PRACTICE GUIDE

Assessing Lifelong Learning Technology (ALL-Tech): A Guide for Choosing and Using Technology for Adult Learning

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National Center on Adult Literacy
Graduate School of Education
University of Pennsylvania

North Central Regional Technology
in Education Consortium
North Central Regional Educational Laboratory

National Center on Adult Literacy

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ASSESSING LIFELONG LEARNING TECHNOLOGY (ALL-TECH):

A GUIDE FOR CHOOSING AND USING TECHNOLOGY FOR ADULT LEARNING

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Abstract

This report builds on the framework for evaluating technology effectiveness in K-12 schools as described in *Plugging In: Choosing and Using Educational Technology*. *Plugging In* was prepared by the North Central Regional Educational Laboratory and was published by the Council for Educational Development and Research as part of the *EdTalk* series. The report begins with a discussion of the nature of adult (as opposed to childhood) learning and the potential roles that technology can play in helping to create learning environments that are ideally suited to the needs and interests of adult learners. This is followed by brief explanations of the *ALL-Tech* revisions of the *Plugging In* indicators of engaged learning and high performance technology. The next section provides forms and instructions for using the indicators of engaged learning and high performance technology to evaluate adult education practices and policies. The conclusion highlights some of the factors that may facilitate or obstruct the effective application of technology to adult learning. Following the conclusion, there is a list of additional readings and resources.

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INTRODUCTION

When used well, new and emerging information technologies can be powerful tools for expanding learning opportunities across the lifespan. The potential for technology to expand and improve learning by adults is especially great. To take advantage of technology's potential, adult educators, planners, and policymakers need to critically assess the performance of technology and the quality of learning that technology supports. Assessing the appropriateness and effectiveness of technology for adult learning requires guidelines that capture the special characteristics of adult learners and that are suited to the contexts and politics of adult learning. *Assessing Lifelong Learning Technology (ALL-Tech)* introduces an assessment framework that adult educators can use to evaluate current uses of technology and to plan more effective applications of technology in support of lifelong learning.

Lifelong learning is becoming an increasingly important basic skill. Rapidly changing life and work demands make it imperative for adults to actively acquire new skills and knowledge. As learning extends beyond the school years, adults must adopt new learning styles and strategies.

Keeping up with the escalating need for lifelong learning is a challenge that all adults must face, but it is especially challenging for adults with low-level English language, literacy, and numeracy skills. For such adults, learning needs are relatively greater while access to learning opportunities is more difficult.

Technology is a powerful learning tool, but it can only be used by those who have access to technology as well as the basic skills needed to take advantage of its potential. For adults with low-level literacy skills, the problem of inequities of access to learning may be exacerbated by current patterns of access to technology. As far as technology is concerned, the rich seem to get richer as the poor get poorer. Adults who lack access to the information resources that technology can provide are in danger of falling further and further behind those who have such access. Literacy specialists have long recognized the long-term detrimental effects that a slow start in acquiring basic literacy skills can have. Keith Stanovich (1986) coined the term "Matthew effect" to describe the situation in which children who are delayed in gaining fluent reading ability are unable to keep up with the amount of reading done by their peers and thus may fall further and further behind in vocabulary development and subject matter knowledge. Adults who lack access to technology and the ability to use it may suffer from similarly constricted opportunities to learn.

Within the adult basic education system, current applications of technology do not, for the most part, take full advantage of the potential of technology to optimize adult learning. For example, computer-based instruction and integrated learning systems (which take learners through a step-by-step programmed course of instruction) have become quite common in adult basic education. Applications of technology that support self-directed learning by adults are much less common. Yet it is in support of self-directed learning that new and emerging technologies have the potential to make the greatest contributions to improving adult learning. Advanced data storage and retrieval and networked systems — such as CD-ROMs, the World Wide Web, and network computers — have created the potential to give adults direct access to worlds of information in ways that scarcely could have been imagined a generation ago.

Using technology to address problems of unequal access to information and to raise the quality of adult learning opportunities will take more than simply increasing the supply of hardware, software, and telecommunications equipment. The hard questions have less to do with the quantity and availability of technology than with the quality and effectiveness of technology use. *Assessing Lifelong Learning Technology (*hereafter — *ALL-Tech)* is intended as an initial guide to posing questions about the quality and effectiveness of technology to support adult learning.

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The link to *Plugging In*

ALL-Tech builds on the framework for evaluating technology effectiveness in K-12 schools as described in *Plugging In*: *Choosing and Using Educational Technology*. *Plugging In* was prepared by the North Central Regional Educational Laboratory and was published by the Council for Educational Development and Research as part of the *EdTalk* series. *Plugging In* makes use of the latest research and development findings on effective learning and effective technology to create a planning framework for educators and policymakers. *Plugging In* defines indicators of engaged learning and high performance technology and provides instructions for using these indicators to assess the extent to which technology and technology-enhanced programs complement learning.

Plugging In offers an alternative to traditional methods of evaluating the effectiveness of educational technology that rely on using standardized tests to compare student outcomes in programs that use technology with the outcomes of students in programs that do not use technology. Rather than simply equating "learning" with performance on standardized tests, *Plugging In* makes use of constructivist learning theory and research to define a model of *engaged learning*. *Plugging In* also represents a shift away from technology evaluations that focus on the cost, complexity, and feasibility of technology itself, and presents a framework for evaluating technology as a *tool for learning.*

The indicators of engaged learning and of high performance technology that are listed in *Plugging In* are largely compatible with adult learning theory and practice. Therefore, with only minor adjustments and additions, the *Plugging In* indicators of engaged learning and high performance technology can also be applied to adult learning. One reason for this compatibility is the constructivist interest in making school learning more like learning in the world outside of school. Technology has played a major role in bringing "real world" learning experiences into classroom settings. By the same token, technology has also made it possible to extend learning opportunities once available only in the classroom into the world beyond the school.

Retooling the *Plugging In* framework for the purpose of assessing engaged learning and high performance technology for adult learning requires some slight shifts of emphasis as well as the addition of several new indicators. These adjustments are not fundamental changes, but they are important. Slightly revised versions of the *Plugging In* framework and instructions for its use are included in this document. More complete explanations and instructions for use of the framework can be found in the original *Plugging In* text.

