# SENATE
## STATE OF MINNESOTA
## EIGHTY-FOURTH LEGISLATURE

# S.F. No. 180

**(SENATE AUTHORS: FREDERICKSON, Dille, Olson, Stumpf and Anderson; Companion to H.F. No. 130.)**

| DATE | D-PG | OFFICIAL STATUS |
|---|---|---|
| 01/10/2005 | 62 | Introduction and first reading |
| 01/10/2005 | | Referred to Education |
| 02/28/2005 | 509a | Committee report: To pass as amended |
| 02/28/2005 | 514 | Second reading |
| 03/17/2005 | | Special Order: Amended |
| 03/17/2005 | | Third reading Passed |

A bill for an act

relating to education; providing for parent discretion in classroom placement of children of multiple birth; proposing coding for new law in Minnesota Statutes, chapter 120A.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:

Section 1. [120A.38] [CLASSROOM PLACEMENT; PARENT DISCRETION.]

(a) A parent or guardian of twins or higher order multiples may request that the children be placed in the same classroom or in separate classrooms if the children are in the same grade level at the same school. The school may recommend classroom placement to the parents and provide professional education advice to the parents to assist them in making the best decision for their children's education. A school must provide the placement requested by the children's parent or guardian, unless the school board makes a classroom placement determination following the school principal's request according to this section. The parent or guardian must request the classroom placement no later than 14 days after the first day of each school year or 14 days after the first day of attendance of the children during a school year if the children are enrolled in the school after the school year commences. At the end of the initial grading period, if the school principal, in consultation with the children's classroom teacher, determines that the

requested classroom placement is disruptive to the school, the school principal may request that the school board determine the children's classroom placement.

(b) For purposes of this section, "higher order multiples" means triplets, quadruplets, quintuplets, or more.

**[EFFECTIVE DATE.]** This section is effective for the 2005-2006 school year and later.

# SENATE
## STATE OF MINNESOTA
## EIGHTY-FOURTH LEGISLATURE

# S.F. No. 419

(SENATE AUTHORS: WIGER)

| DATE | D-PG | OFFICIAL STATUS |
|---|---|---|
| 01/20/2005 | 159 | Introduction and first reading |
| 01/20/2005 | | Referred to Education |
| 02/28/2004 | | Committee report: To pass |
| 02/28/2004 | | Second reading |

A bill for an act

relating to education; providing for student access to licensed student support services.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:

Section 1. [LICENSED STUDENT SUPPORT SERVICES.]

Subdivision 1. [ACCESS TO SERVICES.] School districts and the Department of Education shall work to provide for students' educational achievement, to provide for student safety, and to enhance student physical, emotional, and social well-being by providing access to licensed student support services, such as licensed school nurses, licensed school counselors, licensed school social workers, and licensed school psychologists.

Subd. 2. [FUNDING.] Districts and the department shall explore opportunities for obtaining additional funds to improve students' access to needed licensed student support services including, but not limited to, medical assistance reimbursements, local collaborative time study funds, federal funds, public health funds, and specifically designated funds.

Subd. 3. [IMPROVING ACCESS.] Districts and the department must consider nationally recommended licensed staff-to-student ratios, work loads, and best practices when working to improve student access to needed licensed student support services.

**Senator Kelley from the Committee on Education, to which was referred**

**S.F. No. 419:** A bill for an act relating to education; providing for student access to licensed student support services.

Reports the same back with the recommendation that the bill do pass. Report adopted.

Steve Kelley
.....
(Committee Chair)

February 22, 2005.....
(Date of Committee recommendation)

**Senator Kelley from the Committee on Education, to which was referred**

**S.F. No. 180:** A bill for an act relating to education; providing for parent discretion in classroom placement of children of multiple birth; proposing coding for new law in Minnesota Statutes, chapter 120A.

Reports the same back with the recommendation that the bill be amended as follows:

Page 1, delete lines 9 to 11 and insert:

"(a) A parent or guardian of twins or higher order multiples may request that the children be placed in the same classroom or in separate classrooms if the children are in the same grade level at the same school. A school must provide the placement requested by the childrens' parent or guardian"

Page 1, line 12, delete everything before the period

And when so amended the bill do pass. Amendments adopted. Report adopted.

Steve Kelley

.....
(Committee Chair)

February 22, 2005.....
(Date of Committee recommendation)

Frederickson

ENROLLED HOUSE
RESOLUTION NO. 1054 By: Rhoads (Karroll)

A Resolution relating to education; recommending that school districts develop certain policies concerning the separation of multiples in school; and directing distribution.

WHEREAS, it is a tradition of many schools across the state to separate twins, triplets or other multiple siblings into different classrooms upon entering the school system without considering the preference of the parent or the children and the best interest of the multiples; and

WHEREAS, the available studies and data indicate that in most cases separation of multiples in school is not beneficial to their achievement in school and in some cases can be detrimental; and

WHEREAS, often the separation of multiples when entering the school environment can be detrimental to the support system between multiples; and

WHEREAS, each multiple is an individual, therefore separation in school is not necessary to develop their individuality; and

WHEREAS, separation of multiples in school can in many cases cause hardship to the parents who have to deal with different class schedules and activities; and

WHEREAS, because the policy of separating multiples has been followed by many schools does not mean it is the better or the correct policy; and

WHEREAS, each set of multiples is different. While some multiples will do better when placed together others do better when separated; therefore placement of multiples should be determined on a case-by-case basis with priority given to the preference of the parents.

NOW, THEREFORE, BE IT RESOLVED BY THE HOUSE OF REPRESENTATIVES OF THE 2ND SESSION OF THE 44TH OKLAHOMA LEGISLATURE:

THAT the Oklahoma House of Representatives hereby recommends that all school districts in the state develop a policy concerning the separation of multiples which considers each set of multiples on a case-by-case basis and takes into consideration the preference of the parents and the best interest of the children.

THAT copies of this resolution shall be dispatched to the State Board of Education and the Superintendent of Public Instruction for distribution to each school district in the state.

Adopted by the House of Representatives the 28th day of April, 1994.

Speaker of the House of Representatives

Frederickson

# STETSON LAW REVIEW

Mandatory Twin Separation in Schools: How Parents Can Best Rely on Another Set of "Twins"— *Meyer* and *Pierce* — to Keep Their Children Together

*Lana Larson Dean*



This is law review paper – next 2 pages in twins newsletter based on this.

VOLUME XXIX FALL 1999 NUMBER 2

# MANDATORY SEPARATION IN SCHOOL FOR MULTIPLE BIRTH CHILDREN: *A Violation of Parents' Constitutional Rights?*

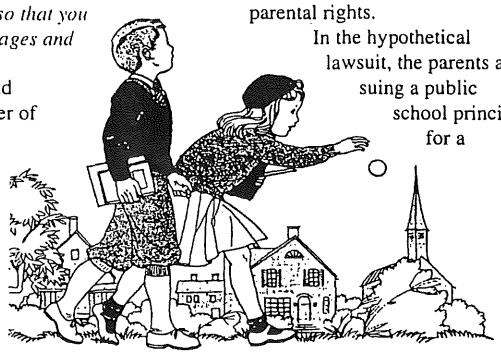
By Lana Larson Dean
Special to MOTC's *Notebook*

*While discussing parental rights and the pros and cons of bringing a lawsuit, this article is not to be considered legal advice. If you are seriously considering bringing a lawsuit on this issue, consult an attorney and get all questions answered so that you will understand fully the advantages and disadvantages to litigation.*

As a mother of four-month-old identical twin girls and a member of my local parents of multiples club, I had heard about the controversial issue of mandatory school separation policies. I dismissed this issue as not being pertinent to me at the time. But as my twins got older, I began to consider our options and rights as parents.

When my twins were a year old, I returned to school as a law student. I decided to delve into the issue of mandatory twin separation in schools as an in-depth law review article. I soon became aware that the issue I once had not taken very seriously was one of the most debated topics among parents and educators.

In speaking with numerous parents, I observed the immense frustration that parents experience when they want their multiples to remain together but were told that they must be separated. This seemingly unfair stance taken by, in most instances, the principal of the school, prompted me to question whether parents had a recognizable right in this situation and whether a court would find that the principal's actions violated such a right. Because there were not published court cases on this issue, I decided to write my law review article using a hypothetical lawsuit as a tool to explore parental rights.



In the hypothetical lawsuit, the parents are suing a public school principal for a violation of their constitutional rights. Often the decision to separate is made by the principal, teacher, or school board and is not backed up by any written policy regarding separation. In this case, the fictional parents are seeking a court order to prevent the principal (or teacher or school board) from separating their multiples. There are no state or federal laws written that prohibit a principal from separating twins. Therefore, the parents are stating that the principal's action violates their constitutional rights because the parents have no statutory rights in this situation. (This action cannot be pursued in a private school context because constitutional rights are unenforceable in that setting.)

The Constitution does not expressly state that parents have the right to decide the separation/non-separation of their multiples in school. Yet, citizens have many established rights under the Constitution that cannot be found in black and white text. Most of these rights are known as "liberty interests." Three such liberty interests that apply in this case are the right to direct the education of children, the right to direct the upbringing of children, and the right to intimate association.

The right to direct education was founded in two United States Supreme Court cases decided in the 1920's, Meyer v. Nebraska and Pierce v. Society of Sisters. Meyer involved a state law that prohibited teaching any subject in any language other than English in any school and the teaching of any language other than English below the eighth grade. Under such law, a teacher was prosecuted for teaching reading in German to a ten-year-old student. The Supreme Court struck down the law as unconstitutional and discussed how parents had the right to direct the education of their children and have them schooled in a foreign language if they desired. Pierce involved a state law that required all children to attend public school. A private school challenged the law's constitutionality and the Supreme Court struck down that law, too. Again, the Court discussed the parents' right to direct the education of their children and the right to send them to private school if they so chose. In both decisions, the Court found that the laws were "arbitrary" or "without reasonable relation" to a legitimate state purpose.

Given that the issue of separation takes place in an educational context, it appears that the right to direct education is the obvious choice for parents of multiples to assert. However, the truth is that parents of multiples should not rely on this right. Interestingly, when parents attempt to invoke this right against a school, the parents almost always lose. There are basically two reasons for this outcome. First, some courts will not recognize the right. And second, if a court does recognize the right, it gets very little regard.

Some courts refuse to recognize the right to direct education because it is too broad. Courts fear that if such a broad right were recognized, schools would be subject to every parent's whim regarding their child's education. Some courts have made the rights in Meyer and Pierce very literal. Instead of

recognizing the right to direct education, some courts find that Meyer and Pierce stand only for the right to have a child schooled in a foreign language and the right to send them to private school. Additionally, courts seem unwilling to expand the interpretations that fall under the right to direct education. As a result, parents attempting to break new ground usually lose.

Another reason parents often lose in education cases is because they fail the "constitutional balancing test." Over the years, the Supreme Court has developed a series of balancing tests to determine whether a constitutional right has been violated. Despite the fact that on several occasions the Supreme Court has referred to the right to ...t education as fundamental, lower courts ...inue to apply a constitutional balancing ...est that favors the government, resulting in the parents' defeat.

The good news for parents of multiples is that although their situation involves the educational setting, their case can be distinguished from other educational cases. Most education cases involve parents who sue because they object to part of the curriculum, extra-curricular activities, or objectionable school programs. In the multiples' case, the parents are not objecting to "what" the school teaches the children, they object to "how." For most parents of multiples, they want their children to stay together for each child's well-being. In other words, they want what they feel is in the best interest of the children. A "best interest of the child" standard is utilized in many parental rights cases involving such issues as custody, medical rights, termination of parental rights, and visitation rights.

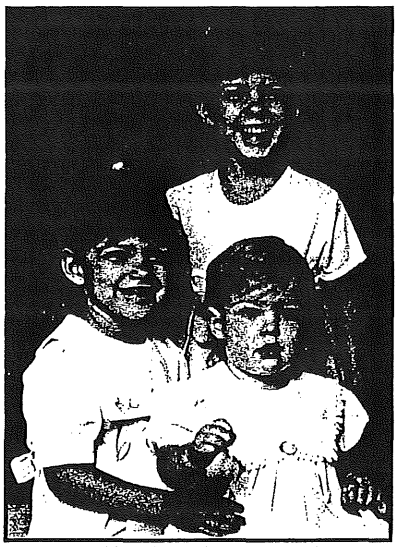
Often the "best interest" cases recognize and discuss the right of parents to direct the upbringing of their children. Courts, for ...sons beyond the scope of this article, have ...orded great respect to the right to direct ...bringing. The right is widely recognized as a fundamental right. If the multiples' situation can be persuasively argued to be analogous to "the best interest" cases, parents have a higher likelihood of success in asserting the right to direct the upbringing of their children.

Now, I must point out that the persuading part is no easy task. Case in point: in 2000 the Supreme Court decided the case of Troxel v. Granville. In that case, the Court discussed at length the right of parents to direct the upbringing of their children. The Court discussed the right favorably. However, the case revealed just how difficult and complicated parental rights are. Although a majority of the court ultimately ruled in favor of the parent, it did so for many different reasons. The decision yielded six separate opinions - evidence that this parental right is still quite an unsettled area of the law.

The last right I will mention is the right to intimate association. It protects the most intimate of relationships from unnecessary interference. The right was not formally introduced or discussed until the 1980's. It is the most tenuous of the rights to assert simply because it is the newest. Because it is not a widely asserted right, few cases exist on the books to guide the lower courts. As a result, lower courts have become confused in a number of areas regarding the right to intimate association resulting in complete uncertainty for any person attempting to assert this right.

As one can see, bringing a lawsuit to keep multiples together involves much consideration. The likelihood of success is questionable. It is impossible to predict with any reliable certainty whether a court would find that the principal's action violates the parents' rights. A case's likelihood of success depends on so many factors. There are many other pros and cons that parents must consider before taking action, one of which is the fact that litigation involves time and money. The upside is that sometimes the mere threat of having to spend time and incur legal fees to oppose a relatively minor battle will cause a school to back off their position. If that happens, fortunately, the multiples stay together. Unfortunately, the relationship with school administrators may be strained.

While I would never discourage parents from asserting their rights, it is important to always try to resolve the situation with the principal first. Going to court should not be a knee-jerk reaction. Parents should go into discussions with the principal armed with information and research to support their position. (Editors note: NOMOTC's booklet, *"The Education of Multiple Birth Children, A Guide for Educators"* would be an excellent tool for parents in this situation.)



Four-year-old identical twin daughters of Lana Larsen Dean, Caroline and Christina pose with their two-year-old sister, Catherine.

Parents should be open-minded, but hopefully, they will do whatever it takes to accomplish what they think is best for their children - with the emphasis on what **they** think is best.

*Lana Larson Dean received a Bachelor of Fine Arts degree from the University of Southern Mississippi. Lana graduated magna cum laude from Stetson University College of Law in St. Petersburg, Florida in 1999. She is currently a law clerk to the Honorable Karla R. Spaulding, United States Magistrate Judge for the Middle District of Florida in Orlando. She has been married twelve years to Gary, an executive in the entertainment industry, and is the mother of Caroline and Christina, four-year-old identical twin girls and two-year-old Catherine.* **NB**

CAL STATE FULLERTON

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Frederickson

January 31, 2005

Wendy Haavisto
Legislative Asst. to Sen. Frederickson
155 State Office Bldg
St. Paul, MN 55155
651-296-8138
x651-296-5241

Dear Ms. Haavisto,

Thank you for giving me the opportunity to voice my very strong support for a resolution that would allow parents to make decisions regarding their twins' classroom placement. This is a crucial issue and I am delighted that the Minnesota Legislature is willing to listen to the voices of parents and other concerned individuals. Most of the work I will refer to is summarized in my recent book, *Entwined Lives: Twins and What They Tell Us About Human Behavior* (2000, NY: Plume), and references therein.

My interest in twins' school separation began while I was at the University of Minnesota. I was a post-doctoral fellow in the Psychology Department for three years (1982-1985), working with the Minnesota Study of Twins Reared Apart, directed by Prof. Thomas J. Bouchard, Jr. Then, I served as Assistant Director of the Minnesota Center for Twin and Adoption Research for six years (1985-1991). I am enclosing a relevant research paper I completed, based on data provided by Minnesota twins.

As a researcher of twins, I have been visiting twins and their families for about twenty-five years. I have done a great deal of research on twin relations. The twin bond, especially among identical twins, is unusually close—but this does not diminish each child's individuality in any way. It does mean that twins are more likely to feel comfortable and secure in a new situation, like school, when they are with their twin. They are also able to develop relationships apart from their twin sibling, despite being in the same classroom—teachers can place them in separate groups, giving them access to new pupils, but also allowing them opportunities to see their twin and to know that the twin is all right.

There is research showing that children entering school with friends are more likely to engage in activities and spend less time with teachers. Being with a friend dampens some of the difficulties in separating from the parent—so it seems blatantly unfair to ask twins to separate from their parents and from their twins.

I have written many letters on behalf of concerned parents who find schools insensitive to their twin children's desires to remain together. The policy of separation is based on an unfounded fear that twins will fail to develop "individuality"—whatever that means!! At the same time, I advise parents of identical twins to dress the children in different outfits to help students and teachers to tell them apart. I also urge parents to work cooperatively with schools, to monitor situations and to be receptive to suggestions should they arise.

Note that Oklahoma has passed legislation giving parents the right to decide their twin children's educational circumstances. Also see an excellent law review article, written by a mother of twins, in support of parents' right to decide (L.L. Dean, 1999, Stetson Law Review, Vol. XXIX, no. 2). Finally, below is a letter from a mother of twins, in Canada, who was involved with legislation allowing families to have a significant voice in their twins' classroom placement. Her response should be taken seriously by anyone who sees it and who has interests in this situation.

Please do not hesitate to contact me if I can be of further assistance.

Sincerely,

Nancy L. Segal, Ph.D.
Professor of Psychology
Director, Twin Studies Center

Dr. Segal,

thank you for your support and your letter. I'm very happy to tell you that the school board of Montreal decided tonight to vote for the parent's choice in the placement of twins in classes. This resolution is going to be sent to every school in the province of Quebec. It means that parents will now have the choice and no school directors will be able to do anything against that unless they have very good reasons that they will have to explain to the school board.

Thanks again,

Nathalie Lalonde
Nathalie Lalonde <nathalielalonde@yahoo.ca>

1. A comparison of differences
ures of classroom performance.

grams for students at risk. Boston:

s: A report to the U.S. Congress.

al report to the Congress of the

A. Education Week, p. 64.

JOURNAL OF EDUCATIONAL AND PSYCHOLOGICAL CONSULTATION, 3(1), 69-84


# Twins in the Classroom: School Policy Issues and Recommendations

Nancy L. Segal
*California State University, Fullerton, CA*

Jean M. Russell
*Veterans Administration Hospital, Minneapolis, MN*

Decisions concerning the assignment of young twin children to the same or separate classrooms have proven difficult for many educators, counselors, and parents. As part of an ongoing study of cooperation and competition, 63 mothers of young twins and triplets were questioned with respect to satisfaction regarding school policies, reasons to support and reject separate classrooms for twins, and related issues. Forty-eight percent of the parents who were aware of the school's policy did not endorse a general practice of separating twins. More parents of monozygotic (MZ) twins (35%) than dizygotic (DZ) twins (13%) favored common placement in the early grades. The individual needs of each twin pair need to be considered by both educational and psychological consultants and parents in formulating school placement decisions. Additional implications for consultation are considered, and future research directions are proposed.

When I began to read the voluminous literature on twins, it became clear to me that many variables relating to twins and the twin situation were still unexplored, and that psychologists who used twins as pawns in the nature-nurture controversy were concentrating exclusively on differences within pairs and neglecting both the twin as an individual and the psychology of the twin pair. (Mittler, 1971, p. 11)

The question of same or separate classrooms for young twin children has proven especially problematic for some parents. School entry is a

Requests for reprints should be sent to Nancy L. Segal, Department of Psychology, California State University, Fullerton, 800 North State College Boulevard, Fullerton, CA 92634.

critical developmental event for all children, but may prove additionally significant for some twins if required to separate from one another for the first time. A considerable body of literature supports a closer social bond between identical or monozygotic (MZ) twins than fraternal or dizygotic (DZ) twins (Koch, 1966; Mowrer, 1954; Segal, 1984a, 1988). Premature separation can be detrimental to the early educational and social experiences of one, or both, co-twins, especially MZ co-twins.[1] This finding is, unfortunately, rarely considered in the formulation of school policy. School separation raises additional concerns, such as comparability in the quality of education received by each co-twin. Many parents of twins have expressed concern at the paucity of information that could facilitate decisions regarding school placement. Many have, in addition, confronted reluctance by some individuals within the educational system to work closely with them toward formulating optimal solutions for their twins. The study of school policy regarding the classroom placement of twins may yield important implications for near-in-age siblings, as well as adopted (genetically unrelated) siblings reared together. Useful guidelines concerning the rearing and care of twin children for use by consultants with diverse specializations may also be suggested.

The majority of schools maintain firm policies of separation for twins upon school entry, although the basis for, and the advisability of individual placement have not been well researched. Indeed, only a handful of studies address the unique psychological and social circumstances relevant to the education of twin children (Kim, Dales, Connor, Walters, & Witherspoon, 1969; Koch, 1966; Paluszny & Gibson, 1974). Koch (1966) was the only investigator to compare benefits and disadvantages of school separation among MZ, same-sex DZ, and opposite-sex DZ twin pairs. Some key findings were that MZ female twins were most frequently placed in the same class, the majority of members of opposite-sex DZ twin pairs (especially females) preferred separation from the co-twin, more advanced speech was observed among separated twins, and separately placed twins showed greater differences in intellectual ability than twins placed together. The difficulty in assigning cause and effect with respect to educational outcomes was recognized, however, as was the need for assessing short-term and long-term consequences of school placement. In sum, the necessary guidelines for determining placement decisions were not generated by these data.

A naturalistic study of nursery school children's initial response to school suggests important implications for some twins (McGrew, 1972).

[1]A number of contacts have been received from parents reporting difficulties experienced by young twins following school separation.

