

Adaptive Learner-Centered Education

A Toolkit for Extension



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Welcome! This guide gives you the information and resources you need to develop an adaptive, learner-centered education program that supports positive change. By working through the steps in this guide, you will learn how to plan, execute, and analyze an education program that is based on input from your stakeholders, accurately captures learners' needs, and is relevant to the local context of the people you are working with.

Introduction

What is adaptive learner-centered education?

Adaptive learner-centered education (ALCE) is an approach that allows you to address serious problems in partnership with learners. This guide focuses on applying ALCE in Extension, but it can be used by anyone interested in working with groups to solve difficult problems. The tools included here will help you determine whether ALCE matches the needs of your audience and the problems that they seek to solve. If ALCE is an appropriate fit, this guide outlines the basic steps in the process.

ALCE is grounded in constructivism, which argues that people acquire new knowledge when existing concepts are challenged by information that does not fit their current mental model. Our approach applies this principle to ensure that the learner is central to the process.

Learner-centered education defined

Learner-centered education acknowledges that each person has a unique way of viewing and solving problems, and provides individualized experience where teachers serve as a guide to support learning.

How is this guide organized?

This guide is divided into two parts: an *overview* of ALCE and a *toolkit*.

The overview describes the three stages of ALCE—Develop, Design, and Learn (see Figure 1, page 2)—and highlights the seven steps necessary to complete each stage:

1. Identify education opportunity and decision-support needs
2. Jointly envision intended outcomes
3. Generate learning guides
4. Create a process map
5. Design learning experiences and develop decision-support tools
6. Support powerful learning
7. Evaluate and inform

The toolkit includes resources to support your work with stakeholders for each step in the ALCE process. Throughout the guide, double arrows (▶▶) direct you to relevant resources in the toolkit.

What categories of problem is ALCE best suited to?

In general, ALCE is best suited to address problems that have been resistant to change, particularly those where learners have been reluctant to take beneficial steps because of uncertainties about the consequences of new decisions.

We first developed the ALCE approach to address the impacts of pesticides on endangered fish species. The farmers we worked with needed to retain crop productivity and quality, while also voluntarily mitigating pesticide impacts to a salmon fishery. There were difficult trade-offs to make, requiring new information to build into crop management decisions.



Figure 1. The seven steps of adaptive learner-centered education are divided into three stages: Develop, Design, and Learn. Each step informs the one that follows. The evaluation at the end of the process provides feedback for improving the next round of program development.

Many problems in agriculture—such as nutrient management, pollinator management, and implementation of biological pest control—share the aspects of our work with farmers on the impacts of pesticides. But ALCE is also applicable to non-agricultural problems, such as the complex challenges of diet, nutrition, and health. Adaptation to climate change is another issue well suited to ALCE because solutions can only come through constructive engagement between stakeholders and other partners who are committed to employing new data to collaboratively develop more resilient systems.

In Extension, ALCE supports stakeholders in making complex decisions and factors in the data that individuals need to recognize the benefits of their altered actions. These stakeholders may be employing skills and processes that are not immediately obvious or known to provide solutions to the problem. In this way, ALCE closes the cognitive gap between the current state where the problem exists and the desired state where it is managed or mitigated. ALCE provides the mechanism through which new kinds of action are possible.

▶▶ *Glossary of terms, page 17*

▶▶ *Adaptive learner-centered education FAQs, page 19*

When is ALCE right for Extension?

Extension audiences are diverse, and each person has different needs when it comes to learning and applying new skills. ALCE is ideally suited to challenges where learners come to the program with different levels of understanding and ability.

In some cases, people may not immediately know the challenges they face. For example, negative health or environmental impacts are not always self-evident; challenges are often only revealed through access to new data or previously unknown information. Therefore, ALCE programs may need to include ongoing access to monitoring information and follow-up to provide feedback to learners about their progress. If the problem you are addressing fits this description, how else will learners know that their actions are contributing to the outcomes that they seek? ALCE provides a mechanism to access, understand, and interpret monitoring data.

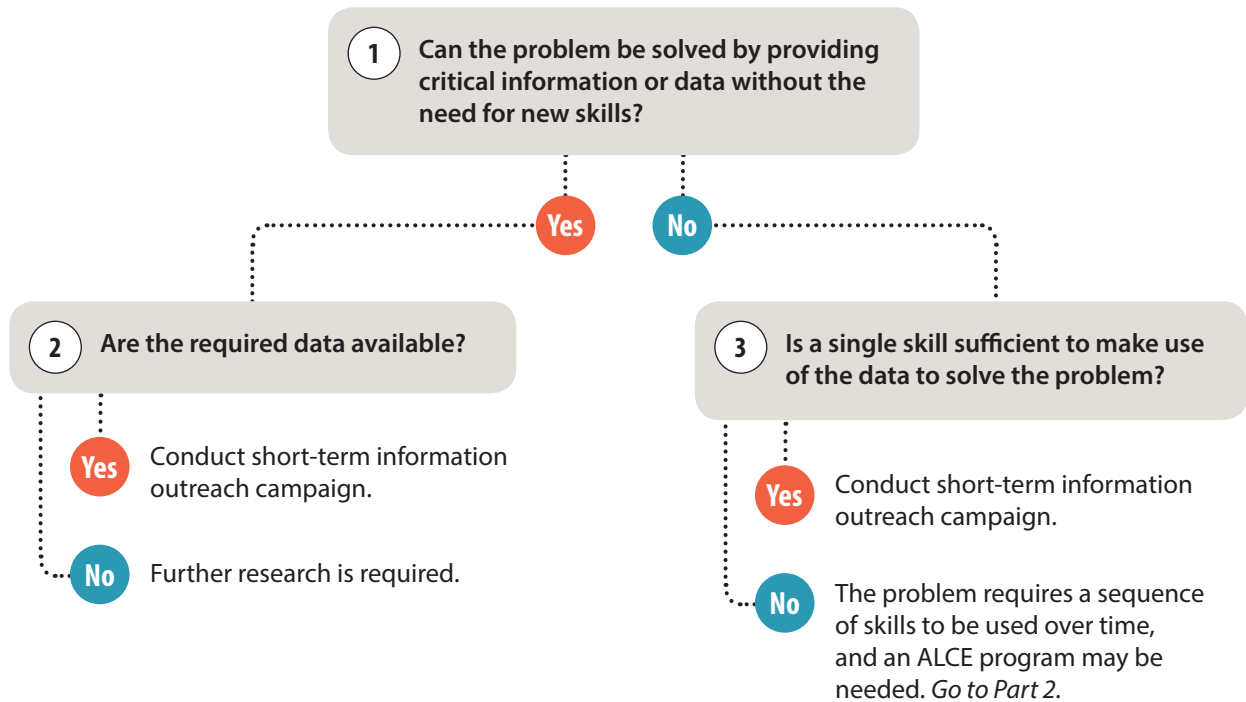
ALCE in action

To see an example of ALCE in practice, read *Adapting an Outcome-Based Education Development Process to Meet Near Real-Time Challenges to Sustainable Agricultural Production* (<http://www.tandfonline.com/doi/abs/10.1080/1389224X.2014.927377>). ALCE encompasses the methods of outcome-based education (OBE) outlined in the article. ALCE is, however, broader in concept and scope, and is intended to convey a continuous and evolving Extension education program of which OBE is an important part. Learner-centered education acknowledges that each person has a unique way of viewing and solving problems, and it provides individualized experience where teachers serve as a guide to support learning.

When is ALCE the right educational model for my program?