Purpose and contents of *ALL-Tech*

Adult educators and others who wish to evaluate current uses of technology or to plan for more effective applications of educational technology to support adult learning should use *ALL-Tech* as a guide and supplement to the original *Plugging In* publication. Because of the wide diversity of contexts, content, and formats for adult learning, adult educators should feel free to adapt the indicators of engaged learning and of high performance technology contained in *ALL-Tech* to suit the particular applications of technology that they wish to assess or plan.

This *ALL-Tech* guide begins with a discussion of the nature of adult (as opposed to childhood) learning and the potential roles that technology can play in helping to create learning environments that are ideally suited to the needs and interests of adult learners. This is followed by brief explanations of the *ALL-Tech* revisions of the *Plugging In* indicators of engaged learning and high performance technology. The conclusion highlights some of the factors that may facilitate or obstruct the effective application of technology to adult learning. Following the conclusion, there is a list of additional readings and resources.

TECHNOLOGY AND ADULT LEARNING

Although in many ways, learning in adulthood is no different from learning in childhood, there are some critical differences. First, there are differences in the characteristics of adult and child learners. Children's abilities and processes of learning are shaped by stages of physical and mental growth and development. Adult learning is shaped by the social and psychological characteristics of adults. Second, there are differences in the contexts of adult and childhood learning. For the most part, adult learning occurs outside of the context of formal schooling. Finally, the politics of adult and childhood learning are also quite different. The special nature of adult learning and the contrast with childhood learning in all three of these areas — learner characteristics, contexts, and politics — suggest several areas of particular concern in evaluating technology applied to adult learning.

Characteristics of adult learners

In the opinion of one prominent adult learning theorist, Cyril Houle, the learning processes of adults and children are "fundamentally the same" (Houle, 1974). Nonetheless, Houle and other adult learning specialists have developed approaches to learning and instruction that are tailored to the special characteristics of adult learners.

Inspired by the work of John Dewey, Eduard Lindeman (1926) was among the first to explore the distinctive characteristics of adult learners. Malcolm Knowles credits Lindeman with defining the "foundation stones of modern adult learning theory." Many of Lindemans' assumptions about the characteristics of adult learners have been supported by later research. Knowles summarizes Lindeman's enduring insights about adult learners as follows:

1. Adults are motivated to learn as they experience needs and interests that learning will satisfy; therefore, these are the appropriate starting points for organizing adult learning activities.
2. Adults' orientation to learning is life-centered; therefore, the appropriate units for organizing adult learning are life situations, not subjects.
3. Experience is the richest resource for adults' learning; therefore, the core methodology of adult education is the analysis of experience.
4. Adults have a deep need to be self-directing; therefore, the role of the teacher is to engage in a process of mutual inquiry rather than to transmit his or her knowledge to them and then evaluate their conformity to it.
5. Individual differences among people increase with age; therefore, adult education must make optimal provision for differences in style, time, place, and pace of learning. (Knowles, 1990, p. 31)

These characteristics suggest that effective adult learning should build on life experiences and should be structured to accommodate learning differences. Also, to motivate and sustain adult learning, the experience must be rewarding. Adults have little time to waste on learning that does not result in clear benefits. These characteristics of adult learners also suggest that effective applications of technology for adult learning need to be designed in ways that are appropriate to the age and life situations of adult learners. Additional indicators of effective learning and effective technology are suggested by the contexts and politics of adult learning.

Contexts of adult learning

The contexts of adult learning are remarkably diverse. Although many adults participate in the formal educational system, most adult learning occurs in nonformal and informal educational settings. Nonformal education refers to learning and instructional programs that are organized in school-like settings, but are not part of the formal system of elementary, secondary, and post-secondary education. Informal education refers to learning that occurs outside of school-like settings in the context of daily life and work.

In the United States, the nonformal educational system includes a variety of adult and continuing education programs that cover a full range of skill levels and content areas. Although the list of indicators included in the *ALL-Tech* evaluation frameworks could be applied to all types of nonformal education, the primary focus in developing these indicators has been on assessing the impact of technology in improving learning in adult basic education.

The adult basic education system consists of three general types of educational programs.

- Adult basic education (ABE) programs that provide basic literacy, numeracy, and life skills instruction
- Adult secondary education (ASE) programs that provide instruction for GED preparation or alternative high school diplomas
- English for Speakers of Other Languages (ESOL) programs that provide English language instruction

ABE, ASE, and Adult ESOL programs may be administered by local school districts, community colleges, community-based organizations, volunteer agencies, libraries, or various other educational organizations. Classes, small group instruction, and/or one-on-one tutoring sessions may be held in public school classrooms, community centers, public libraries, church basements, workplaces, or in a wide variety of other settings. In addition, there are a variety of program orientations, ranging from those that stress academic skills to a variety of work-related and vocational skills programs to ones that stress parenting skills.

Although it is difficult to estimate precisely the number of adults in the United States who could benefit from basic language and literacy education, the best available data suggest that less than 10% of such adults participate in adult education programs. On top of this, adults who join basic education programs are very likely to attend sporadically and to drop out before completing a course of instruction. Technology can help to remedy the problems of participation, recruitment, and retention in a number of ways. The novelty and entertainment values of technology, particularly multimedia technologies, can be a source of attraction to bring adults into educational programs and to sustain their interest in learning. Access to computers and to training in basic computer literacy can also be a motivating factor for adult learners who recognize the market value of such skills. Technology can also provide adult education programs with the tools they need to better track and monitor the progress of learners who drop in and out of instructional programs.

Beyond the utility of technology in nonformal adult education, existing and readily available information technologies can also provide unprecedented opportunities for informal learning by adults. This is a critical need given the low numbers of adults who are able to participate in nonformal adult education. Broadcast media, interactive video, and the Internet can provide rich informal learning opportunities to adults in a wide variety of contexts. To be effective, such learning must not only be attractive to adult learners but must also be designed to fit into their already crowded daily schedules. The following vignette is a good example of learning designed to fit into the daily schedule of a busy adult.