Children accompanied by older siblings or who were already acquainted with some classmates showed greater ease of adjustment than unaccompanied children. Older siblings directed the movement of younger siblings to activities, whereas unaccompanied children remained closer to the periphery of activities or followed the nurse. Schwarz (1972) compared the behaviors of 4-year-old children in novel play situations across three conditions: accompanied by a familiar peer, accompanied by a stranger, or alone. Peer familiarity was associated with more positive affect and greater motility.

Subsequent to Koch's (1966) study, the single major research effort to focus on educational issues associated with twinning was reported by Gleeson, Hay, Johnston, and Theobald (1990) in Australia. These investigators administered questionnaires to 784 multiple birth families and to 1,264 teachers to assess the implications of school placement decisions. Their results underlined the importance of: (a) increased parent–teacher dialogue concerning twins' classroom arrangements, (b) flexibility in making classroom assignments, and (c) the need for additional empirical data concerning the adjustment of twins in school. There is a pressing need for a similar study of twins in the U.S. and elsewhere.

Unfortunately, some of the studies just cited failed to organize the twin pairs by zygosity, or twin type (i.e., MZ, same-sex DZ, and opposite-sex DZ), or to document the methods by which zygosity was assessed. MZ twins share all their genes, whereas DZ twins share half their genes, on average, by descent. Accurate classification of twins as MZ or DZ is a critical procedure in any psychological or medical study using twins because misassignment can yield misleading estimates of genetic and environmental influence, as well as inaccurate conclusions concerning twin group differences in the variables of interest. Co-twin comparison of eight blood group systems, four serum proteins, six red blood cell enzymes, fingerprint ridgecount, ponderal index, and cephalic index enable assignment of twin type with a probability of misdiagnosis of less than .001 (Lykken, 1978). MZ twins have consistently shown greater resemblance than DZ twins in general intelligence (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990; Segal, 1985), special mental abilities (Foch & Plomin, 1980; Vandenberg & Vogler, 1985), school achievement (Loehlin & Nichols, 1976; Nichols, 1965), learning disabilities (Ho & Decker, 1988; Stevenson, Graham, Fredman, & McLoughlin, 1987) and personality and temperament (Buss & Plomin, 1984; Loehlin & Nichols, 1976; Tellegen et al., 1988). It is, therefore, mandatory to evaluate twins' school adjustment with reference to twin type. More detailed discussion of the biological bases of twinning and the application of twin research designs is presented in Segal (1990).

In an attempt to redress the status of research activity concerning classroom assignments of twins, 63 mothers of young twins and triplets were surveyed with respect to satisfaction with school placement policies, reasons in support of and against separate classrooms for twin children, and related issues. This survey represents an initial step in what will, hopefully, stimulate future research efforts toward systematic analysis of the themes to be highlighted. Implications for educational and psychological consultation and suggested research directions are summarized in the final sections of this report.

## METHOD

### The Sample

Twin pairs were primarily identified through Mothers of Twins Clubs and personal referrals in Minneapolis–St. Paul and surrounding suburbs. They represent 94% (62 out of 66) of the families contacted. The twins were specifically recruited for participation in a study comparing cooperation and competition in MZ and DZ twin pairs. Table 1 compares key descriptive characteristics for the sample. The mean age of the twins was 8.78 years, $SD = 1.06$, and ranged from 6.9 to 11.5 years. MZ and DZ twins did not differ significantly in age or in age variance.

Twins were assigned as MZ or DZ based on extensive blood-typing for 49 twin pairs; in the remainder of cases, assignment was determined by parental responses to the Nichols and Bilbro (1966) Physical Resemblance Questionnaire.[2] All DZ twin pairs were same-sex. Additional details concerning zygosity diagnosis are available in Segal (1984b).

All twins completed the Wechsler Intelligence Scale for Children–Revised (WISC-R; Wechsler, 1974). The senior investigator and an assistant administered the test to each member of a twin pair. (In the case of two triplet sets, one examiner tested two co-triplets and the other examiner tested one co-triplet. A member of one twin pair had been tested by a school psychologist prior to the study.) The mean IQ for the sample was 110.07 ($SD = 11.21$), and ranged from 80 to 138. The mean IQ score for MZ twins was 109.49 ($SD = 12.46$), and the mean IQ score for DZ twins was 110.56 ($SD = 10.10$). Mean IQ and variance did not differ significantly between twin groups; additional IQ analyses appear in Segal and Russell (1991). The mean IQ score for this sample places the twins well within the range of normal intelligence, or two thirds of a

[2]Funding limitations restricted blood-typing to twins judged by the investigators to be either MZ or "difficult to classify."

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TABLE 1
Sample Characteristics for MZ and DZ Twin Pairs

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|---|---|
| *N* (Pairs) | |
| MZ | 29 |
| DZ | 35 |
| Total | 64[a] |
| *N* (Individuals) | 126 |
| Age in Years | |
| *M* | 8.78 (1.06)[b] |
| Range | 6.90–11.50 |
| MZ | 9.00 (1.04)[b] |
| Range | 7.0–11.0 |
| DZ | 8.55 (1.01)[b] |
| Range | 6.90–11.5 |
| Sex | |
| %Male | 43% |
| %Female | 57% |
| IQ Score | |
| Mean IQ | 110.07 (11.21)[b] |
| Range | 80–138 |
| MZ | 109.49 (12.46)[b] |
| Range | 82–138 |
| DZ | 110.56 (10.10)[b] |
| Range | 80–134 |
| Background | |
| White | 61 |
| Black | 0 |
| Mixed | 0 |
| Oriental | 2 |
| Hispanic | 1 |
| Parental Occupation[c] | |
| Professional/technical/managerial; clerical sales | |
| Mother | 54% |
| Father | 61% |
| Service; agriculture/fishery/ forestry; processing; machinery; benchwork; structural; miscellaneous; unemployed | |
| Mother | 46% |
| Father | 39% |

[a]Includes one set of MZ triplets counted as one twin pair, and one set of MZ/DZ triplets counted as one MZ twin pair and two DZ twin pairs. [b]Standard deviations are based on individuals, not pairs. [c]Classification is based on the scheme provided in the *Dictionary of Occupational Titles* (U.S. Department of Labor, 1977).

standard deviation above the mean. This suggests that (with the exception of three twins whose scores were 80, 82, and 88) the sample includes children of average or above average intelligence. It is important to note, however, that twins, on average, score 4 to 10 points below the population mean (see Bouchard & Segal, 1985, for a review). The following findings reported are, therefore, applicable only to families whose twins are functioning successfully in a school setting.

### School Questionnaire

A form, "School Questionnaire for Mothers of Twins," included items relevant to school policy and parental satisfaction regarding classroom placement of young twins. This form was completed by mothers while twins engaged in other phases of the study. A copy of the questionnaire is included in Appendix A.

## RESULTS

### School Policy

Thirty-one of the 63[3] mothers were aware that their twins' school maintained a firm policy concerning the classroom placement of twins. Twenty-five of these 31 mothers (81%) reported a policy of assignment to separate classrooms, while 6 mothers reported a policy of retaining twins in the same classroom. Of the 25 cases in which schools had a firm policy of separating twin pairs, 13 mothers (52%) agreed with the policy, 10 mothers (40%) disagreed with the policy, and 2 mothers (8%) had mixed feelings. Of the 6 cases in which schools assigned twins to the same classroom, 4 mothers (67%) agreed with the policy and 2 (33%) mothers disagreed with the policy.[4] Most importantly, nearly half the mothers (48%) did not endorse a general policy of separate classrooms for twins. Parental attitudes toward general school policies and practices appear, however, to be distinct from satisfaction with current classroom assignments of twin children; see below.

[3]The mother of an MZ/DZ female triplet set provided data for one MZ twin pair and for one DZ twin pair. The mother of two female twin pairs (one MZ and one DZ) provided data for each pair. Data provided by the mother of an MZ female triplet set was entered for one MZ twin pair.

[4]Parents indicated general agreement or lack of agreement with this policy, without special reference to their own twins.

### Current Placement of Twins

Of the 63 twin pairs, 53 pairs (84%) were assigned to different classrooms, while 10 pairs (16%) were assigned to the same classroom. Significantly more MZ twins were enrolled in the same class, as compared with DZ twins, $\chi^2$ (1) = 4.01, $p < .05$. Sex differences in current placement were not found.

### Satisfaction With Current Placement of Twins

Among the 53 mothers whose twins were assigned to separate classrooms, 51 mothers (96%) were pleased with the decision, 1 mother was dissatisfied with the decision and 1 mother had mixed feelings.[5] The dissatisfied parent had MZ male twins who experienced jealousy over perceived differences in activities available in their separate classrooms. The parent with mixed feelings also had MZ male twins. She noted that separate classrooms aggravated the stressful situation posed by a recent move to a new neighborhood. All 10 mothers of twins sharing a classroom indicated satisfaction with that decision. In sum, the majority of parents were pleased with the current placement of their twins. It is important to note, however, that actual or anticipated educational and/or social difficulties associated with school entry had been resolved at the time of the interview.

### Reasons For and Against School Separation: Specific to Own Twins

The most frequent reason given in support of separate placement was enhancement of individuality and independence (28 mothers, 56%). A second reason was minimization of co-twin comparison and competition between the twins (10 mothers, 20%). Reasons to support common placement included assurance of equality of educational opportunity and experience (1 mother) and feelings of security in a novel situation (2 mothers). One parent referred to a diagnosis of specific learning disabilities in her MZ male twins, noting that teachers advised common placement as beneficial to both twins. Eight mothers (16%) indicated that classroom placement should reflect the twins' own preferences. Thirteen parents did not respond to this question.

[5]Placement decisions were not necessarily those of the parent.

### Classroom Placement in the Early Grades

A slightly higher proportion of parents agreed that twins should be placed in separate classrooms (57%) than in same classrooms (43%) during the early grades. A higher proportion of parents of MZ twins (35%) were in favor of common early placement, as compared with parents of DZ twins (13%), a difference which approached, but did not achieve statistical significance. Ten parents did not respond to this question. Sex differences in early classroom placement were not detected.

### Reasons For and Against School Separation in the Early Years: Twins in General

Arguments in favor of school separation were the promotion of individuality and independence, and the development of individual talents and abilities (33 mothers, 52%), and the elimination of opportunities for competition and/or comparison by others (6 mothers, 10%). It is worth noting that nearly twice as many mothers of DZ twins than mothers of MZ twins emphasized individuality and independence. Reasons given in favor of common placement were the provision of equal educational opportunities (1 mother), and the provision of a sense of security during adjustment to a novel situation (6 mothers, 10%); five of the six parents indicating security considerations had MZ twins. Three mothers (5%) felt that the choice should be left to the twins themselves, whereas 14 mothers (22%) indicated that the special needs and situation of the twin pair in question should dictate the decision.

### Suggested Age at Separation

Suggested age for assigning twins to separate classrooms was 5.82 years ($SD = 1.90$). Mothers of MZ twins (5.76, $SD = 2.77$, $N = 21$) and DZ twins (5.85, $SD = 1.09$, $N = 33$) did not differ in suggested age for separation, although the variance of this measure was significantly larger for mothers of MZ twins than for mothers of DZ twins ($F = 6.44$, $p < .001$). The age ranges specified by mothers of MZ twins and by mothers of DZ twins were birth to 15 years, and 4 to 8 years, respectively. The increased variance among parents of MZ twins is associated with the responses of the two mothers who favored very early (birth) and late (age 15 years) opportunities for separate experience. Sex differences in suggested age at separation were not detected.

## IMPLICATIONS FOR EDUCATIONAL AND PSYCHOLOGICAL CONSULTATION

The data presented here represent a preliminary inquiry into an issue of primary importance, in particular, parental satisfaction with classroom placement policies for young twin children. A key finding is that nearly half the mothers (48%) who were aware of a mandatory policy of separating twins at school did not endorse this practice. In the majority of cases, however, twins were currently separated at school, a decision with which parents were satisfied. Some twins were currently placed in the same classroom and all parents were pleased with this decision. An important distinction between parental views on general school policies regarding the placement of twins and parental evaluations of twins' current assignments is, thus, underlined. Although many families did not favor routine separation of twins as a general practice, the majority of parents (96%) whose twins had been separated were satisfied with this decision. Early concerns associated with classroom assignments had apparently been resolved at the time of participation in this study.

Observation of excessive co-twin dependence, possibly leading to immature speech patterns, may necessitate partial or complete separation at school (see Luria & Yudovitch, 1971; Douglas & Sutton, 1978). Observation of twin toddlers revealed development of conventional syntax and vocabulary, but also the modified use of pronouns and verbs to express their twin status (Malmstrom & Silva, 1986). The language deficits observed among many twins have been the focus of recent attention by experts representing a wide variety of behavioral science disciplines (Hay & O'Brien, 1981; Lytton, 1980; Savić, 1980). At issue are the relative contributions of biological prematurity, reduced verbal interaction with parents, and restricted social opportunities associated with the twinship to language difficulties.

Studies of twins and twin relationships that bear upon classroom placement decisions are relevant to other areas of psychological functioning. A basis for genetic influences on general intelligence and special abilities is demonstrated by greater MZ than DZ twin resemblance in measured characteristics. More frequent convergence in level of school performance (even at early ages), and subsequent academic plans and career goals by MZ than DZ co-twins may be anticipated. Such similarities may reflect the twins' genuine preferences and need not signal an absence of individuality or independence. Recent studies show that the loss of a twin is experienced more severely than the loss of other relatives. Furthermore, loss of an MZ co-twin is a more devastating event than loss of a DZ co-twin (Segal & Bouchard, 1991; Woodward, 1988). Such data dramatically underline the importance of acknowl-

edging twinship in counseling situations in which loss of, or separation from, the co-twin are of concern. Research on twin relationships has also proven useful to legal experts and other consultants associated with cases involving the custody, injury, or death of twin children (Segal, in press).

### Guidelines for Educational and Psychological Consultants

Listed are suggested guidelines for assisting educational and psychological consultants who work with twins and their families. These guidelines, based on outcomes from this study, provide a convenient summary of the practical implications of these findings. Directions for future research are also proposed.

1. School placement decisions should fit the special circumstances of individual twin pairs. The more common policy of separating twins upon school entry is inappropriate in all cases because it fails to accomodate the individual needs of each pair.
2. A research basis for separating twins at school has not been established. A judicious approach would, therefore, allow for periodic consultation with each family to determine an optimal solution. Several options are, in fact, available to educational and psychological consultants concerned with promoting independence in twins placed in the same classroom: encouraging separate play or study groups may help twins to function independently from the twinship, but with the knowledge and security that the co-twin is in close proximity. This may be especially applicable in nursery school settings if separate classrooms are unavailable. Consultants may additionally advise concerned parents to similarly structure the social and recreational situations of twins outside the classroom.
3. The zygosity of a given twin pair should receive some consideration in the assignment of separate versus common classrooms. More parents of MZ twins than DZ twins favored a general policy of common placement in the early grades. Final decisions should not, however, rest solely upon twin type, but should also consider the twins' social relationship, social skills outside the twinship, intellectual abilities, and other factors.

## RESEARCH DIRECTIONS

The information in this study was not gathered prospectively, such that certain issues may have been overlooked in light of twins' current

satisfactory school adjustment. In addition, opposite-sex twin pairs were, unfortunately, not included in this research design. To date, the best data relevant to these twin pairs are available in Koch (1966). Opposite-sex twin pairs were, in fact, the most problematic group with respect to early schooling, a finding associated with the average earlier physical, social and intellectual development of female co-twins, relative to male co-twins. The desire to be placed in separate classrooms was expressed more frequently by members of these pairs than by the members of other twin groups, with the females being more rejecting of the males.[6]

Future research directions call for longitudinal studies of twins, beginning at entry into nursery school (when twins are typically placed together) and extending through the junior high school years (when different school subjects are taught in separate classes). MZ, same-sex DZ, and opposite-sex DZ twin pairs should be organized according to the following characteristics: parental preference (for same/different classes) and school placement (concordant/discordant with parental preference). Twins' own preferences should also be assessed, a procedure that will generate pairs in which co-twins wish to be together, co-twins do not wish to be together, and co-twins who are discordant.

The following are several proposed research studies that will, hopefully, yield specific information for promoting school policies and practices that will benefit young twins during the early school years. This information should also prove useful to educators and psychologists who will be involved in these important decisions.

1. Twins' intellectual abilities and classroom performance should be assessed by standardized tests (e.g., WPPSI-R and WISC-R) and by repeated observation. Relationships between these measures and school placement characteristics can be examined.
2. Social adjustment should be evaluated by teacher and peer ratings, parental and twin interviews, and observation, both in the classroom and during recess periods. Relationships between these measures and school placement characteristics can be examined.
3. The early school experiences of opposite-sex DZ twin pairs deserve close attention. Correlates of both favorable and unfavorable intellectual and social outcomes among male co-twins are especially important to identify.

[6]Several parents have contacted Dr. Nancy L. Segal regarding the advisability of assigning opposite-sex twins to separate grades. These requests are largely based on the males' lack of school readiness. Different classrooms or different schools, rather than different grade levels, were suggested owing to potentially damaging responses by relatives and peers.

4. The special educational and social concerns of twins concordant for and discordant for various learning disabilities and physical handicaps should be the focus of additional research. The relatively increased incidence of reading disability in young male twins, relative to non-twin males, is recognized. Continued research efforts in this area would be of practical benefit to the twins, and would help to identify mechanisms associated with reading difficulties (Hay, O'Brien, Johnston, & Prior, 1984).

Projects of this scope and design require identification of sizeable twin populations, so that collaboration among investigators from different research institutions would facilitate success. The proposed studies may suggest important implications for educational policies and practices concerning near-in-age, non-twin siblings, as well as adopted siblings. Certain intellectual and social characteristics of some same-sex, near-in-age biological and adoptive siblings reared together (e.g., relative lack of resemblance in special mental abilities and interests) may approximate those of DZ twin pairs. The inclusion of these kinship pairings in the research design would enable some informative contrasts, for example, to what extent does the social situation confronting DZ opposite-sex twin pairs replicate among opposite-sex sibling pairs?

It is encouraging that, in recent years, there has been increasingly greater public and professional attention directed toward the unique psychological and biological circumstances of young twin children. A bimonthly publication, *Twins Magazine,* was launched in 1984 and addresses a variety of psychological and medical issues relevant to twins and their rearing; additional resources for educational and psychological consultants are provided in Appendix B. Dr. Nancy L. Segal recently directed a seminar on the education of twin children for teachers in a preschool center in the Minneapolis area. A central theme that emerged from this meeting was the need for research findings that would enable both teachers and educational and psychological consultants to offer effective guidance for school placement decisions concerning twin children. This brief report will, hopefully, stimulate continued efforts along these lines.

## AUTHORS' BIOGRAPHIES

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## APPENDIX A

School Questionnaire for Mothers of Twins

The question of whether twins should be separated in school is difficult to answer. We are interested in learning your opinions on this topic, as well as the current policy at your twins' school.

1. Does your twins' school have a firm policy concerning the placement of twins in separate classrooms?
   1. Yes.
   2. No.
   3. Uncertain.
2. If you answered yes to question 1, does your school insist that twins should be in separate classrooms?
   1. Yes.
   2. No.
3. Do you agree with this policy?
   1. Yes.
   2. No.

4a. Are your twins in the same class now?
   1. Yes.
   2. No.

4b. Was this your choice, or the school's decision?
   1. My choice.
   2. School's decision.

4c. If this decision was yours, what was the reason?

_____

_____

4d. Are you happy with this decision?
   1. Yes.
   2. No.

5. Do you think that twins, in general, should be in the *same* class or *different* classes during the early grades?
   1. Same.
   2. Different.

   Why? _____

   _____

6. If you think that twins should be separated in school, at what age should this first occur?

   _____ years old.

## APPENDIX B

Resources on Twins for Educational and Psychological Consultants

*Center for the Study of Multiple Birth*, 333 East Superior Street, Suite 476, Chicago, IL 60611, (312) 266–9093.

*International Society for Twin Studies*, The Mendel Institute, Piazza Galeno 5, 00161, Rome, Italy.

*Minnesota Center for Twin and Adoption Research*, University of Minnesota, Department of Psychology, 75 East River Road, Elliott Hall, Minneapolis, MN 55455, (612) 625–4067.

*Multiple Births Foundation*, Queen Charlotte's and Chelsea Hospital, Goldhawk Road, London W6 0XG, England (44–01) 748 4666, Ext. 5201.

*National Organization of Mothers of Twins Clubs* (NOMOTC), 12404 Princess Jeanne NE, Albuquerque, NM 87112–4640 (505) 275–0955. (Includes Cope/Outreach Department for Twin Loss)

*Our Newsletter* (Support group for parents who have lost a twin), Jean Kollantai, P.O. Box 1064, Palmer, AK (907) 745–2706.

*The Twins Foundation*, P.O. Box 9487, Providence, RI 02940–9487 (401) 274–TWIN.

*Twins Magazine*, P.O. Box 12045, Overland Park, KS 66212, (913) 722–1090.

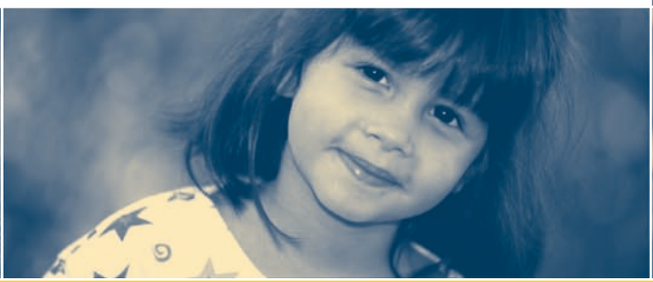
*Twin Services*, P.O. Box 10066, Berkeley, CA 94709, (510) 524–0863.

