Assessment Models and Software Support for Assistive Technology Teams

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The authors review the current mandate for considering the need for assistive technology services within the IEP process and highlight the importance of collaborative teamwork in assessing individual student needs for assistive technology (AT). Current assistive technology models are described to show what each contributes to our understanding of the process of AT assessment. They then outline "AT CoPlanner," a model that draws upon current models to create a more comprehensive framework for supporting AT teams. Finally, the efficacy of using " groupware," software to facilitate team planning and communication, is considered and a software version of the AT CoPlanner model is described.

Provision of assistive technology (AT) to facilitate the education of students with disabilities has become a priority in North America. Blackhurst (1997) traced the historical evolution in use of technology in special education over the last three decades. Advances in the development of assistive technology in special education, especially those associated with the use of computer innovation, have accelerated during the past ten years (Salend, 1998; Wood & Lazzari, 1997) as has the practice of teamwork in planning and service delivery (Male, 1997). In fact, since 1997, teams planning Individualized Education Programs (IEPs) have been required to consider both supplementary equipment and assistive technology services (Chambers, 1997; Etscheidt & Bartlett, 1999; Golden, 1998). Besides providing special materials and equipment, IEP teams are also required to arrange for any technology-related service such as assessment, implementation, and monitoring required by students.

Blackhurst and Edyburn (2000) published a brief history of the development of special education technology in the United States, including a chronology of the important people, events, and legislation associated with the advances made in this field. The "people" and "events" components of their history showed a growing professional commitment to the AT needs of people with disabilities, while the legislative mandate for the provision of assistive technology devices and services for students with disabilities expressed the national commitment. With the advent of a national mandate and funding for assistive technology services, much professional effort has been devoted to developing effective models for the provision of AT services. The twofold purpose of this arti-

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cle is to consider the important role of assessment in several current assistive technology models and to highlight how computer software can facilitate collaborative teamwork in the AT assessment and planning processes for students with disabilities.

Providing an assistive technology service virtually always begins with a functional assessment of the student in the typical environment (Chambers, 1997; Golden, 1998). Such assessments, which are central to current models of assistive technology, are the mandatory responsibility of IEP teams. Most AT models also provide for ongoing student assessment through team monitoring. It is precisely because AT services are so important for the education of students with disabilities that these services are mandated.

Source of the Mandate

Although some provision for assistive technology services for persons with disabilities was made in the United States prior to 1990, the mandate for the provision of AT in schools originates with Public Law 101-476, the Individuals with Disabilities Education Act (IDEA). Under this 1990 law, assistive technology "device" and assistive technology "services" were defined and made mandatory for each student with a disability (Culatta & Tompkins, 1999; Etscheidt & Bartlett, 1999). With the reauthorization of IDEA in 1997 (Public Law 105-17), all IEP teams were required to consider the needs for both AT devices and services for all students with disabilities (Golden, 1998). As Golden noted, the context for considering AT services for students with disabilities was their right to a "free and appropriate education" (p. 4). Etscheidt and Bartlett (1999) have reviewed the important litigation that has elaborated and consolidated the mandate for AT aids and services.

Public Law 105-17 created the expectation that special education teachers will have a new set of knowledge and competencies in assessing student needs for assistive technology and in the use of such technology in the classroom (Lahm & Nickels, 1999). For school systems and schools operating under an inclusion model, even when support services are provided through collaborative teams, regular classroom teachers must also have knowledge and competencies in assessing student needs for assistive technology and in the effective use of such technology in the classroom. Many of these essential teacher skills have been identified and described by Lahm and Nickels (1999).

AT Planning Teams and Assessment

Assessments for students who need AT devices and services are always team efforts (Chambers, 1997; Golden, 1998; Parette, Hourcade, & VanBiervliet, 1993), and assistive technology planning teams are virtually always dispersed teams. That is, some team members are school-based, others, including the parents, are at different geographical locations. Most often an individual's need for assistive technology will be identified in a school or preschool setting, so teachers, resource teachers, and special education consultants are frequently core members of AT teams. Besides educators, however, a whole range of medical and social services specialists may also be part of the teams, though they may have offices some distance from the school. Parents, too, will likely be important members of the team, as will the student or individual for whom the assistive technology is being considered (Parette, 1999). Indeed, failure to incorporate family concerns in assessment for AT can lead to ineffective use of AT devices or actual abandonment of their use (Parette & Houcade, 1997; Wehmeyer, 1999).

