).

Statistical significance and time horizons matter. ROI teams should report results at multiple timepoints (1 month, 6 months, 1 year) to capture both immediate effects (e.g. reduced training costs via faster onboarding (www.jarmatrixpharma.com)) and longer-term gains (e.g. strategic adoption of AI in R&D). It is also important to isolate the effect of training from other initiatives. For example, if a new AI software was deployed concurrently, one might run a pilot group vs control group to gauge training-specific impact.

Confidence varies by outcome: in KPMG's Q1 2026 UK findings, 14% were confident measuring ROI from improved analytics used by the C-suite in business decision-making, while 76% were confident measuring productivity ROI. We recommend upfront allocation of budget for measurement (surveys, data analysts) – "what gets measured gets managed." Demonstrating ROI with hard data (as above) not only justifies the current program but unlocks funding for continuous learning.

Case Studies: Pharma Companies Upskilling in AI

Real-world examples illustrate how leading pharma firms are approaching AI training. The following cases highlight diversity in scale and strategy:

- **Johnson & Johnson:** With ~150,000 employees globally, J&J established an enterprise AI learning ecosystem under its first Chief Learning Officer (www.cdomagazine.tech). After aligning all job roles to necessary skills, J&J opened its AI curriculum to *every* employee (www.cdomagazine.tech). Key elements: a proprietary AI platform ("learning experience platform") that maps careers, AI skills, and learning paths; levels of AI literacy training from introductory to advanced; and AI tools integrated into daily workflows (J&J built its own secure GenAI environment). An interviewed J&J executive emphasized broad upskilling: "We provided **incredible opportunities for all employees to upskill** … in GenAI fundamentals and prompt engineering" (www.cdomagazine.tech). In her March 25, 2025 interview, Sandra Humbles reported that employee engagement scores in learning and career development had surpassed 80. The interview does not specify the scoring scale; this is not an AI-training participation percentage. J&J's story underscores that large-scale AI training can be woven into talent development, not just L&D.
- **Merck (MSD):** In John Kell's March 2025 reporting, Merck said more than 50,000 employees regularly used GPTeal, its proprietary platform providing access to large language models while protecting company data from external exposure. This figure measures platform adoption; it does not establish how many employees completed AI training.
- **AstraZeneca:** AZ launched an enterprise-wide "Thriving in the Age of AI" upskilling campaign starting late 2024 (www.astrazeneca.com). This was a highly structured program available to *all* employees, with tiered certification (Bronze through Diamond) and multi-modal content (lectures, labs, workshops) (www.astrazeneca.com). As of April 2025, AZ reported **12,000 employees certified** at various levels (www.astrazeneca.com). Learning content is offered in 12 languages to ensure global access. Importantly, AZ tied AI learning to ethical principles ("one of the first to publish AI ethics guidelines") and to business metrics: AZ executives explicitly stated the goal of "compress(ing) timelines from drug discovery to patient delivery" by training staff in AI (www.astrazeneca.com). This program's design—combining CEO sponsorship, clear competency paths, and alignment with scientific goals—serves as a model of strategic L&D investment.

- **Novartis:** In a September 16, 2026 company article, Novartis US described a new data and AI learning program and stated that approximately 6,000 employees would complete its initial level by year-end. This was a US program target, not a count of completed training or global enrollment.
- **Others:** Many other pharma/biotech firms are implementing upskilling efforts. For example, Takeda's 2024 CEO letter described AI/ML proofs of concept for risk classification and deviation summaries in manufacturing and quality control. Large biotech Genentech (Roche) and Regeneron have reportedly set up internal data science training academies. Even smaller firms are joining: in Swiss pharma Roche opened a "data factory" in 2023 with associated training, and Japanese Merck KGK reportedly uses generative AI in quality reviews after staff training sessions. Diverse case reports (including Merck in Italy or Recordati improving manufacturing AI) reflect that *the training imperative is industry-wide*.

These examples highlight key lessons:

1. **Scale:** Leading pharmas treat AI training as *enterprise* initiatives, not optional. Upskilling thousands of employees is viewed as essential for innovation.
2. **Multifaceted Approach:** Companies combine e-learning, live workshops, hackathons, certification, and executive buy-in. The content spans broad awareness (what is AI?) to deep technical skill-building.
3. **Alignment with Business:** Programs are tied to strategic goals. AZ links AI literacy to faster R&D; J&J connects it to career development; Merck focuses on productivity tools. This alignment is critical for organizational support and ROI.
4. **Measurement and Iteration:** Most companies set milestones (e.g. number of people certified) and continuously update content. For instance, AZ noted accelerating to "agentic AI" in the next phase (www.astrazeneca.com).

