IMPLEMENTATION OF ASSISTIVE COMPUTER TECHNOLOGY: A MODEL FOR SCHOOL SYSTEMS

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Many researchers conclude that assistive computer technology (ACT) has the potential for improving educational outcomes and improving the quality of life for those with disabilities (Blackhurst & Edyburn, 2000; Fisher & Frey 2001; Lewis, 1993; Lindsey, 1993). While it is recognized that ACT can have a positive impact on learning for students with learning problems, the process for the integration of assistive technology into the curriculum is more complex. A well documented gap exits between the potential of ACT and the realities of the classroom (Edyburn, 2000, 2004; Zabala, 2006; Zabala et al., 2000). Educators need easy access to professionals with expertise in technology and pedagogy. Technology strategic planning is essential. This report reviews these factors and suggests a model to address the ACT implementation process.

For the purposes of this report, the term learning problems *will be used as a general term that refers to significant difficulties in acquiring, processing, retaining or applying information for any student. Students with these challenges are at risk for early school leaving. Much of the research in the use of assistive computer technology has been reported for students with high incidence disabilities such as learning disabilities. This report includes, but is not limited to, research related to assistive computer technology for student with identified learning disabilities.*

The benefits of computer technology have transformed the academic experience for students with learning problems. The potential of assistive computer technology (ACT) to address educational needs for students with learning problems is well documented. (Blackhurst & Edyburn, 2000; Fisher & Frey 2001; Lewis, 1993; Lindsey, 2000; Male, 2003). The use of screen readers, voice recognition technology, optical character recognition, spell check and word prediction technologies provide students with independent access to the curriculum where access would otherwise have been difficult, if not impossible. The use of this technology is designed to establish equal access to learning opportunities and to support for those with learning problems. The impact of assistive technology on the ability to successfully complete post-secondary education is being recognized (Burgstahler, 2003; Raskind & Higgins, 1998; Schmetzke, 2001; Smith & Jones, 1999; Waddell, 1999). Its use has been shown to provide a greater sense of independence and a considerable reduction in student anxiety levels as well as performance benefits. (Barton & Fuhrmann, 1994).

While it is recognized that technology can have a positive impact on students' learning problems, the process for effective integration of assistive technology into the curriculum is more complex. A well documented gap exits between a vision of the potential of technology and the realities of the classroom (Edyburn, 2000, 2004; Zabala, 2000). Lack of teacher time, limited training, access to support service, limited leadership and lack of a common vision or rationale for ACT use are commonly cited problems (Beigel, 2000; Edyburn 2000). One study noted that as problems such as these decreased, students' use of ACT increased (Forgrave, 2002; Schlosser et al., 2000). It has been noted that the potential for ACT can only be realized if educators and those supporting ACT services are trained in instructional methodologies that allow ACT to be integrated in a meaningful way (Bowser & Reed, 1995; Edyburn, 2000; Schlosser, et al., 2000; Toddis & Walker, 1993). The issues involved in ACT service delivery, need to be more carefully considered and require a more complex understanding that goes beyond the mere access and operation of the ACT device.

Defining Assistive Computer Technology

Broadly defined assistive technology (AT) is any technology that allows an increase, maintenance or improvement of the functional capabilities of an individual with a disability (Edyburn, 2000; Hitchcock, 2001; Individuals with Disabilities Education Act of 1997; Lewis, 1998). In essence AT use allows the person with a disability or learning problem to enhance their performance and complete tasks more efficiently and independently. It may allow them the ability to complete tasks they could not otherwise achieve at all. Not all assistive technology is computer based. Wheelchairs, hearing aids, and vision aids are considered assistive devices. U.S. Legislation (IDEA '97) defines assistive technology using this broad definition. Some examples of AT provided by the Adaptive Technology Resource Center (2001) are: positioning systems that allow access to educational activities; daily living aids and products, alternative communication systems, switches and controls for access to equipment; assistive listening devices; visual aids such as contrast enhancement, enlargement/magnification of materials, adaptive computer switches, access and modified hardware. (Blackhurst & Edyburn, 2001; Dubbels, 2001; Sheldon & Hager,1997). While these technologies are supportive to individuals with disabilities, the present report will only include Assistive Computer Technology (ACT). Assistive computer technology is functional in the same manner as an assistive *device*, but requires access to electronic technology, specifically computer technology and is used to address students' learning problems.