Besides being geographically dispersed, AT planning teams are interdisciplinary, thereby requiring extraordinary efforts to facilitate team consensus and ongoing, effective communication about assistive technology. While the current AT models can do a great deal to facilitate a common understanding of the AT team process, there remain the important factors of ongoing communication, information sharing, and reporting that are so important for team decision-making. The personal computer and the Internet are powerful new tools to link members of AT planning teams, and to facilitate effective, ongoing communication (Bayles, 1998). Even though AT teams cannot meet face-to-face as frequently as they might wish, the computer can serve as an effective means of communication and consultation between face-to-face meetings.

Computer Support for AT Planning Teams

In this article we are advocating the use of "groupware" such as CoPlanner software (Robertson, Haines, Sanche, & Biffart, 1997; Sanche, Haines, & Robertson, 1994) to support IEP teams involved in planning and implementing AT services for students with disabilities. Any AT plan, even if it is still being developed or elaborated, should be a shared document among team members. Computers have several important features to support IEP planning teams. First, all members of the AT team can use the computer and Internet as efficient means of

communicating during planning periods (Robertson et al, 1997). Second, the computer can guide the AT planning process, prompting each team member to participate appropriately and fully in the planning process. Third, team members can share a common planning calendar, which will allow individual members to carry out their tasks independently, while incorporating the results into the common AT plan. Fourth, any assessment tools or forms can be stored as electronic templates, easily accessible for all team members. Fifth, maintaining accessible records of AT plans and of client progress are greatly facilitated. Finally, completing official forms and making official progress reports are more efficient using the storage, instant access, and word processing capacities of the computer.

Models for AT Assessment and Planning

Because team decision-making is of central importance in providing assistive technology support to students with special needs, it is essential that all team members have a shared vision of the AT needs of the student, and work together to serve those needs. One effective way to achieve concerted group action is to use models, or conceptual frameworks, as guidelines to address such matters as team composition, members' relevant expertise, and the process the team will follow in assessing student needs, and in designing and implementing the assistive technology plan. There has also been much recent interest in assessing the quality and effectiveness of the outcomes of assistive and instructional technology (see *www.uwm.edu/edyburn/effect.html* for an overview). Assistive technology teams need to consider what standards to adopt in choosing and using AT devices, and what student assessment information to collect to inform their decision-making.

Many models have been proposed in recent years to guide IEP teams in the integration and implementation of instructional technology for students in school systems and schools (see *www.seirtec.org* for an overview). More specifically, in the area of assistive technology, several influential models have emerged to guide IEP teams as they plan the use of AT devices and strategies for students. For example, the RESNA Technical Assistance Project Model (*www.resna.org/taproject*) seeks to enhance communication between providers of assistive technology and consumers, while supporting the user. The model consists of nine steps: Identify Need for Assistive Technology, Seek Venue for Problem Solving, Conduct Assessment/Evaluation, Set Goals and Identify Possible

Solutions, Carry Out Product Trials, Identify and Specify Intervention Components, Seek and Obtain Funding, Provide Product and Ensure Delivery and Support. The RESNA model serves as a useful general model to enhance the relationship between providers and consumers of AT products and services. However, it was not designed specifically for educational settings, AT teams, and the development of the AT component of the IEP process.

Another model, Education Tech Points (Bowser & Reed, 1995), was designed to help school districts determine and meet the assistive technology needs of individual students and to evaluate and improve their systemwide assistive technology services. At each Education Tech Point (Referral, Evaluation, Extended Assessment, Plan Development, Implementation, and Periodic Review), key questions are considered about an individual student's needs for assistive technology, and the implications for school districts are discussed. This is a useful model that is strategically integrated into the IEP process.

Chambers (1997) has developed a Consideration Model to guide AT teams in their planning. This model takes the form of a flowchart of guiding questions to facilitate decisions that need to be made throughout the instructional planning cycle. An important feature of the Consideration Model is that assessment is focused on currently effective practices in the student's program, the knowledge base of the AT team, the interactions between the AT decisions and the instructional plan, and ongoing updates to the student's program.