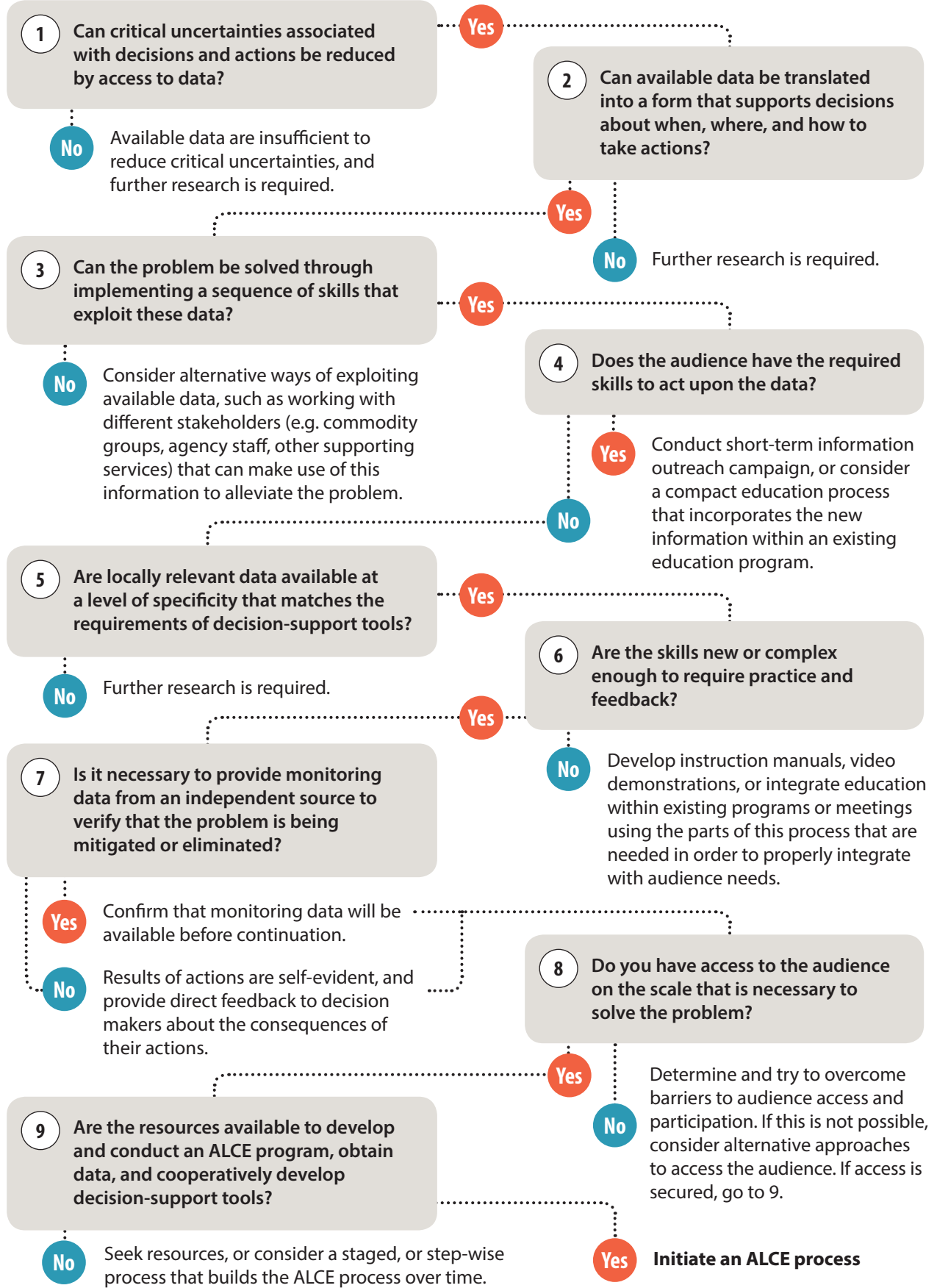
The ALCE Decision Guide (Figure 2) is a dichotomous key that can help guide your decision about the use and applicability of this approach. The guide is not designed to provide you with definitive answers about the structure of your education program, but it can help you consider different options and evaluate the quality and value of the data available to you. Answer the questions below and on the next page to help you to determine the best course of action to follow.

Figure 2. The ALCE Decision Guide



Continued next page

PART 2: Is ALCE an appropriate education approach?



What is needed to conduct ALCE?

Adaptive learner-centered education, when fully implemented, requires an investment of time and resources by educators and a subset of stakeholders. To justify these investments, problems should be serious enough and wide enough in scope to require an education program with multiple parts. If locally relevant data are needed for the design of learning exercises and feedback given on progress over time, these must be accessible and in a form that learners can use.

How much time is required for ALCE?

We can only provide cautious estimates of the time required for the three stages in the ALCE process, but we have found that each stage occupies about one third of the total time available. The total time will depend on the magnitude of the problem being addressed. People tend to allot too little time to planning, design, and evaluation, even though each of these elements makes important contributions to a successful program.

Time allocation with the ALCE process

Develop: 33% Design: 33% Learn: 33%

How do I develop and implement an ALCE program?

There are three stages in the ALCE process: Develop, Design, and Learn. The essential aspects of each stage are summarized below.



Stage 1: Develop (page 6) has two steps to help you to:

1. Articulate the problem that is to be addressed through education and determine what data you will need to measure change
2. Create a unique understanding with stakeholders and other experts to authentically capture the context in which the problem needs to be solved



Stage 2: Design (page 8) has three steps to help you to:

3. Develop a comprehensive framework for the education program
4. Design realistic learning experiences that enable skill building
5. Facilitate joint development of and practice in using new information that informs decisions about possible courses of action



Stage 3: Learn (page 11) has two steps to help you to:

6. Serve as a learning facilitator who can catalyze an exchange of ideas and provide feedback on progress
7. Develop an evaluation plan that documents the impact of the program and shares the results with appropriate audiences



Stage 1: Develop

Stage 1 of ALCE has two key steps to help you define education needs: first, formulate a problem statement, and then define meaningful outcomes based on community input and data.

STAGE 1 - DEVELOP	
Step 1: Identify the education opportunity and decision-support needs	<ul style="list-style-type: none"> • Convene a group of colleagues and others to assist in the creation of a problem statement • Create a problem statement and evaluate critical uncertainties • Identify target audience and other program partners • Determine the data needed to support change • Locate sources of monitoring data to track progress • Use feedback from Step 2 (below) to refine the problem statement before moving on to Stage 2 (page 8)
Step 2: Jointly envision intended outcomes	<ul style="list-style-type: none"> • Engage a diverse and representative group of stakeholders and jointly create program outcomes • Facilitate feedback about the progress made in Step 1 before moving on to Stage 2 (page 8)

When Steps 1 and 2 are complete, you will have defined a clear education need and target audience, and determined the data sources that are required to monitor progress.

Step 1: Identify the education opportunity and decision-support needs

Step 1 begins with the formulation of a problem statement, which is an essential aspect of education program design. The problem statement captures the extent of the challenge and scopes out possible solutions. In this step you also investigate data sources that can be used to monitor progress. These can be external data sources as well as information that learners can generate themselves.

Formulating the problem must be rigorously and carefully undertaken. To guide the process, you often need a conceptual model and an analysis of scientific knowledge gaps that are barriers to progress. With significant new problems, such as the challenge of protecting salmon in agricultural watersheds that we outlined in the introduction, problem formulation can take weeks or months but ultimately brings you to the point where the need and readiness for an education program becomes apparent.

Problem formulation helps formalize what you are learning and allows you to incorporate expert input. Set aside time to lay out what is known, and consult with experts and stakeholders in developing a detailed understanding of the problem and its causes. Often this emerges over a series of conversations. Problem formulation can be a highly creative process, and it is an essential part of ALCE. It should be regularly revisited as more is learned about the problem.

▶▶ *Instructions, Stage 1, Step 1, page 21*

Step 2: Jointly envision intended outcomes

The community engagement in this step provides unique insight into what your audience needs and wants from an education program to solve the problem identified in Step 1. In this second step, you can merge the latest science with the local context to create an education design that fits the learners' needs. You achieve this by engaging a group of representative, potential participants and subject matter experts to jointly create the intended outcomes that will be achievable after the education program.



To prepare participants to focus on a future when the problem has been solved, it is important to articulate the following question to focus them on ultimate outcomes and not on immediate concerns: “How will this program prepare learners to take actions that address the problem?” Posing this question allows individuals with diverse perspectives to jointly envision what the learner will be able to do within a given context. It is important to get this question right by focusing on the part of a challenge that your program can affect. It is easy to craft a broader question than is necessary. The consequence of doing this is that you end up with a set of general outcomes that do not reflect the specific area where your program can make a direct contribution. A focused question ensures that the program includes only those essential learning components that contribute to solving the problem.

- ▶▶ *Instructions, Stage 1, Step 2, page 23*
- ▶▶ *Sample invitation for outcomes visioning session, page 44*
- ▶▶ *Action words for developing learning outcome statements, page 43*



Connecting the outputs of Step 1 and Step 2

Before moving on to Stage 2, it is important to integrate the results from Steps 1 and 2 to ensure that data needs match education needs. By the end of Stage 1, you will have a clear and agreed upon problem statement, data sources for decision-making by learners, data for monitoring progress, and a set of guiding outcome statements that allows you to move on to education program design.



Stage 2: Design

Stage 2 of the ALCE process has three steps to help you design a cohesive learning experience and refine decision-support tools.

STAGE 2 - DESIGN	
Step 3: Generate learning guides	<ul style="list-style-type: none"> • Convene a subgroup of stakeholders and experts to build a program outcome guide (POG), using the “design down” approach • Structure a linked set of courses or other educational experiences, and develop course-level outcomes guides (COGs)
Step 4: Create a process map	<ul style="list-style-type: none"> • Create a system-level view of the program, showing flows of data and information within and between courses and partner groups
Step 5: Design learning experiences and develop decision-support tools	<ul style="list-style-type: none"> • Develop locally relevant learning experiences that build skills and simulate real-world situations and decision making challenges • Enable improved decision-making through refinement of tools that reduce critical uncertainties

When Steps 3, 4, and 5 are complete, you will have a set of connected learning guides and a visual representation of your program. You will also have an empowering decision-support tool that is incorporated into the program through active learning.

Step 3: Generate learning guides

The purpose of Step 3 is to develop a cohesive education plan with the necessary courses or workshops. To complete this step, meet and talk with a smaller, representative group of stakeholders to isolate what learners need to be able to do after the program to achieve the outcomes. Working backwards from the outcomes, identify the necessary tasks, skills, and key concepts. This generates the structure learners require to organize and apply their new knowledge. It is easy to miss some of the linkages between these key elements of learning if a formal design process is not used.

Through this process you will create a program outcome guide (POG). The POG clearly articulates what is needed for a learner to achieve the intended outcomes that have been identified. Its structure mirrors the constructivist view that learners build their conceptual knowledge to enable actions that are informed by deeper thinking and direct experience.