> *While it is recognized that technology can have a positive impact on student's learning problems, the process for integration of assistive technology into the curriculum is not well understood (Edyburn, 2000, 2004; Zabala, 2000). Lack of teacher time, limited training, access to support service, limited leadership and lack of a common vision or rationale for ACT use are commonly cited problems (Beigel, 2000; Edyburn 2000). One study noted that as barriers such as these decreased, students' use of ACT increased* (Schlosser et al., 2000).

It is a logical conclusion that in order to begin assessing student learning with ACT, students would first need to overcome barriers to use the technology. It has been noted that the potential for ACT can only be realized if educators and those supporting ACT services are trained in instructional methodologies that allow ACT to be integrated in a meaningful way (Bowser & Reed, 1995; Edyburn, 2000; Schlosser et al., 2000; Toddis & Walker, 1993). The issues involved in ACT service delivery need to be more carefully considered and require a more complex understanding that goes beyond the mere operation of the ACT device. We need to understand more about barriers to effective implementation as discussed in the following sections.

Barriers for Effective Implementation of ACT into Core Curriculum

Human Resources

Research shows that teachers' attitudes are a key factor for implementation of assistive computer technologies (Derer et al., 1996; Dorman, 1998; Johnson, 1999; Webb, 2000; Zabala, 2006) and teachers' acceptance of ACT is partly attributable for student success using ACT (Duhaney & Duhaney, 2000; Elliot, et al., 2003). In two studies teachers perceptions that additional training would be required or that the technology would only be applicable to a few students affected their enthusiasm for using it (Roberson, 2001; Scott, 1997). Another study demonstrated that teachers were less willing to accept the technology if they believed its implementation would require them to alter their teaching style (Dorman, 1998). Overall, educators often feel inadequately prepared to implement ACT recommendations (Bausch & Hasselbring, 2004; Bowser & Reed, 1995; Hutinger et al., 1996; McGregor & Pachuskie, 1996; Toddis, 1996; Todis & Walker, 1993).

Teachers' comfort level with ACT is closely related to training issues. Lack of training is a commonly cited barrier for effective ACT use (Beigel, 2000; Derer et al., 1996; Edyburn 2000; Roberson, 2001; Smith, 2000; Elliot et al., 2003). Teachers feel inadequately trained in the operation and implementation of ACT (Bausch & Hasselbrig, 2004; Beigel, 2000; Edyburn 2000; Kaplan, 2003; McGregor & Pachuski, 1996). Teacher training is shown to increase the comfort level for using ACT (Elliot et al., 2003). The Oregan Department of Education, Special Education Technology Task Force (1996) reported that specific barriers for teachers to support successful ACT implementation include lack of: (a) skills to use ACT, (b) skills to employ ACT, (c) resources to learn to use ACT and (d) the best ways to teach ACT. Furthermore, preservice teacher education programs may provide some special education courses of which assistive technology may be a small part, if at all. University based ACT courses in Canada are rare. There has been little systematic training during a time when the field is expanding and more powerful technology tools have been developed (Howell et al., 2000).

In addition, research indicates that training that has been made available to educators tends to focus on the basic functionality of the technology with limited modeling of instructional methods (Maushak et al., 2001). Training tends to be provided in the initial stages of implementation. There is less attention paid to ongoing support for teachers and inadequate attention to understanding how ACT can enhance learning (Edyburn, 2003). The integration of technology is viewed as a process that actively engages students with learning problems in instructional delivery. It involves a complex process that integrates ACT with learning objectives and proven learning theories (Okojie & Olinzock, 2006). ACT use is not a separate entity but is an integral part of the learning process itself. Yet there are few references to appropriate application of ACT in classrooms (Forgrave, 2002; Maushak et al., 2001).

