Modular Course Design:
Develop and Deliver a Technical Course
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Introduction

What is a modular course? Webster's definition of modular is "constructed with standardized units or dimensions for flexibility and variety in use." In that context, a modular course can be easily modified to meet the needs of audiences with varying aptitudes, experiences and backgrounds. A modular course can be quickly adjusted to provide the information required for a particular situation. A modular course is flexible enough to be broken into smaller training sessions. Also, technical updates or enhancements can be made to a modularly designed course with ease.

In today's business world, the people responsible for training, manning help lines and performing various other technical support functions require as much structure as possible in what can otherwise be a chaotic environment. This paper will provide guidelines for modular technical course design. Where do you start when developing a course? What should the course include? How do you know when it is complete? This paper will move through the steps involved in course development, beginning with determining the scope of the training need, moving through design and construction of the course material, and concluding with tips on how to deliver a course.

Determining Scope

Determining the scope can be likened to the "analysis" phase of the systems analysis and design life cycle. This is a period of questions and answers. If done thoroughly, analysis is performed once. After that, it might be necessary to make changes or enhancements to the course material, but the scope should not be affected. Most important is to make sure everyone's needs, present and future, have been taken into account.

It is key to know who the audience is for the course. Are there many audiences or just one? When identifying the audience, take into account the needs of all of the groups that require training for that topic. Sometimes it is difficult to determine the difference between those who want the course versus those who need the course. Institution or company policies can play a key role when determining who is appropriate for participation in technical courses. Is the course being offered as a vehicle for personal growth or do participants require the skill in order to perform their job? If the course is being offered for personal growth, then expectations of the course participants having had previous experience in the subject may be lower. However, if the participants require the knowledge for their job, chances are better that they have had experience in, or have an aptitude for the subject.

The Information Center personnel or the company's experts for the topic can also provide insight about the audience. In that they answer questions all day, they know who needs help, what types of questions are most frequently asked, and what level of experience the users have. If documentation is kept by people manning the help lines, it is possible to use those records as a resource for many of the questions concerning the scope.

When a new concept is being introduced to the user community as an addition to their current knowledge, what to teach can be easily defined. On the other hand, terms such as "Basics", "Introduction", or "Beginners" can leave a course designer in a quandary when determining what topics to include in the course. How will the tool be used? For example, if you are planning a SAS Basics course, for what purpose are people using SAS . . . to write reports? . . . perform statistical analysis? . . . or maybe to download data? What must SAS users at that site learn about the technical environment? Are programs run in batch, interactively or both? How is data stored? Are there security issues or other constraints? By understanding the environment and how the tool will be used, it is possible to pin down the topics.

Because people are coming from different levels of experience, it is recommended that topics concerning environment, text editor, general computer technology and problem solving be taught separately from the tool. There is nothing worse than having part of the class fall asleep, while the other half is floundering because they are not familiar with something as simple as the text editor. By separating environmental or general knowledge subjects into electives, learners can attend only those subjects for which they require training. This method will result in a modular curriculum, instead of one lengthy course.

What are the expectations of the people who made the decision that training was necessary? What level of expertise will be expected from participants attending this course? Will the topics included in the course really satisfy management's requirements? Whether you need to take into account management's expectations ties back to the issue of personal growth versus a necessary job skill. If the subject matter is pertinent to job performance, then input from management and supervisors becomes an important piece in determining the scope. Communication with management can be an education for the course designer, as well as management. Do not assume that management

understands the possible uses for the tool or topic you have been requested to teach.

Course Design

The end result of the course design phase is a course outline. The course outline serves two purposes. First, it forces the course developer to provide written results from the analysis stage. If it is not possible to describe the course and its learning objectives, then this is the opportune time to back up and take another look at the "Scope". Second, the course outline will act as the key informational or advertising vehicle for the course. A course outline should answer all of the questions that a person considering participation may have concerning the course.

