Painting Pressure-Treated Wood

A TRAINING HANDBOOK

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Includes information on instructional design principles

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Preface

This is a custom-made instructional handbook to assist you, the instructor, in teaching learners on the process of painting pressure-treated wood. Based on our needs analysis, the audience needed enrichment of their attitudes, their knowledge base, and their skills. Therefore, the handbook features three learning objectives which we hope you will integrate into your course:

1. *Given a computer with internet access, learners will value the worth of do-it-yourself renovation, as measured by appropriate assessment software.*

2. *Given a computer with internet access, learners will be able to differentiate between pressure-treated and untreated wood, as measured by appropriate assessment software.*

3. *Given several blocks of pressure-treated wood in various states of preparation, learners will prepare and paint pressure-treated wood, as measured by successfully demonstrating the proper method taught in this instruction within 10 minutes.*

Our handbook provides not only guidance for you, the instructor, in teaching this course but also a thorough explanation of the analysis our company performed for the client. You may find these sections helpful in determining how to best approach teaching this course: the needs, task, and learner analysis sections will acquaint you with the client's expectations and what to expect from your audience. The Learner Objectives and Events of Instruction sections will also aid you in structuring your course for the maximum benefit of the learners.

In addition, we have provided for you three different learner assessment instruments. Each corresponds to one of the learning objectives we identified above and will help you to determine the progress your learners have made in completing those objectives. However, we wish to stress that these are merely suggestions for assessing your learners. We respect your knowledge as an instructor, and are confident in your ability to provide effective instruction for these learners.

Each section of this handbook has two parts, the first of which explains the principles of instructional systems design relevant to the topic at hand. If you are already an experienced instructional designer, you may skip these explanations. The second part explains how the aforementioned instructional design principles apply to this course, as indicated by the phrase “in this case.”

Inquiry

A local recreation center is presently undergoing renovation and is attempting to perform as much do-it-yourself work as possible in order to reduce costs. However, the staff have encountered problems with painting pressure-treated wood. None of the staff members understand the difference between untreated and pressure-treated wood, know how to properly paint wood that has undergone such treatment, and are frustrated with the idea of do-it-yourself renovation. The owner of the rec center has requested this company to provide training manuals in order to instruct staff members to value the worth of do-it-yourself renovation, understand the difference between pressure-treated and untreated wood, and demonstrate the proper method of painting pressure-treated wood.

Needs Analysis

Our company began with an analysis of the client's needs, determining whether or not instruction should occur, and what sort of instruction is needed. According to Brown and Green (2011), there are several popular approaches to conducting needs analysis (p. 43). One such approach is a five-step process developed by Allison Rossett. Another is Robert F. Mager's Performance Analysis Process. His process determines what individuals are currently doing versus what they should be doing (p. 44). We will first examine the similarities and differences of Rossett and Mager's approaches.

At first glance, Rossett and Mager's approaches share a similar philosophy. Rossett believes designers gather information based on five factors when conducting needs analysis. These factors are optimal performance versus actual performance, feelings, causes, and solutions (Brown and Green, 2011, p. 48). Most of these factors act as "purposes" for three types of situations that initiate problems (as cited in Anglin, 1995, p. 190). With the exception of feelings, Mager's performance analysis process analyzes the same factors. However, Mager asks designers direct questions about the situation at hand. For example, such questions include: what are the obstacles to performing as desired? Is there a simpler way for a person to perform the task? Are the skills necessary for the task used often? Mager's approach provides recommendations for intervention based on answers to those questions (Mager, 1989, pp. 25-26). Rossett's approach instead leaves analysis and recommendations up to the designer (Brown and Green, 2011, p. 49). The approach is a "bird's eye view," where needs assessment is a phase unto itself. In lieu of questions and solutions, Rossett says to conduct assessment in stages.

Of these two approaches to needs analysis, our company preferred to use Mager's Performance Analysis Process for this project. A major reason for this choice is because Mager's process is expressible in flowchart form (Brown and Green, 2011, p. 45). This allows our instructional designers to quickly assess the situation and determine if intervention is necessary. More than that, the Performance Analysis Process helps determine the nature of the intervention required. Rossett's five-step process, in contrast, is more open-ended and less organized. Although this approach allows designers to develop more unique intervention, it is also less efficient. Mager's philosophy toward needs analysis is that it should only take a few minutes (p. 46). After performing our analysis, we confirmed that there is indeed a need for instruction and instructional materials as the client requests. In this case, Mager's performance analysis model allowed us to answer several guiding questions put forward by Brown and Green (p. 42):

1. What is the change being requested (including who is being asked to change and what is currently taking place)? The staff of the client's recreation center are being asked to learn to value do-it-yourself renovation, understand the difference between pressure-treated and untreated wood, and how to correctly paint pressure-treated wood. As the staff members are unaware of the nuances between treated and untreated wood, their current attempts have met with failure. The staff members are frustrated with and resistant to do-it-yourself renovation.