The Decision Making Process

There is a great variety of specialized ACT software for students with learning problems. Each of the software programs support learning in different ways and for different purposes. For example, OCR software supports access to print material where voice recognition technology supports written word production. The characteristics of these software programs must be considered to make a match to a student's learning needs. It would not make sense to provide a speech synthesizer to a student who has a hearing disability. Knowing the capabilities of the software is one step in identifying appropriate software related to student need. In addition, understanding student strengths, needs and preferences is vital information when making decisions about appropriate technology selection (Edyburn 2000; Forgrave, 2002; Lueck, 2001).

Software that might be appropriate for one student with learning problems may not be helpful for another student experiencing similar difficulties. The questions that arise then are: what ACT is appropriate for which students and how are these decisions made; is the use of ACT being evaluated for effectiveness; and what is the impact of ACT on learning? (Edyburn & Gardner, 1999; Holzberg, 1998; Howell et al., 2000). Scherer (1993) claims that attempts to use ACT for students are sometimes abandoned. The foremost reason for such failure or abandonment is related to a failure to consider the learner's needs and motivation for using the technology.

The integration of ACT and curriculum also involves the selection of suitable technology (Okojie & Olinzock, 2006). To ensure that students are provided with the appropriate ACT, educators not only need to be educated on the use for ACT, but on which tools will be appropriate for the unique needs of students with learning problems. An appropriate student/technology match is critical (Bryant & Bryant, 1998). Each student should be assessed to evaluate the appropriate tool for making the student/technology match (Bryant & Bryant, 1998; Edyburn, 2000).

Initial and ongoing assessment is required to insure that the ACT use is effective or is continuing to be effective. An application which may support achievement for students with learning problems may become ineffective in time. For example, a student who uses word prediction with a small dictionary may find that this writing tool supports written composition. As the student progresses through grades and personal vocabulary knowledge increases, he/she will need to access a larger dictionary if the tool is to continue to be effective. Ongoing assessment of ACT effectiveness is needed to insure the maximum benefit from its use (Bryant & Bryant 1998; Bowser & Reed, 1995; Ebner, 2004).

A challenge for educators is finding personnel who are qualified to complete ACT assessment and make technology recommendations. The pace of developments in the ACT field is exponential so it is difficult for educators to keep up with the pace of developments. There is no formal course of study in Canada to educate personnel as ACT experts. While many occupational therapists have some knowledge of some ACT, they are not qualified to understand the application of ACT with the curriculum in the class environment. Researchers report that some members of Individual Education Plan (IEP) teams are unprepared to make assistive technology decisions (Bowser and Reed, 1995; Hutinger et al., 1996; MaGregor & Pachuski, 1996; Todis, 1996; Todis & Walker, 1993). IEP teams cannot recommend ACT solutions with which they have little expertise. Barriers to ACT use are further challenged in Canada by the fact that IEP teams are not required to consider ACT solutions.

Instructional Environment

Some researchers have identified the importance of examining the instructional environment and the setting demands it places on students. Setting demands are those tasks that students are asked to perform in their classes and the prerequisite skills needed to complete the requirements (Bryant &

Bryant 1998; Riegel, 1988; Rieth & Everston, 1988). A key step in effective ACT implementation involves identification of setting demands and the student's ability to perform those tasks with appropriate ACT. The features of technology need to be environmentally useful for the user (Bryant & Bryant, 1998; Reed, 2005). ACT may be helpful in one setting but have little value in another (Bryant & Bryant, 1998). Some school districts in the U.S. use environmental assessments to insure that the instructional environment is considered when making ACT selection decisions (Webb, 2000).

Managing ACT

Effective ACT use requires careful planning and design (Forgrave, 2002). In his work, Edyburn (2000, 2004) describes the goal of integrating ACT in the curriculum as linking software, media and technology tools with specific instructional objectives. Technology that is to be used should be focused, purposeful, manageable, and enhance student performance. Edyburn's work recognizes that effective implementation is a process involving selecting, acquiring, implementing and integrating technology. The most significant factors for introducing technology to the general education classroom are shared responsibility for participation and decision-making, and for securing and sharing resources. Shared accountability for student outcomes is necessary (Cook & Friend 1996; White et al., 2003).