Vignette 1

It is 7:30 A.M. and Tatiana has already been up for two hours. Three mornings each week, she gets up early to watch a tape of the English language learning series, Crossroads Café. With help from her 12-year-old son, Tatiana sets the timer on her VCR to tape the 1:30 A.M. broadcast of the half-hour show. In the morning, Tatiana watches the tape once through and then plays it back, stopping and starting the tape as she works on exercises in the workbooks that accompany the series. After preparing lunches for her family and sending her children off to school, Tatiana goes to work at a local manufacturing plant cafeteria. Growing up in Russia, she had studied biology in college. Now in the United States, Tatiana hopes someday to return to college and complete a degree in nursing. But first, she needs to improve her English. Today, Tatiana tells several co-workers about the charac-

ters and events in the day's episode of Crossroads Café. One worker, also from Russia, asks Tatiana if she can borrow the videotape and watch it with her family over the weekend.

At home that evening, after finishing supper, Tatiana helps her high-school-age daughter to work on a multimedia history project. Tatiana's daughter uses a tape recorder to audiotape her mother's description of family photos that will later be scanned into a computer and included in a schoolwide presentation. Tatiana enjoys the opportunity to teach her daughter some new words in Russian. In return her daughter corrects Tatiana's work in the Crossroads workbook. She also tells her mother about a website that she discovered while surfing the World Wide Web at school. The website is designed to help English learners who, like Tatiana, are studying the Crossroads Café materials at home. It gives learners opportunities to watch segments of Crossroads Café episodes online and then discuss them either online or in face-to-face discussion groups. Tatiana's daughter has printed several pages from the website. The pages contain tips for at-home learners of English and also list the phone number of a nearby public library where a Crossroads Café discussion meets each week. Tatiana has long felt that it would be good to practice her English with other learners and she is also looking forward to the chance for help from the instructor who facilitates the library discussion group.

This brief vignette illustrates the capacity for technology to bridge the gaps between nonformal, informal, and formal education. It also illustrates the fact that technology of one sort or another is often already present in the homes and communities of potential adult learners. Schools, libraries, and workplaces often have computers, audiovisual equipment, and in some cases, connectivity to the Internet. More often than not, homes have televisions and radios as well as potential Internet access through personal computers and modems or cable television. While the availability of technology remains a problem, particularly in low-income communities as well as in the adult basic education system, it is clear that more effective use can be made of existing technology.

Both the diversity within the adult education system described above and Tatiana's story highlight the need for high levels of adaptability in the application of technology to support adult learning. Technology should be available in functional contexts where adult learners can make use of it to meet information and learning needs as they arise in the course of daily life and work. The recent trend toward the development of convergent technology (merging of computer and telecommunications technologies) has great potential for facilitating such daily access to technology. Access to video learning materials through broadcast, videotape, and online is just one example of this trend in technology toward multiple channels of access and interoperability. The vignette also illustrates the fact that effective technology should be robust and provide learners with tools that function effectively and reliably in a variety of adult life and work contexts.

Politics of adult learning

The political character of adult education is another point of contrast between adult and childhood learning. Although instructors should treat all learners with respect, the status of an adult teacher and that of a child in school are inherently unequal. This should not be the case in adult education. Adults come to learning as fully developed individuals with adult responsibilities and privileges. Yet, social expectations confer relatively greater power and authority to the role of teacher, even to a teacher who may be younger than the adult learners he or she is instructing.

Critical theorists have made the case that all adult education must be understood as a political process and have developed approaches that ensure that the adult educational process is democratic. The work of the Brazilian educational philosopher, Paulo Freire (1970) has been especially influential in this regard. Freire viewed all education as either liberating or oppressive and argued for an approach to adult education that has as its goals raising consciousness of social inequities and motivating learners to take action to achieve social transformation.

Jack Mezirow's Perspective Transformation theory of adult learning builds on the work of Freire as well as that of the critical theorist, Jurgen Habermas. Mezirow's theory is framed by discourse ethics and the goal of emancipation.

> The social goal toward which adult education strives is one in which all members of society may engage freely and fully in rational discourse and action without this process being subverted by the system. Such subversion occurs in everyday life when communications become distorted by unequal distributions of power and influence. Transformation theory holds that adult education's intervention is to redress this distortion or "violence" by creating protective learning environments with norms which assure everyone more free and full participations in emancipatory discourse. (Mezirow, 1995, p. 57)

The politics of adult learning call for norms of participation that empower all learners to engage freely in the learning dialogue. When properly used, technology can play a role in amplifying the voices of previously silenced individuals and communities, as can be seen in Vignette 2.

Vignette 2

Terry is a part-time student in a GED preparation class offered at an inner city literacy center run by a nonprofit, community-based organization. The literacy center is housed in a large house and contains a drop-in learning lab with networked personal computers open for use by learners at the center on weekday evenings. Terry works during the day and attends classes at the literacy center two evenings a week. Tonight, even though it is not a class night, Terry decides to drop by the center's learning lab and use the computers there to check email and to get some extra help with the previous night's math lesson on percentages. After reading and responding to several email messages, Terry visits the LiteracyLink site on the World Wide Web. Tonight Terry uses the LiteracyLink search engine to find a website that will provide some practice in calculating percentages. Unable to find such a site after searching for a few minutes, Terry sends a message to the online tutor in the LiteracyLink live chat room. The tutor suggests several websites and eventually Terry finds a useful site. After working on percentages for half an hour and passing an online test, Terry decides to browse messages on a GED student listserve. One message on the listserve catches Terry's eye. It is a note about plans to build a toxic waste dump in an abandoned factory lot adjacent to Terry's neighborhood. Terry asks the learning lab technology assistant for help in locating information about communities that have been successful in keeping toxic waste dumps out of their neighborhoods.

The following evening Terry talks to the GED class about the plans for the toxic waste dump and relates the strategies used by other communities to fight such plans. Together with the other students in the class, Terry decides to organize a petition-drive and to enlist the support of local politicians and businesspeople in a campaign to keep the dump out of the neighborhood.

This vignette illustrates the capacity of networking technologies to open channels of communication and to provide access to information resources for marginalized communities and individuals. It also highlights the potential for technology to support a learning process that is transformative (empowers learners to become more critically aware of individual and collective interests and to pursue these interests more effectively).

ADAPTING THE *PLUGGING IN* INDICATORS

The *Plugging In* indicators of engaged learning and of high technology performance are designed for use in clarifying goals for learning and for planning and evaluating the effectiveness of technology in achieving learning goals. The indicators reflect a clear point of view and one that extends the vision of effective adult learning described above.