The SETT model (Zabala, 1995) provides a framework to aid in gathering and organizing information that can be used to assist the AT team in making decisions. This model considers aspects of the Student, the Environment, and the Tasks required for the student to participate actively in the education setting, as well as the system of Tools needed by the student to address the tasks. Each stage of the model consists of a sequence of guiding questions that assist team members in progressing logically through the stages of planning an educational program that includes assistive technology.

The Quality Indicators for Assistive Technology Services (QIAT) model (Bowser, Korsten, Reed, & Zabala, 1999) provides a set of quality indicators—that is, indicators that would be present in high quality programs to guide IEP teams in developing and providing technology services for students with disabilities. The QIAT model includes sets of quality indicator statements that can be used as planning criteria at key stages of the IEP team's decision-making process. Specifically, quality

indicators have been developed for use during consideration of the student's need for AT, during AT assessment, during AT intervention, and while assessing the effectiveness of AT services. The QIAT provides a set of systematic reference points and criteria to be considered at various stages of the IEP team's planning, to ensure that the AT component meets high standards.

While the assistive technology models described thus far offer ways to plan and systematize the AT decision-making for IEP teams, the process of integrating technology into the ongoing educational program of the student also needs to be considered. The Technology Integration (TI) model proposed by Edyburn (1998) offers a framework to help AT teams address this dimension. Although not designed explicitly for AT teams, the TI model may be readily adapted for that purpose. The model consists of four phases: Selection, Acquisition, Implementation, and Integration. The Selection phase is designed to produce a comprehensive, prioritized list of products that will support teaching and learning according to specific objectives. Selection consists of the following steps: planning, locating, reviewing, and deciding. The Acquisition stage, which focuses on obtaining and reviewing the identified AT products to assess whether they will meet the needs and expectations of the team, consists of previewing, evaluating, and purchasing. The Implementation Phase addresses the integration of technology into the setting, as well as the training of teachers and students to use it. The steps involve organizing, teacher training, and student training. Finally, the Integration phase focuses directly on using AT to enhance teaching and learning by addressing the activities of linking, managing, assessing, and extending. Each of the models reviewed here offers some useful features to guide IEP teams in planning for integrating AT into student programs. In comparing the models, it is clear that there is considerable redundancy across models, while some models address only distinct aspects of AT teamwork. None of the models provides a comprehensive conceptualization of the AT planning and implementation team processes. In the section that follows, we focus on the shared and unique attributes of four models (Consideration, SETT, TI, and QIAT) that we believe have the potential to contribute to a more comprehensive synthesized AT model.

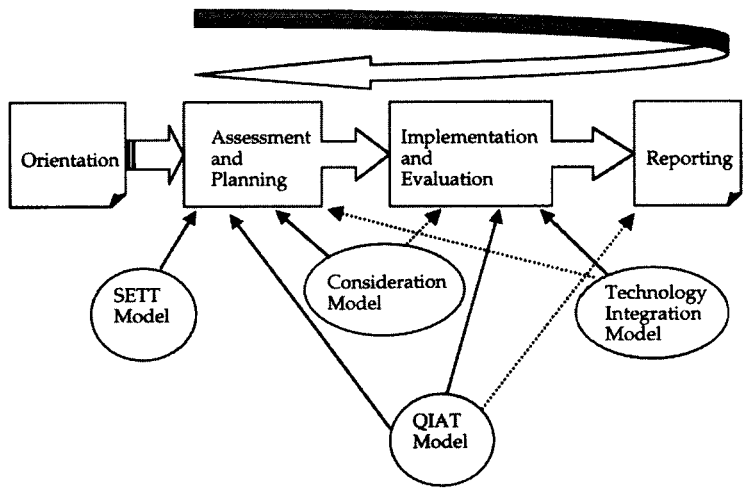
A Synthesis of Current AT Models

The first step in synthesizing the AT models discussed here involves creating a comprehensive framework or organizing structure to serve as a

guide to the AT team as it develops assessment and instructional plans. This structure should also facilitate the design of a software version of the model. Figure 1 presents a flowchart of the AT CoPlanner model, which is conceptualized around four stages: Orientation, Assessment and Planning, Implementation and Evaluation, and Reporting. At the Orientation stage, the student in need of AT services is identified and the AT team is established and begins work. The Assessment and Planning stage involves the gathering of information about the student and the learning context. During the Implementation and Evaluation stage, the team translates the assessment information into action and, subsequently, to determine the effectiveness of the instruction. The Reporting stage involves deciding who should receive reports of the work of the IEP team, and what form the reports should take. As Figure 1 illustrates, a feedback loop makes the Assessment and Planning, Implementation and Evaluation, and Reporting stages cyclical. Ongoing monitoring and assessment are used to determine subsequent adjustments to the instructional plan and the AT component.

