

A stylized tree graphic with a thick, curved trunk and several branches extending upwards and to the right. The leaves are represented by overlapping, semi-transparent green shapes. The background is a dark green gradient.

ATD Training Basics Series

2nd Edition

Technical Training

BASICS

Sarah Wakefield

2nd Edition

Technical Training
BASICS

Sarah Wakefield

atd
PRESS

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About the Training Basics Series

ATD's Training Basics series recognizes and, in some ways, celebrates the fast-paced, ever-changing reality of organizations today. Jobs, roles, and expectations change quickly. One day you might be a network administrator or a process line manager, and the next day you might be asked to train 50 employees in basic computer skills or to instruct line workers in quality processes.

Where do you turn for help? The ATD Training Basics series is designed to be your one-stop solution. The series takes a minimalist approach to your learning curve dilemma and presents only the information you need to be successful. Each book in the series guides you through key aspects of training: giving presentations, making the transition to the role of trainer, designing and delivering training, and evaluating training. The books in the series also include some advanced skills, such as performance and basic business proficiencies.

The ATD Training Basics series is the perfect tool for training and performance professionals looking for easy-to-understand materials that will prepare nontrainers to take on a training role. In addition, this series is the consummate reference tool for any trainer's bookshelf and a quick way to hone your existing skills.

Preface

When industrial accidents occur as a result of human error, it is only a matter of time before the inevitable question is asked: Where was the training?

In a world where things like safety, quality, and efficiency are essential, we cannot afford ineffective, inefficient technical training. Technical training must be done, and it must be done well in today's business environment. Yet there are few resources available that specifically discuss how to effectively develop technical training.

Technical training development is a complex, challenging, unique, misunderstood, and sometimes frustrating process. As a course developer without specific expertise in the content itself, your job is especially tricky: You must complete all the regular tasks of developing courseware, but you must do this using words and concepts you don't fully understand.

I have worked with contract course developers from many different levels, including developers who were paid a premium for their impressive (on paper, at least) backgrounds. But what I have learned is that experience isn't always the biggest success factor for putting together a technical course. Some of the most expensive, experienced developers have let me down—calling me one week before an assignment is due to tell me that the project is just too complicated for them, that they have never had to do anything so difficult before, and that they won't be able to finish. Conversely, I have worked with developers fresh out of university who demonstrated promising skills and, with a little practice, were able to outperform more experienced individuals.

I've noticed that the technical developers who are successful exhibit some of the same characteristics and approaches. That is what this book is about.

Technical training requires different tactics to develop than nontechnical training. One of the biggest success factors is the ability to work effectively with your subject matter expert (SME). In addition, launching the project the right way, understanding different ways technical courses can be organized, finding the right information, designing technical exercises, and piloting a course with a SME or instructor are all important. This book is intended to discuss these things and more—in a specific and readable way.

What This Book Does Not Cover

If you have never designed a training class before, this book is not for you. This book covers how to apply basic instructional design concepts to a technical training project.

Primary Audience

The primary audience of this book is anyone who develops technical training with the help of a SME. This includes training developers, instructional designers, curriculum developers, technical writers, training managers, training coordinators, content designers, and training specialists, among others.

SMEs who develop their own technical training will still be able to pull concepts from this book, but the bulk of the writing is geared toward developers who are working with a SME.

How This Book Is Organized

This book provides specific ideas, tips, and strategies to effectively and efficiently develop technical training, from the beginning of the project all the way through the pilot course and postcourse review. It is loosely organized according to the course development process.

Chapter 1: The Technical Training Enigma describes technical training and discusses some of the differences between technical and nontechnical training. The technical organization is briefly explored.

Chapter 2: Effective Technical Training covers quality measures—backed by research specifically on technical training—that you can include in your technical learning programs.

Chapter 3: The Successful Development Team covers the roles needed for technical course development and the characteristics of an effective developer and a SME.