The original *Plugging In* indicators of engaged learning were elaborated from a list of seven variables developed by Barbara Means of SRI International. When present in a classroom (or other learning environment), these seven variables indicate that effective learning and teaching is taking place.

- Learners are engaged in authentic and multidisciplinary tasks
- Assessments are based on performance of real tasks
- Learners participate in interactive modes of instruction
- Learners work collaboratively
- Learners are grouped heterogeneously
- The instructor is a facilitator in learning
- Learners learn through exploration

The dimensions and qualities of engaged learning described in *Plugging In* are quite compatible with the characteristics of adult learners. Many of the *Plugging In* indicators of engaged learning are directly reflected in Lindeman's list (see page 3), including taking responsibility for learning, engaging in authentic tasks, and learning through a process of collaboration and mutual inquiry. The characteristics of adult learners also suggest a need to shift the emphasis and reinterpret some of the *Plugging In* indicators.

Plugging In elaborates a list of 26 indicators of engaged learning based on these seven variables. To make the framework of engaged learning more applicable to adult learning, *ALL-Tech* makes some slight adjustments to the indicator definitions (for example, substituting "learner" for "student") and adds four new indicators to the list (see Table 1).

These indicators and their definitions are shown in parentheses in the "Indicator of engaged learning" and "Indicator definition" columns of Table 1, which is *ALL-Tech*'s modification of *Plugging In*'s indicators of engaged learning.

Indicators of engaged adult learning

The characteristics of adult learners, the contexts of adult learning, and the politics of adult education all call for some adjustments in the *Plugging In* framework for assessing engaged learning

The four new indicators that are needed to make the framework more applicable to the evaluation of adult learning are the following:

- Transformative - learners are empowered by learning and are able to define and pursue individual and collective interests
- Builds on life experiences - learning tasks are rooted in the lived experience of adult learners
- Rewarding - knowledge and skills acquired in learning tasks carry clear and tangible benefits to learners
- Accommodates learning differences - instruction is available in a variety of modes suited to a range of learning styles and preferences

Table 1: Indicators of Engaged Adult Learning

Variable	Indicator of engaged learning	Indicator definition
Vision of Learning	Responsible for learning	Learner involved in setting goals, choosing tasks, developing assessments and standards for the tasks; has the big picture of learning and next steps in mind
	Strategic (and Transformative)	Learner actively develops repertoire of thinking/learning strategies (and critical awareness to empower pursuit of individual and collective goals)
	Energized by learning	Learner is not dependent on rewards from others; has a passion for learning
	Collaborative	Learner develops new ideas and understanding in conversations and work with others
Tasks	Authentic (and Builds on experience)	Pertains to real world, is addressed to personal interest (and rooted in the lived experience of the learner)
	Challenging (and Rewarding)	Difficult enough to be interesting but not totally frustrating, usually sustained (and conveys clear and tangible benefits to the learner)
	Integrative	Involves integrating information of many types and from a variety of sources to solve problems and address issues related to daily life and work
Assessment	Performance-based	Involving a performance or demonstration, usually for a real audience and useful purpose
	Generative	Assessments having meaning for learner; maybe produce information, product, service
	Seamless and ongoing	Assessment is part of instruction and vice versa; learners learn during assessment
	Equitable	Assessment is culture fair
Instructional Model	Interactive (and Accommodates learning differences)	Instructor or technology program responsive to learner needs, requests (e.g., menu driven) (and adapts instruction to suit a variety of learning styles and preferences)
	Generative	Instruction oriented to constructing meaning; providing meaningful activities/experiences
Learning Context	Collaborative	Instruction conceptualizes students as part of learning community; activities are collaborative
	Knowledge-building	Learning experiences set up to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming
	Empathetic	Learning environment and experiences set up for valuing diversity, multiple perspectives, strengths
Grouping	Heterogeneous	Small groups with persons from different ability levels and backgrounds
	Equitable	Small groups organized so that over time all learners have challenging learning tasks/experiences
	Flexible	Different groups organized for different instructional purposes so each person is a member of different groups; works with different people
Instructor Roles	Facilitator	Engages in negotiation, stimulates and monitors discussion and project work but does not control
	Guide	Helps students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options
	Co-learner/co-investigator	Instructor considers self as learner; willing to take risks to explore areas outside his or her expertise; collaborates with other instructors and practicing professionals
Learner Roles	Explorer	Learners have opportunities to explore new ideas/tools; push the envelope in ideas and research
	Cognitive Apprentice	Learning is situated in relationship with mentor who coaches learners to develop ideas and skills that simulate the role of practicing professionals (i.e., engage in real research)
	Teacher	Learners encouraged to teach others in formal and informal contexts
	Producer	Learners develop products of real use to themselves and others

"Vision of Learning" indicators

Plugging In describes a vision of learning in which learners are responsible for learning; they are strategic, energized by learning, and collaborative. All of these indicators apply equally well to describe a vision of engaged adult learning. Self-direction and motivation are key concerns of adult learning theorists and these concerns are clearly specified in the original list. Likewise, learning outside of formal educational contexts is almost invariably collaborative.

The addition of transformative to the list of indicators is necessitated by the relatively greater need to ensure that adult learners are not in any way disempowered by the educational process. While it is equally important for adults and children to develop strategic and critical thinking and learning skills, learning by adults must be oriented more directly and more immediately toward personal and societal transformation.

"Task" indicators

The *Plugging In* framework specifies learning tasks that are authentic, challenging, and multidisciplinary. Because adult learners acquire knowledge from a wider variety of knowledge domains (many of which are beyond the boundaries of traditional academic disciplines), the *ALL-Tech* framework substitutes the term *integrative* for *multidisciplinary* and broadens the definition of this indicator.

Adults have experienced a lifetime of learning. In some ways, this experience is a tremendous advantage and in other ways it may be a burden. The addition of "builds on experience" to the list of task indicators is a reflection of the need to structure adult learning in ways that take advantage of knowledge gained from life experience. Building on experience will affect both the content and the processes of adult learning. Adults with basic learning needs have often had negative experiences in formal education and thus adult learning is best structured in ways that avoid evoking and possibly repeating past educational failures.

Given the noncompulsory nature of adult learning, it is critically important that learning tasks not only be challenging but also be rewarding. Adults are motivated to learn when they can see that the time and effort devoted to learning will pay off. Adult learners have a wide range of learning goals, from an improved sense of self to a better paying job, and they are not likely to waste time on learning tasks that are not clearly leading to the achievement of their goals.