Through each stage of the model, a series of questions serves as a guide to the decision processes of the IEP team. In general, the questions create a logical progression for the team to pursue in designing, implementing, and monitoring the educational program. For example, key questions at the Orientation stage focus on team formation and the goals

Figure 1. AT CoPlanner model: A composite of current AT models



for the student's program. First, the initial team is asked to consider whether additional team members are needed with expertise essential for addressing the unique AT needs of the student. Next, the team considers the outcomes they might anticipate as a result of their planning. Finally, a question directs the team to consider factors in the student's current context that could influence the team's deliberations.

The second stage of the model involves assessment and planning activities. The organizational structure of the SETT model provides an appropriate framework and a related set of guiding questions to facilitate teamwork at this stage. However, the "Tools" stage of the SETT model has been removed, leaving the dimensions of "Student," "Environment," and "Task" at this stage of the AT CoPlanner model. The Consideration model includes several important questions that are not asked within SETT and have been added to the AT CoPlanner model ("What is it we want the child to do within the educational program that cannot be done because of a disability? What has been tried to meet the educational goal? Is it working?"). Responding to each of the guiding questions requires the team to engage in a range of assessment activities. Some of the assessment work is directed toward the student in what could be traditional ways ("What are the student's current abilities?"), while others address the needs of the team itself ("Do we as a collective team have the knowledge and resources to make informed decisions?").

The Implementation and Evaluation stage focuses upon integrating AT hardware and software into the educational program. To accomplish this goal, the Technology Integration model offers a valuable framework. The four phases of the model (Selection, Acquisition, Implementation, and Integration) provide a systematic and detailed series of steps to guide the team through selection and acquisition of hardware and software, installation and training, linking technology to the curriculum, and evaluating the outcomes within the student's educational program.

None of the models included in this synthesis provides frameworks for guiding the reporting process. Since the AT team works within the IEP process, the completed IEP form provides written documentation of the AT decisions and plans developed by the team. However, there may be persons or agencies that should be apprised of the student's educational status and progress. The AT CoPlanner model poses a sequence of guiding questions to facilitate consideration of who should receive reports, what form such reports should take, who will prepare them, and when they should be delivered.

The QIAT framework was not used directly in the formulation of guiding questions for the AT CoPlanner model. However, the QIAT model has an important role to play, since it includes monitoring questions to ensure that the team uses thorough and effective processes and practices through all stages of its work. The QIAT model goes beyond AT planning for individual students to address broader aspects of the provision of AT services, such as district policies and procedures. The QIAT indicators are presented as statements the team can use to assess the quality of the services it is providing. There is considerable congruence between the quality indicators included in the QIAT model and the processes comprising the AT CoPlanner model. For example, the seventh indicator within the assessment component of QIAT states: "Assistive technology needs are reassessed periodically based on changes in the child, the environments, or the tasks." This review component is also an explicit part of the AT CoPlanner model. The content of QIAT contributes strongly to the Assessment and Planning and Implementation and Evaluation stages of AT CoPlanner, but only marginally to the Orientation and Reporting stages.

In summary, AT CoPlanner draws upon guiding questions from four current AT models to create a more comprehensive framework than any one of these models offers by itself. The AT CoPlanner model has also been implemented within a software environment that is described in the section that follows.