Next, you will design one or more course outcome guides (COGs). These provide only the essential content necessary to achieve the program outcomes through a series of courses or workshops where skills are gained and practiced. This sequence of courses can be portrayed visually to ensure that logical connections exist between the learner and the flow of information over a series of education events.

As you create course outcomes based on the program level outcomes, it is important to consider the amount of time learners will be willing to commit. This information will allow you to scale the course outcomes and, ultimately, the course design. In an active learning setting you may cover less content in a

Benefits of an instructor guide

To ensure that you have enough time to carry out what is in your COG, we suggest that you create an instructor guide for yourself that distributes the required details of learning over the time available. This document will guide time allocation. Do not forget to include time to explain the process and plan to learners, as well as allow for opportunities for learners to practice skills, complete tasks, reflect, discuss and evaluate their progress.

course than you originally envisioned because it is essential to allow adequate time for learning to occur. If you try to squeeze too much into a course, you reduce the time that is available for productive discussion and skill development.

- ▶▶ *Instructions, Stage 2, Step 3: Design a program outcome guide (POG), page 25*
- ▶▶ *Instructions, Stage 2, Step 3: Design a course outcome guide (COG), page 27*
- ▶▶ *Outcome guide worksheet (for program or course) page 35*
- ▶▶ *Essential terms for program course outcome guide, page 36*
- ▶▶ *Sample program outcome guide, page 37*
- ▶▶ *Sample course outcome guide, page 38*
- ▶▶ *Checklist for program and course outcomes, page 39*
- ▶▶ *Review checklist for program and course outcome guides, page 41*

Step 4: Create a process map

If your program has multiple courses, or draws on external data or other resources, then it is helpful to create a map illustrating the relationships between these components of the program. A process map shows the flow and timing of data input for decision-making, and it can extend to the point when learners provide post-program feedback to gauge the adoption of new skills. It can also extend beyond this to include monitoring data that indicate the beneficial impacts of the changes that have taken place. This visual representation promotes better understanding of the linkages between courses, and it illustrates the connections between skills and the intended outcomes.

- ▶▶ *Instructions, Stage 2, Step 4, page 29*
- ▶▶ *Process map structure, page 42*

Step 5: Design learning experiences and develop decision-support tools

The final step of Stage 2 has two parts: first, the design of realistic learning experiences based on locally relevant data and scenarios that provide representative practice with new skills, and second, the refinement of decision-support tools that can be used to reduce uncertainties about whether or not to employ the new skills in real-world problem solving.

To teach from a constructivist orientation, instructors may need to change their traditional roles. The instructor still provides necessary new information, but learners have more control over learning by completing realistic tasks, having time for reflection, and engaging in discussion. This requires a shift in how time is spent and an openness to having learners actively work together.

To begin designing learning experiences, start by imagining the learner successfully working in a realistic scenario and completing a task that integrates new sets of skills and concepts. Critically analyze the scenario by asking these questions:

1. What actions or outputs will I be able to observe that signal learners' effective use of skills, and allow me to assess and support their learning?

Instructor tips

- 1) Get used to covering less and achieving more. This will increase the impact of your education program.
- 2) Remember to regularly review and modify previous steps as you learn more throughout the process. Then work forward through the process again to refine it.

2. What types of data will I need to create realistic learning scenarios that allow learners to practice decision-making in a way that is compelling to them?
3. What will it look like when learners are making progress towards successfully meeting program outcomes?

To complete course content development, locate sources of local information that can be inserted into the learning scenarios you create, and that catalyze skill building and task completion. Let learners integrate new skills using any decision-support tools (see below) that have been developed to accomplish tasks within the course.

▶▶ *Instructions, Stage 2, Step 5: Design learning experiences, page 30*

Develop decision-support tools

Decision-support tools channel the critical information that is needed by learners into a form that helps them select among alternative courses of action. Decision-support tools take many forms. For example, you might regularly publish a table of quality-assured data on your website or work with programmers or other specialists to build a tool. Full development and deployment of some decision-support tools can require input and participation by many specialists. Other tools, however, package existing information in a new way that has value for your audience.

Keep in mind that it is important to communicate to learners any uncertainties about the data and models you choose. Your audience's confidence in using a new tool will be greatly enhanced if they also understand both its benefits and its limitations.

A decision-support tool does not provide the solution to a problem, but it reduces uncertainties that limit our ability to make rational choices. Our role in Extension is to diagnose what information is needed, determine if it is available, and translate that information into a form that contributes to improved decisions.



Given that someone's livelihood may be at stake, or that human or environmental health might be affected by the decisions that are made as part of an education program, we have an ethical responsibility to ensure that the data and associated models in a decision-support tool meet their intended need. Remember, pilot studies, trial and error, and feedback from end-users are all extremely helpful in

refining these tools. A key part of the ALCE process involves documenting the benefits associated with the skills taught. These skills cannot be applied effectively if a decision-support tool is not a good fit for its purpose. The ALCE process that we outline here builds in the development or adaptation of these tools within the process of interaction with stakeholders and avoids the pitfall of using off-the-shelf tools without considering whether or not they are appropriate.

▶▶ *Instructions, Stage 2, Step 5: Develop decision-support tools, page 31*



Stage 3: Learn

Stage 3 of the ALCE process has two steps to help you explain and demonstrate progress on tasks. It shows how evaluation can inform learners about the status of the problem they are addressing, and it demonstrates how you can use evaluation to improve future program design.

STAGE 3 - LEARN	
Step 6: Support powerful learning	<ul style="list-style-type: none"> • Support learning by providing clear assessment and feedback • Provide adequate time for discussion and reflection
Step 7: Evaluate and inform	<ul style="list-style-type: none"> • Craft an evaluation plan and develop instruments that enable program improvement • Review external monitoring data for evidence of progress (if applicable) • Report results to participants and partners, and return to Stage 1

When Steps 6 and 7 are completed, you will have an approach to teaching that provides feedback between learners, educators, and partners, and you will have a plan that captures and reports impacts.

Step 6: Support powerful learning

At this stage of the ACLE process, you are finally in the classroom with a group of learners. ALCE encourages you to create a powerful learning experience by broadening the way you interact with learners and allowing learners to adopt greater responsibility for their experience. You can enhance learning by:

1. Ensuring that learners have clarity on what is needed to complete a task
2. Providing feedback on progress through learning assessment
3. Creating opportunities for group discussion and individual reflection

By placing the learner at the center of the educational experience, the instructor can serve as a resource person and coach by providing what is needed to accelerate learning. Then, through both active and social learning guided by the instructor, learners can further develop new insights and reconstruct their mental models. This process can generate deeper thinking and inform the future decision-making that supports behavior change.

During the learning process, the role of the instructor includes defining indicators of progress towards meeting outcomes as tasks are completed. Constructive and effective feedback using learning assessment tools ensures that skills are being applied properly within each task. An assessment tool can be as simple as a set of descriptive statements that clearly convey the indicators of quality work. This provides a standard that learners can aspire to, and by understanding this, they are able to evaluate their own progress. It can also be a checklist that shows the sequence of processes and outputs that are ideally conducted and produced when a task is being completed properly. This approach increases the probability that learners will perceive

Keeping the course on track

Before starting Step 6, look back at the tasks in the COG and review the necessary steps for each one. Determine the sources of evidence that can be used to indicate whether or not learners are advancing. This connects you back to the outcome statements and keeps the course on track to meet the original intention.

the progress they are making because they can orient themselves towards a known standard in their work and gain confidence in their ability to make changes after the course.

More elaborate assessments are certainly possible (e.g., ones based on rubrics that allow the instructor to score progress with mastery of a set of skills), but working with adult audiences in Extension, this approach may be cumbersome and unnecessary. These more complex assessment systems may, however, be very important in professional training, where a specified standard must be met, or in a public health education setting, where mastery of a task to a high standard is a requirement.

Supporting learning in courses

Early in the course, explain the course outcomes and how they relate to the way in which time will be allocated to the different learning activities. Also at the start, set the expectation that learners be fully engaged in the process by seeking their input and supporting the sharing of information between learners.

There are some important principles to bear in mind when conducting a course to make sure that the value of all the planning is built into the learning experience.

For example, it is very important to clearly convey the key concepts that underlie the course outcomes. This provides a consistent knowledge base from which learners can construct new meaning. When learners have this shared conceptual framework, it increases the likelihood that they will correctly apply the skills they learn through your program to problems in the real world. When you were growing up, and your teachers explained that it was important to get the basics right first, this is what they were referring to! A process that starts with key concepts and then builds skill through individual and group work enables deeper learning that can be transferred to other situations over time.

Using learning assessment

Developing an assessment tool takes time and insight but has the benefit of accelerating progress towards achieving the intended learning outcomes. You must allocate time to explain the assessment tool to learners and also demonstrate how feedback from the tool will be provided. Ideally, learners use this tool themselves to assess progress, but you can also ask learners to assess each other or you so that problems can be identified and addressed during the course. Once you have a tool, you can develop feedback statements based on what you think might go well and not so well, and draft some probing questions that allow you to understand the thinking behind the choices that learners make. This approach to teaching allows you to facilitate the application of concepts and skills within the task, while still allowing learners to direct their own experience.

