DOCUMENT RESUME

ED 466 061 EC 309 028

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TITLE Teaming with Technology Research Project, September 30, 2000-June 30, 2001. Final Project Report.
INSTITUTION Wyoming Univ., Laramie.
SPONS AGENCY Special Education Programs (ED/OSERS), Washington, DC.
PUB DATE 2001-00-00
NOTE 79p.
CONTRACT H023C70140
PUB TYPE Numerical/Quantitative Data (110) -- Reports - Descriptive (141)
EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Computer Assisted Testing; *Disabilities; Early Identification; *Early Intervention; *Evaluation Methods; Individualized Education Programs; Individualized Family Service Plans; Infants; *Interdisciplinary Approach; Preschool Education; Rural Areas; Teamwork; *Technology; Toddlers
IDENTIFIERS *Wyoming

ABSTRACT

This final report presents findings of a Wyoming research project designed to test the possibility of using interactive technology in the assessment, at a distance, of infants and toddlers in rural or frontier areas. The project compared the quality of reports developed when a transdisciplinary assessment team conducted assessments either in person or utilized interactive technology at a distance. Evaluation of reports was in terms of their value to the child's parents, to the professionals developing the Individual Education Plan or Individual Family Service Plan, and to those conducting the developmental interventions. The project found no detectable difference in the quality of assessment reports between on-site and distance assessments. Three papers resulting from the project are also included. They are: (1) "Teaming with Technology: Utilizing Interactive Technology To Conduct Distance Assessments in a Frontier State" (Christy L. Thomson, Michelle L. Buchanan, Kenneth B. Heinlein, and Laura L. Westlake); (2) "Utilizing Interactive Technology To Conduct Team Assessments" (Christy L. Thompson, Laura L. Westlake, and Michelle L. Buchanan); and (3) "The Role of the Nurse on a Transdisciplinary Early Intervention Assessment Team" (Mary Beth Stepans, Christy L. Thompson, Michelle L. Buchanan, and others). (Individual papers contain references.) (DB)

CFDA 84.023C
Field Initiated Research Projects

Teaming With Technology Research Project

Final Project Report
or Progress Report

September 30, 2000 - June 30, 2001

U.S. Department of Education
Office of Special Education and Rehabilitation Services
Office of Special Education

GRANT AWARD NUMBER
H 023 C 70140

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II. Project Summary

Teaming with Technology is a research project designed to test the possibility of using interactive technology in the assessment of infants and toddlers in rural or frontier areas. In frontier areas the costs of sending a team to a site, be it a developmental center or a child's natural home, can be excessive and the logistics of scheduling equally challenging. In the age of interactive technology, an entire team need not be sent to a site to accomplish a team assessment of an infant or toddler thought to have a disability. The Teaming with Technology Research Project used interactive technology to connect the child with the transdisciplinary assessment team.

In year one of the project, the Assessment Team developed and refined themselves as a Transdisciplinary team. Transdisciplinary teams conduct assessments that are interactive and collaborative. Team members share and release assessment and therapeutic expertise with each other. Throughout the Teaming with Technology Research Project, children were assessed simultaneously by multiple professionals from varied disciplines. For research purposes the Assessment Facilitator remained constant. The reports generated from the Transdisciplinary team were integrative, collaborative, and consensual.

The goal of the Teaming with Technology Research Project was to compare the quality of the transdisciplinary reports developed by the Assessment Team when the assessments are conducted in person compared to those conducted through the use of interactive technology. The Teaming with Technology Research Project evaluated the team reports in terms of their value to the parents of a child with a disability, the professionals developing the Individual Education Plan (IEP) or Individual Family Service Plan (IFSP), and those conducting the

developmental interventions. The outcomes of the Teaming with Technology Project were evaluated by specialists in early intervention, who, using a specific protocol (see appendix A), rated pairs of assessment reports. The pair was made up of a report from an assessment using interactive technology (off-site assessment), the other report from an in-person assessment (on-site assessment). Satisfaction of the assessment process was evaluated by the parents of the child who completed the assessment process and by the developmental center the child was or would be enrolled in (See appendix B).

In summary the findings indicate that conducting transdisciplinary assessments using interactive technology can be as successful as conducting transdisciplinary assessments on-site with each child and family. Additionally, there is no detectable difference in the quality of the assessment reports between on-site and distance assessments This has great implications for use throughout Wyoming and other rural states in offering comprehensive team assessments for children and their families without having to travel long distances to get appropriate assessment information which leads to appropriate intervention services. The next logical step in the development of this model is to work with this model as an outreach program in Wyoming and surrounding states.

III. Project Status

Project Status History:

The Teaming with Technology Research Project started October 1, 1997 and had an ending date of September 30, 2000. An extension of the program was granted and the new ending date was June 30, 2001. Year one focused on the hiring of the Assessment Coordinator, the approach to the assessment process the Assessment Team would take, team building activities to ensure a quality team that could function as a Transdisciplinary team, initial testing of the interactive technology, and formulation of procedures. The second year focus was on formalizing the assessment process which included using standardized assessments combined with play-based assessment, natural environment observations, parent, caregiver, and professional provider interviews, and gathering medical information. Training with and adjusting to using the technology proved to be a bigger challenge than expected. Several barriers were dealt with and modifications on computers were made in order to gain the best possible audio and visual presentation. The team conducted five trial assessments that were not included in the research. These trial assessments were necessary in order to ensure team reliability in scoring protocols across domains, to work with various technology adjustments, to become familiar with and adjusted to distance assessment, and to make adjustments to the overall assessment process where necessary. Trial interactive technology sessions were conducted prior to the trial assessments to allow the team to get used to the equipment and experimenting with different microphones, computer settings, etc. In the Fall of 1998 actual assessments with children began and continued throughout the project with one to two assessments a month being completed. For the purposes of the research study, twenty-four

assessments were completed with equal numbers of on-site and off-site assessments. This is fewer assessments than were projected in the original application. Primarily, this resulted from significant difficulties with and limitation of the technology we first selected.

The challenges of the technology caused us to modify the approach. Initially, we expected the Project Coordinator to travel to each of the four sites for some of the assessments and have the parents travel to the University of Wyoming for other assessments. The assignment of on-site and off-site assessments was to have been random. During the end of the first year and start of the second, as we were evaluating various technological combinations, we were never able to get a consistent signal. The bandwidth for color transmission during the early part of the day, the time which is best for assessing young children, was easily overwhelmed. PCMCIA cards and modems could not handle the signal. We frequently lost the video signal as the image on the viewing monitor turned to a lovely shade of pink, sometimes the audio, occasionally both. During the final month of the Project, Envison released compression software that could be used on a lap top computer. This technological change could have been very valuable earlier in the research.

Given the limitations of the technology three years ago, we modified the approach. As we were struggling with bandwidth, the University decided to install and DSL between the University and the off campus offices of Wyoming Institute for Disabilities, which is where the Project Director (Assessment Coordinator) for the Teaming with Technology Research Project was located. This enabled us to test the potential for distance assessments using more reliable technology. All distance assessments were conducted using the DSL connection with

assessment staff located off-campus and the Assessment Coordinator located on-campus. The on-campus assessments were conducted as originally specified with assessment team and Assessment Coordinator in the same setting, separated by a two way mirror.

Current Project Status:

During the final months of the Teaming with Technology Research Project data collection and analysis were completed. Data were gathered to measure the **goal** of the project, which was to compare the quality of the transdisciplinary team assessment reports when the assessments were conducted in person compared to those conducted through the use of interactive technology. The reports were evaluated in terms of their value to the parent of a child with a disability, the professionals developing the Individual Education Plan or Individual Family Service Plan, and those conducting the intervention services.

The **outcomes** of the project were evaluated through a parent and service provider survey, the assessment results used in determining eligibility for special education services, tracking the time commitment of each member of the team in the assessment process, estimating the cost of each assessment, the ease and comfort a Transdisciplinary team has in conducting assessments using this methodology, and the degree to which the assessment was family centered.

The following section will describe the findings from data collected on the goal and outcomes of the Teaming with Technology Research Project.

Goal

Four external reviewers rated twelve pairs of reports; one on-site report paired with one off-site report. As mentioned in an earlier report, the original application named five external

reviewers. Two of the reviewers were unable to review reports when the actual time came and only one of them was replaced. The four reviewers were: Dr. Rebecca Fewell, Dr. Patricia Spencer, Dr. Peggy Shaeffer, and Dr. Gail Zahn. A multi-variate analysis of variance to test the differences in the quality of the reports based upon the ratings of the external reviewers was used. A letter grade was assigned to each section of the reports, pluses and minuses were allowed. Grades were based on the following: a statement of strengths and needs in each of the five domains (cognitive, motor, expressive and receptive language, and social/emotional and adaptive behavior) and an overall rating of each report. This resulted in seven ratings for each report with the rating scale being zero (F) to four (A). A plus raised the grade .25, a minus lowered the grade by the same amount. Thus, a B+ was scored as 3.25, a B- as 2.75. In the MANOVA for repeated measures in this research there were two main effects and one interaction. The main effects were for raters (the four experts) and for setting (on-site versus off-site).