Course outlines come in many shapes and sizes. Here are the key elements of a course outline:

Goal or Description
Describe the course in one or two sentences. The description needs to answer the question, "Why does this course exist?"

Audience
Who should attend this class? Is there a group for whom this course is not appropriate?

Learning Objectives
What will course attendees be able to do after attending this course? The two prerequisites for learning objectives are that they begin with an action word and that they are measurable.

Topics
What topics must the course participant learn in order to achieve the 'Learning Objectives'? Topics will be used to build the course material. (Note: When developing the course materials more topics may come up. If that occurs, update the course outline.)

Benefits
How will learning this topic benefit the participant, his department, or the company?

Format
Describe the format that will be used to deliver the course. Will you be using lecture, hands-on, demonstrations, discussions or written exercises?

Duration, Prerequisites, Facilitator, and Class Size are also common ingredients on a course description.

Developing your first course outline can feel like putting the cart before the horse. Since many people chosen to perform training come from a technical background, their first instinct might be to start writing the workbook or designing transparencies. The course outline acts as the overall "plan" when developing the course material. It will provide focus and assist in keeping the topics "modular".

To allow for flexibility, the course outline may require adjustment each time the course is offered. Factors may vary, such as the audience's experience level, or how different groups plan to use the tool. If half of the people in the company are using SAS to run programs that they have inherited, but do not require the knowledge necessary to develop new applications, and the other half require the skills to develop applications from scratch, what is the training solution? The situation warrants two course offerings, complete with separate outlines. Does this mean two unique sets of course material? No! People who want to be application developers will be interested in everything the Basics course has to offer. Those people running inherited programs will be interested in the basics about Basics or those "general" topics taught earlier in the course. Topics such as "Arrays" and "Customized Report Writing" are not appropriate for that audience. Part of determining scope is to identify those two audiences. By developing a "modular" course, it is easy to use the same core course, with some minor adjustments to meet the needs of many groups.

The Course Material

This should be the easy part, but can be the major cause of stress, particularly for those course developers who do not perform up front analysis and design. By now the picture has been drawn and developing the course material should be like painting by numbers. Energies should be spent first on organizing topics and then on the workbook or handouts. If an idea comes up for a transparency, overhead or flip chart, write it down and come back to it later. It is important to get the bulk of the informational material in print first and everything else should act as an enhancement to that material.

Where do you begin? Return to your course outline and re-list each "topic" on a blank piece of paper with a lot of white space in between. Without worrying whether they are relevant, in the right order, or too high/low level, add to the list:
• additional topics that a learner must know before he/she can move into the topics already listed
• the subjects that make up each topic
• any other topics that come to mind (nice-to-knows)

Review the "learning objectives". Do the topics still support the "learning objectives"? Should the topics that don't support the "learning objectives" not be included in the course? It may also be necessary to back up and rethink the course outline. Most important is that the course fills the training need, not that you perform a "brain-dump".

The organization of topics directly affects the course's modularity. With your list of topics in hand, organize them in building block order. Putting together course material is much like building a house; you start with the basement or those topics that people must know in order to support other topics introduced later in the course. Determine which of the topics are higher level, and below each, list the subjects that make up that topic area. Once all of the topics have been reorganized and you have determined that they are still in harmony with the scope, the result is a rough draft of the class agenda.

Constructed with standardized units or dimensions . . .
Research one topic at a time. Use short, simple, non-technical terms, but be concise. The document must be well organized, and well written, so that students can use it for post-course reference material. For example, include the following elements when describing syntax in a workbook:

> Description or purpose
> Skeleton of syntax
> List of options and select statements
> Examples
> Exercises

It is impossible to have too many examples. Initial examples should demonstrate the syntax at its simplest level and each following example should build on the previous example's concept. Test examples for accuracy. Including a sample of the output from examples within the course material or as an overhead is much more effective than verbal descriptions. To encourage note taking, allow for a lot of white space on each page and include visual aids that are not part of the workbook material. Taking notes is a form of participation and will keep the audience from dozing off.

