Tips for Prerequisite Management

Identify and Manage Prerequisites - a PBET Characteristic

One of the 7 PBET Characteristics is: "Prerequisite course tasks are identified and their enforcement is carefully managed." Let's be clear that

- the foundation for *managing* prerequisites lies in *identifying* them.

- prerequisite management is not just the job of the training group; it requires support and commitment from management, sales, service, and others in the company. That's why I recommend calling together a task force to work on this.

- the key to managing prerequisites lies in a combination of **strategies** devised especially for your company and frequent, quality **communication** about the strategies.

Identify Prerequisites

I highly recommend that you attempt to identify prerequisite *tasks* for your training courses. This is different than listing prerequisite knowledge or prerequisite experience or prerequisite skills; the problem with those is that they are harder to enforce.

In a way, "skills" are close to "tasks" but unfortunately skills can be vague and therefore harder to enforce.

"Knowledge" is thought to be easy to enforce through a knowledge test. Perhaps, but knowledge is only part of what enables successful performance. And for *prerequisite knowledge* to be even partially useful, it needs to be specific. For example:

- Know basic electronics. [Poor.]

- Can determine from Sample Diagram A what is required for the motor to be energized with power. [Better. In fact this is a low level *task,* because of the verb "determine."]

A good example of a **prerequisite task** might be: "Use a digital volt meter to check voltages on specified check points on a board." This incorporates a number of things: knowledge of voltage, some interpretation of electrical prints, some identification of components on a board, and so on. A series of prerequisite tasks like that example will serve you better than "know basic electronics."

Sometimes, prerequisite courses, degrees, or training certificates are used. However, unless you know for sure that a specific certificate or degree from a specific school incorporates training in the tasks you have identified, don't use it. In general, the only courses you should use as prerequisites are *your own courses*. And even then, it is not foolproof.

Consider these two options:

a) "To take the Level 3 Troubleshooting Course you must taken our Level 2 Maintenance Course."

b) "To take the Level 3 Troubleshooting Course you must competently perform 15 of the objectives listed for our Level 2 Maintenance Course."

Option **a** is straightforward. But there will be times when it doesn't work. There will be individuals who have learned to do the 15 maintenance tasks without having attended your course. There may be some question as to whether they do these tasks as required by the standards in your objectives. That's where you will need a strategy to assess these individuals. This is not frequent, but it happens, so it is best to have a strategy pre-planned for assessing these people (see page 8).

In summary, the foundation for any prerequisites enforcement strategy is to think in terms of prerequisite **tasks.**

Know Why Prerequisites Need to be Enforced

You can view an animated story that helps to visualize the reasons for enforcing prerequisites here.

Some of the reasons why enforcing prerequisites is important:

- If you have students that do not meet the prerequisites it is going to be impossible, or at least unlikely, that they will learns the tasks in the course, get signed off and certified in the course tasks.

- If you have students that do not gain competency in the course tasks, but are nevertheless sent back to work as though they **have** gained competency, there is the possibility that the trainer or training will be blamed. This could get worse: the machine itself could be faulted or blamed.

  These techs failed to gain competency.

  Sometimes the machine *is* designed poorly for maintenance (like making it very difficult to access the oil filter on a car). Some machines *do* have a high failure rate. In such cases, companies deserve to lose future business. But false assumptions about human performance and training can also cause customer dissatisfaction with a brand and its products, and the results can be just as costly for a company's bottom line.

- If you have students that do not meet the prerequisites, there is the potential for increased safety risks and damage to equipment during the course.

- If you have students that do not meet the prerequisites, it will be impossible or difficult to manage other PBET Characteristics like, giving every student the opportunity to repeat a practice or test until they have mastered the objective. As such, the participation of unqualified participants in your course will interfere with the legitimate needs of other students who do meet the prerequisites.

Understanding these things, and being able to communicate them, should help you to:

- Get people from your company's sales and service organizations to participate on your Task Force [see below].

- Gain help and commitment from your company's sales group in communicating the importance of prerequisites to your customers and in respecting your decision to exclude the few applicants who do not meet the prerequisites.