2. Who is requesting the change? This question is important to us as the client may not be the one who is required to change. In this case, the owner of the recreation center has hired our company to facilitate the change and not the staff members themselves.

3. Where will this change need to take place? Understanding the environs in which a instruction-based change will occur allows instructional designers to better understand the context of a client's situation. In this case, the recreational center is located in a middle and low-income section of the city, and does not have a significant budget for professional remodeling services. This is why our client has attempted to save money through do-it-yourself renovation.

4. Is instruction the most appropriate means for bringing about the desired change? According to Brown & Green, "instruction is most appropriate when a change in skill or knowledge is desired" (Brown and Green, 2011, p. 52). Our client is specifically requesting aid in training staff members in how to perform a certain task, which certainly qualifies as a skill and even knowledge and thus an appropriate scenario for instruction.

Task Analysis

Task analysis, which involves identifying the type and sequence of content that will be delivered via instruction, takes on many different forms. Some experts even disagree on whether task analysis is separate from needs analysis (Rossett, 1987). According to Brown and Green (2011), however, there are many approaches to task analysis. One such approach, not given a name, was developed by Jonassen, Hannum, and Tessmer (p. 59). Another approach is provided by Brown and Green themselves, which they call "Task Analysis Procedures" (p. 62). The two approaches differ greatly, but in such a way that they complement one another.

Jonassen, Hannum and Tessmer (1999) say task analysis articulates what students are required to learn (p. 3). Their approach has five functions: inventorying, describing, selecting, sequencing and analyzing tasks. Designers first identify tasks to develop for instruction, elaborate on the tasks identified. Next, designers prioritize tasks and choose the most feasible on which to focus. After that, designers define the most effective sequence in which instruction should occur. Finally, designers analyze the tasks by describing the type of behavior, performance, or response required (pp. 16-21). In contrast, Brown and Green's "Task Analysis Procedures" model is a blend of different approaches. It highlights common features found in the approaches of other authors. For example, it emphasizes involving a subject matter expert (SME) in the task analysis process. Brown and Green (2011) argue that SMEs provide insight into the sequence and makeup of content (p. 63). This recommendation is not an explicit part of Jonassen, Hannum, and Tessmer's approach. Brown and Green also discuss how to compile analysis into documents depicting tasks and/or content (p. 63).

As Brown and Green (2011) state, there is no single approach that works for every situation (p. 65). However, these two approaches are two pieces of the same puzzle. Jonassen, Hannum and Tessmer's approach is a procedure by which instructional designers analyze tasks. Brown and Green's approach makes suggestions on how to go about performing such an analysis. Jonassen, Hannum and Tessmer state "what" to do; Brown and Green advise on the "how." Therefore, it is not wise to consider these approaches as mutually exclusive or situational. Rather, the two approaches complement each others' methods. Prudent is the designer who utilizes both approaches in task analysis.

In this case, given their complementary nature, our company used both approaches to conduct task analysis. This allowed our designers to answer several guiding questions as suggested by Brown and Green (2011, p. 67):

1. What are the key tasks that learners need to accomplish? In this case, our company found that the staff needs to understand the differences between untreated wood and pressure-treated wood. They need to know how to clean the wood in preparation for painting, how to judge when the wood is ready to take on paint, and the proper method in painting wood.

2. What are the key components of each task? Our company considered the specific skills and knowledge required for each task and then prepared a task analysis document in an outline format, as can be seen in Figure 1.1.

3. What is the sequence in which the tasks should be taught? Our company consulted with a subject matter expert (SME) on how best to proceed. The SME recommended that we explain the process used in the type of wood at the recreation center, but also cautioned that the process would depend on the source of the wood and date of manufacture. With the SME's help we were able to determine the wood was treated with micronized copper azole (MCA); the lumber was acquired in 2010.

4. How can we determine if the learners are able to complete each task? Our company's analysis determined that a two-part test would allow us to determine if the staff members had achieved all the objectives. The first half would be a multiple choice test that would determine if staff members learned to value do-it-yourself renovation, understood why pressure-treated wood was different from other kinds of wood, and how to correctly paint pressure-treated wood. The second half would be performance-based with each staff member demonstrating how to properly prepare and paint several pieces of pressure-treated wood provided to them in various stages of preparation.

According to Benjamin Bloom and his colleagues, there are three widely recognized domains that classify the different forms in which learning occurs (Brown and Green, 2011, pp. 32-33). We discovered that each task in our task analysis covers the three domains equally. Persuading the recreation center's staff to value the worth of do-it-yourself renovation falls under the affective domain. Educating the staff on the nature of pressure-treated wood and how it is different from untreated wood falls under the cognitive domain. Teaching the staff the correct method on how to paint pressure-treated wood falls under the psychomotor domain. Understanding which of these domains applied to each task helped our designers in preparing a task analysis document.