Promoting discussion and reflection

Group work provides for the sharing and synthesis of ideas in a way that all group members can benefit from. Small groups create unique educational experiences for themselves. When given time for reflection, learners can better integrate new knowledge with their previous experience—this process

Assessment tool example

Working with a group of farmers on issues related to integrated pest management (IPM), we defined the following course outcome: “Limit exposure of surface waters to pesticides by IPM, combined with good application practices and application technology.” One of the tasks associated with this outcome was: “Given a case study, develop a farm-specific plan that integrates online weather data with pest prediction model output to schedule pesticide applications.”

To carry out this task, participants were expected to develop and practice the following skill: “Locate local, on-line weather forecasts and pest models to time applications effectively and optimize pesticide use.”

The assessment guidance was as follows:

A well-scheduled decision to apply a pesticide is based on evidence of high pest risk, which is determined by accessing an appropriate IPPC decision-support model, and using weather forecasting and real-time weather monitoring to confirm that:

- Wind-speed falls between 3 and 9 mph
- Air-temperature does not exceed 70°F and humidity is above 40%
- Stable air, or inversion conditions, do not exist at the site of spraying

This COG had four tasks with four associated skills that met the two intended outcomes.

is further improved if they have worked with their peers. Setting aside time specifically for reflection and group discussion can promote greater participation and maximize learning. This time is valuable as it also allows new ideas to emerge from the group that can be built upon or examined for their usefulness in contributing to solving the problem. To provide a sense of completion in a course sequence, it helps to have group representatives or willing individuals share what they have learned and how this might be implemented in the real world.

Bloom's Revised Taxonomy of terminology can be very helpful in guiding your course design and describing the importance of these stages in learning to others. As the instructor, your role is to bring technical content

to support learners in building new conceptual knowledge. Through ALCE, each learner has the opportunity to integrate technical content in a unique way, resulting in greater control over how they make use of this new information to solve problems in their own context.



Step 7: Evaluate and inform

ALCE involves developing an evaluation plan that links intended outcomes with the collection of data that verify whether or not outcomes have been met. Evaluation data also provide actionable information that can be used to adjust future programs. In situations where monitoring data can be used to track progress in alleviating a problem, these data can be communicated back to participants to validate and reinforce the changes that resulted from applying new skills. Once evaluation

results have been analyzed and reported, it is possible to return to Stage 1 and determine whether a new or modified education program is required.

The final step of this process is to use an evaluation plan to document the progress learners have made in their knowledge, skill, and ability to solve the problem. In addition, the evaluation will help you determine areas for improvement in future courses. The intended learning outcomes express what the goals are for the learners to attain in their lives, and these form the basis for the evaluation. A comprehensive evaluation plan captures course-level changes as well as tracks application of skills in real-life situations after courses are completed. It is tempting to create the evaluation along the way, as and when you need it. However, it is important to have a rigorous evaluation design in place prior to the education program. By having it at the start, you focus on what needs to be known, who needs to know it, and by when.

Four core areas to consider as you assemble your evaluation strategy include:

- **Clear purpose statement:** A useful first step in creating your evaluation plan is to write a statement that captures its purpose and the reasons for conducting it. We have found that this helps to focus the plan from the outset.
- **Set of overarching questions:** A second step is to draft a set of key questions that the evaluation seeks to answer. This provides direct guidance when you are developing evaluation instruments.
- **Appropriate approach:** A thoughtfully selected evaluation approach with associated instruments and metrics that are fine-tuned to your program.

Tips for facilitating learning

A great way to start courses that are taught from a constructivist orientation is to help learners to draw upon existing knowledge and past experience. If learners have had the opportunity to do this, they can access this personal context more readily during the course. This can be done in a number of ways, including asking learners to discuss their experience with a given situation in a small group or with a neighbor for two or three minutes, or by asking them to reflect individually on what they know or have experienced related to the topic.

- **Results communication:** The fourth step involves creating a communication plan for the results. This includes determining the types of audiences that need to be reached and identification of their distinct information needs.

The POG and COGs can guide the evaluation development; they contain the intended learning, skills, and actions that can be measured in terms of learners' intentions and actual changes in their lives.

Good evaluation practice involves piloting each evaluation tool with a few people who are similar to those who will participate in your program to obtain feedback on wording, questions, and response options.

Course evaluation

For at-event evaluation in our courses, we have often used a retrospective pretest at the end of individual events to capture changes in knowledge and skill, based on a specific COG. This approach allows the educator to use a single form at the end of each event to measure changes. Regardless of the method you choose, remember to allocate time in the instructor guide for participants to complete these evaluation instruments.

In our work with farmers, we conduct follow-up evaluation one cropping season after the education program to document actual changes in behavior that can be linked to a given course. These surveys are done by mail or online, with up to three reminders to increase the response rate.

Program evaluation

The purpose of program-level evaluation is to determine the impact your program has had on the participants and on the challenge you are seeking to address. This is typically completed during and post program to gather the data after sufficient time has passed to allow for changes to be implemented and for system-level impacts to be possible. It is very important to note that program evaluations have to be tuned to available resources and to the scale and importance of the problem that you are addressing. This process can be small-scale, consisting mainly of follow-up evaluations that determine the degree to which the skills have actually been employed in the real world. For complex societal challenges, however, where the results are of widespread interest, a rigorous evaluation may be very important and must be planned as an intrinsic part of your program.

To document the impact of your program, it is ideal to collect baseline data prior to education to better understand the group you are working with and the status of the system you are working in. Baseline datasets often include demographic information, and can detail current behaviors and actions related to the challenge you seek to address. These may also include measurements from monitoring, or other attributes of the problem, so that you can quantify the impact of your program once it is complete. Baseline data are essential if any change in condition is to be inferred as a result of education. Control sites, where education has not been undertaken, are an essential prerequisite if this connection is to be formally asserted.

For projects that rely on external monitoring data, this can be a source of independent evidence for the achievement of outcomes, as long as your problem formulation provided a scientifically plausible connection between the behavior of learners and the phenomenon that is being monitored. If your program does

Getting the most out of your evaluation

In our experience, many educators come to program evaluation simply wanting a survey, but if you do not have a purpose and context for your evaluation, this may prevent you from properly measuring the impact of your program. It is important to have your evaluation plan drafted before your program begins to capture short- and long-term changes and outcomes.

Informed consent

In the USA and elsewhere, you may need to consult an institutional review board (IRB) for the ethical conduct of research using human subjects, if you are obtaining data from individuals that will be used in research. Depending on your program, informed consent for data collection may be required as well as a protocol to protect personal information.

not have access to such data, then follow-up evaluation based on the outcomes defined in the POG can serve as the basis for your program evaluation. Follow-up evaluations can capture a wider range of behavior changes and their impact on the system or the challenge that you are working with.

▶▶ *Instructions, Stage 3, Step 7, page 33*

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Glossary of terms

- **Bloom's taxonomy:** A hierarchy of terminology that is used to classify learning objectives (revised version in Krathwohl, 2002).
- **Constructivism:** A theory of learning where individuals construct new knowledge from prior knowledge in a context where they can test new ideas and approaches through active learning that simulates realistic experience (often termed cognitive constructivism).
- **Concept:** An idea or a theory that needs to be understood prior to learning, and that forms an essential part of learners' knowledge on a subject. In Bloom's Revised Taxonomy, concepts are a part of Factual and Conceptual Knowledge, and they are also incorporated within the cognitive processes Remember and Understand (Krathwohl, 2002).
- **Course:** A single education event or workshop that is generally a part of a series making up a program.
- **Course outcome guide (COG):** The course design document that is sourced from the program outcome guide (POG) and scaled to fit the time allotted for learning (Stiehl and Lewchuck, 2008).
- **Decision-support tool:** A model or device that translates the data that are required to inform a decision into a form that can be readily assimilated by the decision maker.
- **Designing down (a program or course):** The process of designing an education program or curriculum by working backwards from intended learning outcomes that state what learners will be capable of doing after the program through a sequence of steps that lead to these outcomes (Spady, 1994).
- **Education program:** A series of connected courses, workshops, or other education events.
- **Intended learning outcomes:** A set of statements that clearly define what learners will be capable of doing in their lives after the education program.
- **Instructor guide:** A document that outlines the learning activities and time required for each part of a course in order to ensure that the course outcome guide (COG) is realistic and practical.
- **Learning assessment:** The process of providing feedback on learning (from peers, self, or instructors) that is based on evidence of the mastery of skills and the quality of work on a task.
- **Learning theory:** A conceptual framework that describes how information is acquired, processed, and retained and leads to learning.
- **Problem formulation:** The process of specifying a problem by defining the unacceptable state of a system, identifying likely causes, identifying the resources and actions that are available to return the system to an acceptable state, and defining the criteria that determine when the population or system has recovered.

Glossary of terms (cont'd)

- **Program:** A sequence of education events or courses that are connected and that build to enable the intended program outcomes.
- **Process map:** A visual representation of education program elements, including a sequence of courses, incorporation of decision-support tools, data flow, and the contributions of partners and supporting activities.
- **Program outcome guide (POG):** A framework that is built from the intended program outcomes and shows the necessary learning that is required to achieve those outcomes (Stiehl and Lewchuck, 2008).
- **Skill:** An ability that requires feedback and practice to master. In Bloom's Revised Taxonomy, skills are incorporated in Procedural Knowledge and through the cognitive process Apply (Krathwohl, 2002).
- **Task:** An integrating experience that requires learners to think more deeply to combine multiple skills and knowledge associated with related concepts. In Bloom's Revised Taxonomy, tasks can include both Procedural and Metacognitive Knowledge and can require the cognitive processes Analyze, Evaluate and/or Create (Krathwohl, 2002).