Chapter 4: Technical Training Development Strategies discusses different learning development methodologies along with when you might use each.

Chapter 5: Beginning the Technical Training Project discusses aspects related to the initial course design meeting, including why the meeting is important, who should attend, important questions to ask, and what should be accomplished.

Chapter 6: Targeting the Content describes how to use SMART objectives and a content analysis process to create targeted technical content.

Chapter 7: Arranging a Technical Curriculum examines various options available for arranging a technical curriculum. It also describes how to create a course design document.

Chapter 8: Designing Classroom Exercises for Highly Technical Content provides specific examples, templates, and takeaways designed for such exercises.

Chapter 9: Gathering Information discusses the type of information to seek and the challenges associated with gathering technical data.

Chapter 10: Working With Subject Matter Experts covers tangible ways to draw information out of SMEs. The chapter gives specific tips for going through edits with SMEs.

Chapter 11: The Pilot Class and Beyond explores development opportunities from the pilot class, how to help out a SME-turned-trainer, and following through on postcourse maintenance.

Chapter 12: Troubleshooting: Challenges and Solutions investigates different technical training challenges and provides specific and useful takeaways and solutions.

What's New in This Edition?

Technical training has come a long way since the first edition of this book. There is more of a focus on smaller performance solutions, Agile design, and the learner experience. Here is what's new in this edition:

- **Chapter 2: Effective Technical Training** covers research-based methods related to technical training that you should incorporate into your training solutions.
- **Chapter 4: Technical Training Development Strategies** has been added to discuss when to use ADDIE versus Agile. It includes a focus on choosing your strategy based upon your SME relationship.
- **Chapter 7: Arranging a Technical Curriculum** has been updated to include best practices of spaced learning and chunking.
- Additional needs analysis questions focus on performance improvement, human factors, and audience analysis.
- Additional activities for technical training have been added.

Overall, the structure of this edition has been updated to tell a more complete story about technical training.

Icons to Guide You

This book has plenty to offer in the way of content that can help you every day. Some icons will alert you to key features of the book:

What's Inside This Chapter

Each chapter opens with a short summary that serves as a quick reference to the chapter contents. Use this section to identify the information in the chapter and, if you wish, skip ahead to the material that is most useful to you.



Basic Rules

This rule cuts to the chase. It is an important concept that is true in most instances.



Noted

This icon flags sections with greater detail or an explanation about a concept or a principle. Sometimes it is also used for a short but productive tangent.



Think About This

These are helpful tips that you can put in your back pocket to pull out when needed as you prepare to design a job aid.

Getting It Done

The final section of each chapter supports your ability to take the content of that chapter and apply it to your situation. The focus of this section is mostly on job aids and tools for understanding the content. Sometimes this section contains a list of questions for you to ponder, sometimes it is a self-assessment tool, and sometimes it is a list of action steps you can take to improve your skills and help increase the chances for participant success.

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I would like to thank my husband, John, for all of his support, edits, and comprehensive insights for this book. His intelligence, care, and patience were wonderful during the process. I would also like to thank my daughters, Marie, Maggie, and Lauren, for their humor and smiles that make my day. Finally, thank you to the professionals quoted in this book. Your contributions added much-appreciated perspectives and made the finished product much more valuable.

1

The Technical Training Enigma



What's Inside This Chapter

Let's begin by answering the questions on every technical training practitioner's mind. This chapter will define:

- what technical training is
- the differences between technical and nontechnical training
- what a technical organization is
- the role of technical training within the technical organization.

Two worksheets at the end of the chapter will help you analyze your own technical project.

1

The Technical Training Enigma

How do you develop training for a specialized, complex subject that you don't fully understand? This feat is accomplished daily by technical training developers all over the world. Technical training can be a mystery. An early experience opened my eyes to this:

I stare at the scribbled notes in front of me. My engineer co-worker has just given them to me so I can incorporate them into a training manual I am developing.