Measuring Return on AI Training Investment

Having established robust metrics (see Table 3), organizations must implement a measurement plan. This typically involves:

- **Baseline Data Collection:** Before launching training, record current performance metrics in key areas (development timelines, error rates, tool usage). Also baseline employee skill assessments and survey attitudes toward AI.
- **Post-Training Assessment:** Immediately after courses, capture reaction and learning data (quiz scores, satisfaction). Assign "AI training champions" or L&D analysts to follow up periodically (e.g. 3, 6, 12 months) to gauge behavioral and results changes.
- **Comparative Analysis:** Whenever possible, use control groups or phased rollouts to compare trained vs untrained teams. For example, if only one department receives early training, its outcomes can be contrasted with others. This helps isolate training effects.
- **ROI Calculation:** Monetize only benefits with credible valuation and attribution; report other outcomes as intangibles (ROI Institute). Explain any conversion from project counts to attributable monetary value and avoid double counting. Include relevant staff time, implementation, and evaluation costs. A count of

AI-enabled projects alone is not a monetary benefit.

- **Illustrative Commercial Example:** JAR Matrix describes personalized digital learning for 200 new sales representatives that shortened a 12-week onboarding baseline by five weeks per person. Its stated $15,000 per representative, or $3 million for the cohort, should be treated as the example's valuation of released onboarding capacity, rather than verified payroll savings. The example does not identify an AI intervention.
- **Continuous Feedback:** Training ROI is not "set and forget." Leadership should review metrics regularly. If adoption is lagging (e.g. <50% tool usage after training), adjustments such as refresher modules or mentoring may be needed (www.itpro.com). Document lessons learned to improve subsequent cohorts.

Key Takeaway: Well-defined metrics and early buy-in from finance/operations are as crucial as the training content itself. Presenting an evidence-based ROI fosters further investment.

Discussion: Implications and Future Directions

Pharma leaders face a strategic imperative: investing in human capital to reap the rewards of AI. The evidence reviewed here demonstrates that **AI training is not a cost center but a value enabler**. Companies that hesitated risk falling behind competitors who leverage AI-augmented productivity.

Looking forward, several trends and recommendations emerge:

- **Continuous Lifelong Learning:** Unlike traditional one-off workshops, AI skills will require continuous updates. AI will evolve rapidly (as executives note, today's AI is "least capable it will ever be" (www.astrazeneca.com)). Institutes of higher learning and MOOCs will continually update content. Organizations should institutionalize periodic refreshers and tap into new learning channels (podcasts, social communities, micro-credentials). Gamified upskilling paths (e.g. AZ's tier system) keep learners engaged long-term.
- **Integration with Digital Transformation:** AI upskilling works best as part of broader digital initiatives. Training programs can be integrated with digital labs or pilot projects; for example, employees could be seconded to a "data factory" team for immersive experience. Likewise, new hires (especially PhDs or engineers) increasingly expect AI skill development as part of their career path.
- **Change Management:** Effective training requires change management. L&D must partner with HR, IT, and compliance. Communication campaigns to build excitement ("AI for All") help. Addressing fears is vital: in PwC's 2017 five-country survey, 37% of respondents believed automation put their jobs at risk. Explicitly framing upskilling as empowering rather than threatening improves uptake (as AstraZeneca's leaders emphasize).
- **Ethical and Regulatory Preparedness:** Include risk-based AI assessment and documentation in the curriculum. The FDA's January 2025 draft guidance contains nonbinding recommendations for AI supporting drug regulatory decisions. The joint FDA/EMA January 2026 guiding principles address good

AI practice across the drug product life cycle, including multidisciplinary expertise. FDA describes them as principles developers can consider; they are good-practice recommendations, rather than a staff-training mandate with a 2026 effective date.