"Assessment" indicators

The *Plugging In* framework for engaged learning calls for assessments that are performance-based, generative, seamless and ongoing, and equitable. In adult learning it is especially important that assessments be generative (have meaning for the learner) and be seamless and ongoing (integrated with instruction). For adults who have had bad experiences in formal education, testing can be a very stressful and unpleasant experience. Unwillingness to be tested may keep some adults away from learning opportunities.

Good assessment acts as a guide to improving further learning. Even when computer-based assessment systems use traditional testing methods, they still have the advantage of being able to monitor and provide feedback on performance to learners privately. For many adult learners, such anonymity in testing situations is essential.

"Instructional Model" indicators

The *Plugging In* instructional model is interactive and generative. These indicators are even more critical to effective adult learning. In addition, instruction of adults needs to accommodate differences in learning styles. Adult educators understand well the need to address individual differences in learning preferences. They do so by presenting information to learners through different perceptual modalities (visual, aural, and psychomotor) and by creating learning environments that can be adapted to suit adult attitudes and affect. Accommodating learning preferences can be as simple as varying the time, pace, and setting in which learning occurs. In all these ways, technology can play a major supporting role in customizing adult learning.

"Learning Context" indicators

According to the *Plugging In* framework of engaged learning, learning contexts should be collaborative, knowledge-building, and empathetic. For adult learners, these criteria for effective learning contexts are relatively simple to realize because of the fact that adults most often are learning outside of classrooms and school-like contexts. Ideally, technology should support adult learning within authentic life contexts and situations of the adult learner.

"Grouping" indicators

The *Plugging In* framework calls for learner grouping modes that are heterogeneous, equitable, and flexible. While these indicators are designed for application to classroom learning, they can also be applied to nonformal and, in some respects, to informal adult learning. Working effectively as a member of a team and learning to appreciate diversity are key skills in the contemporary workplace. Collaboration is an effective method of adult learning and one that mirrors real-world problem solving. Technology should be used to facilitate group learning by enabling both real time and asynchronous communications as well as by enabling face-to-face and distance collaboration.

"Instructor Role" indicators

The role of the instructor in the *Plugging In* framework is that of facilitator, guide, and co-learner/co-investigator. These roles for the instructor are consistent with the goal of fostering equal status for instructors and learners. Given the politics of adult education, this is a critically important goal. Technology should assist in creating a learning environment that encourages co-learning and mutual inquiry among learners and instructors.

"Learner Role" indicators

In the *Plugging In* framework, learners are called upon to take roles as explorer, cognitive apprentice, teacher, and producer. These roles are ideal for the self-directed adult learner as well.

High performance technology for adult learning

Plugging In builds on a growing body of research that demonstrates the potential for technology to support engaged learning. This research also highlights the features of technology performance that are most supportive of engaged learning. *Plugging In* defines 22 indicators for identifying effective, high performance technology. The features of technology that lay the foundation for engaged learning are organized within six categories:

- Access to technology
- Operability of the technology
- Organization of the technology (in terms of location and distribution)
- "Engagability" (the capacity of the technology to engage learners in challenging learning)
- Ease of use
- Functionality

The distinctive features of adult learning require some adjustments to the *Plugging In* indicators of high performance technology. As with the indicators of engaged learning, these adjustments for adult learning are relatively minor. *ALL-Tech* adds four new indicators to the *Plugging In* list (see Table 2).

- Available in functional contexts - technology tools and uses are available in adults' current and/or prospective life and work contexts
- Convergent - information and learning opportunities are available in multiple formats and through multiple channels
- Appropriate to age and life situation - technology is designed to match the information needs and interests of particular age categories and life situations
- Robust - technology functions effectively and reliably in a variety of adult life and work contexts

Table 2: Indicators of High Technology Performance for Adult Learning

Variable	Indicator of high technology performance	Indicator definition
Access	Connective	Learning contexts are connected to Internet and other resources
	Ubiquitous (and Available in functional context)	Technology resources and equipment are pervasive and conveniently located for individual (as opposed to centralized) use (and useable in daily life and work settings)
	Interconnective	Learners and instructors interact by communicating and collaborating in diverse ways
	Designed for equitable use	All learners have access to rich, challenging learning opportunities and interactive, generative instruction
Operability	Interoperable (and Convergent)	Capable of exchanging data easily among diverse formats and technologies (including integration of computer and telecommunications technologies)
	Open architecture	Allows users to access third-party hardware/software
	Transparent	Users are not - and do not need to be - aware of how the hardware/software operates
Organization	Distributed	Technology/system resources are not centralized, but exist across any number of people, environments, and situations
	Designed for user contributions	Users can provide input/resources to the technology/system on demand
	Designed for collaborative projects	Technology is designed to facilitate communication among users with diverse systems/equipment
Engagability	Access to challenging (and Appropriate) tasks	Instructor or technology program is responsive to learner needs, requests (e.g., menu driven) (and meets the needs and interests corresponding to particular age categories and life situations)
	Enables learning by doing	Instruction oriented to constructing meaning; providing meaningful activities/experiences
	Provides guided participation	Technology responds intelligently to user and is able to diagnose and prescribe new learning
Ease of Use	Effective helps	Technology provides help indices that are more than glossaries; may provide procedures for tasks and routines
	User friendliness/user control	Technology facilitates user and is free from overly complex procedures; user can easily access data and tools on demand
	Fast	Technology has a fast processing speed and is not “down” for long periods of time
	Available training and support	Training is readily and conveniently available, as is ongoing support
	Provides just enough information just in time	Technology allows for random access, multiple points of entry, and different levels and types of information
Functionality	Diverse (and Robust) tools	Technology enables access to full diversity of generic and context-specific tools basic to learning and working in the 21st century (that function reliably in diverse settings)
	Media use	Technology provides opportunities to use media technologies
	Promotes programming and authoring	Technology provides tools (e.g., “wizards”) that are used to make other tools
	Supports project design skills	Technology facilitates the development of skills related to project design and implementation

"Access" indicators

Issues of access to technology are vital indicators of high performance for adult learning. The *Plugging In* framework calls for technology that is connective, ubiquitous, interconnective, and designed for equitable use. To facilitate adult learning it is also important for technology to be available in the settings in which adults find themselves in the course of their daily routines. Ideally, technology that is already available in adults' daily life and work settings should be used to expand adult learning opportunities.