Software Implementation

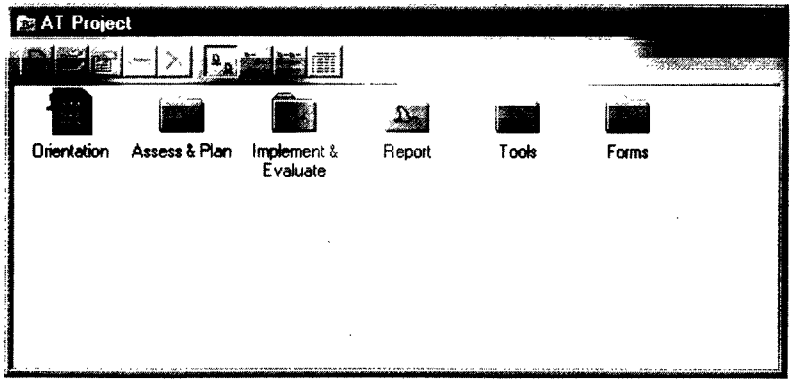
The AT CoPlanner model has been implemented as a content module for CoPlanner software (Haines & Sanche, 2000). The features of the software that support collaborative teams have been described in detail elsewhere (Robertson et al., 1997) and include user-modifiable templates, password security, worksheets, forms, text documents, team calendars with reminders, external document aliases, and file transfer and messaging. In combination, these features create a working software environment that guides the team's assessment and planning activities and captures the products of the team's work.

A team planning "project" begins with the creation of a student file by the project manager from a template that contains preformatted documents organized in an order that reflects the model's flow and content (see Figure 2). The Orientation stage is displayed as a worksheet, which prompts the team to decide on the members for the team and presents

guiding questions that yield consensus statements about the reasons for starting the AT project, the outcomes anticipated, and background information about the student. Once these preparatory decisions have been made, the team progresses to the Assessment and Planning folder.

The Assessment and Planning stage of the model is implemented as a sequence of three worksheets: Student, Environment, and Tasks. The rows of each worksheet consist of curriculum areas as described by Chambers (1997). The columns prompt team members to consider each of these curriculum areas as they conduct their assessments while addressing the guiding questions. To support the team's assessment activities, the Tools folder contains a variety of assessment devices, including checklists, questionnaires, and observation guides. The team members may draw on printed or on-line versions of these tools as needed in addressing the guiding questions. Assessment tasks are assigned to team members as appropriate and related timeframes are entered on the shared project calendar. Completed assessment tools and summary statements are returned to the case manager, who updates the master file. At the same time, the team can begin to complete the IEP form, which is contained in the Forms folder. At this stage, the team also opens the document containing the QIAT indicators, which is implemented as a checklist consisting of the indicator statements, check boxes, and text fields for comments. The assessment process is facilitated as it proceeds by using the QIAT form as a reflective tool.

Figure 2. AT CoPlanner software screen: The layout of an AT planning "project."



At this point, the team proceeds to the Implementation and Evaluation folder, which contains four worksheets: Selection, Acquisition, Implementation, and Integration. The rows of the worksheets focus on the same curriculum areas as the worksheets at the previous stage. The columns for the Selection worksheet are entitled "planning," "locating," "reviewing," and "deciding." Each of these column headers contains a guiding question that directs the team's actions on this dimension (e.g., Locating: "What products could be used to reach the goals and objectives?"). The team progresses to the Acquisition worksheet with column headers "previewing," "evaluating," and "purchasing," then to the Implementation worksheet ("organizing," "team training," and "student training"), and finally to the Integration worksheet ("linking," "managing," "assessing," and "extending").

The Managing step poses the question: "How will we determine that the products are used as planned and work as expected? This question, in turn, prompts the team to set outcome criteria and plan ongoing assessment activities to monitor those outcomes. The next questions in the Assessing column are: "What are the results of technology-assisted instruction for the student? Are changes needed ?" They prompt the team to conduct ongoing assessments of the effects of the AT components of the student's plan and to adjust the program based on the outcomes of the assessment. As in the previous stage of the model, assessment tools are accessed as needed from the Tools folder to support these activities and QIAT observation forms entitled "Inclusion of AT in the IEP," "Implementation," and "Evaluation of Effectiveness " are used as monitoring devices. Also, the IEP form is updated on a continuous basis throughout the Implementation and Monitoring stages.

The IEP team now proceeds to the final stage of the AT CoPlanner software, "Reporting." This folder contains a worksheet with column header questions that guide team members to consider why they are reporting, who should receive the report, what form the report should take (i.e., oral, written), what information should be reported, who should prepare the report, and when it should be delivered. To expedite the reporting process, the team can choose from several preformatted report forms within the software.