An Inter-Departmental Task Force

Call together several colleagues for a "Prerequisites Task Force."

- **GOAL:** identify policies and procedures that can improve the likelihood that only those that meet the prerequisites will be enrolled in training department courses.

  Within Reason: It will never be perfect but significant improvements can be expected; the broader the participation the greater the potential improvement.

- **INCLUDE:** training manager, one or more trainers, customer satisfaction manager, sales manager or sales persons.

  Why Sales and Service people?   Often it is sales and service representatives that have the most difficulty accepting the value of prerequisites. This is seen when these groups:

  - force the training department to accept students into courses that do not meet prerequisites,

  - prevent the training department from assessing prerequisites of customers; it is seen as "making waves" with customers.

  Another reason is that service people or sales people *in the field* may be in a better position to help with assessing whether individuals at distant locations meet the prerequisites if they are given some guidance and/or tools with which to do so.

- **TOPICS:** There at least 3 general areas to be considered in ensuring that the right people get into the right classes. They are covered in the following pages, but the ideas are merely suggestions. Each company must evaluate their own situation and determine solutions that will bring improvements for them.
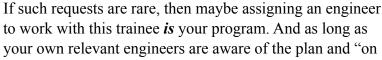
(1) Consider Course Offerings

It is important to ensure that you actually have training programs (courses) available for each constituency that may come to you for training. Let me put it this way: Do you provide training, with respect to each machine you sell, for the tasks that all of the following people may need to do on your machines:
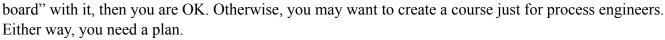
- Operators - Operation tasks
- Maintenance Techs or Engineers - maintenance, troubleshooting tasks
- Application or Process Engineers - creating a recipe, set of parameters, or program
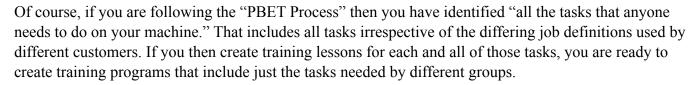- Service Engineers - installation, leveling, and rare calibration tasks

This is important!

Here is a typical example of what can go wrong when your training is created for only one of those groups. A process engineer from one of your customers wants to come for training. Let's say you do not have a specific program or course for process engineers, so she ends up in the only course that you do offer, a maintenance course. However, only a few of the tasks in that course are of any interest to process engineers and there are many process-related questions that the course does *not address*. As a result, you will either have to take her out of the class and assign an engineer from your company to tutor her (work with her on the tasks that she wants help with) or risk having a very dissatisfied customer.

If such requests are rare, then maybe assigning an engineer to work with this trainee *is* your program. And as long as your own relevant engineers are aware of the plan and "on board" with it, then you are OK. Otherwise, you may want to create a course just for process engineers. Either way, you need a plan.

Of course, if you are following the "PBET Process" then you have identified "all the tasks that anyone needs to do on your machine." That includes all tasks irrespective of the differing job definitions used by different customers. If you then create training lessons for each and all of those tasks, you are ready to create training programs that include just the tasks needed by different groups.

Laying out all the tasks in a learning hierarchy can help you in this process of ensuring that you have programs for all that need them. Creating and using a learning hierarchy is covered in the PBET Workshop in great detail.

Tip: dividing the total available training courses into *more courses but shorter courses* can allow more customization for the individuals who request training from your customer sites.

In summary, to reduce the placement of good people in the wrong courses, we need to have the right courses available. Or at least a ready-to-go plan for meeting the training needs of a segments from our customer base.

(2) Consider New Ways to Check for Prerequisites

In order to manage the enforcement of prerequisites, you need a way to find out if the person wishing to register for a course, actually meets your prerequisites. In other words, you need ways to *assess for prerequisites*.

In order to assess applicants for prerequisites, you need to know who they are! So, one thing that can help immensely is to abandon the practice of "saving 3 seats for customer ABC." This practice puts the supplier at the disadvantage since you have no way of knowing who will show up in class until the first hour of the class. Possible ways to assess for prerequisites include:

- administering and getting results from a written test
- watching an applicant perform prerequisite tasks
- asking a supervisor (or onsite field engineer from your own company) if the applicant can perform the prerequisite tasks
- interviewing the applicant by phone or in person about the way that he performs prerequisite tasks

Do you see the problem? Without a specific name of an applicant, none of the above are possible.