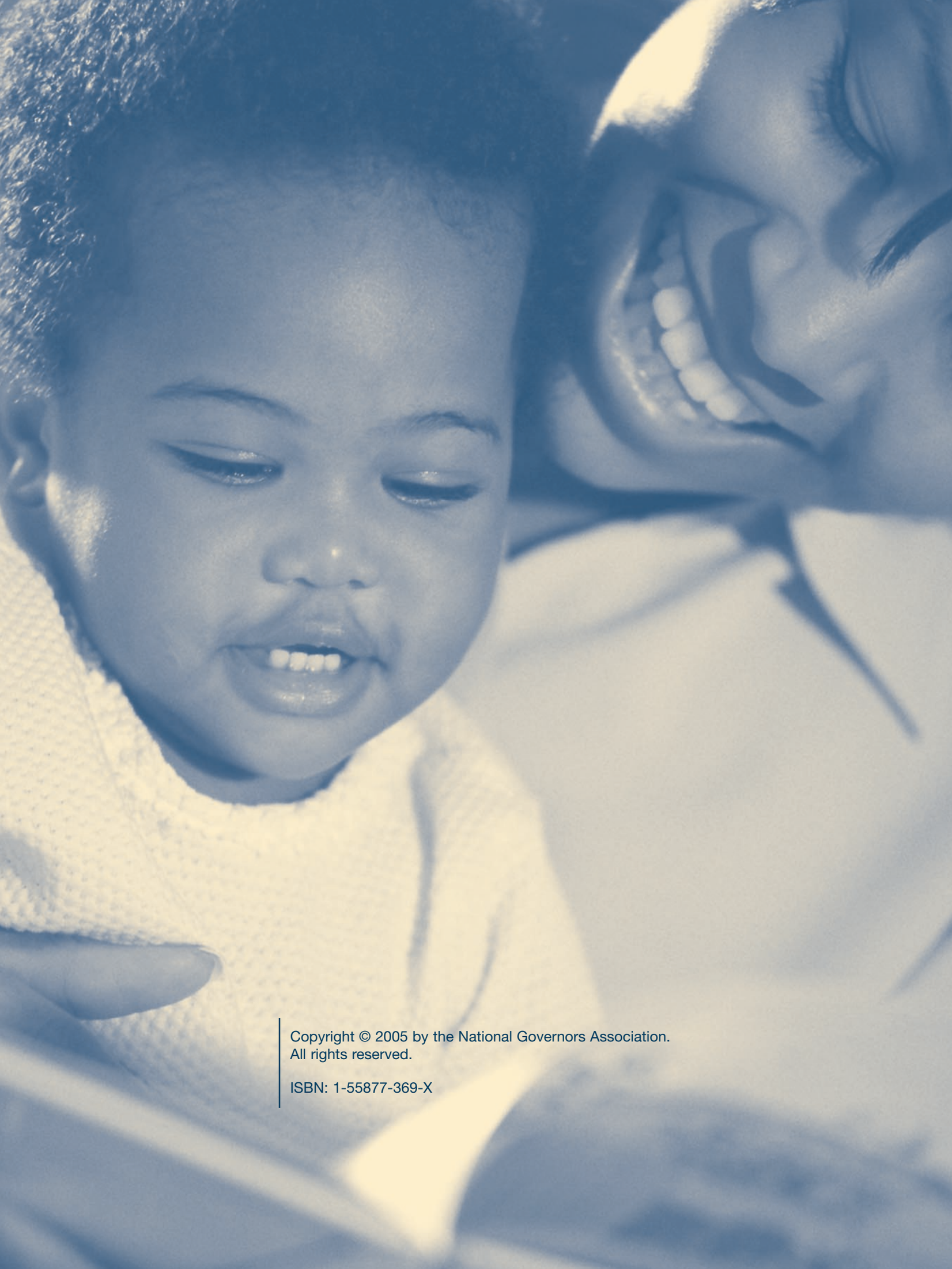
*Twin Studies Center*, California State University, Department of Psychology, 800 North State College Boulevard, Fullerton, CA 92634, (714) 773–2568.

# Final Report

of the NGA Task Force on School Readiness

## Building the Foundation for Bright Futures







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# Building the Foundation for Bright Futures





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# F O R E W O R D

hildren are our nation's greatest resource, and there is no more important task than building the foundation for bright futures in school and in life. Learning begins at birth, so efforts to prepare children for school success must start early. Over a decade of research has identified what children need to be ready for school and what role families, schools, and communities can play in supporting children's development. However, the state's role in this complex policy area remains less clear.

Under the 2002-03 chairmanship of former Governor Paul E. Patton of Kentucky, the National Governors Association (NGA) established a gubernatorial Task Force on School Readiness to identify actions that governors and states can take to support families, schools, and communities in their efforts to ensure all children begin school ready to reach their full potential. The task force continued under the leadership of the 2003-04 NGA chair, Governor Dirk Kempthorne of Idaho. Participating governors were Governor Mike Huckabee of Arkansas, Governor Jennifer Granholm of Michigan, former Governor Bob Holden of Missouri, Governor Bob Taft of Ohio, Governor Edward G. Rendell of Pennsylvania, and Governor Mark Sanford of South Carolina.

We discovered that states are leading the way in promoting school readiness and that there is already much on which to build. There are no one-size-fits-all approaches that states can adopt quickly or easily, but this report presents different options for state action and provides a policy framework for coordinating state decisions across programs and agencies. Not every policy recommendation we offer comes with a high price tag. The NGA Center for Best Practices has prepared a companion publication, *Building the Foundation for Bright Futures: A Governor's Guide to School Readiness*, which ties the task force recommendations to concrete best practices and promising strategies from the states.

This task force was a true collaboration of individuals and institutions that care about our nation's children and our collective future. Our sincere thanks are extended to those who made this effort possible: the staff of the NGA Task Force on School Readiness and the NGA Center for Best Practices who supported our work; the research and policy experts who contributed to our thinking; the many states that submitted best practices and promising strategies to promote school readiness; and the David and Lucile Packard Foundation, the Annie E. Casey Foundation, the A. L. Mailman Family Foundation, and the Joyce Foundation that generously supported this endeavor.

Achieving school readiness cannot be accomplished by any single agency or individual. It requires public-private partnerships and strong leadership from governors. Together, we can build the foundation for bright futures for all children.

## NGA Task Force on School Readiness

Former Kentucky Governor Paul E. Patton and Idaho Governor Dirk Kempthorne, Co-chairs

Arkansas Governor Mike Huckabee

Michigan Governor Jennifer Granholm

Former Missouri Governor Bob Holden

Ohio Governor Bob Taft

Pennsylvania Governor Edward G. Rendell

South Carolina Governor Mark Sanford

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**Anna Lovejoy,** *senior policy analyst, Education Division, NGA Center for Best Practices,* organized the task force meetings, identified the supporting research on school readiness, and synthesized the key findings and the task force's policy recommendations into a concise document for governors.

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**Kim Townley,** *director, Division of Early Childhood Development, Kentucky Department of Education*

**Patricia Kempthorne**, *First Lady of Idaho*

**Blossom Johnson**, *director, Idaho Governor's Coordinating Council for Families and Children*

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**Susan DeVenny**, *director, South Carolina First Steps*

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### NGA Staff

**Elisabeth Wright,** *senior policy analyst, Education Division, NGA Center for Best Practices,* provided research and editorial support to this report.

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**John Blacksten**, and **Kimberly-Anne Boyer**, *press secretary, NGA Center for Best Practices, and program assistant,* respectively, *of NGA's Office of Communications,* provided design and editorial guidance and helped shepherd the report through production.

**Helene Stebbins**, *president, HMS Policy Research,* helped facilitate the task force meetings and provided valuable guidance and support to this endeavor.

## EXECUTIVE SUMMARY

"Children learn more from birth to age three than any other time in life. During these years, what we do will affect the way they learn, think and behave forever. As parents, child care providers and concerned citizens, it is our job to ensure that our youngest and most vulnerable residents are prepared and ready to enter the classroom."

**– Michigan Governor Jennifer Granholm**

The first years of life are a critical time for development of the foundational skills and competencies that children will need for success in school and in life. Too often, children who enter their kindergarten classroom without these skills and competencies start behind and stay behind. Fortunately, early intervention and supports can help close the gap before it starts to widen. Investments in young children yield high returns and are the best strategy for improving children's odds for a bright future.

The National Governors Association Task Force on School Readiness sought to identify actions that governors and states can take to support families, schools, and communities in their efforts to ensure that all children start school ready to reach their full potential. The task force adopted a framework for school readiness that incorporates the elements of ready schools, ready communities, ready families, and ready children. It also added a newly emerging element, ready states, which refers to the state systems and infrastructure that support the other elements of the framework. Guiding the recommendations included in this report are core principles on which the task force agreed. The recommendations are based on a review of available research and of strategies, activities, or approaches that have proven effective in attaining intended outcomes. Governors are encouraged to consider the suggested options for what states can do to promote school readiness and select those that best match their state's needs, resources, and priorities.


### Core Principles

These core principles guided the task force's recommendations.

- *The family plays the most important role in a young child's life.* Public policies should seek to support families in this role and to expand parents' options for the care, health, and education of their children.

- *Responsibility for school readiness lies not with children, but with the adults who care for them and the systems that support them.* Public policies should seek to provide comprehensive information, resources, and support to all who are responsible for children's development.

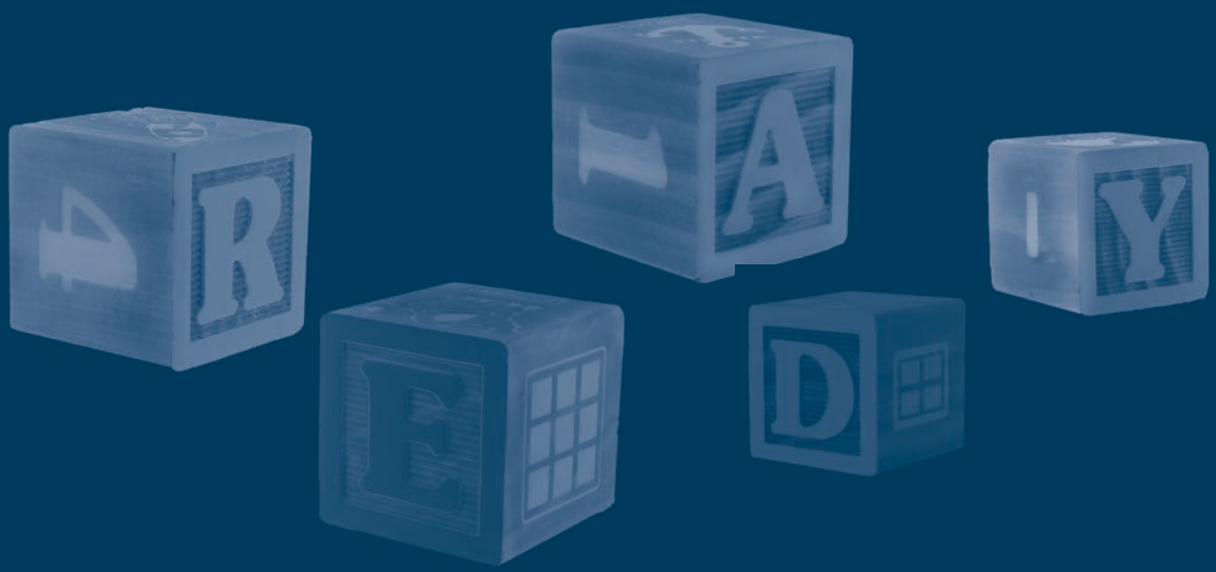
- *The first five years of life are a critical developmental period.* Important opportunities exist to influence the healthy development of children in the early years. Public policies should seek to address the risk factors affecting children's development from before birth to age five.

- *Child development occurs across equally important and interrelated domains — physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge.* Public policies should seek to address all of young children's developmental needs.

- *Governors and states can pursue various options to promote school readiness.* There is no one-size-fits-all policy approach to promoting school readiness, and states will pursue different options based on their needs, resources, and priorities.

"The best way to ensure children get a good education is to give them a strong foundation in their early years."

**– Arkansas Governor Mike Huckabee**



## TASK FORCE RECOMMENDATIONS

*The NGA Task Force on School Readiness offers these recommendations and policy options for what governors can do to promote ready states, ready schools, ready communities, ready families, and ready children. Many of the recommendations presented here are already in place to varying degrees in different states so there is much to build upon. And not every recommendation offered comes with a high price tag. Even in a lean fiscal environment, states have an opportunity to set priorities, align policies, build collaborative relationships and leverage existing resources to maximize impact and achieve goals over the long term.*

### Ready States

The NGA Task Force on School Readiness believes that gubernatorial leadership is critical to building a comprehensive and coordinated state infrastructure for school readiness. In most states, a single system for promoting school readiness does not exist. Governors are in a unique position to lead key agencies and decisionmakers in building a more comprehensive and coordinated system that delivers supports and services to children and families efficiently and effectively. Such leadership is often a decisive factor in whether systemic change occurs and is sustained over the long term. Therefore, governors should consider these recommendations and policy options.

**Develop a vision and strategic plan for school readiness that considers the role of families, schools, and communities and that addresses the developmental needs of children beginning before birth to kindergarten and beyond.**

**What States Can Do**

- Use the vision to set specific goals for promoting school readiness and develop a strategic plan to achieve them.
- Start with a comprehensive review of existing federal, state, and local school readiness programs, policies, funding streams, and decisionmaking structures. Review demographic data on the number of children and families and data on those in need of special services. Identify gaps, inefficiencies, duplication, and opportunities for leveraging resources. Use this information to identify, recommend, and prioritize policies and actions that will support the achievement of school readiness goals.
- Seek regular input from state and local stakeholders from the public and private sectors on the vision, priorities, and policy recommendations to ensure a comprehensive approach and strong buy-in. Include state agency leadership and program administrators for health, justice, housing, prekindergarten, child care, Head Start, child welfare, early intervention, mental health, family support, K-12 education, and workforce development as well as parents, legislators, local leaders, early care providers, early childhood educators, business and philanthropic leaders, and other key voices.
- Periodically revisit the comprehensive statewide plan to evaluate progress and realign goals and priorities over time.
- Partner with public and private stakeholders to develop a strategic plan for raising awareness and building public and political will for school readiness among parents, voters, policymakers, and business and community leaders.

**Build a comprehensive and coordinated statewide system for school readiness.**

**What States Can Do**

- Create a consolidated agency for early childhood and/or establish a governance structure that promotes collaboration and establishes clear lines of authority over priorities and policy decisions (e.g., a children's cabinet, an interdepartmental council for school readiness, or a public-private commission). Empower its leadership to make critical decisions on priorities, funding, and service delivery once stakeholder input is received.

- Establish mechanisms to require all agencies that administer programs and services for children to collaborate on policy decisions and coordinate services (e.g., formal memoranda of understanding or joint administrative authority over funding streams).

- Implement unified data collection requirements, training opportunities, and professional standards across prekindergarten, child care, and Head Start programs.

- Provide new funding and leverage existing resources for system coordination efforts.

**Ensure accountability for results across agencies and between the state and local levels.**

**What States Can Do**

- Establish goals and measure progress toward outcomes for children, families, schools, communities, and state systems. Select measures that suggest that the responsibility for school readiness lies not with children, but with the adults who care for them and the policies and systems that support them. Use multiple measures to track progress toward system outcomes (e.g., evaluate progress toward integrating service delivery systems and adopting key policy changes); program outcomes (e.g., evaluate program implementation efforts and track aggregate data from developmentally appropriate child assessments); and child outcomes (e.g., track indicators of family stability and child health and well-being). Use results to hold policymakers and stakeholders accountable for meeting agreed-upon goals.

- Establish common measurements and consistent data reporting mechanisms to enable information sharing and analysis across state agencies and programs and between the state and local levels. Invest sufficient resources to support consistent data collection efforts.

- Develop a communications strategy to report progress and use results to inform policy decisions and build support for school readiness efforts among parents, educators, legislators, policymakers, and the public.

- Use results to revisit the school readiness plan, evaluate progress, and realign goals, resources, and priorities over time.

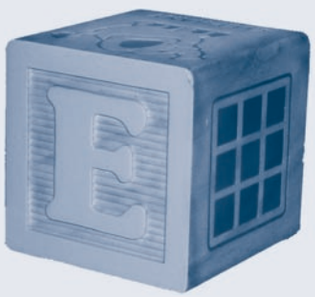
## Ready Schools

The NGA Task Force on School Readiness believes that as important as it is for children to be ready for school, schools must also be ready for children. Children enter school with different skills, knowledge, and previous experiences, so schools must be ready for a diverse student body at kindergarten entry. Schools can play a key role in reshaping the public's perception of when learning and education begin and in identifying the key roles that families, early care and education providers, K-12 educators, and other community partners play in supporting young learners. To support schools in this role, states should consider these recommendations and policy options.

**Support schools, families, and communities in facilitating the transition of young children into the kindergarten environment.**

### What States Can Do

- Establish school readiness as a goal among state and local K-12 leadership, invite K-12 leadership to the state school readiness planning table, and/or include early childhood representatives in state and local P-16 councils.
- Provide guidance, resources, and technical assistance to schools and communities in developing local transition plans among schools, families, child care providers, early childhood educators, and other community stakeholders.
- Offer supports and incentives to administrators and teachers for committing time and resources to transition activities.
- Support local innovation and research into effective transition practices.



**Align state early learning standards with K-3 standards.**

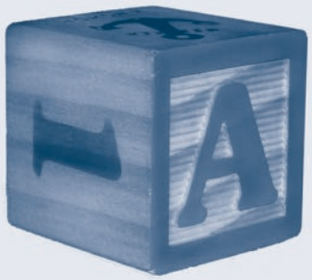
### What States Can Do

- With input from the early childhood and K-12 community, develop research-based early learning standards that are developmentally appropriate and that set clear expectations for what young children should know and be able to do before, during, and after school entry.
- Use the early learning standards to guide early education curriculum and assessments to ensure that what is being taught and measured matches expectations.
- Solidify partnerships with higher education institutions to ensure that early childhood and elementary educator preparation tracks incorporate early learning standards and child development into their curriculum. Provide joint professional development opportunities for school staff and early childhood educators in community-based programs.

**Support elementary schools in providing high-quality learning environments for all children.**

### What States Can Do

- Require curriculum and instruction to be research-based and linked to high standards, as well as incorporate classroom observation and constructive feedback mechanisms into professional development programs for teachers, to ensure high-quality instruction across grades and classrooms.
- Hold schools accountable for results; provide guidance on demonstrated best practices and curricula for the population of children served by the school, including supports for children whose native language is not English, children with disabilities, and children with challenging behaviors; and provide incentives for schools to revise practices that have not proven beneficial to children.



- Enhance training and professional development for teachers and administrators on the process of language learning and second-language acquisition.

- Work with institutions of higher education to support research and innovation in early learning credentialing (e.g., a credential to teach children from birth to age three) and develop articulation agreements between two- and four-year public and private institutions of higher education and community-based providers for credit-bearing professional development.

- Identify and remove state and local regulatory barriers to blending or braiding state and federal funding streams, such as Medicaid, Title I of the Elementary and Secondary Education Act, the Individuals with Disabilities Education Act, and the Child Care Development Block Grant, so schools identify and address children's special needs early and have greater flexibility over resources to provide high-quality learning environments for all children.

## Ready Communities

The NGA Task Force on School Readiness believes that communities play a critical role in promoting school readiness. Much of the action, responsibility, and decisionmaking for child and family service delivery occurs at the local level. Whether or not families have access in their communities to information, health services, quality care and early learning opportunities, and other resources can directly impact children's readiness for school. Public assets such as parks, libraries, recreational facilities, and civic and cultural venues provide a better quality of life for children, foster community participation among families, and provide opportunities to engage parents, educators, and care providers in positive activities with children. Recognizing the central role that communities play, many states are supporting local school readiness efforts with technical assistance and public and private funding. States should consider these recommendations and policy options to support communities.

**Promote local collaboration and needs assessment for school readiness.**

### What States Can Do

- Provide guidance and resources to help community leaders and all related stakeholders (e.g., family support, early childhood education, health and mental health, and other services) to collaboratively assess needs, prioritize investments, and streamline service delivery systems to meet local school readiness needs.

- Offer flexible funding to support local school readiness priorities in exchange for measurable results.

**Assist community leaders in tracking school readiness outcomes.**

### What States Can Do

- Provide guidance to communities in setting measurable goals for child outcomes, selecting indicators and measures of progress, evaluating results, and communicating outcomes.

- Compile results across communities to measure statewide trends and conditions and to communicate them to raise awareness and build support for school readiness efforts.

**Seek community input in statewide planning efforts.**

### What States Can Do

- Include community representatives at the state school readiness planning table, or form an advisory board of local leaders and stakeholders to inform state decisions.

- Hold town hall meetings, local public forums, or focus groups with community stakeholders to seek their input on statewide planning efforts.

## Ready Families

The NGA Task Force on School Readiness believes that the family plays the most important role in a young child's life. Parents have the primary responsibility for nurturing, teaching, and providing for their children. It is the relationship between parent and child that is the most critical for the positive development of children. Children need supportive, nurturing environments. However, the new economy has brought changes in the workforce and in family life. These changes are causing financial, physical, and emotional stresses in families, particularly low-income families. Moreover, increasing numbers of new immigrants are challenged to raise their children in the face of language and cultural barriers. Consequently, the role of parents and the condition of families should be central concerns for policymakers interested in promoting school readiness. Therefore, states should consider these recommendations and policy options to support the role of families.

**Support parents in their primary role as their children's first teachers.**

### What States Can Do

- Provide easy access to information on parenting, child development, and available support services through Web sites, information kits, parent resource guides, and community-based programs (e.g., libraries, recreation centers, and family resource centers).
- Engage pediatricians, family practitioners and other health care providers in identifying children with developmental delays (physical, cognitive, social, and emotional), referring children for assistance, and providing information to parents on child development.
- Conduct information and outreach campaigns to build public will and inform parents about child development through, for example, public service announcements and public and private media outlets.
- Provide support services to families through income support, prenatal care, child care, home visiting, family literacy, and parent-child education programs and reach out to at-risk and socially isolated families.
- Promote public- and private-sector strategies to increase parents' flexibility in balancing work and family needs (e.g., adopt paid family leave and/or child care tax credits for individuals and employers; adopt family-friendly policies, such as flex-time, telecommuting, and child care assistance for state employees; and encourage and publicly recognize private-sector employers for doing the same).