"Operability" indicators

In the area of operability, the *Plugging In* framework calls for technology that is interoperable, has open architecture, and is transparent. In the case of adult learning, it will also be advantageous for technology to be convergent. In other words, technology should allow multiple channels of access to information. The current trend toward convergence of computer and telecommunication technology has great potential for creating informal learning opportunities in a wide variety of contexts. Access to the internet through cable television and high-speed modems are just two examples of ways in which convergent technology can expand access to information and computing power.

"Organization" indicators

According to the *Plugging In* framework, high performance technology for K-12 is distributed, designed for user contributions, and designed for collaborative projects. These criteria are even more important considerations in assessing high technology performance for adult learning. Adult learners need to have access to technology in settings that are close at hand, are available on demand, and accommodate collaboration.

"Engagability" indicators

The *Plugging In* framework identifies three indicators for assessing the ability of technology to engage and sustain learners' involvement in learning. Engagable technology provides learners with access to challenging tasks, enables learning by doing, and provides guided participation. For adult learners, technology should also provide learners with access to tasks that are appropriate to the age and life situation of the adult learner.

"Ease of Use" indicators

Ease of use is an important variable in the *Plugging In* framework for assessing high performance technology. Indicators of ease of use include the presence of effective helps, a high degree of user friendliness and user control, the relatively fast processing speed of the technology, the ready availability of training and support, and the provision of just enough information just in time. Ease of use indicators are especially important concerns for adult learners, particularly for adults with low-level language, literacy, and numeracy skills.

"Functionality" indicators

The final variable in the *Plugging In* framework defines indicators for assessing the functionality of technology. The functionality indicators in the original framework are access to diverse tools, opportunities to use media technologies, promotion of the use of authoring and programming tools, and support for developing project design skills. Together these indicators point in the direction of technology that is highly adaptable to individual learning needs and preferences and that allows the learner a high degree of control over the learning process. This is precisely what adult learners need. One additional indicator has been added to the list. For adult learners, it is especially important to have access to robust as well as diverse tools. These tools must not only apply to a wide variety of learning contexts and interests, but also must function reliably under what may be far from optimal conditions. Furthermore, adults should be able to take their learning tools with them wherever they may go.

APPLYING THE TECHNOLOGY EFFECTIVENESS FRAMEWORK

Plugging In defines technology effectiveness as the intersection of learning and technology performance. With the additional indicators and revisions made by *ALL-Tech*, the *Plugging In* technology effectiveness framework can be used to assess current practices and policies as well as to plan for more effective applications of technology to enhance adult learning. For this purpose, revised versions of the pullout section of tables and graphs from *Plugging In* are included (see Tables 3, 4, & 5).

Table 3 is an instrument for assessing a program's current practices and policies to measure the degree to which these practices and policies support engaged learning. Table 3 can also be used to assess a program's future goals for policy and practice. Table 4 can be used to assess current realities and future goals for high performance technology. Table 5 is a chart upon which cumulative scores from Tables 3 and 4 can be placed to reveal the current status of an adult education program's practices and policies. Table 5 can also be use to chart the desired trajectory for a an adult education program's future goals for high performance technology and engaged learning.

Completing Table 3

Under the "Current Realities" heading, scores can be recorded for both **practice** (what is actually taking place in an adult literacy program) and **policy** (what program directors think and what policy documents such as mission statements, project reports, etc. state as important). Similarly, scoring for both practice and policy under the "Future Goals" heading should be based on planning documents, ideas, and goals. Score points should be assigned using the following rubrics:

Current Realities in Engaged Learning Practices	
Measure	**Description**
0 =	not in place at this time
1 =	some users/teachers/tutors are exploring/piloting/testing
2 =	many users/teachers/tutors have good skills in these areas; practice is effective
3 =	most users/teachers/tutors have mastered skills, and practice is very widespread; it is a major strength of the adult literacy program

Current Realities in Engaged Learning Policies	
Measure	**Description**
0 =	not in place
1 =	not so important
2 =	somewhat important
3 =	very important

Future Goals in Engaged Learning Practices and Policies	
Measure	**Description**
0 =	not a priority for improvement at this time
1 =	will concentrate on improvement, but a low priority
2 =	will concentrate on improvement, but a medium priority
3 =	will concentrate on improvement, but a high priority

Table 3. Worksheet for Assessing Engaged Learning Indicators in Adult Learning Programs

Engaged Learning Indicators	Current Realities		Future Goals	
	Practice	**Policy**	**Practice**	**Policy**
Vision of Learning				
• Responsible for learning	_____	_____	_____	_____
• Strategic (and Transformative)	_____	_____	_____	_____
• Energized by learning	_____	_____	_____	_____
• Collaborative	_____	_____	_____	_____
Tasks				
• Authentic (Builds on experience)	_____	_____	_____	_____
• Challenging (and Rewarding)	_____	_____	_____	_____
• Integrative	_____	_____	_____	_____
Assessment				
• Performance-based	_____	_____	_____	_____
• Generative	_____	_____	_____	_____
• Seamless and ongoing	_____	_____	_____	_____
• Equitable	_____	_____	_____	_____
Instructional Model				
• Interactive (and Accommodates learning differences)	_____	_____	_____	_____
• Generative	_____	_____	_____	_____
Learning Context				
• Collaborative	_____	_____	_____	_____
• Knowledge-building	_____	_____	_____	_____
• Empathetic	_____	_____	_____	_____
Grouping				
• Heterogeneous	_____	_____	_____	_____
• Equitable	_____	_____	_____	_____
• Flexible	_____	_____	_____	_____
Instructor Roles				
• Facilitator	_____	_____	_____	_____
• Guide	_____	_____	_____	_____
• Co-learner/co-investigator	_____	_____	_____	_____
Learner Roles				
• Explorer	_____	_____	_____	_____
• Cognitive Apprentice	_____	_____	_____	_____
• Teacher	_____	_____	_____	_____
• Producer	_____	_____	_____	_____
Column Totals	_____ +	_____	_____ +	_____
Grand Totals	= _____		= _____	