1. Value the worth of do-it-yourself renovation.

a. Do-it-yourself renovation saves money.

i. Contractor markup can be anywhere between 35 to 60%.

b. Owners have a greater measure of control over the work performed.

c. Learning do-it-yourself skills can provide a side revenue.

d. Do-it-yourself done properly provides satisfaction and self-fulfillment.

2. Understand the difference between pressure-treated and untreated wood.

a. Pressure-treated wood is designed to resist damage from insects and fungus.

b. Pressure treatment forces chemicals into the wood.

c. The chemicals used for building structures are typically waterborne.

i. Several kinds of preservatives exist; micronized copper azole is a recent innovation.

ii. MCA is non-toxic and registered environmentally safe.

d. Pressure treated wood is usually water resistant due to the chemicals inside the wood.

e. Paint will not properly take on pressure-treated wood unless it is prepared first.

3. Demonstrate the ability to paint pressure-treated wood.

a. Clean the wood surface with a stiff-bristled brush and soapy water.

b. Rinse the wood and allow it to dry.

i. Place the wood on stickers (small pieces of wood) and allow time to dry.

ii. Test to see if the wood is dry enough by dropping a bead of water on the surface.

iii. If the water soaks into the wood, proceed to step C. If not, continue drying wood.

c. Sand the wood before proceeding with adding the primer coat.

i. Wear safety goggles and a breathing mask when sanding.

ii. Always sand in the direction of the grain.

d. Paint the wood with a primer formulated for exterior use and pressure-treated wood.

e. Allow primer to dry.

f. Sand the wood again to make sure the primer coat is smoothly applied.

g. Paint the wood with a latex-based topcoat.

i. Paint sprayers are the ideal tool for this job, but brushes are better for detail work.

Figure 1.1—Task Analysis Document Outline Format

Learner Analysis

Analyzing the audience that partakes in instruction is an important phase in the design process. It is necessary for academic success to consider all physical and intellectual aspects of learners (Curry, 2003). According to Brown and Green (2011), numerous experts have developed approaches for this phase. One such approach, developed by Dick, Carey and Carey, is presented as a list (p. 78). Brown and Green have also developed their own approach to learner analysis (p. 81). The two approaches complement one another by addressing different aspects of learner analysis.

Dick, Carey and Carey (2009) focus on information about the target population (p. 96). Included therein: entry skills, prior knowledge, academic motivation, educational and ability levels, and group characteristics. However, attitudes toward the training organization, the content, and potential delivery system are especially important (pp. 97-98). Brown and Green (2011) observe that these factors can impact the effectiveness of instruction (p 79). For their own approach, Brown and Green focus more on procedures of learner analysis. Brown and Green recommend that instructional designers create a working document that describes the audience. One suggested method is the creation of an audience characteristics chart. This chart would then rate the capabilities of each learner in the audience. Another method suggested is creating a profile of a fictitious average learner (p. 81). Brown and Green suggest consulting several perceptions and reports to create such a fictional person (p. 82).

Brown and Green and Dick, Carey and Carey's approaches have little overlap with each other. Dick, Carey and Carey illustrate what information about learners is useful for designers. Brown and Green's approach, on the other hand, shows how to compile the information gathered. Therefore, an instructional designer should not feel forced to choose one over the other. Combining the two approaches as part of a comprehensive analysis would be far more effective. For example, designers could use Dick, Carey and Carey's criteria for a learner ability chart. The strength in using methods developed by experts is not in any one single approach. Rather, it is in combining approaches to suit the needs of the project at hand.

In this case, as per Dick, Carey and Carey's approach, our team worked to answer several guiding questions put forward by their model (pp. 78-79):

1. What are the entry skills of the learners involved? The staff members are all literate in English. Their mastery of reading and writing falls within the high school level. They are all physically capable of handling a brush.

2. What prior knowledge of the topic area do the learners possess? Our analysis found that the most that the staff understands of painting is that it is done with a brush. They have no knowledge of applying a primer coat, the different types of paint, or any of the other steps necessary to properly painting wood. They do not understand the differences in treated and untreated wood the value of do-it-yourself renovation.

3. What are the learners' attitudes toward the content and delivery system? Most of the staff are frustrated at the idea of continuing the renovation of the rec center without enlisting professionals. They find attempts at painting the treated wood themselves to be a complete waste of time and resources. Most of their resistance in regard to any sort of instruction on the matter was mostly due to a belief that the owner was wasting even more money on hiring an instructional design firm rather than professional renovators.

4. What are the educational and ability levels of the owners? Our company found that the level of education between the various staff members was widely varied. A few were high school dropouts that had never acquired their GED. Most had completed primary education and had at least some college experience (or were actively seeking a degree). Most of the staff members who did hold a degree only had an associate's, with one holding a bachelor's. Of ability and expertise in renovation, only the owner has any sort of experience.

5. What are the general learning preferences? The majority of the staff members would prefer hands-on demonstrations and the opportunity to engage with instructors and discuss potential issues or problems.

6. What are the learners' attitudes toward the training organization? Although our company is recognized for its excellence in providing instruction and instructional materials, the staff feels our hiring was a wasteful decision on the part of the owner. For that reason, we expect our learners to be mildly resentful of our presence.