**Promote safe, stable, and economically secure families.**

### What States Can Do

- Establish school readiness as a goal of housing, workforce, family health, and economic support systems and include these systems in statewide school readiness planning.
- Promote asset development and savings among working families (e.g., individual development accounts, asset disregards for public cash assistance, home ownership promotion programs, and antipredatory lending legislation).
- Offer mental health services, counseling, and prevention services for substance abuse, domestic violence, and child abuse and neglect to at-risk parents and foster parents.

**Address the needs of culturally and linguistically diverse families.**

**What States Can Do**

- Provide information and resources to families in their home language as well as in English.
- Expand access to English language training and resources for parents.
- Recruit teachers, caseworkers, service providers, and policy leaders from diverse backgrounds.
- Train providers and early childhood educators on language development, second-language acquisition, and culturally responsive teaching methods.

## Ready Children

The NGA Task Force on School Readiness believes that the first five years of life are a critical period for all child development domains —physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge. The task force also recognizes that states, communities, schools, and families play a critical supporting role for children from birth to age five. Stable relationships with parents and caring adults and safe, nurturing, and stimulating environments are all fundamental to school readiness. To support children's growth and development, states should consider these recommendations and policy options.

**Ensure that all young children from birth to age five have access to high-quality care and learning opportunities at home and in other settings.**

**What States Can Do**

- Develop innovative strategies to raise the quality and quantity of licensed early care and education options for families. Strategies could include efforts to:
  - Adopt quality ratings and a tiered reimbursement system for licensed child care;
  - Provide support, incentives, and technical assistance to providers to achieve state or national accreditation of programs; and
  - Investigate innovative capital improvement and facilities financing strategies (e.g., establish public-private facilities funds, provide low-interest capital improvement loans, and provide training and technical assistance on the design and development of high-quality child care settings).
- Support a high-quality early care and education workforce. Strategies could include efforts to:
  - Partner with the early childhood research and practice community to identify the core content (i.e., the specific knowledge, competencies, and characteristics) needed by early childhood practitioners to work effectively with families and young children. Use this core content as the foundation for determining training content, course content, and competency standards for professional performance.
  - Provide incentives and financial support to providers and early childhood educators to engage in professional development and training (e.g., provide scholarships for higher education that are linked to increased compensation through bonuses or other mechanisms);

- Partner with higher education to establish professional development standards, credential requirements, and articulation agreements among two- and four-year institutions for associate's, bachelor's, and master's degree programs in early childhood care and education; and

- Provide curriculum, instructional materials, and training for home-based providers on early learning and development.

**Provide comprehensive services for infants and toddlers.**

**What States Can Do**

- Use flexible funding sources (e.g., Temporary Assistance for Needy Families funds, the Child Care and Development Fund, or state general funds) to expand voluntary, comprehensive, high-quality birth-to-age-three initiatives (e.g., state-expanded Early Head Start or similar programs), home visiting programs, and parent education programs.

- Offer incentives for providers to increase high-quality child care services for children from birth to age three.

- Raise standards for infant and toddler licensing.

- Offer professional development opportunities for all early care and education providers on infant and toddler development, require specialized training for infant and toddler providers, and consider offering financial support and incentives for such training.

- Develop a statewide network of infant and toddler specialists to provide training and on-site mentoring to infant and toddler providers.


**Expand high-quality, voluntary prekindergarten opportunities for three- and four-year-olds.**

**What States Can Do**

- Use flexible funding sources (e.g., Temporary Assistance for Needy Families funds, the Child Care and Development Fund, or state general funds) to support prekindergarten programs, create a dedicated funding stream (e.g., state lottery revenue or revenue from a tax on goods or services), encourage local school districts to use Title I funds for prekindergarten programs, leverage local and private-sector resources, or consider parent fees or sliding-scale tuition rates.

- Set high standards for key quality components, such as classroom size and child-staff ratios, teacher qualifications and training, and curriculum linkages to K-12 learning standards.

- Leverage existing capacity among school districts, child care providers, Head Start programs, and others to provide greater access to prekindergarten programs and integrate program and learning standards for child care and prekindergarten programs to ensure high-quality programs across all settings.

- Provide resources and guidance to prekindergarten educators on creating literacy-rich environments and incorporating state early learning standards into curriculum and activities.

**Address the school readiness needs of children in foster care and children with special needs.**

**What States Can Do**

- Increase collaboration among health, foster care, child mental health, early intervention services, and early care and education programs to increase early identification and referrals to necessary services and ensure the needs of all children are met. Strategies could include efforts to:
  - Cross-train early care and education providers, child welfare professionals, and early intervention specialists on child development and abuse and neglect risks and indicators;
  - Encourage identification and referrals to needed services across systems; and
  - Conduct joint outreach and information efforts directed to parents.
- Improve integrated service delivery among systems. Strategies could include efforts to:
  - Co-locate programs and services in family resource centers or community-based agencies;
  - Develop a unified design, management, and implementation plan for co-located programs to ensure seamless service delivery; and
  - Align eligibility guidelines and streamline in-take procedures.

# Building the Foundation for Bright Futures

## INTRODUCTION

"The education of America's children begins the day they are born, not their first day in a classroom."

**– Former Kentucky Governor Paul E. Patton**

Children are born learning. The first years of life are a period of extraordinary growth and development. During this time, the brain undergoes its most rapid development as neural connections (synapses) are made at incredible rates that are reinforced and solidified or lost through attrition over time.[1] Development in very young children is continuous. The cognitive, physical, language, social, and emotional skills that are key to school readiness arise from competencies achieved beginning in infancy. Striking disparities in what children know and can do are evident well before they enter kindergarten, and these differences are predictive of later school achievement.[2] Getting children ready to succeed in school begins at birth.

High-quality comprehensive services for at-risk families with young children can improve children's life outcomes. As they grow up, children who attend high-quality early childhood programs show a reduced need for special education, improved high school graduation rates, fewer arrests, and higher earnings than children who do not receive a high-quality early childhood experience. Based on these outcomes, leading economists have concluded that investments in young children yield the highest cost-effective returns and are the best strategy for improving children's odds for success in school and in life.[3]

After years of study, however, it is evident that the complexities of child development make crafting policy solutions to ensure children's readiness for school extraordinarily difficult. Readiness is multidimensional, and promoting school readiness must involve families, schools, and communities. States, too, have an important role to play—supporting families, schools, and communities in their efforts to ensure children start school ready to reach their full potential. To pull together all elements of readiness into a clear policy agenda, state policymakers need to know what the research says about how to define school readiness, what factors impact school readiness, and what this means for policy.

### What Is School Readiness?

School readiness is a term used with increasing frequency to describe expectations of how children will fare upon entry to kindergarten. If oversimplified, school readiness can be interpreted to mean whether a child can demonstrate a narrow set of skills, such as naming letters of the alphabet and counting to 10. Yet years of research into child development and early learning show that school readiness is defined by several interrelated developmental domains. These domains—physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge[4]—are all-important, build on one another, and form the foundation of learning and social interaction.[5]

School readiness encompasses children's curiosity and enthusiasm for learning, their physical and mental health status, their ability to communicate effectively, their capacity to regulate emotions, and their ability to adjust to the kindergarten classroom environment and cooperate with their teachers and peers. Ready children are those who, for example, play well with others, pay attention and respond positively to teachers' instructions, communicate well verbally, and are eager participants in classroom activities. They can recognize some letters of the alphabet and are familiar with print concepts (e.g., that English print is read from left to right and top to bottom on a page and front to back in a book).

Ready children can also identify simple shapes (e.g., squares, circles, and triangles), recognize single-digit numerals, and, of course, count to 10.[6]

Life experiences directly impact a child's development beginning at birth and continuing through childhood. Young children are highly influenced by their relationships with adults, by the environment where they live, and by the opportunities they have to play, learn, and grow.[7] A definition of school readiness must therefore also consider family and community contexts. Moreover, whether or not a school is ready for all children—regardless of their prior experiences—affects children's initial school experiences and has implications for their long-term educational career.[8]

A decade of work by such expert panels as the National Education Goals Panel and the National Research Council has brought the research and policy community to agreement on a framework for nurturing, teaching, and promoting children's school readiness that incorporates families, schools, and communities as key elements. A newly emerging element is the concept of "ready states," which refers to state systems and infrastructure that support families, schools, and communities in their school readiness roles.

## Why Is School Readiness an Issue?

### Learning Begins at Birth

Decades of research on brain development indicate that the first five years of life are critical to the structure and functioning of the brain. The brain is not fully developed at birth. Early experiences and environmental inputs help create and strengthen important neural pathways that impact hearing, vision, motor skills, and cognitive and emotional development.9 Children who lack stable and nurturing relationships with parents and caregivers, do not have adequate access to health care and proper nutrition, and lack sufficient opportunities to explore their environment may not fully develop the critical neural pathways that are the building blocks of learning.10 Such children are at higher risk for developmental delays that, absent early intervention, can result in long-term deficits in school achievement, incarceration, teen pregnancy, welfare dependency, or other socially undesirable outcomes.[11]

### An Achievement Gap Persists in America

It is no secret that an achievement gap in K-12 education continues to exist along socioeconomic and racial and ethnic lines in this nation, despite the best intentions of parents, educators, policymakers, and communities. National data now show, however, that this achievement gap exists before kindergarten entry and persists as children continue through school.[12] A recent analysis of social background differences relative to achievement at school entry found substantial variances by race and ethnicity in children's test scores as they begin kindergarten; black and Hispanic children scored significantly below their white peers on cognitive assessments.[13] More significantly, the data show that differences by socioeconomic status are even more substantial; children with a lower socioeconomic status scored significantly lower on tests than did their peers with a higher socioeconomic status.[14]

Research consistently shows evidence of the detrimental effects that economic hardship poses on children's development. Child poverty is associated with higher rates of low birthweight and infant mortality, substandard nutritional status and poor motor skills, higher risk of physical impairment, lower cognitive scores, and lower school achievement.[15] Nearly one in five U.S. children below age five (19 percent) lives in poverty. The rate is higher for black children below age five (40 percent) and Hispanic children below age five (32 percent) than for white children below age five (16 percent).[16]

### The New Economy Means Changes in the Workforce and in Family Life

Parents play a primary role in the development of their children. Children who experience sensitive, responsive care from a parent perform better academically and emotionally in the early elementary years.[17] At the same time, not surprisingly, financial and emotional stresses negatively impact parents' well-being and adversely affect their attentiveness and sensitivity to their children.[18] For children who receive most of their care from a parent in the home, it seems clear that providing families with the resources, information, and tools they need is an appropriate approach for promoting school readiness. Yet most young children in America today spend significant time in nonparental care. Approximately 67 percent of mothers work outside the home today,[19] and data for 2001 estimated that 61 percent (12 million) of children below age six received nonparental child care on a regular basis.[20] Moreover, since 1996, federal and state family assistance policies have required more low-income parents to enter the workforce.

### Quality Care and Learning Opportunities Promote Readiness But Are Often Scarce and Unaffordable

The quality of care that children receive is directly related to their development.[21] Enriched early experiences in high-quality care settings help narrow the achievement gap and produce fewer behavioral problems and better linguistic and cognitive outcomes among at-risk children.[22] Longitudinal studies such as the Abecedarian Project and the Chicago Child-Parent Center Longitudinal Study suggest that at-risk children exposed to a nurturing and stimulating environment in the first five years of life achieve higher results in elementary and secondary education and are more successful as adults.[23]


The quality of early childhood care and education programs rests on both structural characteristics (e.g., staff-child ratios and teacher education requirements) and process features (e.g., interactions between staff and children and curriculum and teaching practices). High-quality early childhood education provides young children with a safe and stimulating environment in which they may learn and develop. These programs offer small classes with well-prepared teachers, foster close teacher-child relationships, and encourage family involvement. They also emphasize and connect social-emotional and academic learning.[24]

Unfortunately, high-quality child care and preschool programs are often difficult to find and prohibitively expensive for low-income families.[25] Very-low-income families spend an average of 25 percent of their income on child care expenses,[26] and these families often receive poorer quality care for the amount they pay.[27]

### Public Investments in High-Quality Care and Education Yield High Returns

Recent writings of James J. Heckman, Nobel Laureate in Economics, and of Art Rolnick, senior vice president of the Federal Reserve Bank of Minneapolis, point to the positive economic benefits that result from investments in early care and education. Rolnick writes that early childhood investments yield "extraordinary public returns." By his calculations, the internal rate of return on the Perry Preschool program, a high-quality preschool intervention program for three- and four-year-olds, yielded an internal rate of return of 16 percent, 12 percent of which was returned to society.[28] In analyzing investments made in early childhood programs, Heckman similarly finds that "the best evidence suggests that learning begets learning [and] that early investments in learning are effective." Moreover, he concludes, "At current levels of investment, cost-effective returns are highest for the young."[29]

## About the Final Report

The final report of the NGA Task Force on School Readiness is based on five Core Principles and is built on the framework of Ready States, Ready Schools, Ready Communities, Ready Families, and Ready Children.

### Core Principles Guide the Recommendations

The task force acknowledges these core principles in developing this report.

- *The family plays the most important role in a young child's life.* Public policies should seek to support families in this role and to expand parents' options for the care, health, and education of their children.

- *Responsibility for school readiness lies not with children, but with the adults who care for them and the systems that support them.* Public policies should seek to provide comprehensive information, resources, and support to all who are responsible for children's development.

- *The first five years of life are a critical developmental period.* Important opportunities exist to influence the healthy development of children in the early years. Public policies should seek to address the risk factors affecting children's development from before birth to age five.

- *Child development occurs across equally important and interrelated domains—physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge.* Public policies should seek to address all of young children's developmental needs.

- *Governors and states can pursue various options to promote school readiness.* There is no one-size-fits-all policy approach to promoting school readiness, and states will pursue different options based on their needs, resources, and priorities.

### Research and Recommendations Are Tied to Framework Elements

The chapters of the report focus on the research findings and policy recommendations that support each element of the school readiness framework—Ready States, Ready Schools, Ready Communities, Ready Families and Ready Children. Myriad policy options are revealed to help build the foundation for bright futures. Governors are encouraged to consider the options for what states can do to promote children's school readiness and select those that best match their state's unique needs, resources, and priorities.

The National Governors Association Center for Best Practices has developed a companion publication, *Building the Foundation for Bright Futures: A Governor's Guide to School Readiness*, which includes further discussion of policy considerations and examples of best practices from states. Governors and other state policymakers can use the concrete solutions and strategies in the accompanying guide to inform their own school readiness policy decisions. ▮

## READY STATES

"To keep our nation home to the best and brightest, you've got to do it early. That starts with early childhood development efforts and it starts with building a reliable public-private network of school readiness partners."

**– South Carolina Governor Mark Sanford**

The NGA Task Force on School Readiness believes that gubernatorial leadership is critical to building a comprehensive and coordinated state infrastructure for school readiness. The challenge for policymakers is that there is no single system of early care and education at the state or national level. Programs that affect young children and their families are typically scattered across government agencies, funded through different sources, and delivered through multiple public and private hands at the state and community levels. Governors have unique authority and influence over many of the key agencies and decisionmakers in their state. Such leadership is often a decisive factor in whether systemic change occurs and is sustained over the long term. Therefore, a critical role for governors is leading efforts to strengthen the state's capacity and infrastructure to promote school readiness. In their chief executive role, governors can improve "state readiness" by defining a clear vision and strategic policy agenda for school readiness, building a coordinated infrastructure for services and decisionmaking, and ensuring accountability for results.

### Ready States Have a Clear Vision and Strategic Plan

Governors should establish and communicate a clear vision, develop goals and measures for achieving this vision, and prioritize strategic action steps that will build momentum for long-term success. The vision should address the developmental needs of children from before birth to kindergarten entry and beyond as well as consider the roles that families, schools, and communities play in supporting children's development. The process should be inclusive. Governors should involve state agency commissioners, especially for health, mental health, education, foster care, social services, and early intervention. Other key stakeholders are parents, advocates, business leaders, Head Start representatives, early care and education providers, infant and toddler experts, and others with a vested interest in and influence over early childhood policy. Turf battles are not uncommon, and long-term success depends on cooperation, collaboration, and buy-in to a common agenda. Governors can involve key voices by appointing early childhood task forces, commissions, cabinet councils, or other collaborative decisionmaking structures. Moreover, involving key legislators and members of the state judicial system may help create stronger buy-in and support among all three branches of government.

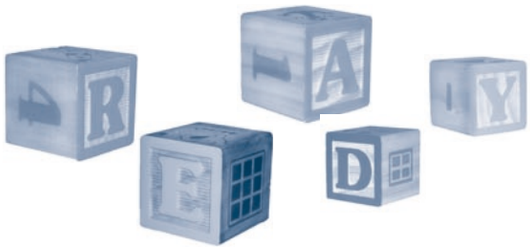
Strategic planning efforts should begin with a review of existing programs, services, and funding streams to identify gaps and duplication and to inform policy decisions. States should be mindful of previous planning efforts and consider them as a starting place to avoid reinventing the wheel. States should also be aware of existing resources available to support planning efforts. For example, the Maternal and Child Health Bureau of the U.S. Department of Health and Human Services has awarded every state a State Early Childhood Comprehensive Systems Planning Grant to encourage cross-agency collaboration in support of positive child outcomes. The philanthropic community is supporting similar system-building efforts in several states.

Public and political support are critical to the long-term success of school readiness efforts. An effective effort to build will for school readiness involves both public- and private-sector partners in specialized roles. It also requires delivering strategic messages to key audiences. Different messages will resonate with different audiences. For example, the business community may respond more to bottom-line cost-benefit information and positive public relations opportunities, while parents and the public may be energized by education and quality issues. Legislators and public officials will react to various messages, especially those that include positive results and show the benefits of public investment. The media is likely to pay attention to both positive and negative stories related to school readiness and young children.

**Ready States Have Strong Gubernatorial Leadership Over a Coordinated State System**

As the chief executive officer of state government, governors are in a unique position to provide leadership over cross-system collaboration efforts. Governors can place authority for key decisions, policies, and programs in a central individual, office, or collaborating body (e.g., a children's cabinet or governor's coordinating council for children and families). They can use their executive authority or sign legislation to establish governance structures or create a superstructure that brings together all early childhood programs in a single agency (e.g., a state department of early care and learning). Or they can require cross-agency collaboration and integration (e.g., by developing formal memoranda of understanding or assigning key agency commissioners joint authority over programs and funding streams). Regardless of the strategy states use to promote coordination among the foster care, early intervention, and school readiness systems, it is critical that all decisions are based on the established vision and goals and that executive leadership is held accountable for results.

The ways that states finance early childhood policies and programs also affect successful system-building. States and communities fund comprehensive supports for young children through multiple public sources (federal, state, and local) and private sources (foundation, industry, and user fees). Streamlined service delivery and coordination at the local level depends on how funds flow to programs, who administers the funds, and the requirements tied to each funding stream.[30] For example, states administer multiple federal funding sources for education, child care, child welfare, maternal and child health, and early screening and intervention. These funds, as well as state-funded programs (e.g., for prekindergarten), are administered through multiple state agencies, including health, education, child welfare, and human services. Complicating the picture still further are federal resources that are allocated directly to local entities or school districts, such as Head Start and Title I of the Elementary and Secondary Education Act (ESEA). States have an opportunity to streamline eligibility requirements and program regulations; coordinate the flow of funds to the local level; and align data collection, reporting requirements, and accountability measures across programs, agencies, and levels of government. With improved understanding of where and how public and private dollars are being spent, states can better identify funding gaps and determine strategies to reallocate, leverage, increase, and maximize funds to fill these gaps.



**Ready States Ensure Accountability for Results**

In today's climate of accountability, no discussion of policy recommendations can occur without considering how states can measure whether the goals they set out to achieve are being met. Numerous reasons for capturing results exist.

- *Understanding the status of young children.* What is the current status of children and how is it changing over time? How are the changes related to policy decisions?

- *Ensuring accountability for expenditures.* Are the funds being used for their intended purposes? Is the investment sufficient and is it having the desired impact? Are coordination and streamlining efforts producing cost savings and efficiencies?

- *Informing policy.* Are current strategies producing the intended results? How do the policies and programs interplay? What is the best mix of policies and programs to achieve the intended results?

- *Informing curriculum and instruction and identifying special needs.* What are children learning and what do teachers need to do to meet their students' unique needs?

- *Building support for school readiness.* What captures the attention of voters, parents, legislators, and other stakeholders? How are results most effectively communicated to each audience?

To answer these questions, states should consider multiple strategies to measure and communicate outcomes, including these. *Program evaluations* answer questions about how a specific initiative is working. Among these, focused evaluations ask whether and why a particular program had an impact on participants; process evaluations, or implementation studies, document whether a program was implemented as planned.

*School readiness indicators* are data used to monitor and measure progress toward desired outcomes. They can be numbers, percentages, fractions, or rates that reflect conditions (e.g., the rate of infant mortality, the number of children with health insurance, or the percentage of four-year-olds attending preschool programs). School readiness indicators can help fill the gap between what is known about a child at birth and his or her status at school entry. Indicators are effective communication tools when discussing policies, programs, and trends. Seventeen states are participating in a national School Readiness Indicators Initiative to develop school readiness indicators that will inform state policy for young children and their families. The indicators are intended to stimulate policy, program, and other actions to improve the ability of all children to read at grade level by the end of the third grade.

*Child assessments* seek to measure what children know and can do and/or how they are progressing over time. Because early child development is nonlinear, episodic, and highly integrated, simple assessment approaches continue to elude the field.[31] However, most

experts agree on several principles for child assessments. The National Association for the Education of Young Children (NAEYC) and the National Association of Early Childhood Specialists in State Departments of Education (NAECS/SDE) jointly recommend that assessment methods be developmentally appropriate, culturally and linguistically responsive, tied to children's daily activities, supported by professional development, and inclusive of families. They also recommend that assessments be connected to informing instruction, identifying the intervention needs of individual children, and/or improving educational and developmental interventions. Ongoing program evaluations can complement child assessment efforts by measuring whether programs meet the expected standards of quality and are on target to meet intended goals.[32] When assessments are clearly linked to early learning standards and curriculum, this helps ensure alignment among what children are expected to know and be able to do, what they are taught, and what is measured.