Make up your bottom hole assembly on the rig floor and trip in the hole.
Apply weight until the pin shears and the whipstock anchor sets. Mill
your window and watch your flow rate. Drill the rathole. POOH. Write
up Post Job Report.

Wait, POOH? *You can't be serious*, I say to myself. What does that even *mean*? I reread the paragraph. This is one of my first big assignments as a curriculum developer for an oil field service company. I know I need to figure this out somehow. I read the paragraph again.

"You look confused," a voice says nearby.

I look up and see my engineer co-worker standing in my doorway. "Do you have a question?" he asks.

I hesitate and then blurt awkwardly, "What is 'POOH'?" He looks confused, and I quickly add, "What does the acronym P-O-O-H stand for?"

Laughter. "It stands for **P**ull **O**ut **o**f **H**ole, as in when you are taking equipment out of the ground," he says, a smile on his face.

"Oh," I say. "Of course it does."



Nowadays, the "POOH" warning is one of the first things I bring up to new instructional designers. I don't mention it to show my lack of technical knowledge, and I don't mention it

because saying “POOH” in front of a group of people is a great icebreaker. The story highlights the fundamental challenge of technical training: decoding the Technical Training Enigma. As a nontechnical course developer, you are doubly challenged: You must complete all the regular challenges of writing and putting together courseware, but you must do it by using words and concepts you don’t fully understand.

It is a process that can be astonishingly frustrating. If you are unable to crack this enigma, you lower your chances for success, and a poor work product can result.

There are strategies, tips, and tricks that can be used effectively to develop technical training, but before we delve into cracking this enigma, we must first address the basics: definitions and descriptions of terms that will be used throughout this book. We’ll start with the most basic question of all.

What Is Technical Training?

Technical training is instruction based on a technical product or task. A technical product is something marketed or sold whose worth is determined by scientific, engineering, mathematical, or design principles. In other words, a technical product is a commodity that will assist in carrying out mechanical, production-related, scientific, or engineering tasks. Technical products include everything from tools, equipment, electronics, computer programs, devices, and instruments to gizmos, thingamajigs, widgets, and doodads.

Technical tasks include services, procedures, or jobs performed using a technical product. Technical tasks can be anything from repairing an HVAC system to running a lab spectrometer to designing an oil field drill bit to performing routine maintenance on a military tank engine.



Basic Rule 1

Technical training is training based on a technical product, task, or skill.



Noted

Technical training tends to have a primary target audience of individuals who will actually be working with or operating the products, equipment, or software. This does not mean that these people already have experience. But, as part of their job description, they deal (or someday will be expected to deal) with highly specialized and complicated technical products, skills, or tasks. Examples of common target audiences for technical training courses include engineers, technicians, operators, programmers, doctors, researchers, mechanics, and inspectors.

For example, a centrifuge machine is considered a technical product. Related technical tasks might include the ways to assemble, disassemble, load, test, unload, maintain, operate, or troubleshoot the centrifuge machine.

Differences Between Technical and Nontechnical Training

While they do share some similarities, technical training and nontechnical training are quite different. Nontechnical training deals with soft skills such as leadership, management, conflict, public speaking, time management, and so on.

Technical training is not as easily classified. For example, the content you would gather if you were developing an interpersonal communication skills course would be more or less the same whether you were teaching in a biomedical research lab or a big manufacturing center. There would be differences in application, but the underlying principles would be similar. However, the technical training content you would gather if you were designing technical courses for one of those places would be unique. In many instances, the course you develop would be the first of its kind. Whereas nontechnical content is more likely to apply across the board, technical content is specific to each topic.

Technical training topics usually have at least one of the following characteristics:

- A distinct vocabulary is used.
- Existing information and resources are scarce or solely experience based.
- It takes years to learn the intricacies of the topic.
- Available information is often proprietary.
- The product in question is in a state of development.
- The training takes longer to develop because it deals with complex topics.