Main Effect: External Reviewers Results

There was a highly significant difference among the experts' ratings of the content of the reports, although the raters were quite consistent in how they rated each report. For example, one rater tended to give high scores - As and Bs, another tended to give somewhat lower scores - C+ and B-. Among the raters, these differences were significant and consistent across the domains assessed.

Main Effect: Setting

Overall, there was no difference in the ratings based upon whether the assessment was conducted on-site or off-site assessments. Analysis of data included looking at ratings in each developmental domain and the effects the setting had on each. For example: the setting (being

on-site or off-site) having an effect on the results reported within specific domains; on-site motor domain results as compared to off-site motor domain results; on-site cognitive results as compared to off-site cognitive domain results. Again, there was no significant difference in the reports between off-site domain results and on-site domain results.

Interaction: Rater by Setting

As important in the context of this research was the potential for rater by setting interaction. In this case, the rater by setting was also not significant. Initially we had anticipated variability in how the experts would rate the reports. We selected the MANOVA with repeated measures specifically to remove the between rater variance, thusly decreasing the error variance and increasing the statistical power needed to find a difference, should one exist.

Outcomes

The Feedback form for parents and service providers contained the same questions and both used the same rating scale. 1 (very poor) to 7 (very good) . Each question was rated and an overall rating of parent or service provider satisfaction was determined.

The outcomes will be discussed in the order presented.

1. The satisfaction of parents with the assessment process. In determining parent satisfaction, an overall score of each question was determined. Each question will be summarized in order to give background on the results of the outcome. Parent overall satisfaction was determined to be moderately to fairly high. Over all satisfaction of the parents with the assessment process was higher than the overall satisfaction of the service providers.

Results from the parent survey report scores of 6.35 in the areas of a "jargon free" report

and the extent to which the report addressed the parents' referral questions. The highest mean score by parents was 6.65; this addressed the extent to which the report identified the child's strengths and needs. On average, parents reported that the reports were very clear (m =6.55) and that the report assisted in the development of the IEP/IFSP (m=6.41). The lowest mean score was in the describing the extent to which the report provided new insight about the child. This mean score was still a favorable score of 6.15. We feel we can conclude from these mean scores that parents gained the information they needed in participating in the assessment process.

2. The ability of the Assessment Team to make appropriate determinations for eligibility for special education services. The use of standardized assessment tools along with clinical observations and resulting reports of functional play-based assessment made it possible to give the eligibility scores as determined by standardized assessments, which the State requires. Functional information provided a clear picture of the child's developmental age and the team could therefore make recommendations for programming based on the information from all aspects of the assessment.

3. The satisfaction of the service providers in the assessment process. Mean scores provided by the service providers (predominantly the developmental preschools serving children with disabilities and some Head Start programs)showed statistical differences in three areas. Those areas include: the degree to which the report answered the referral questions, the extent to which the report assisted the development of the Individual Education Plan or the Individual Family Service Plan, and the extent to which the report provided new insight about the child.

These differences suggest a number of questions. How well informed our parents are regarding their child and his/her disability? Are parents informed enough to be strong advocates for their children in the development of educational programming that is to meet individual

needs? How much information do parents seek for themselves or receive from the service providers regarding specific disabilities? While these differences may suggest that the developmental centers do not adequately inform parents about their child's disability, it is also possible that the higher ratings from parents in these areas represents a halo effect resulting from parents rating the work of the experts (doctors in most cases) from the University. Equally possible, and the alternative we prefer, is that we did provide more detailed information to the parents in a form that they could understand. Unlike a developmental center, we did not face the pressure of completing assessments and IEPs or IFSPs within specified time limits. We took the time to explain each report to the parents allowed them to ask questions and provided additional information as needed.

It should also be noted that there were a few cases in which developmental preschools referred children for whom the staff anticipated a specific diagnosis those children (autism) and upon completion of a comprehensive assessment, the Assessment Team did not diagnose these children with autism. This resulted in very low scores on the referral question answered by the developmental preschools. Thus the statistically significant difference between parents and providers in the areas of new insight and answers the referral questions may be an artifact of those specific cases in which the developmental preschool prejudged the diagnosis.

4. The effectiveness of assessment reports in developing or improving programming/ intervention for children. This particular question was answered in part through the parent/developmental center surveys. Although there was a significant difference between parents reporting how helpful the report was in developing the IEP/IFSP, both groups of respondents felt the reports were helpful in that process (m=6.41 for parents; 5.33 for service providers).

5. The length of time required to complete each assessment. Time commitment for each child assessed was tracked. Time was split between into two categories; Team Assessment and Team Discussion. Team Assessment professional time during actual assessment was determined as described: if a child were participating in an assessment for 2 hours and there were 8 professionals on the Transdisciplinary Assessment Team, that would account for 16 hours of Team Assessment. Team discussion was determined the same way; if a child were the topic of discussion, (whether during pre-assessment planning or post-assessment discussion) that time was multiplied by the number of team members present during that discussion. Team Assessment time ranged from 4 hours to 17.5 hours and Team Discussion ranged from 3.5 hours to 36.5 hours. The length was time spent on each assessment was not affected by the setting of the assessment, that is, whether the assessment was conducted on-site or off-site. The difference in Total Team Assessment Time was due to the age of the child and the severity of the disability.

Individual team member time was also tracked. There was a wide range of individual member time. The project coordinator had considerably more hours with each individual assessment than other team members. This was due to job responsibilities that included pre-assessment information gathering, assessment coordination, compilation of team report, and sharing assessment results with the families and developmental preschools. The team social worker consistently documented more hours per assessment. Again it was her job to do a parent interview with the family prior to the assessment. She was also present during each assessment to gain more information as part of the Transdisciplinary Team. Twenty-four assessments were completed for this research project for a total team time of 1061.5 hours. Individual team members time ranged from 484.5 hours to 25.5 hours over the course of the twenty-four assessments. An average assessment time per child is not warranted. As was discussed above

the total assessment time was determined by the age of the child and the severity of the disability.

A positive outcome of the Transdisciplinary Team approach was the fact that a child could be assessed for 2 hours and we would have assessment results from each discipline. If traditional testing measures were used, that child would have need to make multiple trips for each assessor and the time for the parent and child could easily go to 16 hours. This would lead one to believe that not only is the transdisciplinary approach much more family centered, but it is cost effective to the program.

6. The cost of each assessment. During the grant, there was no cost to the family or the developmental preschools to obtain an assessment from the Teaming with Technology Research Project. The grant was written to work with four regional developmental preschools. Travel distances were not a hardship issue for three of the regions. It was a hardship issue for the fourth region and therefore referrals came from other regions rather than the Early Intervention Program located on the Wind River Indian Reservation. In the grant, cost differences were to be compared when the Assessment Coordinator traveled to the off-site assessment site and the cost of the interactive linkages; the costs would not occur for those assessed on-site. Due to the difficulties using the interactive technology beyond the networking capabilities at the University of Wyoming, those cost differences were not determined. As technology continues to improve and exploring the capabilities of equipment like the Sorenson EnVision Conferencing Kit is done, it stands to reason that using this approach to assessment is still a very viable alternative to conducting comprehensive assessments.

7. How comfortable Assessment Team members were with the technology. This aspect of the project was done through team self-evaluation or the team processing time upon

completion of each assessment. Discussions centered around the use of interactive technology both on a technological level (picture size, quality and motion, sound volume and quality, tracking the actions of assessor and child, observing fine motor activities as well as gross motor activities, etc.) and on a person level (physical distance from the child and the inability to touch the child during the assessment). Some difficulties did arise out of these discussions as were discussed in earlier reports. Measuring muscle tone and determining articulation development were challenges using interactive technology. The team got around these barriers and became comfortable with the adaptations that allowed for these issues to be looked at appropriately. There continues to be various levels of quality (depending on the overall use of the internet); however the team consensus was that doing assessments using interactive technology in a transdisciplinary/arena approach is an exciting and reliable means to provide this sort of service to children and their parents.

8. The degree to which the assessment was family centered. Determining this outcome was completed in 2 stages. The first was discussed in describing the parent survey. The overall determination was that parents did feel the assessment was family centered and although the families did end up traveling more than was anticipated, their participation throughout the process was rated a very favorable. The second stage was completed again through self-examination of the team process upon completion of each assessment. Parents were involved in the entire process from referral to developing a program for their child. Parents were observers and participators during the actual assessment process and their input regarding the assessment was incorporated into the team report. Discussion of team results always included the parents as did programming suggestions. This attempt at bringing in the family as equal members of the assessment team is mandated through the Individuals with Disabilities Education Act and the

philosophy of the team would not have done the assessments any other way.

To summarize the experience of the team and the results of the Teaming with Technology Research Project, we concluded that conducting transdisciplinary assessments using interactive technology is as successful as conducting transdisciplinary assessments on-site with each child and family. This has great potential for use throughout Wyoming and other rural states offering comprehensive team assessments for children and their families without having to travel long distances to get appropriate assessment information which leads to appropriate intervention services. The next logical step in the development of this model is to work with this model as an outreach program in Wyoming and surrounding states.