- **Measuring Soft ROI:** Beyond hard returns, AI training can boost intangibles like employee satisfaction and retention. Tech skills make pharma jobs more attractive to STEM talent. Some companies tie training completion to performance reviews and career advancement, reinforcing culture change.
- **Customized Vendor Collaboration:** External partners (consultants, universities, vendors) will continue to play a role. For example, pharmaceutical associations or the AI Vendor Alliance may offer certification programs. Companies can benchmark outcomes by sharing anonymized training results in industry consortia (e.g. Pistoia Alliance studies).
- **Localization and Accessibility:** Multinational firms must adapt content culturally and linguistically. AstraZeneca's offering in multiple languages (www.astrazeneca.com) is a best practice. Virtual training helps reach global sites, ensuring consistency.
- **ROI Evolution:** What gets measured often shapes behavior. If HR focuses on traditional KPIs (seat time, completion), that's what L&D delivers. We recommend expanding ROI to include innovation metrics: number of AI-driven new initiatives, intellectual property filed, etc. Embracing a broad ROI perspective (as KPMG suggests, beyond profit to decision quality and upskilled workforce (www.itpro.com)) will highlight training's strategic value.

In sum, designing an AI training program in pharma is a **complex but high-leverage initiative**. This report's comprehensive approach—from curriculum to tools to ROI—provides a blueprint grounded in research and practice. As one AstraZeneca executive summarized: "By upskilling our employees in AI at speed and scale, we're future-proofing our workforce to make agile, informed decisions that drive both business and scientific breakthroughs" (www.astrazeneca.com). The future of pharma will belong to those organizations that have prioritized building AI-literacy at all levels.

Conclusion

Building an AI-ready workforce is no longer optional for pharmaceutical companies aiming to stay competitive. This report has laid out a detailed, evidence-based roadmap for creating an effective AI training program for pharma teams, covering curriculum design, supporting tools, and ROI measurement strategies.

Key conclusions include:

- **Urgency and Value:** AI presents multi-billion-dollar opportunities in pharma, but requires human capital to harness. Past and emerging data show that companies taking bold steps in upskilling—through comprehensive programs and cultural initiatives—are gaining efficiency, innovation, and profitability.
- **Curriculum and Content:** A mix of foundational data science, domain-specific AI applications, and compliance training is essential. Learning should be modular, role-specific, and continually updated. Hands-on and project-based elements (hackathons, case studies) make training stick, as supported by

research on microlearning and active learning (www.slideshare.net) (www.pharmaceuticalprocessingworld.com).

- **Delivery Tools:** A suite of modern platforms—from AI-enhanced LMS to VR simulations—can scale training efficiently. Importantly, training programs themselves should leverage AI (adaptive learning) and align workflows (training in context of actual work). Creating communities of practice and embedding learning tools (e.g. chatbots) into daily work helps maintain momentum.
- **Measuring Outcomes:** Build evaluation into the program from the start. Separate monetary benefits from intangibles (ROI Institute); report hypothetical calculations and analogous non-AI training cases as such.

Future Outlook: The landscape will continue to evolve. We anticipate more sophisticated metrics (e.g. AI-driven learning analytics), deeper industry-academic partnerships for curriculum, and perhaps even regulatory requirements to validate workforce AI competence. The learnings from 2022–2026 – including the pivot to generative AI – will inform the next generation of training programs.

In closing, **the objective is clear**: equip pharmaceutical teams with the skills to use AI responsibly and creatively. The transformative potential on patient outcomes and corporate success is too great to ignore. By following the comprehensive design and measurement strategies outlined here, pharma organizations can build training programs that are not just “a nice-to-have,” but a cornerstone of their 21st-century R&D and business strategy.

End of Report.

Sources: All data and quotations are drawn from industry literature, news reports, white papers, and expert blogs as cited above (www.fiercepharma.com) (www.pharmaceuticalprocessingworld.com) (www.cdomagazine.tech). These include analyses from PwC Strategy&, GlobalData, Veeva, JAR Matrix Pharma, KPMG, FiercePharma, and official statements from AstraZeneca, Johnson&Johnson, Merck, among others.

Source links

Links cited in this article, in order of first appearance. Full addresses are provided for readers using extracted text.

1. https://www.strategyand.pwc.com/de/en/industries/pharma-life-sciences/re-inventing-pharma-with-artificial-intelligence.html
2. https://www.fiercepharma.com/marketing/skills-shortage-still-holding-back-pharmas-digital-transformation-survey
3. https://www.linkedin.com/posts/john-kell-3565041a_how-pharmaceutical-companies-are-training-activity-7305654616577200129-LbwY
4. https://www.astrazeneca.com/media-centre/articles/2025/upskillingAI.html%20
5. https://www.itpro.com/business/business-strategy/roi-is-about-more-than-profitability-when-it-comes-to-ai-adoption-heres-what-enterprises-are-looking-for
6. https://roiinstitute.net/whats-the-roi-in-ai
7. https://www.jarmatrixpharma.com/2026/01/28/training-roi-in-pharma-does-better-training-save-money
8. https://www.prnewswire.com/news-releases/big-pharmas-ai-adoption-is-reaching-a-tipping-point-amid-mounting-pressure-and-strategic-opportunity-finds-new-report-from-define-ventures-302507676.html