Another significant—if not the most significant—difference between nontechnical and technical training is that technical training development is extremely dependent on *subject matter experts*. Because technical courses are designed based on the information given by a subject matter expert (SME), we are inherently dependent on the SME when designing a course. In fact, as the topics get more complicated, the instructional design “secret” is productive communication with your SME. Being able to draw information from a SME is a critical skill for a nontechnical designer developing a highly technical training course.

As you proceed through this book, you will find that developing your relationship with the SME and your ability to comprehend information the SME gives you are among the most important skills you can have. Reliance on the SME marks one of the most fundamental differences between nontechnical training and technical training. The SME is the key for deciphering the Technical Training Enigma.

What Is a Technical Organization?

In this age of multinational, multi-industrial omni-companies, it can be difficult to come up with one single definition of a technical organization. One way to define it is to look at whom the organization employs. Are the majority of its employees technicians, scientists, or engineers? If so, there is a good chance that the organization is technically based. There is also the obvious description of a technical organization as “an organization that deals with technology”; however, such a broad definition certainly does not describe the kind of work the organization does. Instead, consider this definition submitted by a professional who works with and for technical organizations:

A technical organization is any organization that creates or distributes technology to the consumer. This includes engineering and design organizations, including research and development (R&D) departments of large businesses, as well as the organizations that apply technology through the manufacture and implementation of tools, techniques, and systems.

So, a technical organization is any group that designs, makes, or sells anything complex.

—Stefanie Matta, Contract Instructional Designer

This description provides a broad but accurate picture of what a technical organization is.

The Role of Technical Training Within the Technical Organization

In the cutthroat world of today’s marketplace, there is no room for accidents, there is no room for quality-control failures, and there is no room for inefficiency. Every technical product and technical service is produced and distributed under a microscope. Just by watching the news, you can see the catastrophic consequences of personnel who are not adequately prepared

dealing with technology. These examples point to the importance of technical training and its role within the technical organization.

Accident Prevention

One constant is that technical organizations face more risk of catastrophic health and safety accidents than do nontechnical organizations. For example, imagine a lawyer who mistypes a word versus an air-traffic-controller software engineer who mistypes a word. What if a salesperson skips a few steps in a sales call? How about a nuclear plant operator who skips a few steps in their processes?

For technical companies that deal with potentially dangerous equipment or services, effective training is absolutely essential. Nothing will torpedo a company faster than a disaster that could have been avoided by better training. Industrial companies lose people to accidents every year; it is inconceivable that such companies would settle for anything less than the best training available.

Cost Savings

How many hours could be saved if training were as efficient as it could be? How often are participants allowed to mentally check out of training classes because of poor instructional structure? How many mistakes are made or how many hours of productivity are lost when someone must relearn on the job what they should have learned in training?

A lean, efficient organization simply cannot afford to use old methods of training.

Quality of Product or Service

When an organization's employees are highly trained, the entire corporation benefits. Employees are then equipped with the knowledge and information to make informed choices on the job. The reliability of the product or service becomes established. The efficiency of the company pleases stockholders and investors. The company stays out of the newspaper disaster headlines. A company can be truly enhanced and supported by its training department.



Noted

Because the idea of competency is so important to technical training, you will often see technical organizations grouping together “training and competency” or “learning and competency” in job and departmental functions.

Competency Assurance

A common topic that comes up when discussing technical training are the ideas of competency and competency assurance. Competencies can be defined as the knowledge, skills, and attitudes a person needs to perform a job or task. Assuring that employees are properly equipped to do the job correctly is extremely important. To achieve a high quality of products and services, cost savings, and a low accident-to-incident rate, technical organizations often focus on identifying and assuring competencies for critical personnel within the organization.