Completing Table 4

As in Table 3, scores should be recorded under the "Current Realities" and "Future Goals" headings for both practice (the degree to which current and planned applications of technology in an adult education program meet the various high performance indicators) and policy (what program directors think and what policy documents such as mission statements, project reports, etc. state as important for the present and the future). Scoring should be done according to following rubrics:

High Performance Technology Practices

Measure	Description
0 =	not in place at this time
1 =	some users/teachers/tutors have limited equipment and technology skills and are still exploring/piloting/testing
2 =	many users/teachers/tutors have good computers and good technology skills; they are actively engaged with technology
3 =	most users/teachers/tutors have mastered complex technical skills; learning sites are rich with technology; and good engaged learning practices with technology are very widespread; it is a major strength of the adult literacy program

High Performance Technology Policies

Measure	Description
0 =	not in place
1 =	not so important
2 =	somewhat important
3 =	very important

Future Goals in Engaged Learning Practices and Policies

Measure	Description
0 =	not a priority for improvement, at this time
1 =	will concentrate on improvement, but a low priority
2 =	will concentrate on improvement, but a medium priority
3 =	will concentrate on improvement, but a high priority

Table 4. Worksheet for High Performance Technology Indicators in Adult Learning Programs

High Performance Indicators	Current Realities		Future Goals	
	Practice	**Policy**	**Practice**	**Policy**
Access				
• Connective	_____	_____	_____	_____
• Ubiquitous	_____	_____	_____	_____
• Interconnective	_____	_____	_____	_____
• Designed for equitable use	_____	_____	_____	_____
Operability				
• Interoperable (and Convergent)	_____	_____	_____	_____
• Open architecture	_____	_____	_____	_____
• Transparent	_____	_____	_____	_____
Organization				
• Distributed	_____	_____	_____	_____
• Designed for user contributions	_____	_____	_____	_____
• Designed for collaborative projects	_____	_____	_____	_____
Engagability				
• Access to challenging (and Appropriate) tasks	_____	_____	_____	_____
• Enables learning by doing	_____	_____	_____	_____
• Provides guided participation	_____	_____	_____	_____
Ease of Use				
• Effective helps	_____	_____	_____	_____
• User friendliness/user control	_____	_____	_____	_____
• Fast	_____	_____	_____	_____
• Available training and support	_____	_____	_____	_____
• Provides just enough information just in time	_____	_____	_____	_____
Functionality				
• Diverse (and Robust) tools	_____	_____	_____	_____
• Media use	_____	_____	_____	_____
• Promotes programming and authoring	_____	_____	_____	_____
• Supports project design skills	_____	_____	_____	_____
Column Totals	_____ +	_____	_____ +	_____
Grand Totals	= _____		= _____	

Using Table 5

By placing learning (from passive to engaged) on one axis and technology performance (from low to high) on the other axis, the technology effectiveness framework (Table 5) defines a matrix with four major learning and technology patterns:

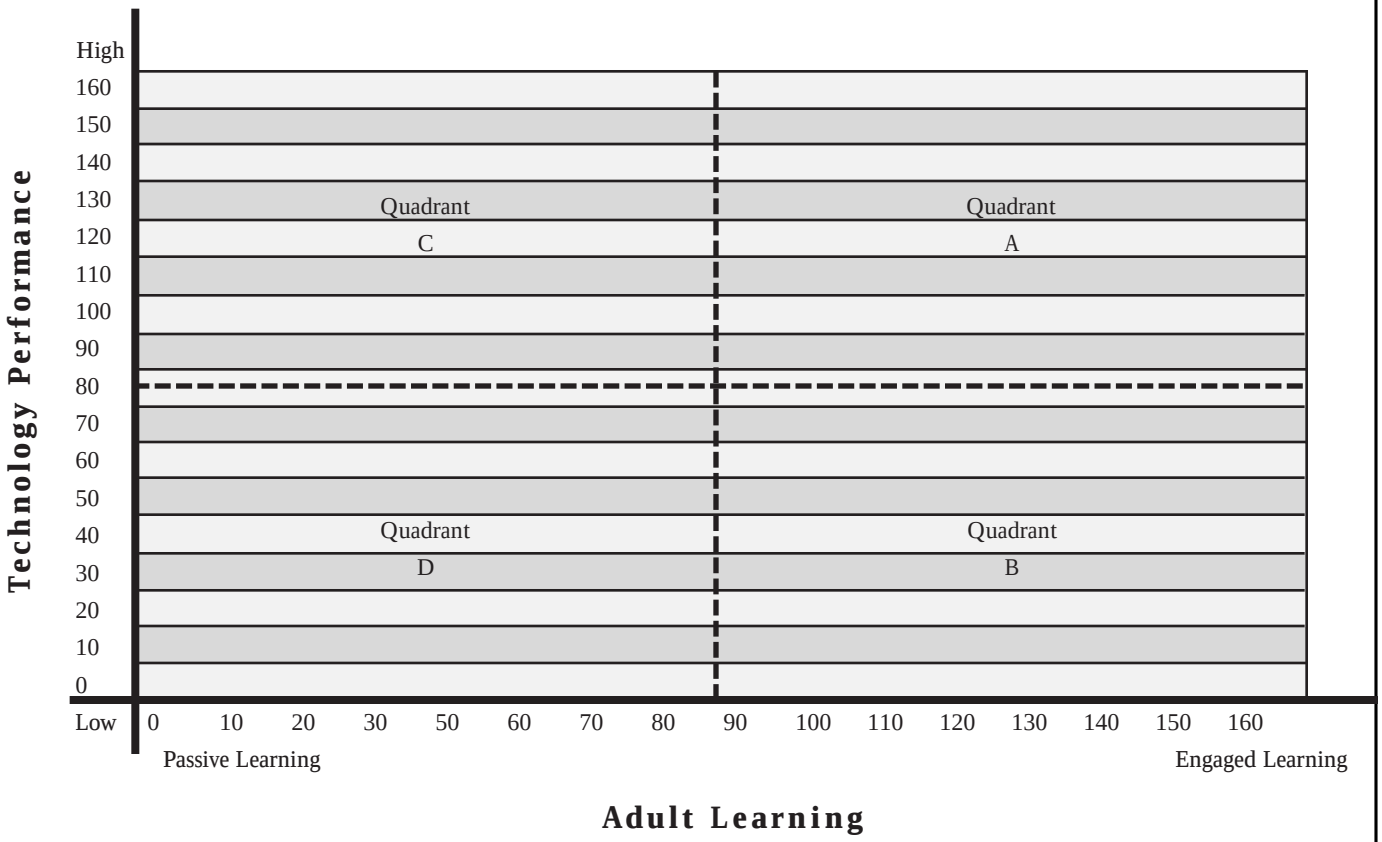
- Pattern A - - Engaged learning and high technology performance
- Pattern B - - Engaged learning and low technology performance
- Pattern C - - Passive learning and high technology performance
- Pattern D - - Passive learning and low technology performance