7. What are the characteristics of the learning group? The staff members are roughly two-thirds male, and one-third female. Another two-thirds are Caucasian, with half of the remaining members Hispanic and the other half African-American.

As per Brown and Green's procedures, our company used this information to compile two separate documents about our learners—a learner ability chart, and a profile of a fictitious “average member” of the group. Both of these documents can be seen in Figures 2.1 and 2.2.

Learners			
Data Type	**Challenged**	**Average**	**Gifted and Talented**
Reading Ability		X	
Writing Ability		X	
Spelling Ability		X	
Tool Usage	X		
Ability to Follow Instructions			X

Figure 2.1—Learner Ability Chart

Learner Profile

James is 24 years old and has an associate's degree from the local university. He is single and uses the job at the recreation center as a source of income to fund his further education. The ongoing efforts to renovate the rec center without the aid of professionals has left him frustrated and annoyed. James has not performed any sort of do-it-yourself handiwork before, and only has the barest knowledge of how to handle certain tools. His ability to read and write is average for people of his education level. He has no disabilities that would present a challenge or prevent him from completing the instruction.

Figure 2.2—Learner Profile

Learner Objectives

After conducting our task analysis, our company proceeded to develop learning objectives. We consider this a necessary step in the development of effective instruction. According to Brett Bixler (2014), the purpose of learning objectives is to provide focus for learning so that both the instructor and audience understand what to do and how to measure progress. Learner objectives also provide additional benefits for the designer, instructor, and audience. Keeping instructional content firmly rooted in learner objectives ensures that the instruction is both relevant and effective. These objectives also allow instructional designers to remove subjectivity from their content. Students will also have a better understanding of the link between expectations, the content that is taught to them, and how it is graded (Bixler, 2014).

Given the wide range of benefits instructional goals and objectives offer to all parties involved in an instructional scenario, the development of such goals and objectives lie at the very core of instructional design technology. However, experts disagree on whether such outcomes are definable and measurable (Morrison, Ross, & Kemp, 2004). One approach is the "ABCDs of Well-Stated Learning Objectives" by Smaldino, Lowther, and Russell (2008). In addition, Smaldino et al (2008) introduce a fourth learning domain, similar to the knowledge domain. Brown and Green (2011), in contrast, provide a checklist of five questions (pp. 96-97). The two approaches are similar to one another, but they have distinct qualities better suited to different situations.

The ABCDs of Smaldino et al.'s approach means "Audience, Behavior, Conditions, and Degree" (Brown and Green, 2011, p. 92). According to these experts, an objective must address all four. Objectives must identify and describe the learners. Objectives should also describe what is expected of learners after instruction. They must also describe the setting and scenario in which learners will perform. Finally, they should explain the standard for acceptable performance. Smaldino et al. also consider interpersonal skills a fourth domain of learning (p. 92). Interpersonal domain shares the knowledge domain's emphasis on values, but through teamwork. Brown and Green believe an objective should help answer five questions. What is the instruction's purpose? Is it reflected in the goals and objectives? Is the organization's culture accounted for, and do goals and objectives match instructional intent? What behavior should learners exhibit? How will instructional goals and objectives be evaluated (pp. 97-98)?

Brown and Green's questions address much of the same criteria as Smaldino et al.'s "ABCD's." Therefore, it would be redundant to use both approaches to design learner objectives. However, each approach is better suited to specific situations by virtue of where they differ. Brown and Green's questions checklist places more emphasis on a client organization's culture and politics. Meanwhile, Smaldino et al.'s approach is more focused on the learners themselves. The "ABCD's" of well-stated objectives do not factor in a client organization's culture. At most, the approach is concerned with the setting and circumstances of performance. Overall, Smaldino et al.'s approach is much more people-centered than Brown and Green's. Clients, like learners, can take many different forms. A "one-size-fits-all" approach to developing learner objectives may not be possible. Therefore, instructional designers should use the approach that best fits the nature of the client.

In this case, our company selected Smaldino et al.'s approach as our basis for developing learning objectives for this particular client's requirements. Our instructional designers determined that the client's organization did not have any sort of internal politics or culture that would significantly impact instruction. Therefore, using the questions checklist provided by Brown and Green would not be efficient, considering the attention it gives to such matters. The lack of organizational politics and culture that might significantly impact instruction allows our designers to focus on the learners and the circumstances of the instruction, for which Smaldino et al.'s "ABCD's" approach is ideal.

Building on our work with the outline document we produced during the task analysis phase, our instructional design team prepared a similar document that focuses on formatting the tasks into learning objectives with an equal amount of sub-tasks. For this document, we also elected to categorize the objectives according to the work of Benjamin Bloom and his colleagues. We consulted the website of Brett Bixler (2014) for information on the learning domains identified by Bloom, as well as his taxonomy of cognitive objectives. Our learning objective outline document can be found on the following page as Figure 3.1.