Because technical jobs tend to have lots of steps, processes, and related specialized information, it can be difficult to pinpoint exactly what is important to competency assurance. A lot of times you will hear, “Everything is important, everything is critical.” It takes great self-discipline to narrow down competency development and measurement to those handful of items that are truly critical. Perhaps even more than self-discipline, there needs to be a strong organizational standard that pushes this.

When possible, organizations should attempt to measure themselves in common competencies across different product lines and business units. This allows for better movement of employees to different positions across the organization. You will likely see a handful of common competencies for the organization, along with some specialized competencies per business unit.



When considering your competency analysis, remember to take a full picture of the performance situation. Technical training should also include the soft skills or behavioral competencies related to working in a technical environment. These “human factor,” or crew resource management, elements can include things such as:

- situational awareness
- situational leadership
- communication
- decision making
- stress
- fatigue
- teamwork.

These things are sometimes overlooked when considering technical training but are critical for safe, effective performance. Each industry will need to identify human factors that are relevant for them.

Technical Courses Versus Technical Learning Experiences

To help prepare the technical workforce to meet its identified competencies, technical organizations are evolving their approach to technical training. Instead of automatically assuming we need a technical course, we should be thinking in terms of individual learning experiences. Gone is the notion that technical learning requires weeks upon weeks of instructor-led training. With the emergence of new learning technologies, technical training now takes many forms. Informal learning, mobile learning, microlearning, simulation, augmented reality, virtual reality, content aggregation, adaptive learning, MOOCs, virtual instructor-led programs, immersive e-learning, real-time evaluation, and video coaching are all learning experiences a technical organization could consider at any given point. Whether it is instructor-led training or a video, you should be thinking in terms of a series of small learner experiences.

We decided to create a learning ecosystem so that we could achieve a more efficient workflow and user experience for the creation, curation, and consumption of content. Central to all of this was the employee learning experience. As we chose the learning systems we would include within our ecosystem, we kept returning to the idea of simplifying and improving the learner experience. From our measurement data, we are already seeing benefits of this.

—Steve Uren, SL Learning Solutions Manager, Schlumberger

Basic Requirements to Promote Technical Learning and Performance Improvement

Regardless of the learning technology used, some basic tenets span all technologies. These will be described next.

Meets Business Requirements

All planned or provided technical learning should relate back to an identified, detailed business need. A business need should relate back to a precise performance requirement within the business to further organizational goals and initiatives. For example, “We need to increase revenue on add-on services during customer service calls.” This is different than “We need to provide

Level 1 training on electricity to our shop hands.” The first business need relates to meeting the organization’s goals. The latter business need does not point to a measurable business outcome; rather, this second “business need” statement implies that training is an end in itself. In technical training, training should never be an end in itself. Training should be a means to an end, a means to improve human performance in some way.

Targets the Audience Correctly

When thinking of any training intervention, a comprehensive picture of your target audience should be completed. You should not only identify the background experiences, skills, and knowledge of your audience, but you should also look at the motivations, interests, reinforcements, rewards, and punishments that are present in the target audience’s role.

Focuses on Performance

Often, organizations jump to the idea that if anything goes wrong in their business, it is automatically a training issue. This is not always the case. Performance solutions should match the performance needs. Organizations should not create an analysis for a “training class” but rather complete an analysis to investigate a “performance solution.” Learning practitioners should be looking first at the big picture and asking themselves, what are all of the possible inputs to this performance situation? Considerations such as time available, management support, available tools and materials, logistics, standard work instructions and approved processes, rewards (financial and otherwise), consequences, and realistic and relevant job descriptions are among other items that should be considered early on when doing an analysis.

Uses Technology When It Is Best Suited

When considering learning technologies, it is easy for organizations to get lost in the “bling,” using extravagant technology when something simpler would better fit their needs.

When choosing a technology, a company needs to ask these questions: Who are you as an organization now? And where do you want to be? What are the cultural barriers in your organization?