So the first step is to insist on actual names of intended students and their email addresses. This includes those who will attend on-site training. You can explain that you need the names in order to:

Get Student Names and Email Addresses

- Send course information directly to attendees, including any pre-work details.
- Confirm that they meet the prerequisites and be able to answer any of their questions.
- Custom print certain course materials, like course certificates and sign-off sheets.

Self-Evaluations by Course Applicants

At the very least, with the name and email address of each applicant/registration, you are able to send them a letter that lists the prerequisites and asks them if they believe they meet the prerequisite tasks for the course. You can improve this by formalizing it with any or all of the items below. Be sure that the applicant has a chance to self-evaluate; supervisors may not really know whether someone can do a task or not.

- Ask them to sign a form that has the name of the course and the list of the prerequisite tasks for the course. Ask them to sign the form and return it.
- Ask them to have their supervisor co-sign the form and return it.
- Add to the form some kind of *disclaimer statement* regarding what happens if the student does not meet the prerequisites. The following is only meant to help your group start the brainstorming process for a statement that best fits your company's needs.

Your disclaimer statement might include elements of these ideas...

- Students will be assigned to a different course that includes training in the prerequisite tasks. [Hard to picture as most suppliers cannot offer more than one course at one time due to conflicts with access to a training machine. But in the case of a few suppliers, this could work.]

- Students will receive one-to-one tutoring in the prerequisite tasks, if necessary, but this will take away the time for learning the tasks in the course for which the student was registered. [Consider an extra fee for this. Also, some prerequisites could take weeks of training in basic electronics or similar fundamentals, so of course that would be impossible.]

- Customer must accept that any student that cannot perform the prerequisite course tasks may be unable to learn the tasks taught in the course for which the student was registered. In that case the student will return without the ability to perform many of the tasks taught in the class. The course certificate clearly states the number of tasks taught and the number of tasks which have been certified as competently performed at the time of training.

- Supplier accepts no responsibility for students who go to a course but does not receive a certificate indicating competence due to the lack of prerequisites. Under such circumstances, the supplier will not be responsible for substitute or repeat training for that student nor will such circumstances play any role in providing free service.

- Students will be sent home. [Harsh, but in some instances may be the only recourse.]

The purpose of any statement of consequences to disregarding prerequisites is to increase customer compliance. Your task is to create such a statement so that it balances your concern for the customer in such a way that it gets the job done.

Online (or Other Written) Assessment for Entry Level Courses

Online assessments can be integrated with any online registration process you might use. It should be adaptable for use in assessing entry course participants in both onsite class conditions and in open enrollment classes at your training center (if you have one).

You may be able to include elements from the above section on "*Self Evaluations.*"

If you plan to include any test elements, questions that assess whether a person can actually perform the prerequisite tasks, you must be sure you are on solid legal ground. For example, if an employee at a customer site is required to take vendor training in order to be advanced in his position and/or salary, and if you prevent that by stating he does not meet the prerequisites, you may find yourself with a lawsuit.

Worried? Don't be. If you are following the PBET Process (explained in detail in the PBET Workshop), then you will have followed all of the requirements of the law and have no liability whatever.

Essentially, any testing that has a bearing on promotion or pay must be valid - the test results must be a genuine indication of whether the individual can do what is expected. One key aspect of this is that the tasks being tested must be relevant to the job that the person must do now or is expected to do in order to be promoted. Both the customer and supplier have a part in figuring this out:

- The customer's part: Only the customer knows which major tasks are required for certain job designations. Every customer will have job titles and job descriptions that vary from other customers. An example might be a designation of "Technician III" which includes diagnosing and repairing any electrical fault to the board level on machines in a specific area, like lithography.