Learner Objectives

Objectives are listed here according to the learning domain in which they belong, as well as what level they occupy on Bloom's Taxonomy.

1. Affective Domain:

Given a computer with internet access, learners will value the worth of do-it-yourself renovation, as measured by appropriate assessment software.

a. Do-it-yourself renovation saves money as contractors can charge as much as 60% markup.

b. Owners have a greater measure of control over the work performed.

c. Learning do-it-yourself skills can provide side revenue.

2. Cognitive Domain:

Given a computer with internet access, learners will be able to differentiate between pressure-treated and untreated wood, as measured by appropriate assessment software.

a. Pressure-treated wood is designed to resist damage from water, insects, and fungus.

b. Pressure treatment forces chemicals (usually waterborne) into the wood.

c. Paint will not properly take on pressure-treated wood unless it is prepared first.

3. Psychomotor Domain:

Given several blocks of pressure-treated wood in various states of preparation, learners will prepare and paint pressure-treated wood, as measured by successfully demonstrating the proper method taught in this instruction within 10 minutes.

a. Clean the wood surface with a stiff-bristled brush and soapy water, rinse, and allow to dry (2 minutes).

b. Sand the wood before proceeding with adding the primer coat (4 minutes).

c. Paint the wood with a primer, allow to dry, then paint with a latex topcoat (4 minutes).

Figure 3.1—Learner Objective Document Outline Format

Events of Instruction

According to Brown and Green (2011), experts in the field of instructional design have devised a system with which to identify and order the activities given within a lesson, which they call "events of instruction" (p. 103). Robert Gagné in particular is known for categorizing events of instruction into nine sequential steps. Brown and Green (2011) argue that adhering to this order of events greatly impacts instruction in the same manner that planning the order of dishes served in a meal improves the overall experience (p. 104). However, other experts admonish that Gagné's findings are not meant to be treated as iron-clad rules; rather, they should be considered framework or guidelines which can be modified to suit the needs of the moment (Clark, 2014).

For the purposes of this instructional packet, our designers chose to organize the material using Gagné's model as a basis. We saw no particular need to reorder, remove, or add events. The following list will provide an explanation of each step in Gagné's model, as well as an explanation as to how each event applies to the three learning domains covered in this instructional packet.

Gain the learners' attention. According to Donald Clark (2014), this event of instruction can entail such activities as presenting a story, problem, or a new situation that will grab the learners' attention. Clark likens this activity to the "cold open" technique of television shows, in which the story begins before a title sequence or opening credits are shown.

For the affective domain objective, in which learners shall value the worth of do-it-yourself renovation, our designers recommend opening with a story or discussion relating to a problem solved through do-it-yourself workmanship. Alternatively, asking the audience if they have ever had a situation where something needed repairs which they were able to conduct themselves may prove effective.

For the cognitive domain objective, in which learners shall differentiate between pressure-treated and untreated wood, our designers recommend following the recommendations for tying this event to the affective domain objective. Such a tie-in will require redirecting the introductory conversation in some way to wood, particularly pressure-treated wood. Focusing on topics concerning outdoor construction may prove beneficial in this regard.

For the psychomotor domain objective, in which learners shall prepare and paint pressure-treated wood, our designers believe that for the purposes of this event of instruction, the recommendations for tying in the first event to the cognitive and affective domains will be sufficient enough to cover this domain. However, guiding the

introductory discussion on problems associated with painting wood may help to satisfactorily cover this particular learning domain.

Provide a learning objective. According to Donald Clark (2014), this event of instruction allows the learners to organize their thoughts on what they will learn and perform. Informing learners what the topic of instruction helps them to understand what goals they are expected to fulfill and how to apply the new skills learned outside of instruction. Clark cautions against reiterating the learning objectives verbatim; rather, the audience should be informed of the learning objectives in plainer, more casual language (2014).

For the affective domain objective, our designers recommend phrasing the objective in a way that automatically signals benefits for the learners: *Today we'll be talking about how do-it-yourself renovation and how doing it right can save you a lot of time and money.*

For the cognitive domain objective, our designers agree with Clark that the most effective course of action is rephrasing the objective in more common language: *You'll also be learning about the differences between regular wood and pressure-treated wood.*

For the psychomotor domain objective, our designers recommend the same course of action as with the cognitive domain objective: *Finally, you'll learn how to get pressure-treated wood ready for painting and then paint it properly.*

Stimulate recall of prior knowledge. According to Donald Clark (2014), this event of instruction involves building upon the learners' previous knowledge and skills, known as scaffolding, and using retrieval practice methods rather than elaborate study processes.

For the affective domain objective, our designers recommend following the advice given by Clark (2014) concerning mental imagery. In this case, instructors should urge learners to create a mind map as a way of taking notes. Mind maps are similar to a concept map, but typically focus on one topic with branching subsets.

For the cognitive domain objective, our designers recommend using the same recommended course of action as with the affective domain objective. Requesting that learners take notes by way of mind-mapping should prove effective for information in both the affective and cognitive domains.