Adaptive learner-centered education FAQs

Why should I consider changing my current approach to ALCE?

Adult education is a difficult undertaking because learners come to programs with varying levels of knowledge and past experience. Adult learners do, however, expect education to help them solve problems by providing them with practical solutions. All educational opportunities require us, therefore, to work with our audiences to integrate new sources of information within expanded knowledge and skillsets. A designed education process will help you to navigate more effectively through both simple and complex challenges, and this guide will help to determine if ALCE provides the right framework for you and your clients.

During the initial planning process, it is crucial to determine whether or not the problem can be alleviated through the implementation of an education program. If education is to lead to positive change, it has to be based on a foundation of knowledge and information that can guide decisions about alternative courses of action. Where current research or the data required for decision support are lacking, education is unlikely to contribute to a solution to the problem, and research or other options may be more applicable.

If there is a skillset that education can impart and uncertainty about an appropriate course of action requires access to new data, then ALCE can empower participants. This approach to education identifies the concepts and skills that are necessary to put meaningful change into effect, and it uses a consultative process that acknowledges adult learners as participants in defining the outcomes that are sought. Through practice with realistic scenarios, learners can adapt more effectively to new challenges and gain the skills and confidence to change their behavior.

What if my time or resources are limited?

If your time or resources or both are limited, the overall program may need to be delivered over a longer period to put the entire set of learning experiences on a timescale that matches resource availability.

What are the unique aspects of ALCE?

The foundation for ALCE design is a set of intended learning outcome statements that provide a vision of what learners will be able to do in their lives after the program. These statements define what is needed to construct realistic and comprehensive learning experiences. The source of the intended learning outcomes is a participatory group process that blends input from potential learners and other stakeholders with appropriate subject matter experts to create an accurate and shared vision.

Our approach incorporates decision-support tool development that enables learners to exploit relevant data in decision-making. Decision support is often undervalued, and we advocate for this to be explicitly considered. Although new decision-support tools may not be needed in every case, we see a number of problems in our own Extension work where such tools are a catalyst to progress.

What is the theoretical support for ALCE?

When we are facing new challenges we tend to draw on prior experience and apply the mental model that has previously guided our thoughts and actions. We are all somewhat resistant to the changes that might be necessary to solve a problem. An education experience can either complement our existing model or challenge it in way that convinces us to change (Kohler, 2014). Education that is based on constructivism recognizes this, and it provides experience in testing new ways of thinking and behaving in a setting that gets as close to the real world as possible (Merriam et al., 2007). By doing this, we argue that

Adaptive learner-centered education FAQs (cont'd)

it maximizes the likelihood that learners might act in ways that are more consistent with the world that they experience.

In designing education programs that focus attention on skill development, it is helpful to have a set of descriptive terms that identify the important stages in learning. The best defined set of terms that we have found are included in Bloom's Revised Taxonomy of Educational Objectives. This set of definitions is based on the concept that effective education is built through a cumulative hierarchy of knowledge and cognitive processes (Krahtwohl, 2002). We provide some guidance in the glossary about the ways in which the terminology that we use connects with Bloom's Revised Taxonomy.

Can I make use of the parts that I find most useful and fit them within other methods?

Parts of the multistage ALCE process can meet other needs by being used independently. Step 2 of Stage 1 (joint creation of program outcomes) can, for example, be used to develop a common language with diverse audiences. It can also be used to create shared outcomes in circumstances where the target audience already has the necessary skills but requires education to incorporate new kinds of information into their decisions or actions.

Instructions for Stage 1, Step 1

At this stage, you have either completed the ALCE Decision Guide (page 3) and decided that ALCE is an appropriate educational approach or you have become aware of a problem among your clientele that is suited to it.

Required time: 2 hours of preparation by the lead person; 4 hours of group work by experts and stakeholders

Task 1: Specify the problem as clearly as possible, using terms that can be defined and measured

Actions:

Draft a conceptual model that connects the perceived causes or drivers of the problem with its impacts.

Keep in mind:

- A conceptual model is effective at exposing assumptions about the causes of the problem that need to be tested or explored—try asking for evidence that supports each link in this chain, and rate the quality and consistency of the information that is available to you.
- This process can identify situations where there is insufficient knowledge to support an education program, and save time and resources.
- A conceptual model can be developed through a group process that includes experts and presents a cause and effect pathway (often using a flowchart).

Task 2: Summarize the resources available to address the problem

Actions:

- Identify the critical data required to support decisions and determine whether or not these are available.
- If necessary, translate these data into a form that supports decision-making. This can involve development of summaries or graphical representations of the data, or the development of a computer-based decision-support tool.

Keep in mind:

- Decision-support tools require inputs from decision makers and generate outputs that reduce the uncertainties associated with one course of action or another.
- This step can also involve an analysis of uncertainties or the critical knowledge gaps that prevent progress from being made. This will often suggest the data that would be necessary to support progress and even tell you whether or not more research is required before an education program is justified.

Task 3: Outline possible courses of action

Actions:

- Determine whether it is possible to verify that the problem is tractable enough to be solved by your audience.
- If reasonable courses of action are not apparent, then it may be necessary to reconsider the problem, view it from a different perspective, or decide that further research is necessary before education can take place.

Keep in mind: This task is elaborated later in this step.

Instructions for Stage 1, Step 1 (cont'd)

Task 4: Consider and address constraints and barriers to progress

Actions: Think through possible constraints in advance.

Keep in mind:

- Constraints narrow options for action and often become more apparent as several actions are linked together.
 - Refining the education process or locating additional data that may be required can overcome some constraints or barriers.
 - Constraints may include a lack of access to education and other obstacles to participation by stakeholders.
-

Task 5: Identify the information necessary for monitoring

Actions:

- Determine what information can be used to monitor the current status of the problem you are addressing through the education program.
- Determine what information can be used to track trends in progress towards solving the problem and reaching the outcomes that are identified with your stakeholders in Step 2 of the ALCE process.

Keep in mind: It is important to enter the consultative process in Step 2 having already developed an understanding of the problem and the information required to measure progress and provide feedback to your audience.

Final note: There are many procedures for conducting problem formulation, but the key features listed above feed into the ACLE process. Once you have a written problem statement or create a graphic portrayal of the problem, it can be revisited and refined at any stage of the process with the help of the people you are working with.

Instructions for Stage 1, Step 2

Task: Facilitate a meeting with learners to envision intended outcomes for the education program

Required time: 4 hours

Supplies:

- Pens
- Sticky notes
- Sticky flip chart paper
- Tape
- Copies of action words for developing learning outcome statements (page 43)
- Camera (optional)

Defining questions that fit the local context

To support the design of a series of half-day workshops for farmers in Oregon, we used the question: “What should farmers be able to do in their pest management programs as result of this education program?” In West Africa we asked a broader question to engage a farming community in the design a pesticide risk reduction education program: “What would community members be able to do if an effective pesticide risk reduction education program were available in your community?”

Actions:

1. Before the session, determine a question that captures the education need and that is voiced in terms of what learners need to be capable of doing after the education program is completed. This question should enable a diverse group to think beyond their current challenges and envision learners in action after the program.

Keep in mind: Accurately defining the question is important because it frames the responses that provide the foundation for the education program. The scope of the question can be adjusted to the scale of the education program, whether it is a two-day workshop or a weekly course that might span several months.

2. Invite a group of potential learners, relevant topic experts, and others with key information about the problem to craft a set of intended learning outcomes. A group of 8 to 12 people is generally ideal to obtain a representative set of outcome statements. This usually takes 4 hours including a break. If someone that would be helpful to this session cannot attend in person, consider having an individual phone consultation and try to incorporate his or her input during the process.
3. At the start of the session, introduce yourself and summarize the purpose of the session and how each person’s contribution is key to achieving progress. The purpose of the session is to develop statements that capture the learning intentions of the program.
4. Give each person a pen, a partial pad of sticky notes, and a copy of the action word list (page 43).
5. Write the question on a large sheet of paper for the group to read.
6. Provide the following instructions:
 - Ask the group if the question language is clear and meaningful to them. The question can be edited as needed. The word “do” is used to indicate those actions that learners are not generally able to undertake at present, although it is often the case that some creative individual is already carrying out some of actions that are intended.
 - Ask the group to reflect for a minute or two on what decisions and actions would be necessary for learners to make progress with the challenge.

Keep in mind: This typically takes 30 minutes and is done without conversation or comments. Often groups will have to experience a lull in response before the process is completed, and the best ideas may only emerge towards the end of the allotted time. Action statements should cover as diverse a range of ideas as possible, and participants should imagine themselves or others taking these actions.