Information Dissemination

Dissemination of information about this project began in Year 3 and continued through the end of the project. Two of the Assessment Team members presented at the Division of Early Childhood Conference in 1999. Two members presented at the National Head Start Conference in 2000. A presentation was made by two members of the team at the 16th Annual Community and School Health Pediatric Conference. Three team members including the Principal Investigator presented at the International Association for the Scientific Study of Intellectual Disabilities Quadrennial Conference in 2000. Four team members presented at the American Association for Mental Retardation National Conference in 2001.

On the campus of the University of Wyoming, Assessment Team members have given their time to present at various conferences and present to various classes within various disciplines. As the team became known throughout the state, various members were asked to

present at Developmental Centers and Head Start Programs focusing on assessment and programming for infants, toddlers, and preschoolers.

Publications:

As a result of the Teaming with Technology Research Project, one article has been published (*Utilizing Interactive Technology to Conduct Transdisciplinary Team Assessments in a Frontier State)* and two articles have been excepted for publishing (*The Use of Interactive Technology for Team Assessments; The Role of the Nurse on a Transdisciplinary Early Intervention Team).* These articles are attached to this document.

Challenges to the Teaming with Technology Research Project

The difficulties with the technology, discussed in the previous progress report, delayed starting the distance assessments. Due to this difficulty the team was unable to complete the number of assessments initially expected. However the integrity of the research design was maintained and implications for future use of technology could still be determined. The technology which the project used had the benefits of receiving fairly clear video and audio transmission, the ability to observe the assessment using Real Time, and the ability to interact with the Assessment Facilitator during the actual assessment using the technology. Another benefit was the ability to view videos at a later date if more information was needed or clarification of a specific assessment question. As technology improves the improvement gains in using interactive technology will make this approach to team assessments more accessible.

One modification that the Teaming with Technology Project pursued was the use of compression software (e.g. Sorenson's EnVision Kit). This software can connect anyone anywhere with only a computer, EnVision Software, and the Internet. EnVision is a videoconferencing solution optimized for low-bandwidth. This software became available for

use with laptop computers early in 2001. Training and trial runs to learn the system and determine usability were conducted. This technology looks promising and WIND submitted a grant that would have allowed the Assessment Team to work with this software throughout the state. However that grant was not funded.

Another challenge that the Assessment Team faced was having no physical contact with the child being assessed. The Assessment Coordinator conducted all of the assessments, across all domains. The other team members observed the child via video tapes within the natural environment, viewing Real Time during distant assessment, and through an observation booth during on-site assessments. This situation posed specific difficulties for the occupational therapist in assessing the child's muscle tone. Overcoming this obstacle was as simple as involving the child's local team occupational and physical therapist to answer specific questions that needed hands on assessment.

The side benefit of this modification was that the developmental preschool professionals became an important part of the team assessment. Collaboration on assessments and programming was enhanced. Not only were the OT and PT brought in as active team members, other members of the child's local team were interviewed, observed working with the child, and given specific tasks to perform in order for the university team to gather information in a truly transdisciplinary fashion.

The Speech/Language Pathologist sometimes was not able to hear clearly the child's articulation of speech sounds. The video tapes were extremely helpful in this way. The sound quality on the video tapes was better than over the computer or through the microphone into the observation booth. Although this caused the Speech Pathologist to give more time to the assessment process with some children, it proved to be a workable situation. A modification was

to train the Assessment Facilitator to do a speech and stimulability screening. This modification was used towards the end of the project and appeared to be helpful in the overall assessment process.

Despite these challenges, it is possible to do assessments of infants, toddlers, and preschool children at a distance. The model that was developed can easily be replicated in other locations. The model we developed can be expanded into an outreach model and others trained on how to conduct distance assessments.

IV. BUDGET INFORMATION

The fiscal report is submitted under separate cover.

V. SUPPLEMENTAL INFORMATION

As discussed in the body of the report, the Teaming With Technology Research Project completed fewer assessments than originally anticipated. Part of that resulted from time needed for beginning activities such as hiring the project coordinator, team building activities, and developing the assessment process. The use of technology also influenced the number of assessments completed because of continued challenges and difficulties throughout the project period. Problems such as equipment failure, incapabilities of internet services, and our limited understanding of the complexities of technology use were all factors in slowing down the overall assessment process. The positive side to the technology issue is that improvements continue to be made in leaps and bounds. The latest investigation by the project was the Sorenson Envision Kit. This piece of technology was purchased toward the end of the grant and use was explored. This technology appears to be a promising piece of equipment and the Assessment Team was anticipating incorporating it into the assessment process when the next level of funding was approved. We are hopeful that we will be success in obtaining another grant in order to keep this very valuable resource alive and active within our state.

Teaming With Technology:

Utilizing Interactive Technology

to Conduct Distance Assessments in a Frontier State

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Abstract

This article describes a project that is using interactive technology to conduct arena assessments at a distance. Team building, technology requirements, past technology experimentation, current technology used, and future directions are discussed. We are now able to perform distance assessments through the use of network systems. Appropriate teaming procedures and positive assessment results have been obtained. In the near future, improved access to network systems will be available. The team looks forward to continued success and consistent improvement in assessment procedures.

Teaming With Technology: Utilizing Interactive Technology To Conduct Distance Assessments in a Frontier State

This article describes a distance assessment project, Teaming with Technology, that takes place in a Western state in which the majority of residents live in rural areas. The research project involves the use of visual and interactive technology that provides team members the capability of conducting arena assessments from a distance. Arena assessments meet standards of preferred practice in early childhood special education and they encourage full family participation in the assessment process (Division for Early Childhood Task Force on Recommended Practices, 1993; Neisworth & Bagnato, 1996). Professionals serving young children and families in rural areas, especially those committed to arena assessment, most likely find that the expense and difficulties of assembling appropriate team members can be considerable. The use of technology to conduct distance assessments affords children of families in rural communities access to high quality assessment services without having to travel long distances. Members of the medical field and designers of university courses have successfully established the use of technology to achieve contact with patients and students at distant sites (Colby, 1994; Darkins, 1996; Garrison, 1990; Piskurich, 1997; Taylor, 1998; Thrall & Boland, 1998; Zajtchuk & Gilbert, 1999). The ability to successfully use technology in assessment of young children in rural areas is worth investigation.

The purpose of the Teaming With Technology Research Project is to determine the efficacy of using interactive technology in long distance assessment. Team members conduct arena assessments on-site at the University of Wyoming in Laramie and off-site in homes and early childhood centers around the state. The empirical question addressed in the study is whether the quality of reports produced from on-site and off-site assessments are comparable.

Assessment reports, from on and off-site, are sent to external reviewers who judge the comparable quality of reports in a blind review. The Teaming With Technology Research Project is now in the third year of implementation. Accessing adequate technology for distance assessment has been an ongoing challenge. This article provides a description of the on-site and off-site arena assessment process and the challenges of using low cost technologies to conduct off-site assessments.

Arena Assessment

In arena assessment team members from different disciplines and family members simultaneously assess a child. A designated facilitator interacts with the child to elicit behaviors that correspond to standardized test protocols. The facilitator may also engage the child in play to allow team members to conduct a play-based assessment. The remaining professional team members observe the process and participate by giving the facilitator suggestions to optimize the child's performance or to elicit behaviors from the child not yet observed. Family members are both participants and spectators. They are encouraged to ask questions, interact with the child, comment on the child's performance during the assessment, and to provide information about the child's typical behavior outside the assessment setting (Parette, Bryde, Hoge, & Hogan, 1995). The convergence of multiple perspectives of team members observing the same behaviors together facilitates consensus in assessment and decision-making. A collaborative approach to assessment based on multiple perspectives is recommended practice in early intervention (Bagnato & Neisworth, 1991; Neisworth & Bagnato, 1996).

Team Membership

Team members include family members, faculty members from the University and other professionals from early intervention programs. All team members have expertise in their respective fields and are experienced in the practice of early intervention. Members include early childhood special educators, a pediatric nurse, speech-language pathologist, clinical psychologist, social worker, and an occupational therapist. One of the early childhood special educators also serves as Project Director. The team worked together for several months, assessing children who were typically developing, before accepting referrals from early intervention programs. Initial assessments provided opportunity to agree on a process for conducting assessments and writing assessment reports. During this time, team members shared their expertise and learned to work together as a team.

The On-Site and Off-Site Assessment Process

Families who have young children are invited to participate in Teaming With Technology Research Project assessments. Family members learn about the project from service providers in three regions of the state. Referrals for assessment are initiated by families or early intervention service providers. Following referral, the Project Director contacts the family, explains the assessment process, and arranges for the team nurse to conduct a physical examination, including a hearing and vision screening of the child. A local pediatric nurse performs this function for the off-site assessments. The Project Director and social worker then visit the family and gather a social history. Videotaped observations of the child playing and interacting in natural environments are obtained prior to assessment planning. These videotaped observations provide an ecologically sound means of assessing child behavior in multiple everyday contexts (Neisworth & Bagnato, 1996). Team members view these video

tapes. The team then meets to review the physical examination information, the social history, and to watch the videotape of the child. Team members, including parents and current service providers, agree on appropriate assessment instruments and procedures. Assessment includes standardized testing, play-based assessment (Linder, 1993; Westby 1980), and informal assessment based on previously acquired videotaped observations of the child and family members in everyday environments. The Project Director/early childhood special educator serves as the facilitator for on-site and off-site arena assessments. The facilitator is the team member that interacts directly with the child and family during the assessment.