- The supplier's part: If you have done the analysis well (Step 2 of the PBET Process), you have identified the actual tasks required to operate, maintain, troubleshoot, program, and any other requirement for use of the machine purchased by your customer. For example, "In order to diagnose and repair any electrical fault on our stepper, one must be able to perform the following tasks." Your list of the tasks, and how you determined the list, along with your accompanying learning hierarchy are your documentation substantiation.

So whatever testing items you use for prerequisites must be derived from analysis; they must relate to the actual job requirements and environment.

It is easier to develop valid test items when you have listed tasks as your prerequisites, as opposed to "must have basic electronics" or "must have basic vacuum technology skills." (See "Identify Prerequisites" on page 1.) Ask yourself, when developing entry course prerequisites, what must they be able to *do* in order to learn to do what we will teach them. Maybe they would need to:

- Interpret vacuum readings in Torr

- Manually operate a vacuum system with a diffusion pump and roughing pumps.

- Operate any one of the following leak checker models: W, X, Y, or Z.

Leak Checker Model "W"

Notice that the first bullet is a fairly simple, low-level task. It could be assessed with a few written test items. However, they should reflect real readings that would be seen on your equipment, not imaginary or tricky types of readings.

Notice that the second and third bullets above require a variety of smaller subtasks and relevant knowledge. These do not need to be listed as separate prerequisites, but can be included as part of the standard by which you determine whether they are competent in performing the prerequisite task. The standard could be in the form of a checklist associated with that prerequisite. For example, for the second bullet, one of the several standards could be to operate the system so that backstreaming does not occur. From that it is reasonable to ask the sequence in which the pumps should be turned on and the condition of various valves at each stage of turning on the pumps.

What about using "understanding English" as a prerequisite? (Or similar.) To avoid common pitfalls in this endeavor, you may want to look into standardized testing for this. The most widely used test in the world is the TOEFL (Test of English as a Foreign Language) used by universities, colleges, hospitals, and a few corporations in English speaking countries. I do not know of any equipment training departments using this, put you can sign up to receive test scores at no cost. You decide what test score is acceptable for your training purposes. The cost for testing is born by the test-taker.

Assessment for Advanced Level Courses

The Normal Solution:

Advanced level courses follow your entry level courses. If you are using a learning hierarchy, the entry course is at the bottom of the hierarchy, often a course on machine operation.

If you are following the PBET Process and creating your training by incorporating the PBET Characteristics, then the entry course (and all courses) will have:

- A group of lessons based on performance objectives based on tasks derived from analysis of the actual work requirements related to the machine.

- Each performance objective will have a performance (that is, a task) supported by specific conditions and standards.

    - The conditions tell you what should be available for a test of the task.

    - The standards tell you what is required in order to be judged as passing the test.

- When a student begins a course, they are given a list of the tasks that are taught. As the student passes the test for each task, they are signed off (in writing or electronically). That list is the "sign-off sheet" no matter what other name may be given to it.

- The supplier training organization keeps a copy of each student's sign-off sheet as a record of their accomplishments in each course.

With all of the foregoing in mind, **the prerequisite for an advanced level workshop is the successful accomplishment of the tasks in the course or courses that precede it.** You only need to check the sign-off sheets on record for that individual. And typically, that's all there is to it.

The Unusual Situation:

Atypically, there will be instances where a person wants to attend an advanced level course who has not attended the entry level course and/or other courses preceding it, and yet claims to be qualified. In these unusual cases you hear something like: "My boss thinks I should take the Advanced Troubleshooting Course."

"Have you taken the Operation Course and Maintenance Course, sir?"

"No, but I have been working on that machine, doing all the maintenance, for six years."

What then? Has he accomplished the prerequisites?

- If the applicant is correct, and can, in fact, perform the maintenance tasks (the ones taught in the Maintenance Course) according to the standards for those tasks, he has met the prerequisites. Insisting that he attend the Operation and Maintenance Courses will be counter-productive. He will be bored, likely irritated, and possibly disruptive in the courses.

- If the applicant who has been responsible for the machine's maintenance has not, in fact, done *all* of the tasks, and/or has done many of the tasks incorrectly, then he has not met the prerequisites.