Instructions for Stage 1, Step 2 (cont'd)

7. As they are working, remind the group of the rules for writing action statements:
 - Each answer begins with an action word
 - One answer is written on each sticky note
 - Read your answer aloud and put it on the flip chart at the front of the room, without discussion
 - Do not allow discussion during this first part of the process
8. Stop the brainstorming and ask the group to cluster the sticky notes into groups on the flip charts that capture common themes. Conversation by the entire group is now necessary, and it should be encouraged. New action statements can be added if they arise. This is the hardest part of this step because the group is beginning to construct intended learning outcomes. It is usual to have a small number of responses that do not fit within any particular cluster. Keep track of these as a group of “parked-for-now” ideas.
9. Label each cluster directly on the flip chart with a brief but descriptive summary that captures the essence of this group of actions. Depending on the scope of your education program, the range in number of outcome statements is generally between three and eight.

Keep in mind: Crafting outcomes that reflect all of the action statements is an intellectual challenge, and it often takes the insight of one group member who perceives an emerging theme to break apparent deadlock or overcome excessively complex statements. Groups can find this process tiring and encouragement is usually required.
10. Use the checklist for developing program and course outcomes (page 39) after the statements have been drafted to assist the group in refining its work. This guide acts as a reminder about the underlying purpose and ideal form of outcome statements. Although this step can take a while, it can make a significant contribution to the overall effectiveness of your program, which depends on well-defined outcomes.
11. Keep all the paper and sticky notes from this session so that you can create a document that includes the outcome statements with the associated action phrases that accompanied each statement. Another option is to photograph the sheets of flip chart paper with the clusters of statements.
12. Once completed, share this summary back with the group and thank them for their time and their contribution to the development of the education program.

Instructions for Stage 2, Step 3

Task: Design a program outcome guide (POG)

Required time: 2 to 4 hours

Supplies:

- Worksheets
- Pens
- Flip chart paper or other paper
- Tape
- Camera (optional)

The development of the POG should be conducted soon after the outcome statements session with a subgroup of participants from the outcomes development session (Stage 1, Step 2). Consider using video conferencing if it is difficult to assemble a group for this second meeting.

The group can include some subject matter experts and also, ideally, some potential learners. This process embraces the overall scope of the program and what needs to be achieved for the desired change to become possible. Don't forget that it is the POG that you will return to when designing an evaluation for the overall program (Stage 3, Step 7).

Actions:

1. Transfer the learning outcome statements from Stage 1, Step 2 to the outcomes section on the outcome guide worksheet for the program level (page 35).
2. Welcome the group and explain that the purpose of this process is to generate a learning plan. It is essential to emphasize the importance of focusing on what learners need to achieve based on the jointly envisioned outcomes. Explain and discuss the process of working backwards from these outcomes to develop the guide and share the definitions of concepts, skills, and tasks that comprise the outcome guide (page 36).
3. Complete the worksheet by brainstorming together, then write the items in the tasks, skills, and concepts columns.

Keep in mind:

- Given the program outcomes, it is helpful to consider if there is any previous knowledge or experience that might be expected prior to engaging in this program. You may, for example, require an initial education or training prior to the course for some or all participants for the course to be successful.
- Generate one or more possible tasks that will provide evidence of learning and an opportunity to integrate concepts and skills. It is important to consider the necessary evidence that shows that learners can complete these more complex processes.
- You should identify tasks that are built on an authentic scenario that represents (as closely as possible) the situation that learners will face in the real world to solve the problem. The problem formulation process (Stage 1, Step 1) identified decision-making challenges and the data that would be required by learners to resolve these. Make sure that the program provides a platform for learners to gain access to and use this information in a realistic way.

Instructions for Stage 2, Step 3 (cont'd)

- For each task that the group selects, you must then determine the skills that are needed to complete it.
 - Remember, you may only have one task for a short-duration workshop.
 - Skills comprise the specific abilities that learners master through practice. They differ from tasks by having a single, clearly defined purpose.
 - The final step is to identify the conceptual understanding that is necessary to support the use of skills to maximize their impact. These fundamental topics form the knowledge base for the learning experience.
 - This aspect of education is often overlooked, but the learning cannot take place if the basis for understanding the purpose of the education is not clear.
4. Once these steps are completed, the group works forward—progressing from concepts to outcomes—to determine whether or not the draft program will enable learners to achieve the stated outcomes. This provides an excellent opportunity for constructive analysis, open discussion, and revision.
 5. Use the checklist for program and course outcomes (page 41) to refine the content to ensure that the POG is a clear and cohesive document that makes sense to both the targeted learners and the instructors.

Building a knowledge base

The experience of a colleague in South America illustrates what happens if learners lack the basic knowledge necessary to support the learning experience. He worked with Andean farmers in the management of potato blight and discovered that the concept of germ theory (i.e., that diseases can be caused by microorganisms) was not known to this group. By explaining this underlying concept, farmers became open to adopting new disease management tactics.

Instructions for Stage 2, Step 3

Task: Design a course outcome guide (COG)

The Course Outcome Guide (COG) is similar in structure to the Program Outcome Guide (POG) but it focuses more on the design of specific educational experiences.

Required time: 2 to 3 hours

Supplies:

- Copies of worksheets
- Pens
- Flip chart paper or other paper
- Tape
- Camera (optional)

Actions:

1. Convene a group of two to four people. These can include individuals that contributed to the POG, but given that you have incorporated input from key participants in the process by this stage, the group can also include Extension educators and subject matter experts.

Keep in mind: When setting up the education program, remember to consider barriers to participation, including the location and timing of courses, and issues of access for participants. This process is similar to POG development, but it emphasizes the practical design and implementation of specific education events that are scaled to fit within the educational programs you offer.

2. Welcome the group and explain that the purpose of this session is to talk about generating a science-based and contextually relevant learning plan. It is important to focus on what learners need to achieve the intended learning outcomes.
3. Decide about the sub-outcomes that will be addressed in individual courses. Create a set of sub-outcomes that contribute to meeting the larger program-level outcome(s) through a series of connected education events. Decide on the number of courses or workshops that are required to achieve the outcomes.
4. Review the series of draft, course-level outcome statements. For each course write these onto an outcome guide worksheet (page 35).

Keep in mind: During POG development, you will have already considered if there is any knowledge or experience that might be expected prior to engaging in the sequence of courses. If you have learners that are willing to participate in a series of events, then each course and its predecessors can serve as the as pre-requisites for succeeding courses.

5. Explain the process of working backwards from the outcomes, and the definitions of concepts, skills, and tasks in the context of each course. Hand out the list of definitions of essential terms (page 36).

Keep in mind: In developing the temporal sequence of courses or workshops, you must ensure that the outcomes are at a level that is achievable given the time allocated to each course or workshop. Often only one or two sub-outcomes can be accommodated within a 1-day or shorter workshop because skills take time to be practiced, and tasks can contain multiple parts and should have a form of feedback to the learners.

6. One course at a time, brainstorm possible tasks that support the stated outcome(s). Then, select a practical task that can incorporate decision-support and locally relevant data.

Instructions for Stage 2, Step 3 (cont'd)

Keep in mind:

- A key consideration for a task is that evidence of learning is visible at one or more points in the process. Evidence of task completion using these cues provides the signal that the instructor can move on, and it also determines when assistance or a review of a concept or skill may be needed.
 - If many tasks are generated, you must identify those that will best support learners after the course so that these can be prioritized. For a course that might only occupy a partial day, completing one task is probably realistic. For a full day or multi-day course, more than one task can usually be accommodated, but the number of these will depend on the scope of the task, and the practice and feedback needed to accomplish it. The number of tasks is usually fewer than you initially envisioned.
7. For each task, generate a set of necessary skills and the corresponding concepts. These are taught in very different ways, and it is essential that you consider how you will convey underlying concepts before you move on with building skills.
 8. For skills and concepts, discuss each item and work towards a consensus.
 9. Transfer the chosen skills and concepts to the outcome guide worksheet (page 35).
 10. Work forward through the COG—as it will be taught—and ask the group if they feel that the concepts, skills, and tasks are directly linked and can build to enable learners to achieve the intended outcomes after the course or program is completed. This provides an opportunity to adjust and improve the COG, as well as use the checklist for program and course outcome guides (page 41).
 11. If time allows, move on to the next course in the sequence or set another time with members of the group and agree to continue. This process becomes more efficient with practice.

Tips for POG and COG development

- In a POG or COG there are usually more concepts and skills, and fewer tasks.
- Keep the group focused on learning and the learners' experience.
- Ensure that course design is realistic for the learners and that adequate time is allotted for the course, including time for tasks, discussion, reflection, and feedback.

Instructions for Stage 2, Step 4

Task: Create a process map

The process map illustrates relationships between components of the program.

Actions:

1. Include the planning process as well as the course elements in your map, and show how external groups and stakeholders are engaged and connected with the program.
2. Indicate the flow of data for decision-making from external sources to learners via processes of translation that include easily interpreted summaries and decision-support tools.
3. Show the flow of evaluation data, including at-event indicators of learning, that feed back to the instructor during courses. Also include evaluation of change: (i.e., evidence of task implementation) after the course is complete, evaluation in the form of external monitoring data, and other sources of evidence indicating progress towards meeting the outcomes.

Instructions for Stage 2, Step 5

Task: Design learning experiences

Actions:

1. Imagine, and even work through, the learners' experience to confirm that tasks integrate skills effectively.
2. Analyze tasks for:
 - Observable actions that can provide feedback to you and the learners
 - Applicability and relevance to the learners' context and experience
 - Direct contribution to the intended learning outcomes
3. Integrate local data into a relevant scenario to catalyze the process; integrate skills in using decision-support tools to solve a realistic problem.