In all cases, the child, family members, assessment facilitator, and an assistant in charge of video taping the procedures are present in the assessment room. Family members are in the room with the child during the assessment to reassure and comfort the child, to discuss the child's performance, and to answer any questions team members may have. Family members are also given the opportunity to play with the child several times during the assessment. These interactions are observed by team members and are a part of the informal assessment data.

The difference in the process for on-site and off-site assessments is that when the team assesses a child *on-site* at the University, all team members except family members and the facilitator are in an observation booth adjacent to the assessment room. Team members in the observation booth include an early childhood special educator, a pediatric nurse, a speech-language pathologist, a clinical psychologist, a social worker, and an occupational therapist. These team members are not in direct contact with the child or family members. When the team assesses a child using interactive technology from a distance (*off-site*), the team views and

hears the assessment process and interacts with the facilitator via a computer monitor and microphone system.

In both cases, the facilitator interacts directly with the child and family while other team members watch from the observation booth (on-site) or view a projected image from the assessment site to the University via computer (off-site). Team members interact with the facilitator through use of a headphone/microphone system throughout the assessment. In this way, team members can participate in the assessment by coaching or by offering suggestions to the facilitator. All assessment procedures, including the child's play time with the family, are videotaped and given to team members so that they may review the child's performance at a later date if they wish.

Immediately after the assessment, the facilitator discusses the child's performance with the family members to determine if it was typical, and to gather additional information that may prove useful in considering assessment results. As soon as possible, team members meet to discuss assessment results and the facilitator writes the results and recommendations in a report that is then shared in person with parents and service providers. Assessment reports from on-site and off-site assessments will be sent to external reviewers for evaluation. Parents and service providers complete surveys giving feedback on their satisfaction with the assessment process.

Technology

Requirements

Due to project needs, budget constraints and the limited access to technology in rural areas, these are the necessary requirements for technology:

1. The technology must be low cost.

2. The technology must be obtainable and accessible at rural sites.

3. Technology is required that can capture and send both video and audio signals *from* the assessment setting in real time.

4. The technology must provide audio signals from the viewing team *to* the facilitator in real time. This form of interactive technology is needed to provide the assessment facilitator and off-site team members with the ability to communicate with each other regarding evaluation procedures and requests for additional information.

5. The technology must provide opportunity for a wide angle, room length view of the assessment participants and procedures.

6. The technology should provide capability for instant alteration of camera focus, to view close up work (e.g., tracing, pencil grip, putting small items into a container, etc.) as well as opportunity for observation of more distant room activities including stair climbing and playing with balls.

Technology That is Cost Prohibitive

Due to the public's daily experiences with viewing remote site news reports on television and because of recent media discussions on the power of technology (e.g. telemedicine), an immediate solution for the realization of off-site assessments is use of satellite links. Although satellite links provide the best visual and audio image, they are expensive (Piskurich, 1997; U.S. Satellite Corporation, 2000). Satellite signals require a recording studio with cameras, a satellite dish (or use of a satellite truck) and costly uplink and downlink capability. In addition to the economic considerations, satellite use is impractical for our purposes. In order to obtain and send information, permanent production sites at preschools around the state would be required.

Another option is use of an M4 World Communicator (Infosat Telecommunications, 2000), consisting of a 'laptop size' transceiver and a $2^{1/2}$ feet by 1 foot antenna that transmits information to a satellite. This system also employs use of a laptop computer and connection to the Internet through Microsoft NetMeeting. The image obtained through use of the M4 may not be adequate (12-15 frames/second) and the equipment and air time costs are beyond the scope of the current project.

Early Technology Attempts

The original plan for the project included use of videoconferencing kits to provide interactive real time visual and audio signals over the Internet (Feltus, 1995). These kits can be purchased for approximately $250 each and consist of a small camera and microphone with a computer connection. The facilitator, at the assessment site, and the team observing at a distance, each employed the use of a computer and videoconferencing kit. A video card (personal computer manufacturer card industry association [PCMCIA]) was used for each computer. The Nogatech Video Card (Nogatech California, Inc.) was used. The network application used to send the signal over the Internet was "Microsoft NetMeeting" (Microsoft). This system allowed for interactive visual and audio signals to be sent to and from each site synchronously. In attempts to obtain the best possible signal, we experimented with several variables. These variables included: (a) desk top computers vs. lap top computers; (b) increasing processing speed and RAM; (c) higher performance video cards; (d) modem (telephone) connections vs. university local area networks; and (e) use of a modem that allowed for connection of two phone lines (therefore, requiring the dialing up of two telephone numbers) to send the signal.

Two serious problems occurred. First, the videoconferencing kits did not provide the wide angle vista and room distance needed to view an assessment. Secondly, due to slow signal transmission, modems are not adequate for sending the clear video and audio signals required in assessment. The system could not relay an adequate number of pixels to provide a reasonable image. It appeared that possibly only about 10% of the pixels present within the image at any given time were sent. The program automatically reduced the number of pixels it sent in order to provide a so-called "timely signal". Information sent by modems is limited by telephone line bandwidth. In addition, increased numbers of standard telephone calls at peak times bog the system down.

Key to our original project plan was the use of a modem and laptop computer for sending video and audio signals of an assessment to the computer of the off-site team members. Due to the problems incurred through the use of these initial technology attempts, modifications were made. This resulted in our current use of technology.

Current Technology Employed

We continue to develop our distance assessment protocol. Following is a description of our current use of technology for doing off-site assessments.

At the assessment site:

1. The visual signal is captured by a video camcorder connected to the video input jack of a laptop computer.
2. The audio signal is captured by an overhead microphone, run through a microphone mixer located near the laptop, and ultimately connected to the microphone input jack of the laptop.

3. An assistant, who videotapes the assessments, wears headphones connected to the audio output of the computer. The assistant can receive messages from team members and talk to team members.

At the team location:

1. The video signal is broadcast through a computer monitor or a projection system.
2. The audio signal is broadcast to the team members through computer speakers.
3. Team members speak to the assessment facilitator through a computer microphone.

We use a laptop computer at the assessment site with a video output jack and built-in video card. Currently, bandwidth requirements necessitate use of network connections. Microsoft NetMeeting (Microsoft) is selected by operators of both computers. One team member "calls" the operator of the other computer through the Internet.

Using this software, we experimented with a number of variables including: (a) different types of video cards for the computer at the team site; (Video cards made for video graphics editing work best.); (b) different types of microphones; (c) microphone positions and use of a mixer with the microphone; (d) computer RAM, CPU speed and video memory (Computers with more memory and greater speed transmit more efficiently); (e) omission of the video image at one site; A video image of the assessment team is not necessary; therefore, omitting this video, retaining audio only, improves the clarity of the visual signal from the assessment site; (f) video frame size - three video frame sizes are possible in NetMeeting. The medium size produces the clearest picture.

Benefits and Limitations of the Current Technology

We are able to transmit and receive a fairly clear picture and synchronous audio signal from distant sites connected to a network. We have conducted several off-site assessments using

this technology and are able to perform successful assessments including evaluation of cognitive skills, social skills, language skills, gross and fine motor skills and adaptive behavior. Overall, we are able to perform interactive assessments providing real time communication between the assessment facilitator and off-site team members.

Individual team members are also able to view the assessment videotapes at a later date when additional observation is required. These second viewings provide more opportunity for observation and discussion.

At this time the team has conducted 22 assessments with children with special needs. As the data pool increases, reports will be sent to the external reviewers for evaluation. The research project is on-going and final data analysis has not yet been completed. Survey results received thus far from parents and from the referring developmental preschool service providers have been favorable. See Appendix for survey form. Accessing technology in rural areas and obtaining consistently clear audio and visual images in distance assessments are limitations at this time.

Future Directions

We continue to investigate accessing distance sites with network connections. Mobile satellite connections through the Internet could be obtained at a reasonable fee and would conceivably allow for clear, real-time, visual and auditory contact at a distance. Unfortunately, this presents a problem, as the 'fast connection' is download only. In order to send a signal to the Internet for uplink to a satellite, a modem is still required (Buchanan, 1998). As we have previously stated, modem use is inadequate for our purposes.

We are currently investigating technology that has recently become available throughout the state. As part of a statewide education initiative, a high capacity Asynchronous Transfer

Mode (ATM) network has been deployed which will connect every K-12 school building in Wyoming. The major hubs for this network reside at the state's seven community colleges. The network capacity in each school building will vary with need, but every school building will have access to the Internet at a minimum capacity of 56 kb/s, with some going as high as T-1 (1.544 Mb/s) speeds. Each high school will have interactive two-way video capability as well as Internet access.

The individual school districts are responsible for installing and maintaining their own data networks within the school buildings. We are currently in the process of collaborating with particular schools that (a) have installed their internal networks, and (b) are willing to cooperate with us on this project at the early stages. Our team computer technology specialist has been in communication with individual school district Technology Directors to arrange for successful connections. There will likely be some challenges working through the individual school 'firewalls' and security systems. Our technician is currently working with the schools to overcome problems that may impede the use of Microsoft NetMeeting over the Internet.