While the benefits of ACT for students with learning problems are well documented, some barriers exist at realizing that potential. Professional understanding remains uneven (Smith-Canter, 2002), educators are inadequately trained (Bausch & Hasselbring, 2004), assessment and support are reported to be inadequate (Bausch & Hasselbring, 2004; Edyburn 2000; Watts et al., 2004) and there is a lack of a comprehensive systematic approach (Puckett, 2004). Most ACT is relatively new to education and schools are lagging in keeping pace with new developments (Okojie & Olinzock, 2006). The importance of successful ACT implementation cannot be underestimated. Researchers who have studied the use of technology with individuals with learning problems have concluded that access to this technology is an *equity tool* and has the potential to meet the learning needs of these individuals (Edyburn, 2002, Fitzgerald & Koury, 1996; Woodward & Rieth, 1997).

Barriers are not deliberately placed to do harm and do not affect learning for a majority of students. Yet, students with learning problems deserve to have access to, and make progress in, the regular education curriculum. ACT is relatively new to teaching and has developed alongside a system that has traditionally classified special education programs as separate (or alongside) regular education programs. Fundamental changes to class design, systems responsiveness and policies are required to support the successful use of ACT in classrooms. The final sections of this report will describe a theoretic model for addressing these barriers. For the purpose of this report school systems are defined organized systems for providing education services that includes, but is not limited to, policies, procedures, services, human resources and equipment which can be organized at the Provincial, School District or School level.

A Model for Implementation of ACT: Components

School System Leadership

Lack of a common vision for ACT use and implementation is a commonly cited problem (Beigel, 2000; Edyburn 1998 & 2000). If successful ACT implementation is to become a reality, school systems need to acknowledge that a gap exists between practice and research and then make a commitment to address that gap. Existing practices may need to be reevaluated and require change. School systems will need to articulate a clear vision for what is to be accomplished and how it is that the system will get there.

School system leadership can address the capacity of school systems to manage ACT services by promoting a vision through the establishment of clear ACT policies and procedures (Reed, 2005). ACT plans can be developed that outline long term goals for the implementation of ACT as board and provincial initiatives. Plans could include a shared rationale for ACT use, qualifications of personnel, assessment criteria and support for teachers implementing ACT in their classes. Some tools have been developed in the U.S. to support the development of ACT policies and/or to analyze existing policies. As an example, the National Assistive Technology Resource Institute in Kentucky has developed a Policy Checklist. It was developed by Dr. Edward Blackhurst through the University of Kentucky and is free to use for noncommercial purposes. (National Assistive Technology Research Institute, 2006).

School system leaders are also responsible for setting expectations in every area of education. A grassroots movement in the U.S., Quality Indicators for Assistive Technology (QIAT), has developed a

set of descriptors that is used to set benchmark expectations for quality ACT services. The QIAT group has developed a set of eight competencies for the implementation of ACT and outlines common errors in the process. It is intended to be used as a planning tool. School districts can compare the QIAT list to their own practices to further develop systems policies that is based on sound information (Quality Indicators for Assistive Technology, 2000).

School systems leaders can also encourage the development of IEP teams that include ACT consideration. Some IEP team decisions are supported by providing expert personnel on the use and implementation of ACT. Expert personnel referred to as *assistive technologists* supports ACT use in many ways. ACT has changed and improved at a rapid rate and it is often too difficult for the average teacher to keep on top of the new innovations. An assistive technologist would remain current and bring their expertise to teachers. They would consult with teachers, assess ACT effectiveness and make recommendations about appropriate ACT for individual students. Support would be provided to IEP teams with ongoing supports as a service provider.