A comprehensive approach to measuring how children are faring under what programs and conditions would include program evaluations, indicators, and assessments. Program evaluations and indicators can also be used to measure how the policymaking and implementation processes are supporting child outcomes and whether policymakers and stakeholders are fulfilling their responsibilities under the state's strategic plan for school readiness. Results help build public and political support. Such support is critical to the long-term success and growth of early childhood initiatives. Getting the right messages out to the right audiences is often a formidable challenge.

To successfully tell the story, states may need to address coordination issues across multiple data collection and reporting systems. Typically, individual programs and funding streams require their own data reporting requirements, which are frequently captured in data systems that are not connected with other programs or agencies. Therefore, while the same child may be receiving benefits and services from multiple agencies, there is often no or limited capacity at the state level to share information on that child or groups of children. With such capacity, states could better draw a link between services delivered and child outcomes across multiple programs. It would help states improve service delivery, identify effective policies, and make informed policy decisions. Revamping a state's data infrastructure typically involves a significant investment of financial and human capital, but even incremental steps and thoughtful planning can make a difference. ▮

## READY SCHOOLS

"There is compelling research on early childhood development and that research clearly shows the importance of tapping into a child's potential by beginning education in the first five years of life."

**– Former Missouri Governor Bob Holden**

The NGA Task Force on School Readiness believes that as important as it is for children to be ready for school, schools must also be ready for children. Because children enter school with different skills, knowledge, and previous experiences, schools must be ready for a diverse student body at kindergarten entry. Few schools are ready for all children, however, and the experiences of children in early elementary classrooms vary widely.[33] Historically, both the American public and the education community have viewed education, in the formal sense, as beginning at school entry. Yet increasing awareness that children begin learning at birth is casting a new light on the roles and responsibilities of families, schools, and communities. Schools can play a key role in reshaping the public's perception of when learning and education begin. They can provide leadership by adopting a definition of learning that begins at birth and identifies the key roles that families, early care and education providers, K-12 educators, and other community partners play in supporting young learners. Although research and thinking is still emerging around the concept of "ready schools," there is preliminary agreement that such schools share certain characteristics. Ready schools work with families and early care and education providers to facilitate the transition of young children into the school environment, encourage continuity between children's prior experiences and the expectations awaiting them in kindergarten, and are committed to the success of every child.[34]

### Ready Schools Support Children's Transition to Kindergarten

Kindergarten entry often means a dramatic shift for children—in terms of academic demands, social environment, parent involvement, and class size—relative to what they may have experienced at home or in preschool. Transition difficulties are common and widespread in classrooms. In a 1999 survey, kindergarten teachers in schools nationwide expressed the belief that half the children entering kindergarten experienced either some or serious transition difficulties that affected both the child and teacher.[35] Research into best practices is still emerging, but studies to date suggest that communication and outreach to families and early care and education settings are effective, particularly if they begin prior to the start of school and continue into the first few months of kindergarten. However, most schools employ strategies such as flyers, parent letters, and back-to-school-nights that occur after school starts and that therefore miss a critical window of opportunity to facilitate the transition to kindergarten.[36] Moreover, across the nation, rising numbers of immigrant families with diverse cultural and linguistic backgrounds are posing communication and outreach challenges.

Leading researchers recommend that schools develop communitywide transition plans—in collaboration with preschool and kindergarten teachers, Head Start and child care providers, principals, parents, and community members—and clearly define the skills and knowledge necessary for success in early elementary grades. Other effective strategies include holding kindergarten registration earlier in the year and introducing children and parents to their teachers before the start of school.[37] As a part of transition planning, it is also necessary to include strategies that engage families in a manner that respects different perspectives on the relationships between families and their community and schools.[38] Although there is a need for more substantive transition practices, schools and teachers are already struggling to balance a tremendous workload with limited resources. Therefore, incentives and supports may be effective tools to encourage educators and school administrators to engage in innovative transition efforts.

**Ready Schools Encourage Continuity and Alignment Between Early Care and Education Programs and Elementary Schools**

Often, what children learn in preschool and what they are expected to know and be able to do at kindergarten entry are at most loosely connected.[39] Many times, initial gains from early intervention programs fade as children move through early elementary grades, and some experts attribute this in part to the dramatic differences between prior experiences and the expectations and learning environment of kindergarten.[40] However, efforts to encourage greater continuity between preschool and kindergarten can help ease the adjustment.[41] Moreover, half of all three- and four-year-olds did not attend preschool in 2000, which likely means that significant numbers of children enter kindergarten lacking experience in structured group settings.[42] Leading national experts recommend that elementary schools work with families, preschools, care providers, Head Start programs, and other community partners to align curriculum and create a more familiar learning context for children, regardless of their care and education experiences prior to kindergarten.[43]

States are currently focused on developing early learning standards, which are statements that describe expectations for the learning and development of young children. Such standards aim to inform teachers and caregivers, programs and schools, and parents and communities about what children are expected to know and be able to do and what adults are expected to teach them. Nearly 40 states now have or are developing learning standards for young children.[44] Federal developments, such as President George W. Bush's Good Start Grow Smart initiative, are encouraging states to enhance and align these standards with state standards for elementary and secondary education, particularly for literacy, language, and mathematics.

NAEYC and NAECS/SDE jointly recommend that early learning standards: [45]

- should incorporate expectations across all domains of readiness;
- should not be considered as simple downward extensions of content or performance standards for older children, but should be based on research about the processes, sequences, and long-term consequences of early learning and development;
- should be appropriate for the specific ages or developmental stages they encompass; and
- should accommodate community, cultural, linguistic, and individual variations to the greatest extent possible.

NAECS/SDE also recommends that early learning standards should be developed and reviewed through informed, inclusive processes; should be implemented and assessed in ways that are ethical and appropriate for young children; and should be accompanied by strong supports for families, early childhood programs, and early child professionals.[46]

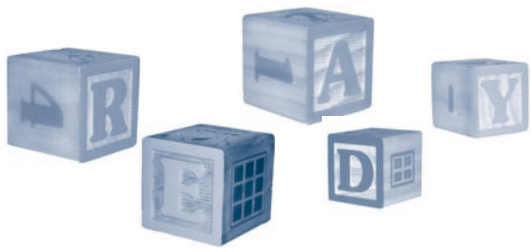
Content specialists working for the U.S. Department of Education recommend that early learning standards be skill-focused, research-based, clearly written, comprehensive, manageable for educators and children, and applicable to diverse settings (e.g., family care, preschool classrooms, and child care centers).[47] States can also develop training and professional development opportunities and provide incentives for parents, teachers, and caregivers to participate in them.

**Ready Schools Ensure High-Quality Learning Environments**

Further research is needed on ready schools, but a consensus is emerging on several important recommendations. The Goal 1 Ready Schools Resource Group of the National Education Goals Panel identified ready schools as those that demonstrate a commitment to the success of every child, regardless of his or her prior experiences, family and economic circumstances, linguistic and cultural background, and natural abilities and interests. These schools adopt curriculum and instruction methods that are research-based and support high standards. Ready schools hire qualified teaching staff that are well-compensated and provide ongoing professional development opportunities. Moreover, they are responsive to individual children's needs, provide environments that are conducive to learning and exploration, and incorporate children with special needs in regular classrooms whenever possible. Ready schools also ensure that second-language learners receive age-appropriate, culturally sensitive, and challenging curriculum instruction.[48]

Ready schools take responsibility for results, engage in demonstrated best practices, and revise practices that do not benefit children. These schools also serve children in their communities, connecting children and families to resources and services and taking an active role in community activities. Finally, ready schools are supported by strong leadership from school administrators who provide instructional focus and coherence to the programs they oversee.[49]

Children's classroom experiences vary widely according to instructional quality, classroom settings, and educational resources. At the same time, schools typically measure quality teaching by curriculum and teacher credentialing requirements. Leading researchers in the emerging area of ready schools recommend that elementary school staff development efforts include a focus on classroom quality—the experiences and activities in which children engage and the environment in which they learn—and involve classroom observation and consultation with teachers. Schools should also align learning goals and curriculum across grades—prekindergarten through grade three—and across classrooms in the same grade.[50] ▮



## READY COMMUNITIES

"Expanding early-childhood initiatives gives students a greater opportunity to learn and grow, giving them a brighter future in the classroom. If our children are well cared for, we know that our communities are strong and our future is bright."

**– Pennsylvania Governor Edward G. Rendell**

The NGA Task Force on School Readiness believes that communities play a critical role in promoting school readiness. In today's age of devolution, much of the action, responsibility, and decisionmaking for child and family service delivery occur at the local level. Whether or not families have access in their communities to information, health services, and quality care and early learning opportunities can directly impact children's readiness for school. Public assets such as parks, libraries, recreational facilities, and civic and cultural venues provide a better quality of life for children, foster community participation among families, and provide opportunities to engage parents, educators, and care providers in positive activities with children. Recognizing the central role that communities play, many states are supporting local school readiness efforts with technical assistance and public and private funding.

### Ready Communities Maintain a Comprehensive Infrastructure of Resources and Supports

Communities play a key role in affording families access to information, services, and high-quality care and early learning opportunities. Poor children, especially those in minority families, are more likely to live in neighborhoods with limited recreational facilities and inadequate child care.[51] According to a recent survey, municipal leaders nationwide identified child care and early education opportunities as pressing needs for children and families, and one in five local leaders rated young children as one of the groups with the most critical needs in their community. The same survey found that elected local officials overwhelmingly support allocating resources to early childhood development.[52] Even in the face of tight fiscal conditions, nearly half of U.S. cities have increased spending on programs and services for children and families during the past five years.[53]

Communities are at the front line of service delivery for nutrition, health care, mental health care, and high-quality early care and education programs. Local leaders can conduct needs assessments, identify strategies to improve service delivery, and leverage federal, state, and private funding for local initiatives. In some cases, local laws or regulations might inadvertently prohibit home-based family child care or prevent providers from offering flexible care because of restrictions related to traffic, parking, or hours of operation. Local leaders can identify and remove statutory and regulatory barriers to services and streamline delivery systems to improve access and increase efficiency. They can also ensure that their communities invest in parks, libraries, family resource centers, and other community assets that promote educational and physical activities for children. States can support communities in their efforts by providing resources, guidance, and technical assistance to address the comprehensive needs of young children.

### Ready Communities Set Goals and Track Progress

Communities can identify specific goals, evaluate programs, and track child outcomes, such as health, learning, safety, and other indicators of well-being, to measure how children are faring and make informed policy decisions. States can help by providing technical assistance and other resources to conduct needs assessment and evaluations, recommending developmentally appropriate and evidence-based indicators, and supporting integrated data collection efforts across programs and agencies at the local and state levels. Capturing local data on positive outcomes is a powerful way to build grassroots support, engage key stakeholders, and inform state legislators and policymakers on effective strategies and investments.

### Ready Communities Are Engaged in Partnerships with State Decisionmakers

Communities can play an important role in informing state policy. They are often sources of innovation and pilot initiatives that reveal important lessons for state policy and programs. Community leaders also play an important role in generating grassroots support for school readiness initiatives, particularly when local residents see positive results for children in their own communities. States can seek community input in school readiness planning efforts through town meetings and focus groups, and they can include local leaders at the table when developing key policies for young children. ▮

## READY FAMILIES

"The importance of a strong family and caring parents in a child's life can't be overstated. Parents are a child's first and most influential teachers."

**– Idaho Governor Dirk Kempthorne**

The NGA Task Force on School Readiness believes that the family plays the most important role in a young child's life. Parents have the primary responsibility for nurturing, teaching, and providing for their children. It is the relationship between parent and child that is the most critical for the positive development of children.[54] Children need supportive, nurturing environments. However, the new economy has brought changes in the workforce and in family life. These changes are causing financial, physical, and emotional stresses in families, particularly low-income families. Moreover, increasing numbers of new immigrants are challenged to raise their children in the face of language and cultural barriers. Consequently, the role of parents and the condition of families should be a central concern for policymakers interested in promoting school readiness.

### Parents of Ready Families Are Supported in Their Roles As Their Children's First Teachers

Parents play a primary role in the healthy development of their children. Children who experience sensitive, responsive care from a parent perform better academically and emotionally in the early elementary years. At the same time, not surprisingly, financial and emotional stresses negatively impact parents' well-being and adversely affect their attentiveness and sensitivity to their children.[55] Beyond the basics of care and parenting skills, children benefit from positive interactions with their parents (e.g., physical touch, early reading experiences, and verbal, visual, and audio communications). They also depend on their parents to ensure that they receive prenatal, well-baby, and preventive health care; receive optimal nutrition; and live in safe and stimulating environments where they can explore and learn. By supporting parents as their children's first teachers, states can help ensure that family environments provide stimulating, interactive experiences to nurture children's early learning.

States already use several strategies to provide parents with information, training, and support. Options include relatively low-cost parent Web sites or information kits. They also include higher-cost, higher-intensity initiatives, such as home visiting programs (e.g., the Parents as Teachers program or Home Instruction for Parents of Preschool Youngsters program) and family literacy programs (e.g., Even Start). When these programs emphasize high-quality, well-implemented services, are staffed by well-trained professionals, and are linked with other family supports, they are more likely to demonstrate success.[56] In addition, states can promote stronger connections among families, teachers, and care providers to strengthen parents' knowledge of developmentally appropriate activities.

### Ready Families Provide Safe, Stable, and Economically Secure Homes

The well-being of young children is significantly related to the economic success and well-being of their parents.[57] There is also strong evidence of the detrimental effects of economic hardship on child development. Child poverty is associated with higher rates of low birthweight and infant mortality, substandard nutritional status and poor motor skills, higher risk of physical impairment, lower cognitive scores, and lower school achievement.[58] Nearly one in five U.S. children below age five (19 percent) lives in poverty. The rate is higher for black children below age five (36 percent) and Hispanic children below age five (29 percent) than for white children below age five (16 percent).[59] Parents, particularly those who have very low incomes or are socially isolated for other reasons, can benefit from family support services and outreach efforts. Policies addressing housing, family income, asset development, job creation, workforce development, and health insurance coverage all play an important role in helping working parents provide a stable and nurturing home environment.

Child abuse and child neglect stall early learning for many children. They are associated with both short- and long-term negative consequences for children's physical and mental health, cognitive skills and educational attainment, and social and behavioral development.[60] Abuse and neglect affect a significant number of young children in America. In 2001 77 percent of all children who died from abuse or neglect were younger than age four.[61] Moreover, it is estimated that 12 percent of children below age five have had some connection with the child welfare system.

A parent's mental health status is also critical to school readiness. Maternal depression is linked to greater risks for academic, health, and behavior problems in children.[62] Among individuals receiving public assistance, the depression rate is estimated to be between 30 percent and 45 percent.[63] Parental substance abuse is another factor affecting children's readiness for school.[64] Therefore, policies that address maternal mental health issues, parental substance abuse, and child abuse and neglect can help promote school readiness and should be considered among the policy options.

This nation's parents are working harder and longer than ever before. Early attachments are critical to child development.[65] With more parents of young children in the workforce, the need for family-friendly policies and supports is becoming more apparent. Policies such as the federal *Family and Medical Leave Act of 1993* make it possible for some parents to spend the first important weeks of their children's lives at home. Although many aspects of creating family-friendly workplaces fall within the purview of employers, states can promote policies that help families better meet the needs of both their young children and their employers. These policies include, for example, paid family leave and child care tax credits for individuals and employers. States can also invite members of the business community to join school readiness policy discussions to add their perspective and win new allies. They can also recognize businesses and employers for supporting parents through family-friendly business awards.

**Ready Families Are Supported By and Connected To Their Communities**

Because the United States is such a diverse nation, educators, policymakers, and service providers face a tremendous challenge in identifying the needs of children and communicating with families with different ethnic, cultural, and linguistic backgrounds. Regardless of home language and cultural perspective, all families should have access to information and services and should fully understand their role as their children's first teachers. Although communities may be in a better position to address these diversity issues, states can play a role in supporting and guiding local efforts to develop communications and outreach strategies for families of varying backgrounds.

To effectively plan and implement early learning programs for young learners with diverse backgrounds, teachers and administrators should understand language learning and second-language acquisition and use research-based approaches to assess the abilities and learning needs of young second-language learners. It is also helpful when teachers and administrators are familiar with the cultural and linguistic backgrounds of the children they serve.[66] Efforts to improve communication and cultural continuity between early learning programs and the home are also necessary. Early childhood educators can collect relevant information about the linguistic and cultural home environments of their students. In addition, recruiting care providers and early childhood educators with different ethnic, cultural and linguistic backgrounds can help bridge the cultural divide and ease communications between families and program staff.[67] ▮

## READY CHILDREN

"Enabling every child to succeed is my number one priority. It drives our agenda and fuels my enthusiasm. Early childhood education and health care will enable every child to enter school ready to learn."

**– Ohio Governor Bob Taft**

The NGA Task Force on School Readiness believes that the first five years of life are a critical period for all child development domains—physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge.[68] The task force also recognizes that states, communities, schools, and families play a critical supporting role for children from birth to age five. Before age three, a child's brain grows with remarkable speed, laying the foundations for developing the skills and competencies that children will need for success in school and in life.[69] Learning and development in early childhood are nonlinear and episodic, however, meaning that children of the same age may naturally reach different developmental milestones at different points. The range of what is considered developmentally "normal" is far wider in the early years than it is at any other stage of life.[70]

Yet, by age five, most children will attain the foundational skills across all developmental domains that are critical to school readiness. Significant numbers of children enter kindergarten without these skills, however, and it is these children who typically start behind and stay behind. Research has unveiled significant differences on measures of cognitive skills between minority and low-income children and their middle-class counterparts beginning before kindergarten and persisting as children continue through school.[71] Risk factors for school "unreadiness" include poverty, family instability, child abuse and neglect, poor-quality child care, and limited access to health care and adequate nutrition.[72] Fortunately, there is increasing evidence that early intervention, high-quality early learning programs, and related supports for young children and their families can be effective strategies in narrowing the achievement gap and ensuring that children enter school ready to succeed.[73]

The task force believes that while the family plays the most important role in a child's life, state policies can support parents and other caregivers in promoting children's development before birth through infancy to the elementary years and beyond. These policies should seek to ensure that all young children have access to high-quality care and learning opportunities at home and in other settings as well as access to nutrition, mental health, prenatal and child health, and other necessary services. States should also seek to ensure that policies and programs adequately reach children in foster care and children with special physical, cognitive, emotional, or other developmental needs.

### Ready Children Are Supported Across Developmental Domains from Birth to Kindergarten Entry and Beyond

Researchers and policymakers now agree on a definition of children's readiness that incorporates five interrelated, interdependent dimensions of development. All five dimensions are critical to learning, and underdevelopment in one will negatively impact the others.[74]

*Physical Well-being and Motor Development*

A child's health status affects his or her ability to explore and learn by doing, seeing, hearing, and experiencing. Nutrition, physical health, and gross and fine motor skills all have a bearing on early learning.[75] Primary and preventive health care services for children in the first years of life support healthy growth and development, increase early identification of special needs, and reduce morbidity and mortality. Providing services to young children also affords an opportunity to teach parents about prevention and child development and to help them develop parenting skills.[76]


### *Social and Emotional Development*

Young children build understanding by interacting with others and their environment.[77] Social and emotional development refers to children's capacity to experience, regulate, and express emotions; form close and secure interpersonal relationships; and explore the environment all within the context of family, community, and cultural expectations.[78] Put simply, social and emotional development forms the basis of children's knowledge of "how to learn."[79] Children learn best when they are able to cope with their emotions and control their impulses, when they can relate with and cooperate with their peers, and when they can trust and respond to the adults responsible for their care and education.[80] Children who can regulate their own emotions are also better at concentrating and focusing on tasks, two elements of cognitive development.[81] Children begin to develop social and emotional capacities in early infancy. Infants and toddlers, like adults, can develop serious psychiatric disorders, such as depression, attachment disorders, and traumatic stress disorders that affect their successful social and emotional development.[82] Once in kindergarten, children lacking social and emotional skills often have a harder time getting along with their classmates, may experience negative feedback and stricter disciplinary action from teachers, and may quickly lose their eagerness to learn.[83] Services and supports that promote young children's social and emotional development and mental health (e.g., early intervention and mental health services for infants and toddlers, Early Head Start, home visiting programs, and classroom-based social competence interventions[84]) can contribute to children's readiness to learn.[85]

### *Approaches to Learning*

A positive attitude and enthusiasm are critical to learning. Children learn best when they are motivated to apply their skills and knowledge to further their understanding of the world around them.[86] Curiosity, persistence, and attentiveness to tasks are critical to learning, as are supportive, nurturing environments that encourage creativity, imagination, and direct engagement in activities and play. A longitudinal study of the nation's kindergartners shows that children experiencing some risk factors, such as low maternal education, receipt of public assistance, and living in a single-parent household, are less likely to be seen as eager to learn by their teachers than are children not demonstrating these risk factors. Moreover, white and Asian children are more likely to be seen as eager to learn by their teachers than are black or Hispanic children.[87]

### *Language Development*

Children learn best when they can communicate effectively and are encouraged in the development of emerging literacy skills.[88] Early language and emergent literacy are interrelated skills that are the foundations for the complex process of learning to read, write, and communicate.[89] The process begins in the earliest years of life; speaking, reading aloud, and singing to infants and toddlers stimulates their understanding and use of language and form the basis of emergent literacy behaviors (e.g., book handling, looking and recognizing, picture and story comprehension, and story-reading behaviors).[90] The quantity and quality of language and early literacy interactions during the preschool years affect the development of language and literacy skills throughout the early elementary years.[91] Preliminary findings of the National Early Literacy Panel suggest that certain skills are directly linked to early literacy development, including knowledge of letters and print concepts, invented spelling, listening comprehension, oral language and vocabulary, and phonemic awareness.[92] As children learn print concepts (e.g., letters have distinct forms, letters are related to sounds, and letters create words), they also learn conventions of reading (e.g., words in print are read from left to right and from top to bottom on a page). Literacy-

rich environments are important, and early education settings that contain interactive print materials are associated with better emergent literacy. Engaging children simultaneously in reading activities and phonological training has also proven to be an effective strategy.[93] Children's language and preliteracy skills at kindergarten entry predict later academic outcomes, and a clear gap exists between children from economically disadvantaged environments and their more affluent peers.[94]

### *Cognition and General Knowledge*

Children learn best when they can apply their knowledge and skills to increase their understanding of the world around them (e.g., planning, problem solving, symbolically representing everyday experiences, comparing and contrasting objects, developing spatial and numerical reasoning, and drawing associations).[95] The skills and knowledge that support problem solving, such as understanding numbers, shapes, and mathematical operations, contribute to critical thinking and cognitive development. General knowledge refers to children's depth and breadth of understanding about the social, physical, and natural world and to their ability to draw inferences and comprehend implications.[96]

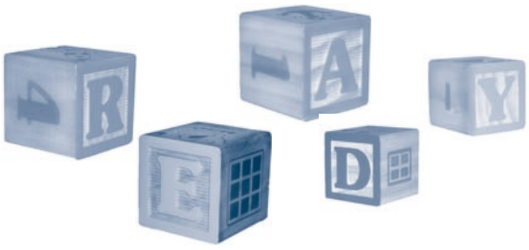
## Ready Children Have Access to High-Quality Early Care and Learning Opportunities

Stable relationships with caring adults and safe, nurturing, and stimulating environments are all fundamental to school readiness. While parents typically provide the first layer of these experiences for children, in the current economy most mothers are now participating in the workforce by choice or necessity. As a result, 12 million young children, or 61 percent, spend at least some of their time in the care of adults other than their parents.[97] Moreover, increasing awareness of the benefits of high-quality early learning opportunities is leading families to seek such programs regardless of their work and child care needs.[98] Therefore, any discussion of school readiness should consider the environments in which children from birth to age five spend their time and the adults with whom they interact at home and in formal or informal early care and education settings. States have various options for addressing the challenges based on their needs, priorities, and resources. The key is to develop a comprehensive vision for meeting the needs of all children and deciding on strategic steps that will ensure progress over the long term.