We will continue to investigate appropriate technologies as they become available. Based on the success of our experiences thus far we believe that interactive technology is a viable medium for distance assessments. This technology enables parents and service providers to access professional staff at the University as well as other service providers in the state when conducting assessments in local communities.

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Appendix

Parent Feedback Form.

(NOTE:) This same survey content is also used for feedback by staff members from developmental centers. In these cases, the title on the form is: Developmental Center Staff Feedback Form.

Running head: USE OF INTERACTIVE TECHNOLOGY FOR TEAM ASSESSMENTS

Utilizing Interactive Technology to Conduct Team Assessments

Christy L. Thompson, Laura L. Westlake, and Michelle L. Buchanan

University of Wyoming

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Abstract

This article describes a project that uses interactive technology to conduct arena assessments at a distance. Team building, technology requirements, past technology experimentation, current technology used, and future directions are discussed. We are now able to perform distance assessments through the use of network systems. Appropriate teaming procedures and positive assessment results have been obtained. In the near future, improved access to network systems will be available. Video conferencing hardware/software optimized for low-bandwidth data connections is presently a new option. The team looks forward to continued success and improvement in procedures. Application of these methods for assessment of children with disabilities at Head Start sites, particularly those located in rural areas is discussed.

Utilizing Interactive Technology to Conduct Team Assessments

This article describes a currently employed distance assessment project, Teaming With Technology, that takes place in a western state in which the majority of residents live in rural areas. The research project involves the use of visual and interactive technology that provides team members the capability of conducting arena assessments from a distance. It is believed that information on the logistics of this project, the technology employed and the results attained thus far may prove useful to Head Start programs and other early intervention agencies as they explore assessment options. The project described is titled *Teaming With Technology Research Project* and is supported by a grant from the U.S. Department of Education, Office of Special Education Programs[1]. Following a description of procedures and technology, methods for utilizing a model of this type in various Head Start settings will be discussed.

Assessment of Children With Disabilities in Head Start

Enrollment of children with disabilities or documentation of serious effort to recruit children with disabilities (at least 10% of enrollment) is a requirement of Head Start grantee agencies (Head Start Bureau, 1999 [Head Start Program Performance Standards and Other Regulations, Section 1305.6c]). In addition, the major focus of the five year Hilton/Early Head Start Training Program, Special Quest, (California Institute on Human Services, 1998-2002) is enrollment, service delivery and support for children with significant disabilities in Early Head Start and Migrant Infant and Toddler Head Start programs. Evaluation of the development and functioning of children, warranted by screening, rescreening, teacher observation, or parent request, is an allowable expenditure for Head Start if evaluations are not provided by the Local Education Agency (LEA) (Head Start Bureau, 1999, [Head Start Program Performance Standards and Other Regulations, Section 1308.4o-(2), 1999]). Examples of evaluation costs that can be covered by Head Start funds include assessment by a multidisciplinary evaluation team, assessment instruments, professional observations, and professional consultation (Head Start

Bureau, 1999, [Head Start Program Performance Standards and Other Regulations, Section 1308.4o, 1999]). Head Start grantees are advised to encourage agencies already providing services, to children with disabilities enrolled in Head Start, to continue to do so. Careful planning can aid in the pooling of resources to achieve efficient use of experts and consultants during pre-arranged time periods. Collaboration with LEAs may provide Head Start grantee agencies with assessment and service delivery opportunities and may also increase funding to a state under the Individuals with Disabilities Education Act (IDEA) *if* Individual Education Plans (IEPs) are formalized by December 1 of each year (Head Start Bureau, 1999 [Head Start Program Performance Standards and Other Regulations, Section 1308.4o, 1999]). Evaluation and service delivery goals, in all instances, are to provide children with disabilities the greatest opportunity for development during their crucial early years (Head Start Bureau, 1999, [Head Start Program Performance Standards and Other Regulations, Section 1308.4o, 1999]).

Distance Assessment

Under any assessment arrangement that may be utilized by or accessible to individual Head Start grantees, the accomplishment of evaluations in rural areas is beset with increased difficulty accessing appropriate and specialized personnel to serve as members of a smoothly functioning multidisciplinary or transdisciplinary team. In addition to the difficulty that may exist locating personnel, travel to the site of the child can be lengthy and even dangerous if winter conditions exist. The costs involved, timing issues, and reduced opportunities to interact with and observe a child in natural settings as part of the information gathering phase of an evaluation, are significant obstacles faced by rural settings regarding assessment of young children with disabilities.

Arena assessments meet standards of preferred practice in early childhood special education and they encourage full family participation in the assessment process (Division for Early Childhood Task Force on Recommended Practices, 1993; Neisworth & Bagnato, 1996).

The use of technology to conduct distance assessments affords children of families in rural communities access to high quality assessment services without having to travel long distances. Members of the medical field and designers of university courses have successfully established the use of technology to achieve contact with patients and students at distant sites (Colby, 1994; Darkins, 1996; Garrison, 1990; Piskurich, 1997; Taylor, 1998; Thrall & Boland, 1998; Zajtchuk & Gilbert, 1999). The ability to successfully use technology in assessment of young children in rural areas is worth investigation.

The purpose of the Teaming With Technology Research Project is to determine the efficacy of using interactive technology in long distance assessment. Team members conduct arena assessments on-site at the University of Wyoming in Laramie and off-site in early childhood centers around the state. The empirical question addressed in the study is whether the quality of reports produced from on-site and off-site assessments are similar. Assessment reports, from on and off-site, are sent to external reviewers who judge the comparable quality in a blind review. The Teaming With Technology Research Project is now in the fourth year of implementation. Accessing adequate technology for distance assessment has been an ongoing challenge. This article provides a description of the on-site and off-site arena assessment process and the challenges of using low cost technologies to conduct off-site assessments.

Arena Assessment

In arena assessment team members from different disciplines and family members simultaneously assess a child. A designated facilitator interacts with the child to elicit behaviors that correspond to standardized test protocols. The facilitator may also engage the child in play to allow team members to conduct a play-based assessment. The remaining professional team members observe the process and participate by giving the facilitator

suggestions to optimize the child's performance or to elicit behaviors not yet observed from the child. Family members, who are present throughout the assessment, are both participants and spectators. They are encouraged to ask questions, interact with the child, comment on the child's performance during the assessment, and provide information about the child's typical behavior outside the assessment setting (Parette, Bryde, Hoge, & Hogan, 1995). The convergence of multiple perspectives of team members observing the same behaviors together facilitates consensus in assessment and decision-making. A collaborative approach to assessment based on multiple perspectives is recommended practice in early intervention (Bagnato & Neisworth, 1991; Neisworth & Bagnato, 1996). The use of distance-based transdisciplinary arena assessment for children in Regional Early Head Start, Regional Head Start, or Migrant Head Start could help professionals and parents more fully achieve best practice (Crais, 1992; Linder, 1993; Norris, 1992; Peña & Davis, 2000; Rossetti, 1994; Westby, 1980) standards by providing opportunity for observation of natural environments (e.g., home and Head Start) and allow input from parents, teachers and staff during the observations as well as during the more structured assessment segment.

Team Membership

Team members involved in the Teaming With Technology Research Project include family members, faculty members from the university and other professionals from early intervention programs. All team members have expertise in their respective fields and are experienced in the practice of early intervention. Members include early childhood special educators, a pediatric nurse, speech-language pathologist, clinical psychologist, social worker, and an occupational therapist. One of the early childhood special educators also serves as Project Director. The team worked together for several months, assessing children who were typically developing, before accepting referrals from early intervention programs. Initial

assessments provided opportunity to agree on a process for conducting assessments and establish interrater reliability for assessment protocols and reports. During this time, team members shared their expertise and learned to work together as a team.

The On-Site and Off-Site Assessment Process

Families who have young children are invited to participate in Teaming With Technology Research Project assessments. Family members learn about the project from service providers throughout the state. Referrals for assessment are initiated by families or early intervention service providers. Following referral, the Project Director contacts the family, explains the assessment process, and arranges for a physical examination, including a hearing and vision screening of the child. The social worker then visits the family to gather a social history including a genogram and an ecomap. Videotaped observations of the child playing and interacting in natural environments (e.g., home and school) are obtained prior to assessment planning. These videotaped observations provide an ecologically sound means of assessing child behavior in multiple everyday contexts (Neisworth & Bagnato, 1996). Team members view the video tapes, review the physical examination information, the social history, and educational information provided by the child development center. Team members, including parents and current service providers, agree on appropriate assessment instruments and procedures. Assessment includes standardized testing, play-based assessment (Linder, 1993; Westby 1980), and informal assessment utilizing the previously acquired videotaped observations of the child and family members in everyday environments. The Project Director/early childhood special educator serves as the facilitator for on-site and off-site arena assessments. The facilitator is the team member that interacts directly with the child and family during the assessment.

In all cases, the child, family members, assessment facilitator, and an assistant in charge of video taping the procedures are present in the assessment room. Family members are in the room with the child during the assessment to reassure and comfort the child, to discuss the child's performance, and to answer any questions team members may have. Family members are also given the opportunity to play with the child several times during the assessment. These interactions are observed by team members and are a part of the informal assessment data.