Exercises reinforce the material for a topic and can act as a review by including topics taught earlier in the course material. Creating exercises requires nothing more than a good imagination and an understanding of how the topic may be applied within the institution. Real world exercises assist adult learners in making the connection between the classroom and on the job application. Walk through all of the exercises before presenting the course, keeping in mind that there is probably more than one solution. Include at least one exercise that will be easy to complete based on the written material for that topic. For advanced students, include an exercise that can't be answered by simply flipping through the course material.

Trial Runs

The material might be great and you may have tons of technical expertise in the topic area, but course walk-

throughs are an absolute must. Course walk-throughs will provide the presentation with fluidity and timing where it might otherwise be awkward. If exercises and examples have not been proofed, this is an opportunity to test them as well. Walk-throughs are best done with an audience of at least two, with varying degrees of experience in the topic area.

Use the walk-through as a brainstorming session to come up with better or different ways to explain topics. When something you would like to repeat in class comes up in a walk-through, make a note on the appropriate workbook page. These will become your teaching notes and consist of the answers to exercises, thought provoking questions, quick examples, and different ways of describing topics.

Tip: When performing a course walk-through have another person make a note of the technical terminology that you use during the presentation. Include the terms and definitions in a handout at the beginning of the class or as a section in the workbook. Review the terminology list with the class so that they do not become lost in technical jargon.

Prepare Your Audience

Assuming you have circulated the Course Outline and have a list of participants, the next step involves preparing the audience. The audience can be broken into two groups: the class participants and the class participant's supervisors or managers. Management's expectations were taken into account during the needs analysis; continued communication with them will provide support for the course and the participants. Choose a format, whether it be by phone, mail, or in person, to provide the following information to the managers and supervisors:
• Time commitment on the part of the course participants
• Course objectives
• Issues concerning work-related vs career growth participants
• Immediate use of the skill in order that participants remain fresh in the subject
• Assistance in providing a project to be brought to class
• Course cost, penalties for no-shows
• Post-course follow-up and future support
• Whether it is necessary to have an aptitude in the subject area

All of the above issues are optional, depending on what you are teaching, and the company's policies. Managers need to understand that you require the participants' complete attention for a specific length of time. Also, when teaching technical topics an aptitude is almost always necessary. Without testing, it is difficult to determine whether a person has an aptitude or not. The manager must be made aware of skills that require an aptitude, so that they can take that into account when looking at on-the-job expectations for an employee.

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If the main course is included among a curriculum of supporting courses participants might have questions concerning which courses are most applicable to them. One format for that communication is a pre-curriculum consultation session. This provides the instructor(s) a chance to get to know the students and vice-versa, as well as to make sure everyone is appropriately matched to classes based upon their previous experience. A consultation session provides the opportunity to discuss sign-ons or security issues, suggested reading, post-course support, information about C(omputer) B(ased) T(raining)s and other course related subjects.

Teaching

The difference between the technical skills of a programmer and the training skills of a teacher are vast. Given the choice, it is better to have a trainer with little technical skill, than a technical person with little teaching skill delivering a technical class. How the course is delivered, and not how much the trainer knows, is a major factor in determining how much a trainee will absorb. The trainer is only as good as his ability to communicate. The ability to teach is a trainable skill. Although teaching may seem more natural to some, there are excellent trainers from all backgrounds and personality types.

A common complaint from trainers with a technical background is nervousness. Pre-course jitters are normal and can be used in your favor. Nervousness is another form of energy that can be channeled into the presentation. Without some tension the class will become bored. To ease some stress, practice introducing both yourself and the course. The course introduction should include how breaks and lunch will be handled, when the course will consist of lecture vs hands-on, what topics will be taught that day and any changes in scheduling. The introduction provides the course participants with a first impression and will influence their expectations of the rest of the course. If the instructor moves through the introduction comfortably, the technical material will also flow comfortably.