### *Care and Education Arrangements for Children from Birth to Age Five*

States face several continuing challenges in providing quality care and early learning opportunities for all children from birth to age five. Market forces are insufficient to support a healthy supply-and-demand relationship that supports high-quality, affordable early care and education options for families. High-quality settings are often hard to find and prohibitively expensive for low- and even middle-income families.[99] Many publicly supported programs are scattered across various state agencies, making them difficult for families to access and causing service duplication and administrative inefficiency.

U.S. children receive early care and education experiences through a continuum of formal and informal settings that includes parents and other family, friends, neighbors, child care and early learning centers, and prekindergarten programs. Many children experience more than one of these settings between the time they are born and age five, and all these settings offer opportunities for promoting school readiness.[100] The type of early care and education setting chosen tends to vary, most particularly by age and family income. Data for 2001 from the National Household Education Survey suggest that among children from birth to age six who were not yet in kindergarten and who were in




nonparental care and education settings, 34 percent were in center-based care, 23 percent were in relative care, and 16 percent were in nonrelative care (i.e., friend or neighbor care). Children below age three and low-income children were more likely to be in home-based family, friend, and neighbor care. Children ages three to six and higher-income children were more likely to be in a center-based child care arrangement, including nursery schools and other early childhood education programs. Factors such as race and ethnicity, maternal education, and maternal employment status (i.e., full time or part time) impact care arrangements to a lesser extent.[101]

Regardless of the early care and education setting (e.g., home, center, or school) or the age group that it serves (e.g., infants, toddlers, or preschoolers), the quality of the experience is associated with warm and responsive adults, language-rich environments, and ample opportunities for learning and exploring.[102] In formal early childhood care and education programs (i.e., center-based care or prekindergarten programs), quality rests on both structural characteristics (e.g., staff-child ratios and requirements for teacher education) and process features (e.g., interactions between staff and children and curriculum and teaching practices). High-quality programs offer small classes with well-prepared teachers, foster close teacher-child relationships, and encourage family involvement. Such programs also emphasize and connect social-emotional and academic learning.[103]

Nationally, two-fifths of children ages six and younger who regularly receive nonparental care are cared for by family, friends, or neighbors. (Nonparental care is also referred to as kith-and-kin, informal, or license-exempt child care.) Most children in this care setting are infants and toddlers, and parents typically choose family, friend, and neighbor care because it is flexible, is provided by known and trusted individuals, and sometimes offers shared language, culture, and values.[104] This type of care is largely unregulated and often is not connected to professional resource networks or state early care and education systems. With so many young children in their care, family, friend, and neighbor providers are a largely untapped link to support children's early learning experiences. States and communities can offer them information, materials, equipment, and training on nutrition, child development, early learning, health and safety, and other topics. States can also include family, friend, and neighbor care representatives in local and state planning and policy bodies, develop early learning standards that are applicable to informal care settings, and offer training, guidance, and resources to these providers on how to apply the standards in their daily activities with children. Family, friend, and neighbor care providers can also be integrated into state career development systems and subsidy reimbursement systems. States can also encourage stronger connections between these providers and local and state child care resource and referral agencies.[105]

### *Programs and Services for Children from Birth to Age Three*

In the first three years of life, children learn in the context of relationships with family members and other important caregivers. All infants need ample time with their parents at the very beginning of their lives to form these critical relationships. However, many parents do not have the option of staying home full time with their newborns. Moreover, infants and toddlers living in high-risk environments need additional supports to promote their healthy growth and development. Just over half of all children below age three (52 percent) are in nonparental care at least some of the time, and most of this care is family, friend, and neighbor care rather than center-based care.[106] For most families, high-quality infant and toddler care is typically the most expensive and the hardest to find, but comprehensive

programs can produce substantial benefits in the first three years of life.[107] For example, the federal Early Head Start program for low-income infants, toddlers, and pregnant women has yielded early gains in measures of children's readiness, family self-sufficiency, and parental support of child development. At current funding levels, however, Early Head Start serves just three percent of those eligible.[108] States can consider expanding Early Head Start or developing similar voluntary comprehensive initiatives for children in the very early years. In addition, they can play a role in informing parents about what very young children need, of the benefits of high-quality infant and toddler care, and how to recognize effective programs. Moreover, states can expand subsidies and other strategies to make such care affordable. They can expand capacity, improve the quality, and increase the affordability of infant and toddler early care and education options for families through incentives, standards, and professional development and training. States can also connect providers to specialists in infant and toddler development, health, and mental health; expand developmental screening services; and provide parents, caregivers, and early childhood education providers with easy access to information on child development in the very early years.

#### *Prekindergarten Programs for Three- and Four-Year-Olds*

The federal Head Start program provides comprehensive early care and education services to more than 900,000 eligible low-income and special needs children. With evidence that high-quality prekindergarten programs help close the achievement gap and provide children with the skills they need to be successful in kindergarten and beyond, support is growing for states to increase prekindergarten programs for four-year-olds (and, often, three-year-olds). Many states are expanding prekindergarten services through public schools or in combination with local child care, Head Start, and other community programs. The quality of a prekindergarten program is determined by the educational attainment and in-service training of teachers, the size of classes and groups, the effectiveness of the curriculum, attainment of national accreditation, and the degree to which learning standards are linked to K-12 expectations.[109] Support infrastructure and accountability measures are also critical to quality.[110] Recognizing the importance of learning in these out-of-home experiences, 38 states now invest in prekindergarten—spending close to $2.5 billion to serve about 740,000 children—and that number is increasing.[111] Despite the increasing investments, however, many working families still struggle to find and pay for high-quality programs. Moreover, finding high-quality, affordable care for the hours before or after the typical half-day preschool program is also a formidable challenge.

States have an opportunity to integrate prekindergarten initiatives with community-based child care programs. This strategy, which many states are now adopting, builds on existing infrastructure to serve greater numbers of children. It also provides an opportunity to integrate child care and prekindergarten program standards and learning guidelines to ensure consistent, high levels of quality, regardless of the setting.[112] In many cases, integrating child care and prekindergarten programs for four-year-olds has also improved the quality of care for infants and toddlers.[113]

### Ready Children Are Supported and Cared For in the Face of Family Instability or Special Needs

Children with special needs and children in foster care should not be overlooked in school readiness policy discussions. These children are at exceptionally high risk of physical, emotional, and developmental delays and are the most likely to benefit from school readiness interventions. Yet these children are typically served under separate state systems, often

compartmentalized from the broader early childhood population and, consequently, are left out of the school readiness equation. States can ensure that all systems that serve young children, including prekindergarten, child care, mental health, foster care, early intervention, and maternal and child health systems, are connected to one another and recognize their collective role in promoting school readiness for all children. They can align eligibility guidelines, streamline in-take procedures, cross-train professionals in child development, and encourage cross-program referrals and joint outreach and information efforts to parents. States can also integrate service delivery efforts, colocate programs, and partner with community organizations to provide comprehensive services.

### *Children with Special Needs*

Premature birth; genetic conditions, such as Down Syndrome; and physical disabilities, such as hearing impairment or cerebral palsy, pose significant developmental challenges for young children. Environmental risk factors, such as parental drug or alcohol addiction, extreme poverty, family mental health problems, and exposure to violence, abuse, or neglect, can also cause developmental delays.[114] Fortunately, early intervention is effective in helping children overcome these challenges. Early intervention screening can help identify whether children need, for example, enhanced educational experiences or physical, occupational, or speech and language therapy. Home visiting programs and parent support groups are also effective strategies.[115] Early intervention services can be delivered in homes, Early Head Start programs, child care and preschool programs, or other early childhood settings. Federal funding sources for early intervention efforts include Parts B and C of the Individuals with Disabilities Education Act (IDEA), Early Head Start, and Medicaid's Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program. State mental health systems can provide consultation and education services to early care and education providers to promote early identification and referrals for children with social-emotional development challenges. The infrastructure for some early intervention programs and services already is in place in states, and an opportunity exists for further service integration and collaboration with other early care and education efforts.

### *Children in Foster Care*

Children below age five account for nearly 30 percent of all children in foster care, and this percentage is growing at an alarming rate.[116] Moreover, infants and young children tend to remain in foster care longer than do older children; approximately 20 percent of children below age six remain in out-of-home care for six years.[117] Young children in foster care often display severe physical, developmental, and emotional needs. Nearly 80 percent are at risk for medical and developmental problems related to prenatal exposure to maternal substance abuse; more than 40 percent suffer from physical health problems; and more than half display developmental delays—almost five times the percentage found among children in the general population.[118] At the same time, most of these children lack access to basic health care and early intervention services that could help them overcome these challenges. Finally, a significant number of children in foster care experience multiple placements that negatively impact their social and emotional development. Early intervention and screening, health and mental health treatment, and family support services to foster parents and biological parents can promote early identification of children's developmental challenges and encourage secure, healthy, stimulating home environments.[119]

**Ready Children Are Supported by Ready States, Ready Schools, Ready Communities, and Ready Families**

Responsibility for school readiness lies not with children, but with the adults who care for them and the systems that support them. Starting at the top, states are responsible for making informed policy decisions, committing sufficient resources, and connecting programs and services to all children who need them. Across all early care and education arrangements for infants, toddlers, and preschoolers, states have responsibility for setting program standards for health, safety, and staffing and learning standards for what children should be encouraged to know, do, and experience. They determine professional development criteria and decide policies for compensation and program evaluation. States also play a role in promoting relationships with the higher education and early care and education professional communities to improve the professional development and training system. In addition, they provide incentives and scholarships for early childhood professionals to seek higher credentials and training. Finally, states can support parents by providing information on child development and quality care and education options, pursuing strategies to make high-quality care more affordable, and giving parents an equal voice in school readiness policy discussions.

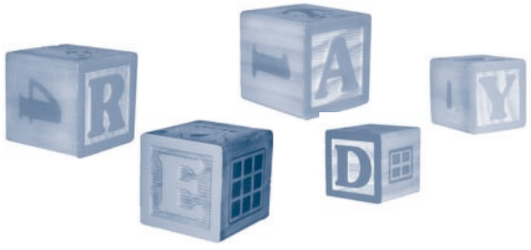
Across all systems that serve young children, including prekindergarten, child care, foster care, early intervention, and maternal and child health, states can improve cross-system collaboration and recognize the role each system plays in promoting school readiness for all children. States can align eligibility guidelines, streamline in-take procedures, cross-train professionals in child development, and encourage cross-program referrals and joint outreach and information efforts to parents. States can also integrate service delivery efforts, colocate programs, and partner with community organizations to provide comprehensive services. Finally, states can bring together stakeholders, including families, schools, and communities, to identify challenges, develop priorities, and implement solutions at the state and local levels. ▮

## CONCLUSION

The NGA Task Force on School Readiness believes that governors are in a critical position to support parents, communities and schools in ensuring that all children enter kindergarten ready to reach their full potential. States have multiple options for achieving this goal, and many states are already leading the way in coordinating intersections among programs, services, and policies, in supporting evidence-based practices, and in seeding innovation at the local level.

Governors can provide leadership over efforts to promote school readiness and focus the talent and energy of public and private stakeholders on a clear vision and common agenda for young children. In particular, governors can focus on building "ready states" by supporting a coordinated and comprehensive infrastructure for early childhood, integrating data systems and supporting evaluation efforts to inform decisions, and holding decision-makers and stakeholders accountable for measurable results. Finally, governors can provide flexibility to local communities to match resources with needs in exchange for positive child outcomes.

Achieving school readiness cannot be accomplished by any single agency or individual. It requires public-private partnerships and strong leadership from governors. Working together with communities, schools and families, states can continue to build the foundation for all children's bright futures. ▮



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# A Governor's Guide

to School Readiness

## Building the Foundation for Bright Futures



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# Building the Foundation for Bright Futures

# PREFACE

The National Governors Association (NGA) Center for Best Practices offers *Building the Foundation for Bright Futures: A Governor's Guide to School Readiness* as a companion piece to *Building the Foundation for Bright Futures: Final Report of the NGA Task Force on School Readiness.* Under the 2002–03 chairmanship of former Governor Paul E. Patton of Kentucky, NGA established a gubernatorial Task Force on School Readiness to identify actions that governors and states can take to support families, schools, and communities in their efforts to ensure that all children are ready for school. The task force continued under the leadership of the 2003–04 NGA chair, Governor Dirk Kempthorne of Idaho. Participating governors included Governor Mike Huckabee of Arkansas, Governor Jennifer Granholm of Michigan, former Governor Bob Holden of Missouri, Governor Bob Taft of Ohio, Governor Edward G. Rendell of Pennsylvania, and Governor Mark Sanford of South Carolina.

This governor's guide ties the state policy recommendations of the task force to concrete examples of state initiatives to promote school readiness. It includes key considerations for state policymakers and resources to help inform their decisions. The guide follows the same readiness framework as the task force report, presenting what states are doing to build Ready States and to support Ready Schools, Ready Communities, Ready Families, and Ready Children.

The program and policy examples are representative of current state efforts to support the adults, institutions, and systems seeking to ensure that all children enter school ready to reach their full potential. Not every option entails a high price tag, and opportunities exist to leverage flexible funding sources and coordinate existing programs and policies to serve children more effectively and efficiently. Besides the specific program and policy examples, this guide highlights emerging state strategies to align all school readiness efforts toward common goals for children. Links to additional electronic information are included throughout the publication.

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School readiness is a term used with increasing frequency to describe expectations of how children will fare upon entry to kindergarten. Children who enter with the "right" skills and knowledge are more likely to succeed in school than are their peers who are less well prepared.[1] Children's social and academic success has significant implications for the well-being of families and communities and the growth of state and national economies. Families, communities, schools, and states have a strong interest in ensuring that children are ready for kindergarten, and they all play an important role in building the foundation for children's bright futures.

## School Readiness Defined

Years of research on child development and early learning show that several interrelated domains of development define school readiness—physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge.[2] These domains are important, build on one another, and form the foundation of learning and social interaction. Ready children are those who, for example, play well with others, pay attention and respond positively to teachers' instructions, communicate well verbally, and are eager participants in classroom activities. They can recognize some letters of the alphabet and are familiar with print concepts (e.g., that English print is read from left to right and top to bottom on a page and from front to back in a book). Ready children can also identify simple shapes (e.g., squares, circles, and triangles), recognize single-digit numerals, and count to 10.[3] Life experiences directly impact a child's development beginning at birth and continuing through childhood.[4] Families, schools, and communities play a central role in shaping these experiences, and states are providing leadership to develop a coordinated service and policy infrastructure to support them.

## Common Elements of State School Readiness Policy

States are leading the way in promoting school readiness. The programs, services, requirements, and funding sources they are using are as varied and complex as are children's developmental needs at this stage. Perhaps the greatest challenge for states lies in coordinating the different programs and services to ensure the right ones are reaching the right children in the right way. Whether addressing broad system-building issues or individual program decisions, however, state policy considerations share common elements related to leadership, administration, accountability, and funding that ultimately affect outcomes for children.

### *Leadership in Decisionmaking*

For governors, the first order of business is generally defining a vision for school readiness and assigning responsibility for key decisions at the state level. To overcome historical silos between programs and among agencies, many governors are tapping top state leadership to develop consensus and identify priorities for state action. Collaborative governance mechanisms vary among states and include children's cabinets, public-private commissions, and intergovernmental agencies or task forces. Regardless of the structure, these collaborations typically build consensus on a vision and goals for the state and review existing investments and policies to identify gaps, overlaps, and leveraging opportunities. In addition, they seek input from diverse public and private stakeholders at the state and local levels, aim to reach agreement on priorities, and outline strategies for achieving short- and long-term goals. Moreover, they raise the profile of school readiness issues, help define stakeholder roles, and often are a means to ensure accountability for decisions made at the top. Such collaborative efforts also help governors and states make bottom-line decisions about which services the state will offer, who will offer these services, and how much the state will invest. Increasingly, states are focusing on evidence-based practices and measuring results to inform decisions. Further, they are working to build on and integrate existing service infrastructures, leverage public and private resources, and avoid duplication across programs.

### *Administration and Delivery*

States have considerable control over many decisions related to funding, eligibility, and implementation. With flexible funding sources (e.g., federal block grants or state general funds), states often have discretion over who is eligible for what services—all families (voluntary or mandatory), at-risk children (as the state defines), or families within specified geographic regions or demographic groups. Depending on the scope and range of services, states may opt to

implement efforts statewide immediately, in a more limited way at initial pilot sites, or gradually through a phased-in rollout. States also decide who is eligible to deliver services (e.g., schools, nonprofit organizations, faith-based providers, or local public agencies) and how funds will be allocated (e.g., through competitive application or formula grant). The decisions will vary depending on the goals and intended outcomes, the services to be delivered, and the existing state and local infrastructure.

### *Accountability*

Increasingly, states are relying on local stakeholders to match services with needs at the community level. State-level entities are offering support, guidance, and incentives, in addition to performing basic administration and oversight functions. In this capacity, states must decide what training and technical assistance to offer, who will provide these supports (e.g., agency staff or private partners), and what financial support and incentives are available to local providers and decisionmakers. Finally, states must determine whom to hold accountable for what outcomes (e.g., fiscal outcomes and child and family outcomes), how to measure results, and what rewards and sanctions to offer.

### *Funding*

For state decisionmakers, the chief question is typically how to pay for the services and supporting infrastructure necessary to reach families and achieve the desired child and family outcomes. States have several sources of public and private funding from which they can draw, depending on intended goals and services. Among the many potential **federal** sources available for school readiness initiatives, there are a few major funding streams.

- The **Community-Based Family Resource and Support Program** and **Promoting Safe and Stable Families** grants fund state efforts to strengthen families and reduce incidents of child abuse and neglect through community-based, prevention-focused family support programs.
- The **Temporary Assistance for Needy Families** and **Child Care and Development Fund** block grants provide states with flexible funding to promote the well-being of children and self-sufficiency of their parents.
- **Even Start** offers resources to states to help break the cycle of poverty and illiteracy by integrating early childhood education, adult literacy and basic education, and parenting education into a single family literacy program.
- The **Maternal and Child Health Block Grant** provides funds to help states strengthen integrated service systems to promote the health and well-being of children and families.
- **Part B** and **Part C** of the *Individuals with Disabilities Education Act* offer funding for infant and toddler early intervention and early care and education services for preschoolers with special needs.
- **Title I** of the *Elementary and Secondary Education Act* provides resources to local school districts to support academic achievement for at-risk students. (Although Title I is a source of funding for local communities, states can encourage districts to use the funds for early education services.)

States often contribute their own resources in addition to or separately from federal funds to expand services, strengthen infrastructure, or pursue state-specific priorities. State general funds are sometimes allocated to support school readiness efforts and are typically distributed to local communities through formula grants, competitive grants, or matching programs. Some states dedicate revenue streams—sales taxes, gaming or gambling fees, state lottery revenues, or tax-exempt bonds—to school readiness initiatives. In many cases, states encourage or require local contributions. Funding sources include local property taxes, local fees, parent contributions, federal-to-local funding sources such as Title I, and philanthropic, business, and community fundraising.

## What Governors Can Do to Promote School Readiness

States are continuing to serve as laboratories of innovation for school readiness policy and practice. In many cases, the most rewarding work and significant accomplishments lie not in the specific programs or services offered, but in the behind-the-scenes collaboration and partnering occurring among public and private stakeholders at the state and local levels. Ensuring that all children are ready for school is a formidable challenge that no single individual, program, or agency can meet alone. It takes individual and institutional leadership to move beyond immediate concerns and commit to a broader long-term vision. It also takes courage to build trust where turf battles are the historical norm. Most of all, it takes smart planning, strategic thinking, and effective communication to reshape institutional and cultural mindsets and implement true systemic change.

Perhaps the most important role that governors can play is in providing leadership over efforts to build Ready States. Governors can bring traditional and new voices to the school readiness table, put their authority behind cross-system collaboration efforts, and demand accountability among stakeholders for decisions and results. Perhaps most significantly, governors can emphasize the central role of parents in their children's lives and clearly define the state's role in supporting families within the context of communities and schools to ensure that all children start school ready to reach their full potential. ▮

Promoting school readiness is a complex and multifaceted effort that requires public- and private-sector involvement. There are no one-size-fits-all approaches that states can adopt quickly or easily. The proven strategies are as varied as are the needs of individual children, and states are already investing in numerous efforts to support children and families. For most states, the key challenge is to bring together all the disparate pieces of the "nonsystem" (e.g., health, child welfare, family support, early intervention, and early care and education) into a coordinated infrastructure of services, programs, and decisionmaking. Top-level public- and private-sector leadership often determines whether systemic change occurs and is sustained over the long term. Accordingly, governors have an important opportunity to lead key agencies and decisionmakers to design strategies that meet the needs of families and the long-term fiscal and social policy goals of their state.