In summary, implementation of the AT CoPlanner model in a software environment offers many advantages to improve the efficiency and effectiveness of AT teamwork. The major benefits include a shared working environment, an array of support tools, and ongoing engagement for

dispersed teams. Software support for AT teams offers the promise of enhancing the effectiveness of assistive technology services and supports to students and families.

Discussion

While the strong mandate and funding for assistive technology included in U.S. federal legislation have inspired the development of a series of AT models, none of these is comprehensive; none addresses all issues of student assessment, AT planning, service delivery, and follow-up or monitoring. Even though each AT model makes a significant contribution to some aspect or aspects of the mandated tasks, there is potentially great benefit in combining the significant features of the existing AT models into a more comprehensive model that addresses all important factors related to assistive technology. An open software system such as CoPlanner provides an ideal medium for combining the most important features of the existing models. The benefits of using computer software to integrate existing models is that the resulting combined model helps an IEP team to be thorough, while not requiring it to follow a lockstep process to achieve that thoroughness. Further, a comprehensive AT model implemented through the use of software is a medium that offers the possibility of effective initial and ongoing communication among team members. Thoroughness in AT assessment, planning, and implementation, along with effective team communication are without doubt the most important factors needed to facilitate effective services.

"Guiding questions" were a significant feature of each of the existing models of assistive technology. Again, computer software facilitates the use of guiding questions to focus the work of AT teams. Essentially the guiding questions represent the series of questions experienced team members—both professional and nonprofessional—would ask themselves in assessing students, and planning for and providing effective AT services. Making the questions available on computer for all IEP team members has the powerful effect of focusing the tasks of all team members and letting them each see what the others are contributing to the AT "Project."

Assessment and monitoring represent critical components of the AT CoPlanner model and, indeed, of all the AT models. The quality of the information gathered by the AT team is fundamental to addressing most meaningfully the educational needs of the student. The requirement that assessments be conducted in the student's customary environ-

ment enhances the authenticity of the assessment process. In addition, the ongoing monitoring function of assessment is crucial to ensuring that the AT component of the student's program is living up to the team's expectations and, if not, is adjusted accordingly. A major advantage of a software implementation of the AT model is that the needed assessment tools are integrated into the planning process and available as needed.

None of the existing AT models focused specifically on the important factors of student identification, IEP team building, and reporting the results of the AT team processes. We consider all of these factors integral to the process and have conceptualized them and provided tools to accomplish each in AT CoPlanner software. Guiding questions can facilitate creating the initial AT/IEP team, and especially helping the team achieve consensus on the AT needs of the student. In the earliest stage of the synthesized model, guiding questions lead the team to assemble existing information about the student's needs for assistive- technology. At that stage, parents and the student with special needs can have considerable input. Later in the AT project, even though the results of the teamwork have been captured by the software and are available for all members, there may still be need for reports. Once again, we consider that process an integral part of the ongoing communication that is essential for maintaining the effectiveness of AT supports for students.

Most IEP teams already use technology to support some aspects of their work. For many teams, IEP software is used to guide and document their planning. However, the AT CoPlanner model and software go beyond IEP preparation to represent and support a range of team processes and activities within a software environment.

At present there is a need to further enhance and refine the model and the software implementation. In particular, extensive field tests should be conducted in which AT teams use these tools in their ongoing work. Feedback needs to be obtained from these teams to determine which features are useful, which are not, and how the model and its software implementation can be made most suitable as a tool for AT teams. There is also a need to design the software to take a more active role in the team process. For example, the software design could take advantage of "prototype cases " to offer suggestions about technology choices or useful outside resources to team members as they proceed in their work.

Another consideration around the software implementation is to create a web-based version of AT CoPlanner. This approach would resolve issues of cross-platform compatibility and multiple versions of

documents and files that can arise with stand-alone software applications. It would also expedite access to the student's file for new team members by eliminating issues of hardware and software availability.

The AT CoPlanner model and software were developed by synthesizing the most useful aspects of several current AT models. Creating a software environment that guides and supports AT teams offers the promise of providing an essential tool to enhance the quality of educational programs for students with special needs.

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