9. https://www.slideshare.net/slideshow/why-ai-powered-microlearning-is-the-best-approach-for-pharma-employee-training-pdf/276383700
10. https://www.pharmaceuticalprocessingworld.com/reinventing-employee-training-to-improve-quality-in-pharma
11. https://pistoiaalliance.org/ai/ai_life_sciences_held_back_may2019
12. https://www.astrazeneca.com/media-centre/articles/2025/upskillingAI.html
13. https://www.fda.gov/regulatory-information/search-fda-guidance-documents/considerations-use-artificial-intelligence-support-regulatory-decision-making-drug-and-biological
14. https://www.pwc.ro/en/press_room/assets/2017/EN/workforce-of-the-future.pdf
15. https://kpmg.com/uk/en/media/press-releases/2026/04/ai-no-longer-needs-traditional-return.html
16. https://www.aizon.ai/success-stories/how-recordati-improved-yield-by-1-5-in-just-three-months-with-aizons-ai-driven-solutions
17. https://www.takeda.com/investors/events/shareholder-letter-2024
18. https://pharmaconsulting.ai/artificial-intelligence-course-in-pharmaceutical-industry
19. https://maxlearn.com/blogs/ai-powered-microlearning-in-pharma
20. https://www.cdomagazine.tech/talent-development/deep-dive-how-ai-is-shaping-career-pathways-for-jjs-150000-strong-workforce
21. https://doi.org/10.1371/journal.pone.0120644
22. https://dailythebusiness.com/how-pharmaceutical-companies-are-training-their-workers-on-ai
23. https://www.linkedin.com/pulse/creating-personalized-learning-scale-hari-srinivasan-yhzze?tl=en
24. https://learn.microsoft.com/en-us/azure/lab-services/retirement-guide
25. https://www.rw-3.com/case-studies/pfizer
26. https://www.novartis.com/us-en/stories/novartis-us-invests-data-and-ai-capabilities-6000-employees
27. https://www.ema.europa.eu/system/files/documents/other/2026-01-13_ai-guiding-principles_ema-fda_en.pdf
28. https://www.fda.gov/about-fda/artificial-intelligence-drug-development/guiding-principles-good-ai-practice-drug-development

THE PUBLISHER

About IntuitionLabs

IntuitionLabs is an AI consulting, custom software development and data engineering firm serving pharmaceutical, biotechnology, medical-device and other life-science organizations. We work with clinical, regulatory, medical-affairs, commercial, quality and IT teams to connect technology decisions with the work people need to accomplish.

AI consulting and adoption

Our AI enablement services cover readiness assessments, use-case selection, governance and policies, team workshops, adoption measurement and ongoing advisory support. We help organizations structure the information layer behind AI: source material, context, permissions and maintained knowledge that make generated answers useful and reviewable. Private LLM inference and hosted AI options support teams evaluating how to operate AI with appropriate control over their data and infrastructure.

Software, data and life-science workflows

IntuitionLabs develops custom software for pharma and biotech, integrates enterprise systems, and builds data engineering and business intelligence solutions. Areas of focus include AI agents, regulatory research, medical writing, medical affairs, CMC information, competitive intelligence and clinical-document workflows. Our eTMF intelligence work includes cross-system reconciliation and inspection-readiness support.

Enterprise platforms and regulated delivery

We provide Veeva services, application support, managed services, integrations and custom applications, alongside enterprise content work involving platforms such as Egnyte. For regulated workflows, our services include GxP enablement, computer-system validation and software development addressing 21 CFR Part 11 requirements. The applicable controls, validation responsibilities and acceptance criteria are defined for each engagement.

Work with IntuitionLabs

Explore AI enablement, pharma and biotech software development, data engineering and BI, and Veeva services. Contact IntuitionLabs to discuss your workflow, information sources and implementation needs.

IntuitionLabs publishes educational research to help life-science teams make informed technology decisions. Coverage of a product or organization does not imply a client relationship, endorsement or partnership.

Website: https://intuitionlabs.ai

This article is educational. Verify consequential medical, legal, financial, regulatory and technical decisions with appropriate professionals and the cited primary sources. Company services are described separately from the article's research findings.