The difference in the process for on-site and off-site assessments is that when the team assesses a child *on-site* at the university, all team members except family members and the facilitator are in an observation booth adjacent to the assessment room. Team members in the observation booth include an early childhood special educator, a pediatric nurse, a speech-language pathologist, a clinical psychologist, a social worker, and an occupational therapist. These team members are not in direct contact with the child or family members however they do have direct access to the facilitator through the use of a voice activated FM transceiver. When the team assesses a child using interactive technology from a distance (*off-site*), the team views and hears the assessment process in real time and interacts with the facilitator via a computer monitor and microphone system.

In both cases, the facilitator interacts directly with the child and family while other team members watch from the observation booth (on-site) or view a projected image from the assessment site to the university via computer (off-site). Both processes allow team members to interact with the facilitator. In this way, team members can participate in the assessment by coaching or by offering suggestions to the facilitator. All assessment procedures, including the child's play time with the family, are videotaped and given to team members so that they may review the child's performance at a later date if they wish.

Immediately after the assessment, the facilitator discusses the child's performance with the family members to determine if it was typical, and to gather additional information that may prove useful in considering assessment results. Team members meet the same day to discuss assessment results and the facilitator writes the results and recommendations in a report that is then shared in person with parents and service providers. Assessment reports from on-site and off-site assessments will be sent to external reviewers for evaluation. Parents and service providers complete surveys giving feedback on their satisfaction with the assessment process.

Technology

Requirements

Project needs, budget constraints and limited access to technology in rural areas, make the following technology requirements necessary.

1. The technology must be low cost.
2. The technology must be obtainable and accessible at rural sites.
3. Technology is required that can capture and send both video and audio signals *from* the assessment setting in real time.
4. The technology must provide audio signals from the viewing team *to* the facilitator in real time. This form of interactive technology is needed to provide the assessment facilitator and off-site team members the ability to communicate with each other, regarding evaluation procedures, and make requests for additional information.
5. The technology must provide opportunity for a wide angle, room length view of the assessment participants and procedures.
6. The technology should provide capability for instant alteration of camera focus, to view close up work (e.g., tracing, pencil grip, putting small items into a container, etc.) as

well as opportunity for observation of more distant room activities including stair climbing and playing with balls.

Technology That is Cost Prohibitive

Due to the public's daily experiences with viewing remote site news reports on television and because of recent media discussions on the power of technology (e.g., telemedicine), an immediate solution for the realization of off-site assessments is use of satellite links. Although satellite links provide the best visual and audio image, they are expensive (Piskurich, 1997; U.S. Satellite Corporation, 2000). Satellite signals require a recording studio with cameras, a satellite dish (or use of a satellite truck) and costly uplink and downlink capability. In addition to the economic considerations, satellite use is impractical for our purposes. In order to obtain and send information, permanent production sites at preschools around the state would be required.

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Benefits and Limitations of the Current Technology

We are able to transmit and receive a fairly clear picture and synchronous audio signal from distant sites connected to a network. We have conducted several off-site assessments using this technology and are able to perform successful assessments including evaluation of cognitive skills, social skills, language skills, gross and fine motor skills and adaptive behavior. Overall, we are able to perform interactive assessments providing real time communication between the assessment facilitator and off-site team members.

Individual team members are also able to view the assessment videotapes at a later date when additional observation is required. These second viewings provide more opportunity for observation and discussion.

At this time the team has conducted 25 assessments with children with special needs. As the data pool increases, reports will be sent to the external reviewers for evaluation. The research project is on-going and final data analysis has not yet been completed. Survey results received thus far from parents and from the referring developmental preschool service providers have been favorable. See Appendix for survey form. Accessing technology in rural areas and obtaining consistently clear audio and visual images in distance assessments are limitations at this time.

Future Directions

We continue to investigate accessing distance sites with network connections. Mobile satellite connections through the Internet could be obtained at a reasonable fee and would conceivably allow for clear, real-time, visual and auditory contact at a distance. Unfortunately, this presents a problem, as the 'fast connection' is download only. In order to send a signal to the Internet for uplink to a satellite, a modem is still required (Buchanan, 1998). As we have previously stated, modem use is inadequate for our purposes.

We are currently investigating technology that has recently become available throughout the state. As part of a statewide education initiative, a high capacity Asynchronous Transfer Mode (ATM) network has been deployed which will connect every K-12 school building in Wyoming. The major hubs for this network reside at the state's seven community colleges. The network capacity in each school building will vary with need, but every school building will have access to the Internet at a minimum capacity of 56 kb/s, with some going as high as T-1 (1.544 Mb/s) speeds. Each high school will have interactive two-way video capability as well as Internet access.

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Another option to be adopted by the team in the very near future, is Sorenson's EnVision Video Conferencing Kit (Sorenson Vision, Inc., 2000). Sorenson EnVision is a revolutionary communication tool that allows the user to connect to anyone, anywhere, with just a computer, EnVision, and the Internet. EnVision is H.323 standards compliant, allowing connections via LAN/WAN or IP networks, and is compatible with other H.323 standards-compliant video conferencing products. EnVision is a hardware-accelerated desktop video conferencing solution optimized for low-bandwidth connections. The use of EnVision will allow the team to perform distance assessments with clear visual and audio information. The

only requirements for both the team site and the assessment site are a computer, the EnVision equipment and an Internet connection.

We will continue to investigate appropriate technologies as they become available. Based on the success of our experiences thus far we believe that interactive technology is a viable medium for distance assessments. This technology enables parents and service providers to access professional staff at the university as well as other service providers in the state when conducting assessments in local communities.

Implications and Implementation Suggestions for Head Start

Interactive technology such as that outlined above may increase access to early intervention assessment professionals as well as provide more opportunity for observation of children in natural environments (e.g., home and Head Start settings) prior to, during and following administration of more formal assessment procedures. An increased number of observations may provide more ecologically valid assessment results and allow for the formulation of more functional recommendations. Plans for service delivery may be more easily developed and individualized. Increased interagency collaborations with Part B and Part C personnel may be facilitated. With on-going technical assistance, interactive technology can also be used by assessment professionals and service providers to communicate regularly with teachers, staff and family members of Head Start programs, particularly those located in rural sites.

Implementation of distance *assessments* at Head Start sites in rural areas would usually require a facilitator from the assessment team to travel to the site in order to (a) bring the laptop computer and camera, (b) set up the equipment, and (c) facilitate the assessment and child observation, *or* (d) assist in a teacher, staff, or family in conversation with team members at another location. If only a natural *observation* of the child were required, and the Head

Start site had access to an appropriate computer, the required software and a video camera, another option would be for a technology person at the site to set up the equipment. If an 'on-line' *conversation* were required between assessment professionals/service providers at another location and the teachers, staff or family at a distant site -- appropriate computers and software would be the only necessary items, omitting the need for a video camera.

Future directions for a project such as this might be the training of facilitators, within Head Start regions, to conduct assessments with off-site team members. This would eliminate traveling by the team facilitator (in our case the Project Director). Head Start Disabilities Quality Improvement Centers (DSQICs) may have an interest in providing such training.

This article demonstrates the success achieved thus far by one early intervention assessment team in providing distance assessments to young children with disabilities and their families. Use of this technology has provided low cost, in depth evaluations that have been well-received by both developmental preschool center personnel and families of the children assessed. Rationale for use of these methods and ways of implementation for Head Start Centers have been included.

Footnote

[1] This project has been funded by a grant from the U.S. Department of Education, Office of Special Education Programs (grant number H 023 C 70140).

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Appendix

Parent Feedback Form.

(NOTE:) This same survey content is also used for feedback by staff members from developmental centers. In these cases, the title on the form is: Developmental Center Staff Feedback Form.

Running Head: ROLE OF THE NURSE ON A TRANSDISCIPLINARY TEAM

The Role of the Nurse on a Transdisciplinary Early Intervention Assessment Team

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Key Words: nurse, arena assessment, transdisciplinary teams, early intervention, collaboration

Acknowledgments: This project was funded by a grant from the U.S. Department of Education, Office of Special Education Programs (grant number H 023 C 70140).

Abstract

Assessing young children with disabilities is a complex process requiring the expertise of a team of professionals from several disciplines. Team members often include the child's family members, early childhood special educators, clinical psychologists, speech-language pathologists, social workers, physical and occupational therapists, and nurses. A team approach meets standards of best practice in early childhood intervention and encourages full family participation in the assessment process. This article explores the process of team building, role release through a transdisciplinary approach and a nurse's role on a transdisciplinary assessment team.

The Role of the Nurse on a Transdisciplinary Early Intervention Assessment Team

Assessing young children with disabilities is a complex process requiring the expertise of professionals from several disciplines. Team members may include the child's family members, early childhood special educators, clinical psychologists, speech-language pathologists, social workers, physical and occupational therapists, pediatricians, and nurses. One model for team assessment that meets standards of best practice in early childhood intervention and encourages full family participation in the assessment process is transdisciplinary team assessment.