Keep in mind: We recommend that you develop an instructor guide that provides a helpful summary of in-course activity with appropriate prompts and timings to keep you on track.

Instructions for Stage 2, Step 5

Task: Develop decision-support tools

Decision-support tools provide a channel for critical information in a form that supports learners in selecting between alternative courses of action. We do not go into great detail here but suggest consulting with experts if the tools you plan to develop or adapt go simply beyond providing information from new sources to assist decisions.

Do not underestimate the importance of providing the information that learners need in a form that is easily accessible and readily assimilated. And also, keep the tool simple: the sophistication in this process comes from recognizing that a critical need for information is not being addressed. The information itself may be readily available, but the need for it has not been recognized before.

Actions:

1. Use what was learned in the problem formulation process (Stage 1, Step 1) to determine where the main decision points are for learners.
2. For each of these points, evaluate what the critical uncertainties are that the learner must face in resolving the problem. Perhaps local monitoring data are needed (for example, for a farmer managing pests on his/her crops, these might include pest abundance, weather forecasting information to determine when certain activities can take place, or even a map indicating the sensitive sites around the farm that need to be protected from pesticide drift).
3. Review possible sources for these data and the form in which they would be required to support a decision at the time and place where it is needed.
4. If these data are available, then the translation of these into a useable form is termed decision support.
5. Integrate the decision-support data within the course, as discussed above.

Instructions for Stage 3, Step 6

Task: Support powerful learning

Actions:

1. Review the necessary steps for each task in the COG to determine indicators of progress by learners.

Keep in mind:

- Is it clear to learners what they need to do to complete a task?
- Are you able to observe progress?

2. Develop an assessment tool from this review that you and learners can use to determine the quality of their work.

Keep in mind:

- Learners may be able to use this tool to assess their own progress or to assess each other's work.
- Develop supportive verbal feedback statements in advance, based on the problems that you anticipate.

3. In your design, set aside time for group work, class discussion, and also individual reflection because all of these play a role in deepening learning and in the ability to transfer skills to different situations.

Instructions for Stage 3, Step 7

Task: Evaluate progress

Actions:

1. Conduct a rigorous evaluation design prior to the education program to address what needs to be known, who needs to know it, and when. This can link to an existing logic model or be built into one for your education program.

Keep in mind:

The evaluation strategy should include:

- A clear statement of purpose
 - A set of overarching questions
 - An evaluation approach and instruments
 - A plan for communication of results
2. Create a statement of purpose. This two- to three-sentence statement clearly explains the rationale for the evaluation, including how the results will be used.
 3. Develop a list of key questions. Key questions should be overarching and cover the scope of what the evaluation will seek to answer.
 4. Decide on the approach and instruments. When possible, include both at-event and post-event or follow-up components.

Keep in mind:

- As you develop evaluation instruments, you can check that the resulting data will help you to answer each of these broad questions.
 - It is important that you recognize the data that you “need to know,” and that you focus on these at the expense of data that are simply “nice to know.”
 - At-event evaluations can indicate progress with learning in the classroom and provide a source of feedback for course improvement.
 - Program evaluation can include follow-up evaluations with learners to determine the degree to which the tasks have been employed and impact has been achieved.
 - Wherever possible, external monitoring data should be sought when these can provide an indication of the state of the system and the degree to which the education program has contributed to solving the problem.
 - It is ideal to collect baseline data prior to education to characterize the population that you are working with and the status of the system. This is essential if change in condition is to be inferred as a result of your education program.
5. Consider the stakeholders and audiences with whom you plan to share the evaluation results, including learners, funders, organizational leadership, program participants, external stakeholder groups, and educators.

Keep in mind:

It can be helpful to create a timeline that includes the data that need sharing with each group.

Instructions for Stage 3, Step 7 (cont'd)

Refer to useful resources, such as:

- *A Toolkit for Assessing IPM Outcomes and Impacts*, which can be accessed at <http://ipmimpact.ucanr.edu>. This resource includes a module on developing an evaluation plan and six modules on common evaluation methods. Although this was developed using IPM examples, the core concepts apply to most Extension program evaluation needs.
- The Evaluation section of the University of Wisconsin Program Development and Evaluation website at <http://www.uwex.edu/ces/pdande/evaluation/>

Outcome guide worksheet (program or course)

Program/Course: _____

Date: _____

	Major Concepts & Issues (POG) Concepts & Issues (COG)	Skill Sets (POG) Skills (COG)	Key Assessment Tasks	Intended Outcome(s)
	<p><i>What must the learners understand to demonstrate the intended outcome?</i></p>	<p><i>What skills must the learners master to demonstrate the intended outcome?</i></p>	<p><i>What will learners do to demonstrate evidence of the outcome?</i></p>	<p><i>How will this program prepare learners to take actions that address the problem?</i></p>

(Adapted from The Outcomes Primer: Reconstructing the College Curriculum, R. Stiehl and L. Lewchuk, 2008)

Essential terms for program and course outcome guide development

- **Designing down (a program or course):** The process of designing an education program or curriculum by working backwards from intended learning outcomes that state what learners will be capable of doing after the program through a sequence of steps that lead to these outcomes (Spady, 1994).
- **Intended learning outcomes:** A set of statements that clearly define what learners will be capable of doing in their lives after the education program.
- **Task:** An integrating experience that requires learners to think more deeply to combine multiple skills and knowledge associated with related concepts. In Bloom's Revised Taxonomy, tasks can use both Procedural and Metacognitive Knowledge and can require the cognitive processes Analyze, Evaluate and/or Create (Krathwohl, 2002).
- **Skill:** An ability that requires feedback and practice to master. In Bloom's Revised Taxonomy, skills are incorporated in Procedural Knowledge and through the cognitive process Apply (Krathwohl, 2002).
- **Concept:** An idea or a theory that needs to be understood prior to learning and that forms an essential part of learners' knowledge on a subject. In Bloom's Revised Taxonomy, concepts are a part of Factual and Conceptual Knowledge, and they are also incorporated within the cognitive processes Remember and Understand (Krathwohl, 2002).

Sample program outcome guide

Program: Watershed "X"- specific IPM and Pesticide Risk Management Education Program for a Specific Industry

Date: 2/17/14

	Major Concepts & Issues (POG)	Skill Sets (POG)	Key Assessment Tasks	Intended Outcome(s)
Entry Requirements: Manager with IPM responsibilities, plant health personnel, and other staff involved in IPM	<ol style="list-style-type: none"> 1. Pest life cycle and damage 2. Best management practices (BMPs) for pesticide application equipment management and use 3. Weather and climate drivers of pesticide fate and transport and also pest and disease epidemiology 4. Economics of integrated pest management (IPM) 5. Pest prevention tactics 6. Pesticide risks and benefits 7. Uncertainty in decision making 	<ol style="list-style-type: none"> 1. Pesticide selection 2. Selecting IPM alternatives to pesticides 3. Application timing 4. IPM/pesticide risk management (PRM) decision-making 	<p>As part of an annual IPM Plan:</p> <ol style="list-style-type: none"> 1. Conduct pesticide selection based on risk assessment data, and water quality monitoring 2. Application management to minimize risks to aquatic life 3. Determine effective IPM alternatives in response to a novel pest <p>Note: Tasks to be developed separately for small, medium, and large operations.</p>	<ol style="list-style-type: none"> 1. Create IPM plans, evaluate results, and refine the plan over time—to increase plant health, avoid regulations and increase pesticide use efficiency 2. Implement pest management options that reduce off-site impacts <p>Note: Make program scalable to different size operations.</p>
	What must the learners understand to demonstrate the intended outcome?	What skills must the learners master to demonstrate the intended outcome?	What will learners do to demonstrate evidence of the outcome?	How will this program prepare learners to take actions that address the problem?

Note: The education challenge here was to integrate effective management for pests, diseases, and weeds that harm production and limit the ability to export these commodities, with effective risk management for pesticides that had previously been relied upon. This required some new concepts to be understood, leading to modified decision making, and altered pesticide application practices that were still consistent with production constraints.

(Adapted from *The Outcomes Primer: Reconstructing the College Curriculum*, R. Stthiehl and L. Lewchuk, 2008)

Sample course outcome guide

Course: Industry-specific Application Management Planning

Date: 2/17/14

	Concepts & Issues (COG)	Skills (COG)	Key Assessment Tasks	Intended Outcome(s)
Entry Requirements: Manager with IPM responsibilities, plant health personnel, and other staff involved in IPM	1. Best management practices (BMPs) for equipment management and use 2. Weather and climate drivers of pesticide fate and transport 3. Pest prevention tactics 4. Pesticide risks and benefits 5. Uncertainty in decision making	1. Use risk assessment data to review pesticide risks 2. Factor risks into current selection decision 3. Identify climate patterns that allow pre-season application management planning 4. Classify integrated pest management (IPM) tactics in terms of water quality protection 5. Use and interpret weather forecasts	As part of an annual IPM Plan: 1. Conduct pesticide selection based on pesticide risks and water quality monitoring data 2. Select pesticides on basis of efficacy, risks, and costs 3. Identify likely pesticide loss drivers from a climate chart 4. Determine high pesticide loss risk locations and/or times on a map taking into account seasonal climate and wind direction data 5. Select times in the next 5 days for pesticides spray that avoid risky periods Note: Tasks to be developed separately for small, medium, and large operations.	1. Incorporate pesticide risk into decision-making 2. Map your operation to identify the most pesticide-exposed sites 3. Use a climate chart to determine application management over four seasons 4. Use weather forecasting to minimize losses to surface water and maximize use efficiency Note: Make program scalable to different size operations.
	What must the learners understand to demonstrate the intended outcome?	What skills must the learners master to demonstrate the intended outcome?	What will learners do in here to demonstrate evidence of the outcome?	How will this program prepare learners to take actions that address the problem?