In its final report, the NGA Task Force on School Readiness recommends that governors ensure Ready States by:

- developing a vision and strategic plan for school readiness that considers the role of families, schools, and communities and that addresses the developmental needs of children beginning before birth to kindergarten (and beyond);
- building a comprehensive and coordinated statewide system for school readiness; and
- ensuring accountability for results across agencies and between the state and local levels.

## Forging a Vision and Setting Priorities for School Readiness

Governors can provide leadership in bringing together the multiple, and often competing, voices for children in a state to build consensus on a shared vision, common goals, and mutual priorities. Many states are already collecting funding and outcomes data to identify gaps and duplication of services, set priorities, and inform policy decisions. They are also adopting strategies to measure progress toward common goals and communicate results to policymakers and the public. The most successful efforts tend to enjoy strong gubernatorial support and involvement from influential private nonprofit and for-profit stakeholders. To sustain momentum and ensure a continued legacy, governors should celebrate successes, no matter how small, along the way. They should also communicate results effectively to key audiences (e.g., parents, legislators, community leaders, service providers, and the public). Moreover, they should pursue strategies to sustain efforts in the face of changes in political leadership or policy priorities (e.g., by seeking to codify changes through statute and building strong grassroots and private-sector support).

Several states are taking advantage of national opportunities, such as the federal Maternal and Child Health Bureau's State Early Childhood Comprehensive Systems (ECCS) Project or the multistate Build Initiative of the national Early Childhood Funders Collaborative (see National System-Building Initiatives for School Readiness on page 8). Governor Dirk Kempthorne and First Lady Patricia Kempthorne of **Idaho** are capitalizing on the state's federal ECCS grant to support an Early Care & Learning Cross Systems Task Force to improve coordination across all systems that serve young children. The task force vision calls for all of Idaho's young children to be healthy, nurtured by families with quality learning opportunities, and supported by community resources. The vision is driving the development of a statewide plan that involves communities and families in improving the lives of children. The Governor's Coordinating Council for Families and Children, housed in the governor's office, is directly involved in the task force. The council enables voices from civic groups, government agencies, nonprofit organizations, and the business and faith communities to participate in discussions and decisionmaking on children and families. For more information, visit *http://www.gccfc.idaho.gov.*

**Pennsylvania** is one of several states involved in the national Build Initiative, which seeks to help teams of public and private stakeholders build statewide, comprehensive early learning systems. The commonwealth's strategic workplan for the initiative incorporates Governor Edward G. Rendell's priorities for early care and education. These priorities include expanding and improving the quality of early learning programs, ensuring access, engaging and educating parents and the public, and improving the coordination and integration of all systems

that provide early childhood services. With the governor's leadership, Pennsylvania increased funding for early care and education for fiscal 2004–05 with $15 million in new funds for state-expanded Head Start programs, $30 million to support child care quality and accessibility improvements, and $225 million for the Education Accountability Block Grant to local school districts. Two-thirds of the block grant funds will support three early learning options—prekindergarten programs, full-day kindergarten, or class size reduction in the early elementary grades. For more information, visit *http://www.pde.state.pa.us/early_childhood/cwp/view.asp?Q=104772&A=179.*

**Wisconsin** Governor Jim Doyle released a comprehensive vision and strategic plan to invest in children and their families. KidsFirst is based on broad input from state leaders and local and private stakeholders. It establishes school readiness as the first of four goals; the others are strong families, healthy kids, and child safety and well-being. The plan identifies immediate action steps, potential areas for public-private partnerships, and strategies to achieve a long-term legislative agenda. In support of school readiness, the governor's plan focuses on improving parents' options for high-quality early care and education, investing further in early childhood professional development, expanding kindergarten programs for four-year-olds, and conducting public awareness efforts to promote early literacy experiences. For more information, see *http://www.wisgov.state.wi.us/docs/kidsfirst.pdf.*

In 2003 **Hawaii** became one of the first states in the nation to adopt a definition of school readiness in statute: "Young children are ready to have successful learning experiences when there is a positive interaction among the child's developmental characteristics, school practices, and family and community support." Hawaii's School Readiness Task Force involved public and private stakeholders in the process to develop this definition, which both publicly communicates school readiness as a priority and guides decisionmaking at the state and local levels. The task force represents the early childhood arm of Hawaii's P–20 Initiative to link early learning, K–12, and postsecondary goals and expectations. For more information, visit *http://www.goodbeginnings.org/school.htm.*

**Arizona** Governor Janet Napolitano engaged the public-private advisory State Board on School Readiness to inform her "5-Year School Readiness Action Plan" that aims to improve the early care and education system and increase the long-term educational success of children in the state. As a first step, Arizona is developing a quality ratings system for child care to inform parents about quality and offer child care providers technical and financial assistance to improve quality. The governor supports efforts to build a high-quality early care and education workforce through scholarships, wage enhancements, and a new Early Education Emerging Leaders program. She is also seeking to implement a health consultation system for child care providers and preschool programs. For more information, visit *http://www.governor.state.az.us/cyf/school_readiness/index_school_readiness.html.*

## Building and Governing a School Readiness System

Building a true system of coordinated services and policies for young children requires a strong commitment to collaboration and systemic change on the part of state leaders. Agency executives must be willing to rethink the way they do business and be prepared for shifts in lines of authority over programs and decisions. Governors can lead state efforts to build school readiness systems. For example, they can create children's cabinets or commissions to promote coordination and collaboration. They can also give agencies joint authority over programs and decisions. Moreover, governors can bring all related programs and services for young children under one existing agency or create a new agency to focus on this population.

The historical and political contexts of states vary, so there is no single best arrangement to administer and govern school readiness policies and programs. Each approach brings different benefits and challenges. For example, creating a statewide agency for birth-to-five programs may increase alignment and efficiency among those programs, but it may also create or reinforce disconnects between K–12 and public health services. A collaborative governance body may bring all relevant voices to the table, but it may also increase the difficulty of reaching consensus on a common agenda. Regardless of the governance structure, states should consider collaboration mechanisms (e.g., memoranda of understanding or joint authority over funding streams) among all agencies that touch the lives of children and fam-

ilies to bring policies and decisions into alignment. Such partnerships provide opportunities to create, for example, unified data collection requirements, training opportunities, and professional standards across prekindergarten, child care, and Head Start programs.

A growing number of states are encouraging shared governance and program oversight through collaborative bodies, including cross-agency commissions or state children's cabinets. Such commissions or cabinets generally seek to raise the profile of children and family issues and promote better coordination among government programs that serve children and families. They typically include various public and private stakeholders from the state and/or local levels, depending on their mission and goals. For a full discussion of state children's cabinets, see the NGA Center for Best Practices' *A Governor's Guide to Children's Cabinets* at *http://www.nga.org/center/divisions/1,1188,C_ISSUE_BRIEF^D_7251,00.html.*

The **Louisiana** Children's Cabinet aims to reduce gaps and duplication of services to children. The cabinet's primary function is to coordinate children's policy across the departments that serve children. It makes recommendations to the governor on funding priorities and maintains a children's budget that details spending on all state initiatives for them. The cabinet is composed of key state agency secretaries, two state legislators, and a representative of the Louisiana Supreme Court. It also relies on recommendations from a 32-member advisory board that is composed of parents, assistant secretaries of state departments, and members of statewide child advocacy organizations. For more information, visit *http://www.gov.state.la.us/ldbc/childrenscabinet/childrenshome.htm.*

In support of her early childhood initiative, Project Great Start, Governor Jennifer Granholm established the **Michigan** Children's Cabinet to improve the effectiveness and efficiency of programs for children and their families. The cabinet is developing a three-year strategic plan that will outline priorities and strategies for accomplishing specific goals. Members include leaders of the state's agencies for education, public health, family services, and labor and economic growth. The Children's Action Network, an advisory body to the cabinet, makes recommendations on prevention and early intervention services for children from birth to age five. Among other charges, the network is tasked with implementing a coordinated early childhood system by 2007. The Children's Action Network includes members of the Michigan Children's Cabinet, members of the child advocacy community, and other key state government staff. For more information, visit *http://www.greatstartforkids.org/about.htm.*

Governors can also authorize joint oversight among state agencies for programs and decisions to ensure alignment of goals and services. The **Arkansas** Departments of Education and Human Services are responsible for implementing several interrelated early childhood initiatives. The two state agencies jointly govern early childhood programs, including parent outreach efforts, community-based early childhood mental health pilot projects, and prekindergarten literacy training that is aligned with K–2 training. Under the departments' joint leadership, Arkansas has aligned learning frameworks for early childhood, prekindergarten, and K–4 education. The two agencies also jointly oversee efforts to track indicators of progress toward intended school readiness outcomes. Most significantly, department officials share responsibility for the state's prekindergarten program. Governor Mike Huckabee appointed an 18-member Early Childhood Commission to advise and inform the joint efforts of the departments. For more information, visit *http://www.state.ar.us/childcare/.*

In September 2004, Governor Rendell announced the creation of a new **Pennsylvania** Office of Child Development within the state's department of public welfare to oversee all of the early childhood and child care programs previously housed in three separate offices. The appointed deputy secretary for the new office serves as the administration's point person for the governor's early learning agenda and also serves as a policy director in the department of education. The new office and the deputy secretary's joint appointment to both agencies are intended to ensure an integrated, unified approach to the commonwealth's early learning programs, which are a high priority of Governor Rendell. For more information, visit *http://www.pde.state.pa.us/early_childhood/site/default.asp.*

A few states are pioneering new strategies to strengthen school readiness systems and decision-making. Two states are leading the way in establishing new state departments to consolidate and streamline early childhood programs. **Georgia's** new Bright From the Start: Georgia Department of Early Care and Learning is charged with coordinating and streamlining the state's early child care programs to help ensure every child in the state enters kindergarten ready to succeed. Formerly the Georgia Office of School Readiness, the department will administer the state's universal prekindergarten program, license center-based and home-based child care programs, and administer federal nutrition programs. In addition, it will house the Georgia Head Start–State Collaboration Office, administer the Child Care and Development Fund 4-percent quality set-aside dollars and other earmarked quality dollars, and manage the contracts of the state's resource and referral agencies. The department will also distribute federal Even Start dollars for early literacy and work collaboratively with Smart Start Georgia—a public-private initiative for services to children from birth to age three—and other organizations to blend federal, state, and private funds to enhance early learning and education. For more information, visit *http://www.osr.state.ga.us/*.

A new **Massachusetts** Department of Early Education and Care will become effective July 1, 2005. By statute, the new department will oversee preschool programs previously administered by the education department. It will also assume related early childhood responsibilities from the office of child care services. For more information, visit *http://www.mass.gov* and search for "Early Education and Care Council."

## National System-Building Initiatives for School Readiness

The *Build Initiative* helps states construct a coordinated system of programs, policies, and services that respond to the needs of young children and their families. With funding from the national Early Childhood Funders Collaborative—a consortium of national and local foundations that have substantial grantmaking programs in early childhood care and education—the initiative supports policymakers, service providers, and child advocates in ensuring that children are safe, healthy, eager to learn, and ready to succeed in school. Build currently provides grants to stakeholder teams in five states—**Illinois, Minnesota, New Jersey, Ohio,** and **Pennsylvania**—to build statewide early learning systems. State teams involve parents, advocates, service providers, state agency officials, business and community leaders, and others who work with children. In addition to funding, state teams receive ongoing technical assistance from national policy experts. Build states identify and achieve measurable outcomes in areas such as evaluation, financing, public engagement, quality improvement, and infrastructure employment. The first-year evaluation of the initiative found that although approaches and priorities differed, each state was able to take concrete steps to move specific policy agendas forward. For more information, visit *http://www.buildinitiative.org/*.

The federal Maternal and Child Health Bureau's *State Early Childhood Comprehensive Systems Project* provides planning grants to help state maternal and child health agencies and partner organizations implement comprehensive early childhood systems that promote the health and well-being of young children, enabling them to enter school ready to learn. The project is supporting efforts in two stages: two years of planning and three years of implementation. In 2003 states received grants of $100,000 for the first planning stage, and they will receive another two years of planning support. The three-year implementation phase, which will provide states with $150,000 per year, will begin in 2005. The project requires states to concentrate on ensuring access to parent education, family support services, medical homes, early care and education services, and mental health and social-emotional development services. Many states have used these funds to supplement efforts already underway and, in many cases, to more directly include maternal and child health systems in comprehensive planning efforts (see the **Idaho** example on page 5). For more information, visit *http://www.healthychild.ucla.edu/NationalCenter/*.

## Ensuring Accountability for Results

To ensure ultimate success, states need to establish goals and measure progress toward outcomes for children, families, schools, communities, and state systems. This involves selecting measures that reflect that the responsibility for school readiness lies not with children, but with the adults who care for them and the policies and systems that support them. Multiple measures are required to track progress toward system outcomes (e.g., evaluate progress toward integrating service delivery systems and adopting key policy changes); program outcomes (e.g., evaluate program implementation efforts and track aggregate data from developmentally appropriate child assessments); and child outcomes (e.g., track indicators of family stability and child health and well-being). Measuring results helps hold policymakers and stakeholders accountable for meeting agreed-upon goals.

Public and private stakeholders in **Ohio** have developed a strategic plan for building an early learning system that will enable the partners to regularly monitor and evaluate progress and realign goals and priorities as needed. The plan has been incorporated into the Ohio Build initiative, and it lays out the goals, milestones, and core elements of a 10-year effort to build an early learning system based on three guiding principles: relationships matter, quality matters, and resources matter. Core elements touch on funding, curriculum, service delivery, political will, system infrastructure, caregiver accreditation and regulation, and caregiver training, qualifications, and compensation. For more information, visit *http://www.build-ohio.org/system.htm.*

Many states are far along in developing, using, and communicating the results of school readiness indicators (see National School Readiness Indicators Initiatives on page 10). During spring 2004, **Virginia** Governor Mark R. Warner released *No Time to Waste: Indicators of School Readiness 2004 Data Book.* The result of Virginia's involvement in the national School Readiness Indicators Initiative, the report includes indicator data on the physical, social, emotional, and cognitive status of children—all factors that research has shown to influence whether children are ready for kindergarten. The report will be used to track data trends over time and promote informed policy decisions in support of school readiness (see *http://www.vakids.org/early%20care%20and%20edu/SRI2004.pdf).*

Inconsistent data can challenge states interested in setting up sound accountability systems. One important step they can take is to establish common measurements and consistent data reporting mechanisms to enable improved information-sharing and analysis across state agencies and programs. This may involve increasing or reallocating resources to support consistent data collection efforts. Since 1996 the **Minnesota** Departments of Education and Health and Human Services and the Minnesota Head Start–State Collaboration Office have partnered to coordinate and enhance the state's screening efforts of young children in the Early Childhood Health and Developmental Screening Program, the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) program, and the screening that occurs in Head Start. Recently, the departments released *Minnesota Quality Indicators for Child Health and Developmental Screening: A Comprehensive Framework to Build and Evaluate Community-Based Screening Systems* (see *http://education.state.mn.us/content/077474.pdf*). These comprehensive standards aim to improve the content quality and consistency of screening programs for young children in EPSDT, Head Start, and early childhood programs. They were developed with substantial input from parents and community health and early childhood education experts. An evaluation of the impact of the quality indicators' framework on screening programs and subsequent child outcomes is planned for 2005. Once the results have been tracked, the public will be made aware of progress toward school readiness goals.

States can develop a communications strategy to report progress, using results to inform policy decisions and build support for school readiness efforts among parents, educators, policymakers, legislators, and the public. In **Connecticut** Ready, Set, Grow . . . CT Kids! is a statewide, multiyear communications and mobilizing campaign in support of the public goal that, "All children born in Connecticut beginning in 2004 will enter kindergarten healthy, eager to learn, and ready for school success." The campaign seeks to inform parents and the public about the importance of children's readiness for school and to persuade policy leaders to reinvest in young children. For more information, visit *http://www.readysetgrowctkids.org/about.html.*

## National School Readiness Indicators Initiatives

The *School Readiness Indicators Initiative* works with 17 states to develop comprehensive school readiness indicators to inform public policy for young children and their families at the state level. The task of participating states is to develop child outcome and systems indicators that tell the school readiness story of children in the state from birth through age eight. The indicators are intended to stimulate policy, program, and other actions to improve the ability of all children to read at grade level by the end of the third grade. They are broad enough to present a picture of the whole child, including what he or she knows and can do and his or her health status, economic well-being, and mental and emotional health status. States have also identified indicators for ready families, ready communities, and ready schools, and they have selected system outcomes to monitor the services and supports available to young children and their families. For more information, visit *http://www.gettingready.org/matriarch/default.asp*.

Through its *Policy Matters* initiative, the Center for the Study of Social Policy (CSSP), a nonprofit policy research organization, has developed a research-based policy framework and method to benchmark and measure state progress toward specific policy goals. Policy Matters applies the Casey KidsCount indicators model, which tracks common indicators of child well-being across states and over time, to state policy decisions. It identifies the critical policy elements necessary to achieve positive outcomes for marriage, youth development, school readiness, family stability, and economic security. Under the school readiness piece, these elements include licensing and accreditation policies, comprehensive professional development systems and compensation policies, and quality standards for early care and education. CSSP has developed an interactive database with state-by-state information on existing policies within this framework. Policymakers can use this tool to help them establish goals and track progress toward policy and systems outcomes. For more information, visit *http://www.cssp.org/major_initiatives/state_policy.html*.

## Conclusion

Governors are in a unique position to guide collaborative efforts in building Ready States. Gubernatorial leadership is critical to establish a clear vision and common goals for children and to empower other state, local, and private-sector leaders to make informed decisions in exchange for positive results. Governors can ensure that state efforts focus on the needs of children and families first, are based on solid research, and are implemented in partnership with local and private-sector efforts to maximize resources and seed innovation. ▮

Increasing awareness that learning begins at birth is casting a new light on the role of public elementary schools in ensuring that children enjoy positive early experiences in the kindergarten classroom. Today, children are entering school with varying skills, knowledge, and experiences that challenge a school's ability to meet all children "where they are." The concept of Ready Schools seeks to define what schools can do to better support young children. It centers on children's transition to the school environment, clear expectations for what children should know and be able to do at kindergarten entry, and continued high-quality instruction throughout the early elementary grades (and beyond). Local leadership remains a strong feature of public education in America. Yet the NGA Task Force on School Readiness identified three actions that governors can take to support local efforts to implement Ready Schools:

- support families, schools, and communities in facilitating the transition of young children to the kindergarten environment;
- align state early learning standards with K–3 standards; and
- support elementary schools in providing high-quality learning environments for all children.

## Facilitating the Transition to Kindergarten

Kindergarten entry often means a dramatic shift for children—in terms of class size, academic demands, social environment, and parent involvement—relative to what they may have experienced at home or in preschool. School efforts to communicate and reach out to families and early childhood educators prior to the start of kindergarten help alleviate culture shock for children and their parents.[5] States can help schools develop local transition plans in collaboration with parents, principals, preschool and kindergarten teachers, Head Start and child care providers, and other community members. They can also encourage innovative and promising practices at the local level, such as holding kindergarten registration earlier in the year and introducing children and parents to their teachers before the start of school. Finally, states can offer incentives and supports for teachers and administrators, many of whom are already struggling to balance a tremendous workload and limited resources, if they engage proactively in innovative transition practices. Continued study of transition practices is necessary to identify effective strategies, but several models are emerging in states that hold promise. (See, also, National Transition Initiative on page 12.)

In 2004 **South Carolina** launched an innovative public awareness and home visiting initiative to support children's kindergarten transition. Countdown to Kindergarten, a partnership between the public nonprofit organization South Carolina First Steps and Columbia's EdVenture Children's Museum, educates parents about the importance of home literacy and hands-on learning activities. It is privately funded and includes public awareness strategies, teacher home visits to at-risk children and their parents prior to the start of kindergarten, and a Countdown celebration at the EdVenture Museum to celebrate the "first day" of school. In its first year, Countdown to Kindergarten attracted significant media attention and reached more than 600 children across the state. Pre- and post-survey results show that the home visits had a significant positive impact on the frequency of parent-child interactions on early numeracy, reading and early literacy, and arts and crafts activities. Thanks to these successes, South Carolina First Steps is seeking to expand Countdown to Kindergarten in its second year. For more information, visit *http://www.scfirststeps.org/CountdowntoK.htm.*

**West Virginia's** Early Childhood Transition Steering Committee helps local communities develop effective transition policies and practices for children below age five. It includes representatives from state and local agencies, Head Start families, the education department, the child care system, and the birth-to-three system (*Individuals with Disabilities Education Act* Part C early intervention). The steering committee seeks to maximize positive outcomes for children as they move through different settings by ensuring program experiences are consistent, fostering positive ongoing relationships between families and professionals and among participating agencies, and developing a smooth transition process for children, families, and involved agencies. It provides information, training opportunities, and technical assistance materials to local communities. In particular, the steering committee developed a transition checklist for local agencies to track transition proce-

dures and timelines in keeping with effective practice and legal requirements. The West Virginia Department of Education will require schools to use this checklist under the Universal Access to Pre-kindergarten System, which state law requires to be implemented statewide by 2013. For more information, visit *http://www.wvearlychildhood.org/steer.html*.

### National Transition Initiative

The W. K. Kellogg Foundation's *Supporting Partnerships to Assure Ready Kids* (SPARK) seeks to align early learning and elementary school systems, as well as health and critical services, for children who are likely to be unprepared to learn. The initiative focuses on supporting a smooth transition to school over time. Communities in eight states receive support to implement transition practices, such as aligning expectations and standards, increasing parent involvement, and coordinating training for prekindergarten and elementary teachers. SPARK communities are located in **Florida, Georgia, Hawaii, Mississippi, New Mexico, North Carolina, Ohio,** and the **District of Columbia**. For more information, visit *http://www.sparkkids.org/*.