For the psychomotor domain objective, our designers recommend having learners practice the task in their minds as discussed by Clark (2014).

Present the material. Although described in such simple terms by Gagné, there is more to this event of instruction. According to Donald Clark (2014), the goal of this event is to provide learners the material of the course without causing cognitive overload, in which learners are provided with so much information that they actually lose the ability to process all of it. Clark recommends subdividing lessons, known as "sequence and chunk," ideally by individual tasks within each objective (2014).

For the affective domain, our designers recommend breaking up the relevant instruction along the component tasks. The three tasks—understanding that saving money through do-it-yourself workmanship, that owners have a greater measure of control over work performed, and that do-it-yourself workmanship can provide side revenue—should all receive individual focus. Between tasks, the instructors should ask a question to the audience regarding one or two facts presented for the previous task.

For the cognitive domain, our designers recommend the "sequence and chunk" approach as with the affective domain. The three tasks—understanding that pressure-treated wood is designed to resist damage, that pressure treatment forces chemicals into the wood, and that pressure-treated wood must be prepared before painting—should be addressed individually and in sequence. As with the affective domain, instructors should ask the audience a question or two at the end of each task before proceeding to instruct them on the next one.

For the psychomotor domain, our designers again recommend the "sequence and chunk" approach as with the previous two learning domains. The three tasks—cleaning the surface of pressure-treated wood, sanding the wood, then painting it with both a primer and latex topcoat—should each be given their own particular attention. As with the two previous domains, our designers recommend that instructors conclude each task by asking the audience a question before moving on.

Provide guidance for learning. According to Donald Clark (2014), this event of instruction involves the instructor coaching learners on how to learn the skills expected of them. Coaching from an instructor helps avoid learners poorly understanding the concepts involved or incorrectly performing a skill.

For the affective domain, our designers recommend combining this event of instruction with presentation of the material. The designers' previous recommendation on asking the audience a question should be followed by an explanation of whether the answers provided by the audience were correct or incorrect.

For the cognitive domain, our designers recommend combining this event with presentation of material as with the affective domain. The designers' previous recommendation on asking the audience a question should be followed by an explanation of whether the answers provided by the audience were correct or incorrect.

For the psychomotor domain, our designers recommend combining this event of instruction with presentation of the material as with the affective and cognitive domains. The designers' previous recommendation on asking the audience a question should be followed by an explanation of whether the answers provided by the audience were correct or incorrect.

Elicit performance. According to Donald Clark (2014), this event of instruction grants learners the opportunity to do something with the behavior, knowledge, or skill obtained. This event of instruction also involves modelling, which in this context means requiring that learners demonstrate what they have learned.

For the affective domain, our designers recommend holding a discussion near the end of instruction for this portion of the course. Instructors should ask their audience questions about do-it-yourself workmanship. These questions should further encourage the learners to value do-it-yourself renovation.

For the cognitive domain, our designers recommend providing learners with a simple quiz that combines all questions asked during the cognitive portion of the course. This will allow learners to demonstrate what knowledge they obtained as a result of instruction.

For the psychomotor domain, our designers recommend allowing learners to practice cleaning and painting blocks of pressure-treated wood in various states of preparation. The learners should have a chance to practice each step of the process, with guidance from instructors as needed.

Provide feedback. According to Donald Clark (2014), this event of instruction requires instructors to inform learners of their progress and provide specific guidance where they are lacking. The feedback can be from any form of evaluation.

For the affective domain, our designers recommend providing feedback in the form of verbal comments concerning performance elicited and questions answered during instruction. Instructors should discuss where learners provided correct answers as well as where they answers incorrectly as well as why those answers were either correct or incorrect.

For the cognitive domain, our designers recommend providing feedback by grading the quiz provided to learners. Instructors should provide adequate detail concerning both correct and incorrect answers so that learners understand what they did right and what they did wrong.

For the psychomotor domain, our designers recommend providing feedback in the form of verbal comments concerning the learners' performance with the example blocks of pressure-treated wood. Instructors should note what learners did correctly as well as assist them where they do not show proper performance.

Assess performance. According to Donald Clark (2014), this event of instruction entails an evaluation of the learners' performance. The purpose of this particular step of evaluation is to determine whether or not learners have integrated the changes required of them through this course.

For the affective domain, our designers note that performance assessment will be accomplished through the use of assessment software. This assessment shall take the form of a short essay question in which learners discuss the worth of properly completed do-it-yourself renovation.

For the cognitive domain, our designers note that assessment of this domain will be handled through the use of assessment software. This assessment shall take the form of a multiple choice test that examines whether or not learners understand the differences between untreated and pressure-treated wood.

For the psychomotor domain, our designers note that assessment shall be carried out through a hands-on demonstration. Learners shall be required to demonstrate how to clean and paint pressure-treated wood by performing these tasks on prepared blocks of wood. The total amount of time for completing this phase of assessment shall be ten minutes.