To plot current realities, use the grand total under "Current Realities" in Table 3 to draw a vertical line on the learning axis and the grand total under "Current Realities" in Table 4 to draw a horizontal line on the technology performance axis. The point at which these two lines meet will fall into one the four quadrants (A to D) indicating which of these patterns applies to your program's current policies and practices. The same process can also be used for the "Future Goals" grand totals from Tables 3 and 4 to chart the learning and technology pattern toward which your program's goals are directed.

By locating current realities and future goals on Table 5, adult education programs can also evaluate whether or not these realities and goals match any of the following four possible, positive directions for change:

- Type I trajectory: D → B, This is movement from passive learning and low technology performance to engaged learning and low technology performance.
- Type II trajectory: B → A, This is movement from engaged learning and low technology performance to engaged learning and high technology performance.
- Type III trajectory: C → A, This is movement from passive learning and high technology performance to engaged learning and high technology performance.
- Type IV trajectory: D → A, This is movement from passive learning and low technology performance to engaged learning and high technology performance.

Table 5: The Learning and Technology Framework Graph



OBSTACLES AND FUTURE POTENTIAL

The adjustments to the *Plugging In* frameworks for assessing engaged learning and high performance technology outlined above are inspired by the differences (and similarities) between adult and childhood learning. Beyond these adjustments in the assessment frameworks, there are some additional areas of difference that may pose particular challenges (and opportunities) for adult learning. These include the relatively high cost of technology and the poorly funded state of adult education; the training and professional development needs of adult educators; general adult resistance to the new; and finally, the impact of the information revolution on life and work in the 21st century.

Costs

Technology is not inexpensive and keeping up with the latest, state-of-the-art technology is certain to be beyond the reach of nearly all adult basic education programs. Yet, the most cutting edge technology is rarely the most appropriate or most effective one to use in support of adult learning. The two vignettes of adult learning described earlier in this guide illustrate the potential for making effective use of relatively low-cost and widely available technology in order to expand learning opportunities for adults. With careful planning, adult education programs can usually find ways to make more effective use of the technology that they already have. Planning can also be used to anticipate technology needs and to identify external funding sources to meet needs for additional hardware, software, and personnel as these arise (see Hopey & Harvey-Morgan, 1995).

Human resources

Experts have pointed out that the heaviest costs in technology are not for hardware and software but for the human resources needed to effectively manage and support technology use. The high cost of human resources is a major obstacle to effective use of technology in support of adult learning. Adult education programs are typically less well-funded than K-12 education. The majority of instructors in the adult basic education system work part-time. This limits opportunities for professional development and specialized training.

In the area of human resources, advanced technology not only creates demands for specialized training, but also provides the tools for delivering such training. Distance learning and distributed expertise can be effective strategies for meeting the training and support needs that accompany the use of educational technology. Unlike K-12 schools, adult education programs have much experience in making effective use of volunteer instructors. This experience and the experience that adult education programs have in supporting informal learning can be productively applied to the design of technology for professional development.

Resistance

It is not uncommon these days to hear high school (and even elementary) teachers admit that when it comes to technology, their students are the experts. In general, it seems that the level of comfort one feels around new technology is inversely proportional to age. Adults seem much less willing than children and teens to explore new learning environments. This resistance to changes in the learning and teaching process and to the integration of new technology into learning, may be more problematic for instructors than for learners, even in adult education. Because of past, negative experiences in school, many learners in adult basic education may be more open to alternative methods of learning than their instructors who do not have the same affective response to school-like learning environments. Yet nearly all adults are likely to suffer from some degree of technophobia and learned helplessness in the face of new technology. User-friendly interfaces can overcome these fears as can modeling of technology learning and experimentation with technology by instructors. One advantage of technology may be that it allows learners and instructors to approach a learning problem on relatively equal terms. This seems to be happening quite naturally in K-12 settings and is a positive influence in setting up the types of learner and teacher roles described in the *Plugging In* framework. Mutual inquiry around technology can also serve a leveling function in adult basic education. Once adults see the utility of technology in providing them with the tools and information that they need to address daily needs and life goals, any resistance to using technology can soon be overcome.

Information revolution

New information technology has already begun to transform the texture of our lives. As we enter the 21st century, we are leaving the industrial age behind. The information revolution is breaking down the separation of home and work that was created by the industrial revolution. Today, with the aid of modern telecommunications and networked computers, it is possible to bring our workspace into our homespace and vice versa. Educational institutions are also being dramatically transformed by information technology. Schools can no longer provide students with a set of skills and knowledge that will last them a lifetime. Learning how to learn is the key basic skill required for success in the 21st century.

Although some may wish to turn back the clock to simpler and slower times, we must all adapt to the fast pace of life and work that technology has made possible. As a society, we cannot afford to leave anyone behind as we use technology to re-create learning and work environments. Adults with low-level English language, literacy, and numeracy skills are at-risk of missing out on the benefits of advanced technology, but will inevitably have to cope with the pace of life that such technology brings with it.

For these adults, access to high performance technology and to opportunities for engaged nonformal and informal learning are critically important. By thinking critically about current and potential applications of technology, adult educators can do their part to ensure that available human and material resources are used efficiently and appropriately to expand adult learning opportunities.

CONCLUSION

The revised *Plugging In* framework presented here in the *ALL-Tech* guide is designed to provide encouragement and some rudimentary guidelines for critical thinking about applications of technology for lifelong learning. As is true of adult learning generally, experience is the best teacher and collaboration the most productive learning mode. Adult educators and others who use the revised *Plugging In* framework to evaluate engaged adult learning and high technology performance are therefore encouraged to share the lessons of their experience and to suggest changes and revisions in the framework.■

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