When professionals have a history of working independently in assessment and intervention, becoming a member of a transdisciplinary team can be challenging. Professionals at the University of Wyoming rose to this challenge when they took part in the Teaming With Technology Research Project. The purpose of this project was to determine the efficacy of using interactive technology in distance assessment. Professionals serving young children and families in rural areas encounter considerable expense and a variety of difficulties when attempting to assemble appropriate team members for arena assessment (Thompson, Buchanan, Heinlein, & Westlake, 2001). The use of technology to conduct distance assessments affords children of families in rural communities access to high quality assessment services without having to travel long distances. The Teaming With Technology Research Project investigated whether the quality of reports produced from on-site and off-site assessments was comparable. Experiences gained from the Teaming With Technology Research Project will be integrated into the information presented.

This article first reviews the history of the development of the transdisciplinary model for teaming that evolved from multidisciplinary and interdisciplinary team models. A summary of the

team building process is then reviewed from a transdisciplinary perspective along with guidelines for moving from practice based on multi or interdisciplinary models. Because understanding the role of the nurse on a transdisciplinary team emerged as an issue not well resolved in the literature, information is presented from a nursing perspective.

Transdisciplinary Teaming

A transdisciplinary approach to assessment was developed by the United Cerebral Palsy Collaborative Infant Project (1976). This approach grew from more commonly used multidisciplinary or interdisciplinary approaches to teaming. The transdisciplinary approach is a "deliberate pooling and exchange of information, knowledge and skill, crossing and re-crossing traditional disciplinary boundaries by various team members (United Cerebral Palsy Association, 1976, p.1). Transdisciplinary teaming differs from multi and interdisciplinary teaming in several ways.

Multidisciplinary and Interdisciplinary Models

In *multidisciplinary* teaming the child is evaluated independently by different team members in their particular area of expertise (Bergen & Wright, 1994). Each team member presents results of their evaluation to other team members. In *interdisciplinary* teaming, assessments are also conducted independently by members of various disciplines, however, results are shared and discussed among all team members. In both of these models, boundaries among team members prevail in sharing of results and intervention planning. Parents are responsible for bringing their child to the assessment, are spectators during the assessment, and often listen passively to results. Medical models of teaming have typically been based on multidisciplinary or interdisciplinary interaction (Bergen & Wright, 1994).

Multi and interdisciplinary approaches have been problematic when used in assessment of young children (Bergen, 1994; Foley, 1990). Family members are required to interact with a variety of different professionals providing each with the same background information. The family may become confused by jargon used by professionals and conflicting information in reports. Because recommendations are not integrated across disciplines, parents may be overwhelmed by lists of recommendations that appear to be unrelated. Though team members strive to cooperate, the lack of a common vision and language often results in fragmentation in intervention planning and service delivery (Foley, 1990; Woodruff & McGonigel, 1988). The transdisciplinary approach to teaming addresses these problems by providing a comprehensive and coordinated assessment system.

Transdisciplinary Model

When a *transdisciplinary* approach is implemented, family members are asked to provide their subjective assessment of the child and to state concerns and priorities (Bergen, 1994; Foley, 1990, Woodruff & McGonigel, 1988). In order to conduct an integrated appraisal, the team plans the assessment incorporating appropriate methods from all disciplines. During planning the team may also utilize information gleaned from videotapes of the child at home, in child-care, or in preschool settings. A component of the transdisciplinary approach is arena evaluation (Foley, 199 Parette, et al, 1995).

Arena involves one or two professionals interacting with the child while others observe. Parents sit near the child and comment on the child's performance in the assessment setting as well as in the home. Professionals from multiple disciplines and family members assess the child simultaneously (Foley, 1990; Parette, Bryde, Hoge, & Hogan, 1995). One team member conducts assessment activities with the child, while the other team members observe, provide

guidance and collect information. The young child is only required to interact with one unfamiliar person who completes the assessment. This eliminates moving the child from one setting to another. Team and family members view all components of the assessment at the same time. This contributes to the validity of the assessment and contributes to consistency in interpreting results and offering recommendations.

The transdisciplinary model is based upon collaboration, consensus building and role release among members from different disciplines (Briggs, 1993; Foley, 1990; Linder, 1993; UCPA, 1976; Woodruff & McGonigel, 1988). Team members from different disciplines are committed to sharing knowledge, skills and expertise so that information from their discipline can be collected, evaluated and discussed by other team members during the assessment process. After conducting assessment activities, all team members engage in discussion of the child's needs across all disciplines (Bergen & Wright, 1994). This transfer of expertise across disciplines means that each member of the assessment team is knowledgeable about the other disciplines represented on the team. Role release and role expansion occur as each team member takes on the roles of others on the team. As a result, team and family members expand their knowledge base by learning from each other. Family members participate in the assessment process and have an understanding of how recommendations are generated.

Bergen and Wright (1994) report that medical professionals do not commonly participate in transdisciplinary models of assessment once the child is out of the hospital or clinic. In an attempt to remedy this situation, the following guidelines are offered in order to encourage the participation of nurses on transdisciplinary assessment teams.

Expertise/Contributions of the Nurse on the Team

Nursing is a human science with a practice and health orientation based on a caring tradition (Meleis, 1997). Nursing assessments and interventions are holistic in that they include psychological, sociocultural, physiological, developmental and spiritual variables (Neuman, 1995). Typically, nurses conduct comprehensive assessments, planning care and intervention as appropriate. Pediatric assessment can include, among other things, a social and health history, home inventory, physical assessment as well as vision, hearing, developmental, and speech screenings. When the nurse is part of a transdisciplinary team, the comprehensive nature of the nursing assessment brings the nurse into the bounds of all other disciplines represented on the team. For example, the nurse gathers health, family and social history information similar to that obtained in interviews with the social workers. The nurse's vision, hearing and developmental screenings provide preliminary assessment information that is further examined by the occupational therapist, speech pathologist and early childhood special educator.

Consequently, the nurse can experience role confusion when participating in early intervention assessments with other professionals possessing in-depth knowledge in specific areas, such as social workers, physical therapists, occupational therapists, clinical psychologists, speech-language pathologists, and educators. Because of the nurse's holistic perspective, members of the team may also be uncertain about the unique expertise s/he has to offer and share with others. While nurses share the expertise of other disciplines, the nurse on a transdisciplinary team must understand the unmatched role nursing contributes to the assessment and planning process.

The nurse should take an active role in pre-assessment, assessment, report writing that includes recommendations for intervention and sharing information with family members, and follow-up. As a team member, the nurse contributes particular expertise in discussing health

history, interpreting medical records, and offering information about the physical and developmental status of the child from a holistic perspective. The nurse critically reviews health and nutritional status, medication use including appropriate dose and drug to drug interactions, and identifies implications of disease/disorders on child development and behavior. This information is discussed in the assessment planning phase and in the final recommendation phase as the nurse emphasizes health promotion and optimal development.

In keeping with the transdisciplinary process, the nurse shares expertise with other team members. The nurse benefits as s/he learns about assessment techniques in other disciplines, honing observation skills, and strengthening and broadening his/her knowledge base with regard to recommendations for interventions from all disciplines. In order to function effectively on a team, nurses need to be prepared to work collaboratively with team members from other disciplines. This collaborative effort takes place in the ongoing process of team building. Transdisciplinary teaming requires team building, time for ongoing collaboration, and a commitment to practice role release.

Team Building

Initial Training

During the initial phase, professionals representing the disciplines appropriate for early intervention should be identified. Nurses, social workers, early childhood special educators, psychologists, physicians, occupational and speech pathologists should be involved when comprehensive assessments of young children diagnosed or suspected of having developmental disabilities are planned. Team members should engage in initial team building activities prior to doing assessments as a team.

In the formation stages of the team *tasks and goals* must be discussed (Antai-Otong, 1997). "High performance teams have both a clear understanding of the goal to be achieved and a belief that the goal embodies a worthwhile or important result" (Larson & Lefasto, 1989, p. 27). Facilitation by an outside trainer can be sought to enhance team building. The University of Wyoming team chose to work with an outside trainer to achieve understanding between team members and to realize true collaboration. The team chose to work with Larry Edelman, who provides private consultation and also serves as a faulty member in the Department of Pediatrics at the University of Colorado Health Sciences Center. An overview of this process is provided in Figure 1 and discussed below.

Prior to meeting with the consultant, each member was asked to complete and submit a team assessment instrument. The instrument used was the Team Character Inventory, a self-assessment tool (Philips & Elledge, 1989). Strengths identified through this assessment were the practices of shared leadership, joint decision-making and consistent implementation of plans, as well as existence of solid interpersonal relationships and collegiality. Areas identified as needing clarification were (a) project goals, (b) team member roles, (c) ground rules for communication and (d) how to provide and receive feedback. It was also deemed necessary to gain an awareness of each team member's clinical skills and personal gifts.

A review of the range of responses to individual items on the assessment tool was most enlightening. Outward appearances led most team members to believe that the team got along well. Although the item "absence of animosity among members" yielded a relatively high team score of 5.42, one team member scored this item as a "1". Scores ranged between 1 and 7, with 1 assigned as "there is animosity among members". **If not recognized, animosity has the potential to interfere with team functioning.**

The consultant used information from the assessment to custom-build and deliver a day-long training session to improve team effectiveness. The next several paragraphs describe principles used during the training and the process of team building.

Task versus Goal

Initially team members recognized the need to identify both tasks and goals. *Task* was identified as work the team was trying to accomplish (Jones & Miller, 1993). The research project was designed to compare the quality of on-site assessments with assessments produced using interactive technology; therefore, the main task of this team was to answer the research question. However, an important goal was the provision of effective and functional team assessments that would provide insightful, accurate diagnostic information and valuable, efficacious recommendations to families and service providers.