Enhance retention and transfer. For the final event of instruction, Donald Clark (2014) states that learners should be informed of similar problem situations, and given additional practice. The instruction should end with a review of the course material.

For the affective domain, our designers recommend that instructors close this portion of instruction by discussing other do-it-yourself scenarios that may require knowledge of how to handle or paint pressure-treated wood. For example, instructors may discuss staining pressure-treated wood rather than painting it.

For the cognitive domain, our designers recommend that instructors review the material discussed with respect to differences between untreated and pressure-treated wood. Instructors should take care to cover and summarize all steps of the learning objective.

For the psychomotor domain, our designers recommend that, after a short review of the proper procedures for preparing and painting pressure-treated wood, that learners be given access to additional blocks of pressure-treated wood after the lesson is over. This provides an additional opportunity for learners to practice their skills, thereby retaining what they have learned.

Assessment Instruments

Evaluating the changes affected in an audience by instruction is an important part of the instructional design process. As Brown and Green (2011) state, success can and should be measured at different stages and on different elements throughout the process (p. 137). Assessment takes many forms, and there are different methods to performing assessment depending on the type of outcome expected by instruction. The three major types of outcomes with instruction are a change in attitude, a change in knowledge, and a change in skill, all of which are involved in this particular course.

Affective Domain Learning Objective

As has been stated previously in this material, the affective domain involves instruction designed to produce changes in attitude. For this course, the affective domain leaning objective is "Given a computer with internet access, learners will value the worth of do-it-yourself renovation, as measured by appropriate assessment software."

Brown and Green (2011) state that changes in attitude are the most difficult outcomes to evaluate (p. 152). Attitudes are subjective, often subtle, and difficult to evaluate directly, owing to their basis in feelings, emotions, and perceptions. Learner attitudes are usually evaluated by what learners say and how they behave. Among the methods used to conduct attitude evaluation include observations and anecdotal records, surveys and questionnaires, self-reporting inventories, and interviews (p. 152).

For this course, our designers prepared a questionnaire (see Fig 4.1) to assess learner performance in the affective domain. Two types of items common to this type of assessment include open-ended questions in which learners either write answers in response to a question, and questions (usually presented as a rating scale) in which learners pick from a predetermined set of potential answers that best fits their opinion (Brown and Green, 2011, p. 152). The questionnaire prepared by our designers uses a mixture of both types of questions as a compromise between the easily-analyzed fixed questions and the potential for more detailed responses from open-ended questions. On the next page is a copy of this questionnaire.

Questionnaire

Instructions: Please select the answer of your choice or write in the space provided as needed.

1. After attending this course, I learned to value the worth of do-it-yourself renovation.

a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree

2. I feel I would have greater control over renovations if I did them myself.

a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree

3. I feel I could earn side revenue if I learned how to perform various do-it-yourself projects.

a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree

4. Please tell us what you liked about this course or what you thought was done well:

_____

_____

_____

5. Please tell us any issues you have with this course:

_____

_____

_____

6. Do you have any suggestions on how to improve the course?

_____

_____

_____

Figure 4.1—Questionnaire

Cognitive Domain Learning Objective

The cognitive domain involves instruction designed to produce changes in knowledge. For this course, the cognitive domain learning objective is "Given a computer with internet access, learners will be able to differentiate between pressure-treated and untreated wood, as measured by appropriate assessment software."

Brown and Green state that learners must possess fundamental knowledge in order to be competent in a given field (Brown and Green, 2011, p. 142). A critical part of instruction, therefore, is to determine how much knowledge learners obtain from instruction. To this end, assessment of knowledge obtained is usually administered through objective or constructed-response tests, which are often called "paper-and-pencil" tests (p. 142). Objective tests include multiple choice, true and false, and matching questions, or items, which each have one correct answer. Constructed-response tests involve short answer and essay questions, for which learners construct an answer instead of selecting one presented from a list. Objective tests assess knowledge and comprehension, while constructed-response tests assess application, analysis, synthesis, and evaluation (p. 142).

For this course, our designers prepared a simple multiple choice quiz (see Fig 4.2) that will assess learner performance in the cognitive domain. Our designers consider the objective items, such as multiple choice, more appropriate for the scope and scale of this course. The next page contains a copy of the multiple choice quiz, with an answer sheet (see Fig 4.3) explaining the correct answers on the following page.

Quiz

Instructions: For each question, please select the answer you feel is correct.

1. Why are some forms of wood given pressure treatment?

a. Pressure treatment strengthens the wood.

b. Pressure treatment helps protect wood from water, fungi, and insects.

c. Pressure treatment makes wood more resistant to high pressure.

d. Pressure treatment colors the wood much like a stain or varnish.

e. Pressure treatment protects metals from corrosion when used with wood.

2. How is pressure treatment applied to wood?

a. High pressure and vacuum forces chemicals into the wood.

b. The wood is gently squeezed with increasing weight.

c. Lumber is blasted with a high-pressure hose loaded with chemicals.