Assistive technologists bring credibility to ACT service delivery (Lahm, 2003). They provide assessment services to insure that ACT is being used effectively to maximize benefit to students. Assistive technologists would serve as key individuals for providing professional development opportunities to address training issues. They could be utilized to coordinate services. Currently, two barriers exist for the provision of assistive technologists. Funding for personnel and finding personnel qualified to provide ACT services are difficult challenges. These will be discussed in subsequent sections. One means of impacting ACT implementation is through training (Derer et al., 1996; McGregor & Pachuski, 1996). School systems can address these needs by making a commitment to provide time and resources to meet training needs. To be efficient, training teams can be organized to be multidisciplinary in composition (Newton, 2004; Quality Indicators of Adaptive Technology, 2003). Innovative models for training should be considered. In one study, ACT team training began with four weeks of asynchronous on-line training prior to workshop training followed by hands-on workshops (Puckett, 2004). The online training provided teachers with time to develop activities using their own curriculum materials. One study utilized this training model and subsequently measured student use with ACT. The data demonstrated that significant increases in ACT use for students with learning problems. In another study participants in ACT training were encouraged to develop mentorship networks which served to provide ongoing teacher support (Newton, 2004).

School Leadership

Principals in a school are often considered leaders in a school. However, special education teachers, department heads and those educators who take the lead on certain initiatives are also considered to be school leaders. School leaders promote change in school communities. Their leadership provides opportunities to promote student success in their buildings. They support the implementation of ACT when they seek out local expertise, provide professional development opportunities and support input from all stakeholders. They can encourage improvement in assessment practices both in the initial stages of decision making and throughout the implementation process.

Researchers recommend IEP teams be multidisciplinary in composition (Lahm & Sizemore, 2003; Newton 2004). School leaders can promote a multidisciplinary team approach for decision making in IEP teams. A family's role is critical in motivation for ACT use by students (Ebner, 2004). Students should be involved in the decision making process where appropriate. Research shows that students are more likely to be motivated to use ACT when they are involved in the initial decision making process (Schlosser et al., 2000). Principals can support the implementation of ACT by including all stakeholders in the process or delegate that responsibility to other leaders in the school. While a multidisciplinary approach is recommended, research also recommends that IEP teams have one onsite person in charge of coordination of services (Ebner, 2004).

The Education of Teachers

Currently there is no requirement in preservice programs to provide any course work on ACT. Most preservice programs do offer some special education instruction, but there is currently no standard for the provision of such coursework province wide. Currently, the Working Table Report on Special Education to the Minister of Education (May 2006) has recommended that preservice programs make a special education course mandatory but it does not specify that ACT would be part of the course work. Some researchers argue that preservice programs have not changed with changing times (Elliot et al., 2003; Lahm 2003; Lahm & Nickels 1999). Yet, Faculties of Education already face a jam packed

program from the outset (Lahm & Nickels, 1999). Proposals for two year education programs have been made in the past, but have yet to be adopted.

The field of ACT has grown so rapidly that competencies for educators working with ACT has only recently been developed (Lahm, 2003; Council for Exceptional Children, 2003). Provincial standards for basic knowledge and specialized skills in this area do not exist. Nor do educational opportunities. The Ontario College of Teachers accredits teacher education programs and courses, and provides for ongoing professional learning opportunities for its members. Currently the Ontario College of Teachers has not approved courses in ACT. Teachers who wish to upgrade their knowledge about ACT must rely on system or local leadership, or do so on their own.

Teachers

Teachers are one of the most critical factors if ACT implementation is to be successful. They are key individuals who motivate students to use ACT (Lahm & Nickels, 1999). It is important that teachers become proactively seek training opportunities. Self education, locally developed workshops and mentoring opportunities are avenues currently available to teachers seeking to improve their understanding of ACT. Membership in professional organizations and communities of practice may provide additional opportunities for professional development. It is important to acknowledge that effective special education results from knowledgeable reflection and caring responsiveness to students with learning problems (Hitchcock & Stahl, 2003).

It may also be useful for teachers to approach ACT implementation from researched approaches that have been developed and implemented elsewhere. For example, the SETT Framework (Zabala, 2006) is an easy to use format that supports ACT planning. The SETT framework identifies four main areas of focus: the student, environment, task and tools. The approach is a simple yet effective means for assessment and decision making. It can support ongoing assessment.