During later stages of the project it was recognized that an area of incongruence was the desire of clinically oriented team members to proceed to the implementation of recommendations although the function of the research team as a whole was limited to the provision of recommendations only. Consequently, the goal of the team was revisited periodically during the project to maintain group consensus.

Characteristics of Effective Teams

In order to solidify their roles, team members applied the *characteristics of effective teams* as described by Larson and LaFasto (1989). In particular, a *results-driven structure* was supported by clearly defining for the group the responsibility of each individual. This was accomplished during subsequent meetings that identified the 'nuts and bolts of the process' or 'how we do our assessments'. Because of the nature of an arena assessment and the use of interactive technology for distance assessments, it was especially important to identify the role of

the project director/facilitator. The nature of the project required the facilitator to have numerous duties including, initial information gathering from the family and service providers, dissemination of information to team members, performance of the assessment of the child, and report writing. Collaboration with other team members was essential for each component of the process. During subsequent meetings and assessment experiences, the transdisciplinary nature of the team evolved. Adherence to the team goal through *principled leadership* occurred as the project director/facilitator steered the team through subsequent assessments.

Although the other characteristics of effective teams identified by Larson and LeFasto (1989), *competent team members*, *unified commitment*, *collaborative climate*, *standards of excellence* and *external support and recognition*, were already in existence on this team, they were acknowledged as vital to team functioning. *External support* was present in the form of release time and opportunities for travel and conference attendance. However, the time required to participate fully in team building activities as well as team assessments was extensive. There must be a substantial commitment from employing institutions to support the time commitment necessary for transdisciplinary arena assessments. This could pose a significant problem for public health nurses since time and adequate funding are common issues.

Communication

Successful collaboration is dependent upon effective communication. Elements of collaboration (Vosler-Hunter, 1987), development of problem solving skills (Van Gundy, 1988), conflict management skills (Fisher & Ury, 1981) and communication strategies (Edelman, Greenland, & Mills, 1992; Senge, Kleiner, Roberts, Ross, & Smith, 1994) were reviewed and practiced during the training session These elements were used to improve collaborative

functioning and were ultimately used in the establishment of ground rules and for developing strategies to provide and receive feedback.

The establishment of ground rules was extended to the process of meeting planning to "sculpt productive, efficient and satisfying meetings" (Edelman, 1998, p. 21). To achieve this end, *components of meeting planning* were included. It was agreed that meetings would have a defined purpose, all members would attend, and the location would be identified ahead of time and would provide for private discussion. The need for pre-meeting planning and organization of meeting process was met through identifying agenda items for future meetings prior to leaving current meetings. Timely follow-up on post meeting assignments was imperative for achieving the team goal. Ground rules included starting and ending the meeting on time as well as use of and adherence to an agenda. The sharing of food was discussed as an important component of the meeting as long as all members shared in the responsibility. As a result of adhering to this plan, members look forward to productive and satisfying meetings.

The importance of team building was revealed as territorial issues surfaced while the history form was being drafted. The issue centered on an overlap in scope of practice related to history taking. Nurses are trained to take holistic histories that include ecomaps, genograms, in-depth family narratives, developmental milestones, etc. This concern emerged before formal team building took place and could have jeopardized the integrity of the team. From this experience it was learned that before the work of a team commences, it is vital to complete team-building activities.

Sharing Clinical Skills and Personal Gifts

An appreciation for members' rich life experiences and the knowledge each person brought to the team was developed through a time-line activity. This served to bind members of the team together on a more personal level yet acquainted individuals professionally.

Team-building activities that incorporated the above-mentioned principles were completed. Team members took turns at weekly meetings to teach the rest of the team about their particular profession and assessment practices. Various assessment instruments were also presented and discussed. During this phase, the nurse performed a complete "well child" physical assessment that included vision, hearing and developmental screening. After written consent was obtained from the child's parent, the team viewed the nurse's assessment through a two-way mirror. The members of the team expressed an appreciation for the holistic nature and completeness of the physical exam.

Following these initial team-building activities, practice assessments were performed on two typically-developing children in the 0 -3 age range. Discussion of results and assessment issues were addressed. After reaching consensus on the team's process of arena assessment, the project moved forward into the realm of assessing young children with developmental disabilities.

Transdisciplinary Teaming

In meetings following initial training, the team learned about transdisciplinary teaming in assessment and engaged in activities that promoted role release. See Figure 2. Role release is the foundation for transdisciplinary arena assessment. The transfer of expertise across disciplines requires members to give up exclusive ownership of their expertise and share knowledge and skills with others. Woodruff and McGonigel (1988) discuss five aspects of role release (role extension, role enrichment, role expansion, role exchange, and role support).

Role extension and *role enrichment* are closely related. Initially, these aspects of role release were addressed as each team member shared information about the theoretical bases, best practices, and commonly used assessment instruments in their respective disciplines. For example, the nurse described the physical examination process and screening instruments for development, vision and hearing. The psychologist described developmental assessments and intelligence measures and talked to the team about interpreting normative scores. The occupational therapist talked to the team about assessment of sensory and motor functioning and intervention strategies. When the team began performing assessments, team members discussed observations of the child and shared assessment information from their discipline based on those observations.

Role expansion consists of sharing recommendations for intervention based on assessment information from multiple disciplines. After each assessment, team members met to discuss the results of the assessment and share recommendations. This allowed for the development of an integrated set of recommendations. Integrated recommendations blend ideas for intervention from several disciplines. For example, the educator may recommend facilitating the development of social skills in interactive play. The speech pathologist may recommend prompting the use of vocal communication in that interactive play and the occupational therapist recommends strategies for promoting motor planning and imitation in interactive play.

In transdisciplinary assessment, team members take on the roles of members in other disciplines. This is referred to as *role exchange*. For example, the nurse may ask the social worker to gather dietary information during the preliminary social history interview. Or, the occupational therapist may suggest that the team member interacting with the child during the assessment position the child for optimal performance.

Role support occurs as team members guide each other in assuming the roles and interpreting assessment tool results of other disciplines. This collaborative effort contributes to the quality and accuracy of the arena assessment.

The team practiced role release and collaboration while conducting assessments of typically developing children before accepting referrals of children with special needs. Role release and collaboration in assessment can be personally challenging and requires the use of newly required teaming skills. Developing skill in transdisciplinary teaming is an on-going process.

Implications for Nursing Education and Research

Nurses are essential members of a transdisciplinary team since very young children with disabilities often have health concerns. Preparation for this role necessitates exposure to collaborative transdisciplinary team training. Lasker and the Committee on Medicine and Public Health (1997), in their efforts to promote collaboration, identified changing the education process as one of seven basic components for developing an infrastructure of collaboration. Transdisciplinary team training is an ideal vehicle for teaching collaboration skills to nurses. Direct experience in working with transdisciplinary teams is a vital part of nursing education as collaboration and teaming skills cannot be effectively learned out of context. Students benefit from having role models and practicing skills they learn in "real lie" settings.

Collaboration in teaming provides an ideal opportunity for students to join forces in research. The National Institute for Health calls for cross-disciplinary research among health professionals. Nursing educators can facilitate this practice by modeling and providing explicit training and opportunities for conducting cross-disciplinary research. Yonge, Skillen and Henderson (1996) offer practical guidelines for this graduate training. They specifically

identified practical and ethical considerations for cross-disciplinary research as two or more graduate students work together for the purpose of writing a thesis, working on a project or other specified outcome.

Implications for Nursing Practice

Public health nurses can have a particularly valuable role as members of early intervention teams. They can also benefit from being members of transdisciplinary teams. The community presence of public health nurses provides access and affords opportunities for long term contact with families who may have children with disabilities. Health issues are of primary concern before recommendations for facilitating development can be implemented. In monitoring the health and well being of the child and family, the nurse is in an excellent position to recognize a need for referral and/or further assessment by other professionals. With exposure to a wide variety of young children with disabilities, nurses will be better able to recognize developmental patterns requiring referral. By becoming familiar with recommendations for intervention from other disciplines, nurses can become more aware of early intervention strategies for supporting child development. Home visiting also renders the opportunity to ensure recommendations are implemented by families and service providers.

Professional expertise is strengthened through membership on a transdisciplinary early intervention team. A nurse's knowledge base and observation skills are enhanced as one looks at the child and family through the lenses of different disciplines. In addition, nurses gain the invaluable skill of learning to work collaboratively with others. "The collaborative paradigm gives the highest return to the unique perspectives and skills that each sector brings to the table" (Lasker & the Committee on Medicine and Public Health, 1997, p. 157).

Summary

The American Nurses' Association Social Policy Statement (1995) emphasized the "recognition and acceptance of combined spheres of activity" when entering collaborative efforts. Transdisciplinary arena assessment is a perfect example of such an activity. Nurses should seize opportunities to collaborate with specialists in early childhood assessment and intervention in a manner that best contributes to promoting health and optimal development for children with disabilities and their families.

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Figure Caption

Figure 1. Team building process.

Figure Caption

Figure 2. Transdisciplinary team building through role release and collaboration.

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