Note: The education challenge here was to integrate effective management for pests, diseases, and weeds that harm production and limit the ability to export these commodities, with effective risk management for pesticides that had previously been relied upon. This required some new concepts to be understood, leading to modified decision making, and altered pesticide application practices that were still consistent with production constraints.

(Adapted from *The Outcomes Primer: Reconstructing the College Curriculum*, R. Stihel and L. Lewchuk, 2008)

Checklist for program and course outcomes

After the group has created a set of draft outcome statements at the program or course level, give each person a copy of this checklist.

Allow adequate time for each person to work through the checklist and make notes describing areas for improvement. Then, as a group, work through each person's comments and revise the outcome statements. Point out that some items on the checklist (marked accordingly) apply only to program- or course-level outcomes.

Outcome statements build on actions:

- The individual intended outcomes are expressed clearly in active language.
-

- One or more outcomes will enable learners to make better decisions about when and where to apply the knowledge and skills they have gained to address the challenge.
-

Scope of the outcome statements:

- The outcome statements represent reasonable yet challenging expectations for learners.
-

- [*For program-level outcomes*] The number of program outcomes is appropriate, given the scale and resources of your program.
-

- [*For program-level outcomes*] Outcome statements have sufficient breadth and focus to enable learning that can address the problem.
-

Checklist for program and course outcomes (cont'd)

- [For course-level outcomes] The number of course outcomes is appropriate for the time allotted in each workshop or learning experience.
-

- [For course-level outcomes] Course-level outcomes are directly sourced from and contribute to achievement of the program-level outcomes.
-

Outcome statement clarity and authenticity:

- Outcome statement language is direct, concise, and lacks jargon.
- Outcome statements do not contain language that might divide stakeholders, cause controversy, or reflect investigator bias.
- Language in the outcome statements will be understood by learners and stakeholders.

Review checklist for program and course outcome guides

When a program outcome guide (POG) or course outcome guide (COG) is in draft format, share this checklist with the group. Allow adequate time for each person to notice where improvements might be made, then discuss as a group to revise the guide.

Concepts

- Concepts are defined by key words describing the essential knowledge that is necessary for the outcomes to be achieved.
- Concepts inform learners of what they must understand to successfully use skills and complete tasks.

Skills

- Skill descriptions include clearly stated actions.
- Selected skills require mastery during a course or within the program.
- Skills are essential elements of tasks and also necessary to achieving the outcomes.

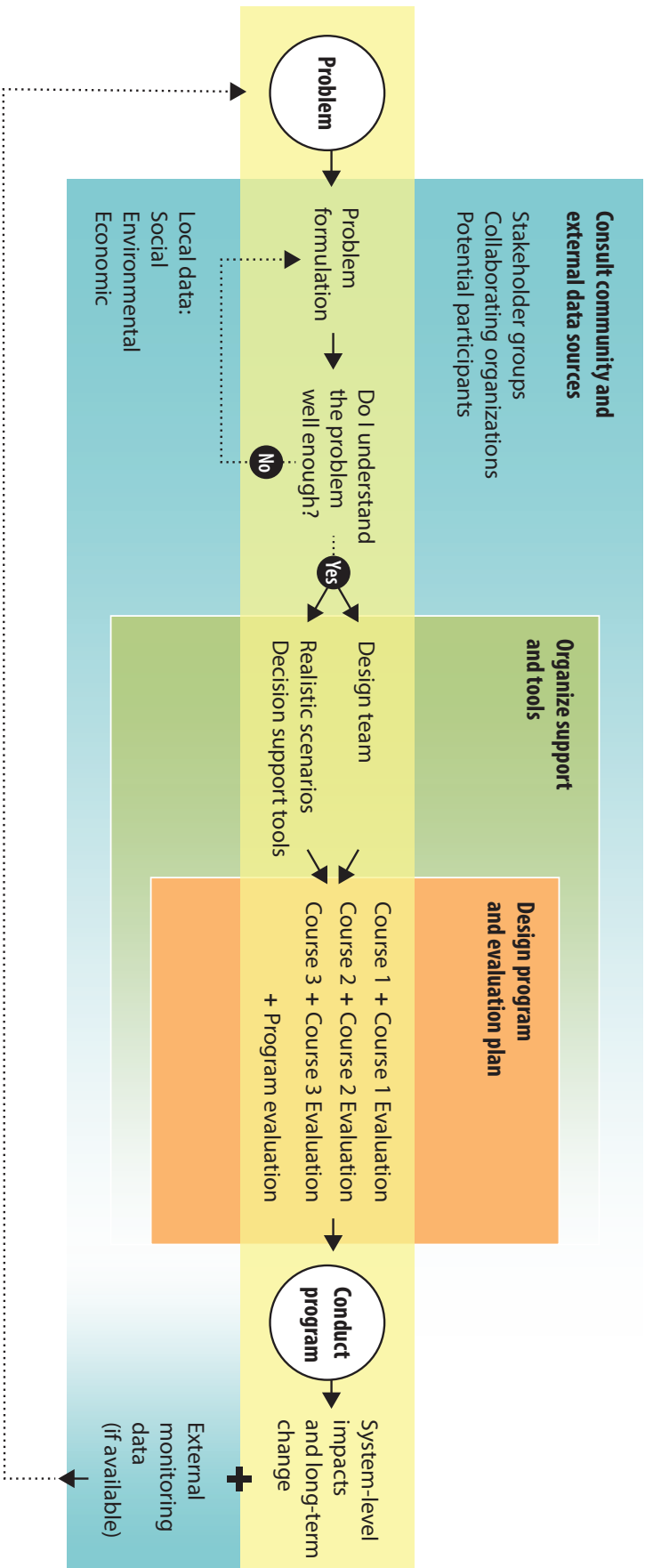
Tasks

- Tasks relate directly to enabling learners to address the challenge in the real world.
- Tasks consist of an authentic combinations of skills that learners can use in real life to achieve the outcomes.
- Tasks employ appropriate decision-support tools and/or locally relevant data.

Educational Progression

- The transition from concepts to skills and tasks is reasonable for learners, with clear linkages between them.
- The educational progression indicates if any prior knowledge is required.

Process map structure



Action words for developing learning outcome statements

Access	Demonstrate	Integrate	Provide
Adapt	Describe	Interpret	Question
Address	Design	Invent	Rate
Advise	Detect	Inventory	Recall
Advocate	Determine	Investigate	Recognize
Analyze	Develop	Judge	Record
Apply	Devise	Justify	Recruit
Appraise	Diagnose	Lead	Reduce
Arrange	Diagram	Maintain	Refine
Assemble	Discover	Make	Reflect
Assess	Discriminate	Manage	Relate
Audit	Distinguish	Map	Report
Calculate	Differentiate	Measure	Research
Categorize	Document	Model	Resolve
Check	Employ	Monitor	Respond
Choose	Estimate	Negotiate	Restate
Clarify	Evaluate	Observe	Review
Classify	Examine	Obtain	Revise
Collect	Explain	Operate	Schedule
Combine	Experiment	Organize	Select
Communicate	Facilitate	Outline	Share
Compare	Focus	Participate	Sketch
Complete	Formulate	Perform	Solve
Comply	Gather	Persuade	Summarize
Compose	Generate	Pilot	Supervise
Conclude	Hypothesize	Plan	Synthesize
Conduct	Identify	Practice	Systematize
Construct	Illustrate	Predict	Teach
Contrast	Implement	Prepare	Test
Coordinate	Improvise	Present	Train
Create	Inform	Prioritize	Translate
Decide	Inspect	Process	Troubleshoot
Define	Install	Produce	Use
Deliver	Initiate	Propose	Value

Sample invitation for outcome visioning session

November 15, 2016

Dear Jane Smith:

I would like to invite you to attend a cooperative planning session to help create an overall vision for Sustainable Integrated Pest Management in Walla Walla.

This session will be held on January 30, 2015 from 8 AM to noon at the Hampton Inn, 1531 Kelly Place, Walla Walla, WA 99362 (just off Highway 11).

I would like to initiate a collaborative project to respond to pest management challenges and expand opportunities for sustainable Integrated Pest Management in the Walla Walla Watershed. The first step in this half-day process is to gather input from a diverse group of growers and other agricultural professionals.

People like you can provide the necessary ideas and experience that will allow our program to be innovative and focus on supporting participants in making positive changes in pest management. This session will have between 10 to 15 participants, each of whom bring a unique perspective and would benefit from the program we are developing.

Refreshments and lunch will be provided. Please let me know as soon as possible if you have any dietary restrictions. I hope you can attend.

If you have any questions please feel welcome to contact me.

Clive Kaiser

Tree Fruits Specialist, OSU Extension

(555) 555-5555

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