Educational Assistants

It is recognized that educational assistants play a key role in programs for students with special needs (French, 2003). Sometimes educational assistants are assigned to support students who use assistive computer technology. Teachers are required to delegate, plan, direct, monitor, coach and manage educational assistants but report little preparation for such responsibilities (French, 1999, 2001). Teachers themselves may have little training on the use of ACT, to support student's access to the curriculum, let alone to train educational assistants on the use of the technology. Educational assistant preparation programs may include training on assistive computer technology, but there is no single standard for the training of educational assistants. Educational assistants have limited training in instructional methodologies in general, let alone when using ACT (#15B). Sometimes educational assistants are assigned to classrooms based on collective agreements rather than on competencies, teachers are often not involved in the hiring process (French, 1998) and there is limited research on skills educational assistants need (French 1999,2001).

Universal Design

Students with learning problems are increasingly being educated in regular classes. This poses an instructional challenge for educators who are being required to address the needs of a wide range of abilities in the classroom. Traditional classrooms tend to approach instruction by *teaching to the middle* with accommodations and modifications being made at either end of the achievement spectrum. This task becomes increasingly difficult in traditionally designed classrooms. One approach that has been proposed to addressing these concerns is an approach based on the concept of universal design.

A universally designed curriculum is an approach that does not classify programs as being either regular education or special education. Rather it views learning as being on a continuum. Teachers plan and organize their classrooms based on that continuum (Education for All: Expert Panel Report on Special Education, 2005). A universal design approach looks at barriers to learning that are not within the learner. Planning is focused on methods and materials which are flexible and adjustable (Rose, 2000; Rose & Meyer, 2002). Universal design considers barriers from the start to plan proactively. ACT plays a role in the provision of instruction based on universal design. Technological solutions for students with learning problems are just as advantageous to many other students. While some students may not require ACT to access the curriculum, it will support learning for many other students. For example, software for organization will support student writing for all students, not just those with learning problems. When teachers plan such support from the beginning all learners will benefit

(Hitchcock, 2001). If ACT is used to plan for universal design from the outset and is useful to many students, it will not be viewed as *extra* programming, but a natural part of classroom activities. In this way, a universal design approach addresses the difficulties of teacher perception as outlined in early sections. ACT is a flexible adjustable tool that supports the concept of universal design.

Communities of Practice.
The Quality Indicators of Adaptive Technology group is one example of a community of practice. Communities of practice provide educators with an opportunity to network with other educators related to a shared repertoire or activity. Communities of practice are groups of people who share a common interest for something they do and learn how to do it better as they interact regularly (Shulman, 2004, Communities of Practice, 2006). Individuals involved with communities of practice interact regularly which involve face-to-face meetings or be web based. Communities of practice are increasingly viewed as valued means to share best practices based on individual's experiences (Zorfass, 2005). Communities of practice can be accessed by all stakeholders involved in the implementation of ACT.

Decision-Making
ACT selection and decision making has been a challenge for educators who know little about ACT as tools for learning and the ability to make an appropriate student-technology match. One approach that has been suggested is an *ACT toolkit* approach (Edyburn & Gardener, 1998). A toolkit is a selection of tools that is targeted to meet the performance demands of a given population and focuses on tools to enhance users' performance. It allows educators to make informed choices from a set of possible solutions rather than from the many choices available on the market (Edyburn, 2004).

School systems that use the toolkit approach provide classrooms with the necessary software, appropriate to the needs of students with learning problems in the classroom. It is a strategy that supports universal design and allows the ACT or *toolkit* to be placed in the hands of teachers and students quickly. Edyburn (2004) reports that

> *the process of developing an assistive technology toolkit could be an invaluable contribution to the profession and could significantly enhance educational performance . . . the assistive technology toolkit would allow teachers to collect performance data regarding the value of specific tools for individual students* (p.13).

Development of a toolkit strategy would require support and commitment on a system level.