3. What kind of chemicals are typically used for pressure-treated wood meant for buildings?

a. Creosote

b. Oil-borne (penta, copper naphthenate, etc.)

c. Water-borne (borate, micronized copper azole, etc.)

4. Why can't pressure-treated wood be painted as-is?

a. The wood already contains pigments.

b. Pressure-treated wood is too dry for paint to remain on the surface.

c. The chemicals used in pressure-treated wood cause paint to bead up and roll off.

d. Pressure treatment makes the wood very wet and unable to absorb paint.

Figure 4.2—Quiz

Quiz Answer Sheet

Instructions: For each question, please select the answer you feel is correct.

1. Why are some forms of wood given pressure treatment?

Correct Answer: B

Pressure treatment helps protect wood from water, fungi, and insects. The chemicals used in pressure treatment need to thoroughly penetrate the wood in order to help protect it from fungi, water, and termites.

2. How is pressure treatment applied to wood?

Correct Answer: A

Pressure treatment gets its name from the method of placing wood in a sealed container and the use of high pressure and vacuum to force chemicals into the wood.

3. What kind of chemicals are typically used for pressure-treated wood meant for buildings?

Correct Answer: C

Water-borne (borate, micronized copper azole, etc.) chemicals are typically used for buildings. Creosote is used for ships, guardrail posts, and railroad ties. Oil-borne preservatives are typically used for typically used in utility poles and cross arms.

4. Why can't pressure-treated wood be painted as-is?

Correct Answer: D

Because of the prevalence of water-borne preservatives used for pressure treatment, the process makes the wood much more moist than regular wood.

In order to pass this section of the course, students must be able to **correctly answer at least three of these questions**.

Figure 4.3—Quiz Answer Sheet

Psychomotor Domain Learning Objective

The psychomotor domain involves instruction that is designed to produce a change in skill or ability. For this course, the psychomotor domain learning objective is "Given several blocks of pressure-treated wood in various states of preparation, learners will prepare and paint pressure-treated wood, as measured by successfully demonstrating the proper method taught in this instruction within 10 minutes." Evaluating such changes in learners' skills requires observing their actions or behaviors, something that is known as a performance assessment. With a performance assessment, learners are not only being judged on the ability to satisfy a skill's performance requirements but also the more precise skills which make up the more general skill (Brown and Green, 2011, p. 147).

When evaluating a skill, Brown and Green (2011) recommend determining whether both the skill's process or the product, the end result, are to be evaluated (though usually both undergo evaluation) (p. 147). For evaluating a process, the authors recognize several elements ideal for assessment: following a series of steps, using tools or instruments properly, and completing the skill in a certain timeframe (p. 147). For evaluating products, instructors can focus on the product's quality or quantity. Brown and Green recommend evaluating learners' skills in as realistic conditions as possible (p. 148).

Performance evaluation takes many forms: direct testing, performance ratings, observation and anecdotal records, and portfolios. Checklists and rating scales are the most common techniques used as part of a performance rating (Brown and Green, 2011, p. 148).

For this course, our designers prepared a performance checklist (see Fig 4.4). As this course involves a simple order of tasks, our designers found that a rating scale would be unnecessarily involved. Simple observation that determines whether or not the learners correctly perform the task is assessment enough for this course.

Process Checklist

Instructions: Examine students as they perform the procedure for painting pressure-treated wood. For each action performed as listed and in the correct order, check off its corresponding box.

Sample Block #1: Uncleaned, Unpainted

- ☐ Uses stiff-bristled brush.
- ☐ Uses soapy water.
- ☐ Scrubs wood in the direction of the grain, not against it.
- ☐ Leaves wood to dry.
- ☐ Finishes work within two minutes.

Sample Block #2: Cleaned and Dried, Unpainted

- ☐ Tests wood for dryness by dripping a few drops of water.
- ☐ Selects primer paint specially formulated for pressure-treated wood.
- ☐ Applies thin coats of primer.
- ☐ Finishes work within four minutes.

Sample Block #3: Pre-painted with Primer

- ☐ Selects a latex-based paint.
- ☐ Applies at least two coats of paint.
- ☐ Finishes work within four minutes.

In order to pass this section of the course, students must be able to **correctly complete all steps for at least two of the sample blocks**.

Figure 4.4—Process Checklist

Appendix

Clean the wood surface with a stiff-bristled brush and soapy water (Carter, 2014).

Place the wood on stickers (small pieces of wood) and allow time to dry ("Douglas fir," 2011).

Test to see if the wood is dry enough by dropping a bead of water on the surface ("When water beads," 2015).

Sand the wood before proceeding with adding the primer coat (Matteson, 2015).

Appendix (Continued)

Paint the wood with a primer formulated for exterior use and pressure-treated wood (Weaver, 2011).

Sand the wood again to make sure the primer coat is smoothly applied (Kimba, 2011).

Paint the wood with a latex-based topcoat (Weaver, 2011).

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