To know the truth in these uncommon situations, an assessment is needed. Continuing with the above dialog, then...

"There are a total of 37 tasks that are taught in the Operation Course and Maintenance Course combined, and your ability to perform those tasks according to predetermined standards is the foundation for your success in the Advanced Troubleshooting Course. Since we have no record of your accomplishing those tasks according to the specified standards, we are prepared and willing to waive the prerequisite courses for you if you are willing to help us with an assessment of your work on those tasks."

Here are some options. Use the ideas that seem best, and embellish and customize them so that they are most workable.

1. A self assessment. Give the person a list of the tasks taught in the prerequisite courses along with the specific standards of performance for each task. For each task, ask: (a) Have you ever performed this task? (b) Did you perform the task to the standard? (c) How many times have you done it approximately?

2. Assessment by the local service engineer. Tell the applicant that he can expect a call from the local field service office. Next, call the local field service engineer (FSE) that knows this customer site best. Ask if she is acquainted with the applicant.

"You can expect a call from our local FSE office."

- If "yes," then go through the list of prerequisite tasks with the FSE and ask whether she has observed the applicant or has other knowledge of the applicant performing the tasks. In essence, can she specifically vouch for the applicant's competence?

- If "no," then ask the FSE to find the applicant and make arrangements to assess the candidate. This does not, necessarily, have to include all of the tasks listed in the maintenance course, but should include 5 to 7 of the tasks that would be most indicative of the person's ability to take the Advanced Troubleshooting Course and be successful.

This entire procedure will only work well if:

- You have previously created a plan for this in conjunction with the approval of the National/ International Service Manager. The Task Force (see page 3) is a good place to get the ball rolling. Undoubtedly, approval would be given only if this is a relatively rare event.

- The plan is in writing so that the local FSE is able to follow it.

- The FSE has previously been given some training on how to implement the plan.

3. Create a written test for the prerequisite tasks.

You could create a written test, but if you do this, make sure you do not attempt to create a test that focuses on how much theory the applicant knows. Instead any assessment must focus on the prerequisite *tasks*. How do you do this if it is a written test?

There is another challenge. If you ask them to tell you in writing how to do a task, keep in mind that most maintenance procedures have objectives that clearly state:

- Each step of the task must be done exactly as stated in the written procedure for the task and in the same sequence.

- The performer is allowed and even encouraged ("given...") to use the written procedure while performing the task.

In other words, in the maintenance course they are tested and signed off on the objective as the instructor observes them performing the task and verifies that they have followed the procedure. And it is an open-book test – *they are not expected to memorize the procedure.*

A written test is not ideal; a hands-on test, like that used in the course itself, is the ideal assessment. With that all in mind, we need to find out if the "experience" they are claiming fulfills the prerequisite requirement. Do they perform all the tasks? Do they perform them correctly? Or do they make common errors when performing the tasks. Here's what I recommend:

- The test will ask questions about their recollection of how they have performed various maintenance tasks in the past. *It will be an expansion of the "Self-Assessment"* (see page 8). It can be set up to be done online.

- They cannot be expected to have memorized the written procedures in the manual.

- At the same time, while we ask them the questions about what they recall about performing the procedures, it will be counter-productive to allow them to look up the procedures in the manual. So this assessment is closed-book. Perhaps an FSE could supervise.

So you will make a list that includes most of the tasks taught in the prerequisite course(s). You should just state the task as clearly as possible, but without the conditions and standards of the objective. Provide a photo of the relevant assembly if it helps an individual know what task is being stated. Then, for each task, ask the following:
- Have you ever performed this task?
  - (a) No
  - (b) Yes, once or twice
  - (c) Yes, 3-6 times
  - (d) Yes, more than 6 times
- If you answered "yes" (b, c, or d above), tell what you remember about this task: When you adjust the whoosit, do you normally...
  - (a) [List one common error that you know from experience actually happens at some customers.]
  - (b) [List one part of the task that is absolutely correct.]
  - (c) I don't remember what I have done in the past while performing this task.

The idea behind this assessment is to determine whether perhaps it would actually be better for the applicant to take the prerequisite course(s) after all if applicant ...