The Research Community
While we have come a long way in our understanding of the effectiveness of ACT, there are still gaps in our knowledge base. Much research has been completed on specific ACT tools in isolation, but less has been completed on the effectiveness of using several tools together (Forgrave 2002). More research in the areas of instructional methodologies for using ACT, assessment tools, matching technology to student characteristics, and integrating ACT with curriculum is needed. Models such as QIAT and the Kentucky Assistive Technology Policy Checklist are promising models that can be studied for assessing ACT effectiveness. The toolkit approach appears to be a promising approach which might be considered as one that is efficient with further research.

Technical Support
Technical support is required to support use of ACT. Students with learning problems who use ACT effectively and find that their equipment needs repair may find they have to wait days, if not longer for technical support. Currently the Ministry of Education of Ontario recognizes that technical support for equipment is a critical component if ACT is to be accessed regularly by students, and provides one technical support person for every thirty thousand students. However, boards are finding that they don't have the funds to support a full time person for a family of schools for ACT alone. Teachers sometimes have to rely on what knowledge they do posses about simple troubleshooting.

Funding
Some challenges in ACT implementation simply come down to funding. Currently, Special Equipment Amount Grants are accessed to purchase equipment and software. Assistive technology personnel could resolve many of challenges in the implementation process, but it is simply not affordable for some boards. Some recent changes in funding have been made to allow for more professional development, which boards may access. No specific funding has been provided for implementation services which boards must creatively budget for on their own. Specific funding to demonstrate

student learning has been suggested by the Working Table Report on Special Education to the Minster of Education (May 2006) which might include training for ACT.

Student Focused

Above all, planning and implementation process for students with learning problems must be student focused. Planning starts with the student, not the technology. Merely prescribing ACT does not necessarily enhance individual performance. User's personal preferences and abilities are critical factors when implementing ACT (Edyburn 1998; Lueck et al., 2001; Zabala, 2006). Student's opinions, strengths, attitudes and interests must be considered (Raskind & Bryant, 1996; Bryant & Bryant, 1998). We must not lose sight of the ultimate goal; provide students with learning problems the appropriate support using ACT that allows them to be successful and meet their educational needs.