New technology has never fixed a culture; it only magnifies the culture that already exists. If you have a cultural barrier present in your organization, implementing a new learning technology is not going to remove that

barrier. The underlying cultural issue also needs to be addressed through a sustained commitment to change management that accompanies the technology.

—Matthew Daniel, Principal Consultant, The Learner Collective

Analyzes Content

Content plays a big role in our learning programs. In addition to creating learning content, we can aggregate, curate, or recommend appropriate and relevant content for our target audience.

When we create content, we can plan to design it to meet SMART (specific, measurable, achievable, realistic, and time-bound) learning objectives. We should take a strategic approach here by doing an analysis to see how important the content is, how easy it is to learn, and how often it will be used once the target audience is back on the job. This helps determine which content should be scrapped from the formal learning and which content should stay and even be emphasized and reviewed.

Additionally, analyzing and prioritizing content also helps you to determine the best method of instruction. For example, if you do an analysis on the content and find that multiple hands-on demonstrations, peer interaction, and immediate and comprehensive feedback from instructors are required, you probably are going to be geared more toward a physical classroom rather than a webinar or virtual classroom.

Takes Into Account Training Quality Measures

We have established how important technical training is and why it is important to get it right. Technical organizations and training practitioners should be diligent about measuring the quality of their learning programs. This evaluation should cover areas such as active and passive differentiated instruction, motivation, and spaced and chunked learning, which will be discussed in the next chapter.

Cracking the Enigma—Learning Measurement

While there likely will always be some uncertainty around technical training, we can increase our chances for success by constantly evaluating and measuring our solutions.

Technical organizations should be evaluating and measuring as much as they can. Elliott Masie's book *Big Learning Data* highlights some of the ways organizations are using data

analytics to not only further their learning functions but also improve their organizations as a whole.

Just as we think about variety in instruction, we should also think about variety in our measurement methods. With things as complex as human behavior, learning, facilitation, attitudes, specialized technical tasks or skills, organization improvement, and ROI, it makes sense to search for a multitude of data sets.

And we need to be critical about the data we collect—that is, we need to be careful about overemphasizing measures where perception plays a major role. We should look for quantitative data wherever we can find it and then match it up with qualitative data to add in more depth and context. More than thinking about evaluation in terms of “levels,” we should weigh how much emphasis we place in a particular measure based upon the scientific rigor that went into collecting it and the verification that the measure collected truly meets the scientific standards of reliability and validity. With this approach to evaluation, we can better analyze and make predictions about the effectiveness of our learning programs, and we can truly start to crack the technical training enigma.

What We've Learned

It is certainly demanding, but the first step of solving the Technical Training Enigma is to gain an understanding of the basics of technical training. In this chapter, we saw that technical training deals with a technical product or task, and that the differences between nontechnical and technical training are distinct. (Technical training has its own set of challenges!) A technical organization is any group that designs, makes, or sells anything complex. In a world where quality, health, safety, and the environment are integral to business, effective training is a must.

The Technical Training Enigma will always exist, but there are specific tips, tricks, and tactics that can help ease your way. With preparation and a mastery of the processes and strategies contained in this book, you can meet your own technical training challenge with effectiveness.

Getting It Done

Understanding your technical organization will help you to be more efficient in finishing your training development project. Use Worksheets 1-1 and 1-2 to get started.

Worksheet 1-1. My Technical Training Project

Answer the following questions to help you analyze your technical training project.

1. What are some characteristics of the technical organization with which I am currently working? What is the culture? What are the norms?
2. What is most important to my organization—cost savings, accident prevention, quality of product or service, competency development, or some combination of these? How will this affect what the organization expects from its technical training?
3. What are some examples of technical and nontechnical competencies that are important to your organization?

Worksheet 1-2. Measurement

Answer the following questions to help you analyze your technical training project.

1. What approach does my organization take to training measurement? (Qualitative? Quantitative? A combination?)
2. How scientifically rigorous are my measurements? What steps can I take to improve them?

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About the Author



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