Describe . . . Show . . . Try . . . Review. Describe each topic. Use examples to show the class how the concept works. Adult learners need to participate in order to retain knowledge. Exercises and workshops will allow them to try the concepts for themselves. Use reviews to reinforce and give continuity to the topics taught thus far. If the course is a multi-day class, recap each morning everything covered thus far. If it is a one-day class, do recaps after breaks and lunch. Ask the class questions during reviews that will inspire questions. (Particularly if it is a morning review and the coffee hasn't kicked in yet).

Training Tips and Techniques:

• Arrive early and arrange the classroom the way it will work best for you.

• Do not "read" the course or overheads to the class.

• Lecture in the morning with written exercises after each topic. Do workshops in the afternoon, so that students can move around more freely. Afternoon lectures are deadly.

• Prepare challenge exercises. Hand them out to people who finish the afternoon workshop early. This will take the pressure off the others and challenge those people who may be familiar with the topic.

• If you don't know the answer to a question, acknowledge that you are unsure, write it down and get back to the student later.

• Use non-technical metaphors to describe technical jargon.

• But most important BE HUMAN, UNDERSTANDING and SYMPATHETIC.

Wrap-up and Follow-up

The value of evaluation forms has always been a debatable issue. When evaluation forms are distributed at the end of the course, students feel rushed to get out of the class and only give cursory answers to the questions. Students with low aptitude for the topic generally give poor reviews, students with high aptitude tend to give great reviews. Anonymous evaluations provoke overly-honest or negative reviews, where non-anonymous evaluations cause people to stifle their true feelings.

To beat the bad press around evaluation forms: Take a break before the last topic of the course and when people return from the break give them time to fill out the forms. Have people sign the forms explaining that their suggestions or comments will affect the next offering of the course and that it might be necessary to get additional information from them about their comments. Publicize changes made to courses based on feedback from people who attended the course, without mentioning the source.

About one month after the completion of the curriculum, send a memo inviting course participants to a follow-up session. By then the people who have participated in the course should be at a point where they have more questions than expertise. The follow-up is a great format for "the big picture". Review all of the course material in a new way (i.e. walk through a complicated SAS program). The follow-up is also a good place to introduce a new topic that may have been too advanced for over-worked brains to absorb. End the follow-up with a list of contacts for those times of trouble. If there are steps involved in requesting assistance, review them carefully. The follow-

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up session is also a time for the students to share experiences. Sharing lays the groundwork for future independent support networks.

Modular Course Design

Modularity has been mentioned throughout this paper. What characteristics make a course modular? How does a course designer create a modular course? At what point in the design process does modularity need to be taken into account? Here are the key modular design concepts:

• To plan for a modular course, consideration must be made up front when "Determining Scope". If the course is going to be offered to audiences with varying training needs, then the initial design should include topics that will fulfill the needs of all audiences. When creating the "Course Outline", it is possible to tailor the "Learning Objectives", "Topics" and "Goal", to meet the needs of specific audiences.

• Along this line of thought, develop course material to meet the needs of all possible audiences for the subject matter. When the course is offered to a group that has been dabbling with the tool already, it might be smart to do a brief summary of the more basic topics. Since each topic is designed to be a unique, stand-alone topic, on-the-spot tailoring can be done with ease.

• The most obvious concept for modular course design presented in this paper involved the development of a curriculum. Supporting subject matters for which people might have already gained experience (i.e. text editor, general information about the environment, JCL, basic computer knowledge, problem solving techniques or other unique technical subjects) should be included in separate training sessions. By setting up courses for the supporting topics, there are fewer chances that course participants will be forced to sit through topics that they already know.

• Use the guidelines for designing workbook material for each topic or develop a standard format, so that technical updates to course material are both easy to design and place within the construct of the already existing material. Keeping each topic unique makes it easy to update whole subject areas.

Modular course design is a structured methodology for creating a course. Although this paper uses technical examples, modular course design can be used for any topic area. This methodology will assist new course designers in pulling together the information necessary to create a course. Good luck in your endeavors at modular course design.

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