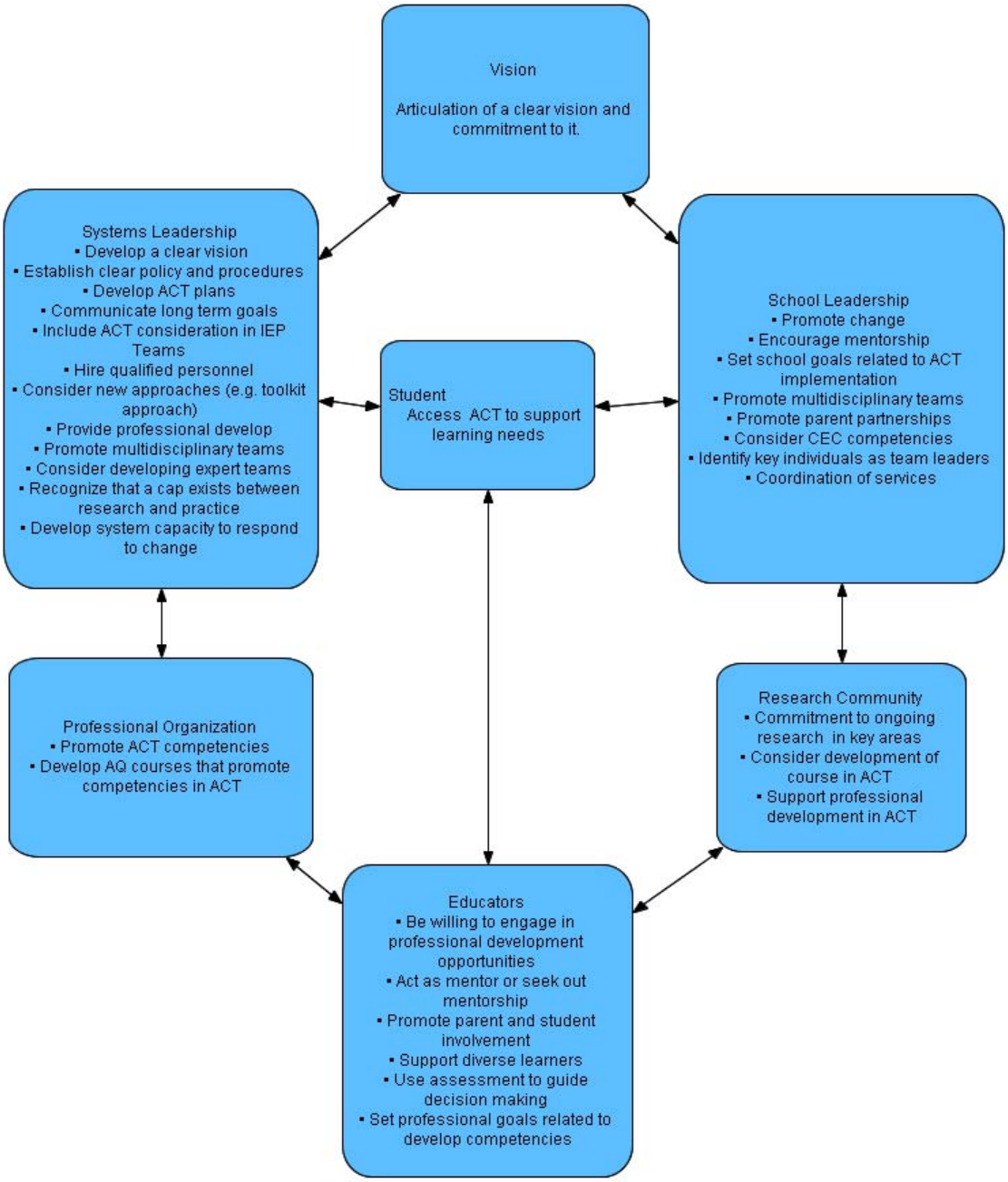

Figure 1
Suggested Model for ACT provision

Commitment

Money alone will not alleviate the challenges of improving the education of students with learning problems through ACT use. By far the greatest contribution to successful implementation of ACT is commitment. It is important that the whole school system recognize that providing ACT alone is a stop gap measure and that support, training, expertise and necessary if student achievement is to be positively effected. The power of technology to address challenges to access to the curriculum is undeniable. The cost of ignoring its power is limiting for students who need access to the curriculum in a way that is effective and meets their needs.

Where Are We?

In his extensive work in assistive technology research Edyburn notes that effective ACT implementation is a process involving selecting, acquiring, implementing and integrating technology. He has developed a four-phase model to describe this process. Phase one, selection, focuses on planning for the use of technology. Instructional objectives and goals are developed and appropriate technology is selected to support those objectives. These goals are developed by an ACT team comprised of educators, students, parents, occupational therapists, special educators and school administrators (Newton, 2004). In phase two the ACT team previews and evaluates the technology. In phase three, the technology is implemented through teacher and student training. In this phase, implementation, the ACT team examines the curriculum to determine the way that technology can be linked to that curriculum. Questions asked here would be: how can the technology be best used to facilitate learning and what activities are best suited to the technology and the task? The final phase includes an evaluation of results to determine if major or minor changes need to be made (Edyburn, 1998). School systems can use Edyburn's four phases to model and assess current practices, and develop policies that more closely align with the implementation process in their school districts.
Based on the discussion of this report an illustration is provided (Figure 1, above).

Conclusion

If all elements of learning are not considered then technology will not be adequately matched to student need. Results will fall short of expectations (Raskind & Higgins, 1998). Recent advances in ACT research are not being employed as widely as experts argue they should be (Edyburn, 2000). The system for ACT service delivery needs to be more carefully aligned so that each part of the system is supporting implementation. To insure that ACT is being utilized to fulfill it potential to support learning for students with learning problem, all stakeholders need to make a commitment to the ACT implementation process and align their efforts to insure that students with learning problems are provided with equitable access to learning using Assistive Computer Technology.

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