- has not really had experience with key tasks listed for the prerequisite course(s) and/or

- has actually performed some key tasks incorrectly without realizing it.

(3) Consider Improved Communication Concerning Prerequisites

If you have already identified a list of course prerequisites, how do you communicate them? How do you let your customers and internal colleagues know about your course prerequisites. I can almost guarantee that you have not devoted enough attention to this.

When I was an equipment company training manager, it was my experience that very few other people in the company understood performance based training, yet many, especially various managers, thought they knew as much about training as I did. The General Manager where I worked believed that "anyone can do training." My years since then have convinced me that these attitudes and misconceptions are quite prevalent in other high tech equipment manufacturing organizations.

Consequently, getting the word out about training takes more than a printed catalog or a few pages on the company website. It takes a training *evangelist*. One must look for opportunities to explain the key elements of good training in conjunction with what your department offers. To apply that to our present topic, you must explain the reason for prerequisites along with your program's specific prerequisite tasks, over and over, in as many venues as possible, both within your company and outside your company.

Training Evangelist

When communicating the value of prerequisites, remember that others see prerequisites as a negative; they just think it is a way for trainers to say "NO!" to people. You have to help other to see prerequisites positively.

- YES! - Prerequisites ensure that people can take a performance based equipment course and be *guaranteed to be successful* during the course.

- YES! - Prerequisites ensure that training really contributes to better uptime, customer satisfaction, and repeat business.

Look for opportunities. Here are some ideas to get you started:

Internal Communication Possibilities:

- Does your company have an Annual Sales Meeting? Get yourself on the agenda for at least a 15 minute talk. Don't waste time with the obvious, like your list of course offerings. Use the time to explain the importance of prerequisites and to request the support and assistance of the sales force.

- Does your company have an Annual Service Managers Meeting? Get yourself on the agenda for at least a 15 minute talk. Use the time to explain the importance of prerequisites and to request the support and assistance of the local service offices.

- Ensure that sales contracts leave the "free" or "credits" training as *undesignated*. Equipment contracts should NOT specify, for example, "5 seats in the advanced course." Such strictures do not take prerequisites into account. Instead contracts should indicate something like, "25 credits – with each credit good for one man-day of training." That allows the training manager (or other manager) to work with customers to slot their people into the classes that best meet their needs at the time and are in keeping with prerequisite guidelines.

- The Task Force idea, mentioned earlier, can help make the goal of improved training something to which other departments can contribute. It is a communication vehicle.

- What other venues or methods can be used to get more people in your company on board with the idea of enforcing prerequisites?

External Communication Possibilities:

- In connection with your online course offerings and course descriptions (catalog), list the course prerequisites and explain the reasons. This also applies to any print catalog or PDF version that is distributed through email.

- On the registration page, have a link to the course prerequisites and have a check box to the person to indicate that they heave read the prerequisites. Like a "terms and conditions," the registration will not process without the checkmark.

- In any confirmation letter to individual applicants, repeat the prerequisites.

- Does your company have any "dog and pony" shows for a customer site, usually organized by your sales or marketing department? Typically, these are dominated by engineering presentations and maybe field service presentations that outline the types of contracts available. Request that training be included in the agenda. Don't waste time describing your many offerings – they are easy to read and digest online. Keep it short and focus on prerequisites and the benefits of competent performers.

- Does your company have a booth and/or presentation at a trade show? Could you provide any PR about training that would enhance your company's position? Could you give a presentation about training?

- Does your company participate in any cross-company user groups? Could you give a presentation about training? This is a wonderful place to explain some of the things that make training effective or ineffective, including prerequisites.

Conclusion

The goal of this paper was to provide ideas to help your training department begin to brainstorm solutions to the challenge of enforcing prerequisites. All suggestions in this paper need to be customized to fit the culture and needs of your company.

No matter what you do, it won't be perfect. Some people that are not qualified will still slip through. However, you can learn from these situations, take action, and dramatically reduce the incidence of people that are in the wrong class and/or people who are not qualifed to be in a class by reason of the fact that they do not meet the prerequisites.