## Aligning Early Learning Standards and Assessments

States are leading collaborative efforts to establish clear expectations for what children should know and be able to do by kindergarten entry. In most states, early learning standards, also termed goals or guidelines, are intended to inform parents, caregivers, and educators about individual children's developing skills. This knowledge can then guide adults' decisions about what each child needs. These standards are not usually intended to directly assess children's performance. Yet they can be used to guide appropriate assessment practices to improve instruction and track children's progress, such as continuous observation and work sampling. Standards are typically developed in collaboration with parents, researchers, policymakers, administrators, and educators and, increasingly, they are linked to K–12 standards.

Nearly 40 states have or are developing learning standards for young children.[6] They are applying these standards to all settings for young children, including the home, preschool and child care centers, Head Start programs, and family, friend, and neighbor care settings. Moreover, states are connecting training and professional development for early care and elementary school educators to support greater continuity between early learning programs and schools. Federal developments, such as the Good Start, Grow Smart initiative, also are encouraging states to enhance and align early learning standards with state standards for elementary and secondary education, particularly for literacy, language, and mathematics (see National Early Learning Standards Initiative on page 13).

Many states have developed standards specifically for preschool-age children. **Rhode Island**, for example, has adopted standards for four-year-olds that are divided into eight domains: approaches to learning, social and emotional development, language development and communication, literacy, mathematics, science, creativity, and physical health and development. **Kentucky** is among several states that have developed guidelines for children from birth to kindergarten-age. Such guidelines recognize the tremendous variability among children at this stage. Although typically incorporating all developmental domains, guidelines for infants and toddlers often emphasize children's health, physical development, and emerging social and language skills. Standards for three- and four-year-olds tend to increase the focus on cognition, general knowledge, language and communication, and emerging literacy skills as well as social and emotional skills (e.g., cooperation, self-regulation, and conflict resolution). Kentucky and Rhode Island, as do many states, offer information and guidance to parents, as well as training and technical assistance to professionals, on appropriate application of the standards to instruction and continuous assessment activities. For more information on Rhode Island's early learning standards, visit *http://www.ride.ri.gov/els/*. For more information on Kentucky's initiatives, visit *http://www.kidsnow.ky.gov*.

The **Maryland** Model for School Readiness (MMSR) is a leading model that incorporates early learning standards into a statewide assessment and instructional system for local schools. MMSR is increasingly being applied to child care, prekindergarten, and Head Start programs. It incorporates research-based instruction, age-appropriate assessment of children's learning, and effective communication among

teachers, parents, and early childhood providers. An important component of the model is the Work Sampling System™, which provides a mechanism for teachers to document and assess children's skills, knowledge, behavior, and academic accomplishments in different subject areas. Trained teachers and early childhood providers document children's learning and rate each child's growth and progress using developmental guidelines, work samples, and checklists. Progress is shared with parents and reported to teachers of the next grade level. Aggregated data inform an annual report to the legislature on the level of school readiness statewide. For more information, visit *http://www.mdk12.org/instruction/ensure/MMSR/.*

### National Early Learning Standards Initiative

**Good Start, Grow Smart**, an initiative of President George W. Bush, aims to help states and local communities strengthen early learning for young children. The initiative seeks to strengthen the federal Head Start program, partner with states to improve early childhood education, and provide information to parents, teachers, and caregivers. The president's plan encourages states to voluntarily develop guidelines on literacy, language, and prereading skills activities for children ages three to five that are aligned with state K–12 standards and are applicable to all child care settings. Good Start, Grow Smart's state activities also incorporate professional development and early childhood program coordination efforts. For more information, visit *http://www.whitehouse.gov/infocus/earlychildhood/toc.html.*

## Helping Schools Get Ready for Children

The main characteristics of Ready Schools include research-based instruction and high standards that are implemented consistently across all classrooms; qualified teachers, ongoing professional development, and adequate compensation; and strong leadership from teachers and school administrators. These schools also address individual children's needs, including second-language learners and students with special needs. Moreover, they measure results and revise practices that are not effective.[7] States can support schools by clearly defining the key features of Ready Schools and by providing local administrators and educators with supports, guidance, and incentives to implement these features.

Several states are developing tools to guide school administrators in measuring both children's readiness for school and schools' readiness for children. (See, also, National Ready Schools Initiatives on page 14.) **Vermont** has developed a multipart assessment that gathers information from kindergarten teachers on children's readiness at the beginning of the school year, collects data from school principals on their school's readiness for young children and their families, and includes health screening data collected by school nurses. The ready schools assessment is based on the National Education Goals Panel's "top 10" characteristics of these schools. Data are generated from reports of kindergarten teachers and principals on four domains: smooth transitions, instruction and staff development, partnership with the community, and resources (e.g., supports for teachers and availability to parents of outside services, such as health services, housing assistance, and parent education classes.) Superintendents and principals receive their own data reports and communities receive important highlights. To date, Vermont's schools are strongest on transitions and resources and show greater variability on partnering with the community and instruction and staff development. For more information, visit *http://www.ahs.state.vt.us/publs/docs/KReady2002-03.htm.*

Similarly, **Hawaii** has just completed the first year of the Hawaii State School Readiness Assessment, which incorporates measures for both children and schools. The Hawaii Children Ready for Schools instrument is based on the state's preschool content standards and relies on teachers' professional judgment of children's ongoing behaviors in the classroom. The instrument was designed to help track school and system improvement over time for cohort groups (not individual children) as they enter kindergarten and to support school- and classroom-level curriculum planning. Schools and teachers can use the classroom and aggregated school results to examine curriculum areas for instructional purposes. The companion Hawaii Schools Ready for Children instrument seeks to track changes in schools' key readiness policies and practices over time related to transition, communication, parent education, parent involvement, school improvement, and early childhood classroom practices focused on early childhood areas. For more information, see *http://www.hawaii.edu/hepc/pdf/Reports/PhaseII_Valid_3_24.pdf.*

## National Ready Schools Initiatives

*Helping Schools Get Ready for All Children* is an initiative to develop a clear definition of Ready Schools and create concrete assessment tools and resources for schools seeking to improve learning environments for children. The W. K. Kellogg Foundation awarded High/Scope Educational Research Foundation $1.4 million to help create consensus on the components of such schools. The initiative seeks to build on current efforts with schools and work closely with early childhood educators, elementary educators, and representatives from the Supporting Partnerships to Assure Ready Kids (SPARK) initiative—a W. K. Kellogg Foundation effort designed to prepare vulnerable children to be ready for school and prepare schools to be ready for children (see National Transition Initiative on page 12). High/Scope has created a ready school assessment instrument and is providing training and technical assistance to schools so they can reach out to children who are particularly at risk of school failure. The instrument includes questionnaires for parents, teachers, and principals. High/Scope is now testing the validity of the ready school assessment instrument in schools, and it will present study findings by the end of the grant term in 2006. For more information, visit *http://www.highscope.org*.

*Mapping the PK–3 Continuum* (MAP) is a broad effort of the Foundation for Child Development (FCD) to support efforts to connect prekindergarten, kindergarten, and the first three elementary grades into a coherent first level of publicly funded education. FCD is focusing its resources on the research and application of PK–3 alignment strategies that reinforce what children learn from one school year to the next and that inform new expectations and learning experiences for children as they continue through the early elementary grades. Details on FCD's P–3 concept are outlined in *Mapping a P–3 Continuum* (MAP): *P–3 as the Foundation of Education Reform* (see *http://www.ffcd.org/uploadDocs/4.30.04.bogard.MAPrelease.final.pdf*). For more information, visit *http://www.ffcd.org/ourwork/f-index.html*.

## Conclusion

Research and thinking are still emerging around the concept of Ready Schools, and states are taking steps to guide and encourage innovative local efforts. States are working with national experts to identify best practices to facilitate children's transition to kindergarten and assess schools' readiness for children. They are also developing appropriate and research-based early learning expectations and aligning them with K–12 education standards. These activities cast a new light on the role of public schools in supporting children's learning before kindergarten entry. Further research will continue to inform policies and practices in this area. ▮

Families' access to information, health care services, and high-quality early care and education options has a direct bearing on children's readiness. Much of the action, responsibility, and decisionmaking for child and family service delivery occurs at the local level, but states can play a supporting role for community leaders. The NGA Task Force on School Readiness recommends that governors ensure Ready Communities by:

- promoting local collaboration and school readiness needs assessment;
- assisting community leaders in tracking school readiness outcomes; and
- seeking community input in statewide planning efforts.

## Promoting Local Collaboration and Needs Assessment

Communities are well positioned to identify the needs of local families. Local infrastructure is just as important as the state's in connecting families to resources and services easily and efficiently. Communities are also well suited to identify local public- and private-sector partners to leverage resources and reach families directly. States can provide guidance and resources to help community leaders and all related stakeholders (e.g., family support, health and mental health, and early childhood education) review the existing policy and service landscape to better match resources with family needs. (See, also, National Community School Readiness Initiatives on page 15.)

Wilmington, **Delaware**, began an early childhood strategic planning process several years ago in collaboration with the Delaware State Early Care and Education Office. The city used the state's strategic plan, "Early Success: Creating a Quality Early Care and Education System for Delaware's Children," to develop goals and priorities based on the state's key systemic elements, including quality programs, professional development, family engagement, and public will. This alignment with state planning enabled the city to leverage state support. For example, the state education department and early care and education office already committed almost $20,000 to Wilmington's early literacy training program for child care providers and parents. For more information, visit *http://www.familyandworkplace.org/providers/provider.advocacy.htm.*

### National Community School Readiness Initiatives

The National League of Cities' *Campaign for Early Childhood Success*, launched under the 2003 chairmanship of Mayor John DeStefano Jr. of New Haven, Conn., was a yearlong campaign to encourage municipal involvement in improving outcomes for children from birth to age five. As the focal point of the campaign, Mayor DeStefano challenged cities and towns across America to develop multiyear early childhood plans for their communities. More than 100 cities accepted the challenge and are working to create a long-term, strategic agenda for addressing the key needs of their youngest residents in areas such as health care, early learning, and parent education and support. For more information, visit *http://www.nlc.org/nlc_org/site/programs/institute_for_youth_education_and_families/early.cfm.*

*Making Connections* is a 10-year investment of the Annie E. Casey Fund in more than 20 communities across the nation to improve outcomes for families and children in tough or isolated neighborhoods. Each Making Connections site works with a team to develop strategies to strengthen families and the neighborhood. Efforts are concentrated on creating opportunities to earn a decent living and build assets; building close ties with family, neighbors, kin, faith communities, and civic groups; and having reliable services close to home. For more information, visit *http://www.aecf.org/initiatives/mc/index.htm*.

Many states have modeled their efforts to seed local planning and implementation activities after **North Carolina** Smart Start, a long-standing comprehensive state initiative to support broad community-driven school readiness efforts. Smart Start is a public-private initiative run through the nonprofit North Carolina Partnership for Children (NCPC) and offers flexible funding to local partnerships in exchange for positive results for young children. Specific services vary based on local priorities, though all partnerships seek to improve the quality of child care, make child care more affordable and accessible, provide access to health services, and offer family support. Currently, $192 million in state funds support Smart Start, and the initiative has raised more than $200 million in

private resources since its inception in 1993. With philanthropic support, NCPC now houses the Smart Start National Technical Assistance Center to help other states implement similar statewide, community-based initiatives. General technical assistance and materials are available publicly, and the center has awarded grants to seven states—**Alabama, Colorado, Iowa, Oklahoma, South Carolina, Tennessee,** and **Vermont**—to support planning and implementation efforts. NCPC also hosts an annual national conference for state and local policymakers and practitioners to share best practices and lessons learned. For more information, visit *http://www.smartstart-nc.org/.*

The **Oregon** Commission on Children and Families provides flexible funding to local commissions to support comprehensive supports and initiatives for children and families. Local plans must indicate how communities will measure and ensure progress toward Oregon benchmarks for children and families. For more information, visit *http://www.ccf.state.or.us/pageoccflinks.html.*

In 1998 **California** voters passed Proposition 10 to dedicate state revenue from a 50-cent tax on cigarettes for early childhood initiatives. Approximately $600 million flows through the public-private First Five California Commission on Children and Families to local commissions for services to infants, toddlers, and preschoolers. For more information, visit *http://www.ccfc.ca.gov/.*

## Helping Community Leaders Track School Readiness Outcomes

States can also provide guidance and technical assistance to communities on setting measurable goals for child outcomes, selecting indicators and measures of progress, evaluating results, and communicating outcomes.

Since 1994 **Rhode Island** KIDS COUNT, a statewide nonprofit organization, has collected community-level data on key child indicators to inform state early childhood and related policies. Through meetings, publications, and other communication tools, the indicators are used to promote best practices in communities and across the state and aim to hold systems accountable. With support from several national foundations, including the David and Lucile Packard Foundation and the Kauffman Foundation, Rhode Island KIDS COUNT led a five-year, 17-state initiative to replicate this model and identify common indicators from which other states and communities can start. Communicating community-level and statewide results is a key component of this initiative, and several states, including **Connecticut** and **Virginia**, have attracted significant media attention to their efforts. For more information, see the School Readiness Indicators Initiative on page 10 or visit *http://www.rikidscount.org/.*

**South Carolina** First Steps is a results-oriented, statewide early childhood education initiative largely based on the **North Carolina** Smart Start model that seeks to ensure children arrive at first grade healthy and ready to succeed. It is developing a rigorous evaluation with the High/Scope Educational Research Foundation to assess local progress toward achieving the First Steps goals and determine the impact of the initiative on children and families at the state and local levels. The impact assessment will include school readiness measures; benefits from child development services; immunization status; low birthweight rates; parent literacy; parenting skills; parental involvement; transportation; developmental screening results; and other related measures. County school readiness boards will use the results to inform investment decisions and will be held accountable for results. For more information, visit *http://www.scfirststeps.org.*

## Seeking Community Input in State Planning Efforts

Community voices offer a reality check for state decisions. Local input is necessary to ensure policies make sense on a local level and are feasible to implement. Local involvement also strengthens grassroots support for an initiative and helps ensure the long-term sustainability of the efforts. State leaders can include community representatives at the state school readiness planning table, or form an advisory board of local leaders and stakeholders, to inform state decisions. They can also solicit local input by hosting town hall meetings, local public forums, or focus groups with community stakeholders to seek their input in state planning efforts.

The **Vermont** Governor's Cabinet on Children and Youth sought local input through community forums, focus groups, and stakeholder planning ses-

sions to design and roll out Building Bright Futures, an initiative to improve early childhood services through regional and local planning efforts. For more information, visit *http://www.ahs.state.vt.us/earlychildhood/BBFutures.htm.*

Similarly, **Idaho** Governor and First Lady Kempthorne's Early Care & Learning Cross Systems Task Force has sought wide community input on a statewide plan for school readiness. The state hosted regional meetings for public and private partners to gather input, which helped secure strong approval of the plan's goals. The plan will be completed by June 2005. With support from the federal Maternal and Child Health Bureau's State Early Childhood Comprehensive Systems grant, the task force will begin implementing the plan in fall 2005. For more information, visit *http://www.gccfc.idaho.gov/ECLCSTF.html.*

## Conclusion

Communities play an important role in directing resources to meet the needs of families, informing state decisions, and building grassroots awareness and support for investments in early childhood. States can strengthen, build on, and spearhead successful community efforts that improve children's readiness for school. Strong state leadership, guidance, community input, and effective partnerships can make a significant difference in the lives of children and families. ▮

The family plays the most important role in a young child's life. Young children depend on their parents for health care and optimal nutrition and for safe and stimulating environments in which to explore and learn. The relationship between parent and child is the most critical to a child's development.[8] Family well-being is also closely associated with school readiness. Child poverty, abuse and neglect, maternal depression, and parental substance abuse are all associated with both short- and long-term negative consequences for children's physical and mental health, educational attainment, and social and behavioral development.[9] However, the new economy has brought changes in the workforce and in family life. These changes are causing financial, physical, and emotional stresses in families, particularly low-income families. Moreover, increasing numbers of new immigrants are raising their children in the face of language and cultural barriers. In its final report, the NGA Task Force on School Readiness recommends that governors and states can promote Ready Families by:

- supporting parents in their primary role as their children's first teachers;
- promoting safe, stable, and economically secure families; and
- addressing the needs of culturally and linguistically diverse families.

Various state efforts to support parents of young children are already underway across the nation. They include parent education and outreach initiatives, home visiting programs, and comprehensive family support programs. States can also ask pediatricians, family practitioners, and other health care providers to distribute child development information to parents and identify and refer children with developmental delays to early intervention services. Moreover, states can promote public- and private-sector strategies to increase parents' flexibility in balancing work and family needs.

## Informing Parents

Parent Web sites, awareness campaigns, and information kits are relatively easy and inexpensive ways to disseminate information to parents, though their direct impact on parent behavior can be difficult to measure. Several states have developed parent information kits and guides through public-private partnerships and distribute these kits through schools, hospitals, doctors' offices, prenatal programs, public libraries, family assistance agencies, local community organizations, and the Internet. **California's** *Kit for New Parents* includes videos with information on early literacy, quality child care, child safety, child health and development, and discipline approaches. It also includes a customized *Parents Guide* with information on resources and services within local communities. The First Five California Commission on Children and Families allocated $18 million for 1 million kits from the state's 50-cent tobacco tax, a dedicated funding stream for early childhood initiatives. Evaluations show the materials have had a positive impact on users' parenting knowledge and awareness of local resources for child care assistance, medial care, and other services. For more information, visit *http://www.ccfc.ca.gov/*. **Alabama, Kentucky**, and **Pennsylvania** are among those states that have adapted the *Parents Guide* using their own information through a partnership with its authors at the Center for Community Wellness of the School of Public Health at the University of California, Berkeley. For more information on customized guides, visit *http://www.ucwellness.org/pub_parents.html*.

A key component of **Michigan** Governor Granholm's Project Great Start, the "Read, Educate and Develop Youth" (R.E.A.D.Y.) program offers parent kits that include health, nutrition, and development information as well as reading information and a video on the importance of early child development. R.E.A.D.Y. is a joint initiative of the Michigan Department of Education and Central Michigan University and is supported with corporate and foundation donations. At-risk families can receive free kits through school districts and county health offices, and the kits are also available for purchase. The state's surgeon general has developed a network of family care, pediatric, and OB/GYN physicians who have agreed to feature the materials in their offices. In addition, the Michigan Department of Community Health has forged a partnership with the state's Visiting Nurses Association to provide new parents in high-priority school districts an in-depth, at-home briefing on the R.E.A.D.Y. kit. The R.E.A.D.Y. program also offers literacy materials for toddlers, preschoolers, and kindergartners, along with other products for parents. R.E.A.D.Y. materials are used widely in parenting and school readiness programs

across the state. Most parents who used the kits report that they provided important information and motivated them to read and interact more with their child. Modified R.E.A.D.Y. products are now available for use nationwide. For more information on the R.E.A.D.Y. program, visit *http://www.michigan.gov/greatstart.*

As part of Governor Warner's Education for a Lifetime initiative, **Virginia** is distributing 111,000 toolkits for new parents in English and Spanish. The toolkit offers information about child safety, nutrition, development, health care, and child care as well as information about resources on early childhood programs and services offered throughout the state. The state also has a toll-free telephone line (1-866-KIDS TLC) to link parents to resources and services. These activities build on continued state efforts to increase enrollment in the Family Access to Medical Insurance Security plan; promote immunizations, good nutrition, and health screenings for children; and reduce the occurrence of childhood asthma and obesity. For more information, visit *http://www.governor.virginia.gov/Initiatives/Ed4Life/Pre-K.htm.*

**Mississippi** Public Broadcasting's "Right from Birth" is a video series on parenting and early literacy. The series, first broadcast statewide in December 2000, leads parents and caregivers through the stages of early childhood from birth to 18 months and gives practical advice on how adults can support children's development. With funding from the state human services department, Mississippi Public Broadcasting also provides outreach and community-based workshops to reach additional parents and child care providers in every county. In 2002 "Right from Birth" was incorporated into the curriculum for family and consumer sciences in Mississippi high schools and community colleges. Mississippi Public Broadcasting also works closely with the Mississippi Department of Health, the Mississippi Department of Education, and Head Start programs to disseminate materials and facilitate workshops. "Right from Birth" and its companion series for three- to seven-year-olds, "Going to School," are now offered throughout **Alabama, Arkansas, Georgia,** and **Louisiana** through a partnership among public broadcasting companies in the region. For more information, visit *http://www.etv.state.ms.us/kids_parents/rfb/overview.html.*

With support from the Talaris Research Institute, Mississippi Public Broadcasting is also one of 20 public broadcasting networks across the nation that are involved in the "Parenting Counts: A Focus on Early Learning" public awareness campaign. The campaign and accompanying workshops provide parents with the latest information on child brain development and good parenting through on-air and print resources. The campaign features Web resources, mini-grants, parenting brochures, early learning workshops, and six 60-second television segments on parenting. The entire campaign models best parenting practices and is designed in an easy-to-use and easy-to-understand format. For more information, visit *http://www.talaris.org/parentingcounts.htm.*

## Visiting Families at Home

Intensive, family-focused initiatives such as home visiting and family literacy programs influence parent behavior and improve child outcomes, particularly when they involve high-quality, well-implemented services, are staffed by well-trained professionals, and link with other family supports.[10] However, these programs tend to require more resources, training, and coordination. The cost of home visiting programs varies depending on the number and duration of visits, the home visitor's credentials and caseload, supervision and administration, and other variables. (Also, see *National Home Visiting Models* on page 22.)

In **Minnesota** Early Childhood Family Education (ECFE) is a voluntary program for all families with children from birth to kindergarten-age. Services are offered free, or for a nominal fee, in all school districts and tribal schools, and they are tailored to meet the needs of families in each community. Most programs include home visits, parent discussion groups, parent-child activities, play and learning activities for children, early screening for potential children's health and developmental problems, community resource information for families and young children, and libraries of books, toys, and other learning materials. The state funds ECFE through a formula grant to school districts. The grant combines state and local funds. For more information, visit *http://www1.minn.net/~ecfe/index.html.*

**Ohio** has consolidated several programs for young children into a single initiative, Help Me Grow, which provides families with prenatal services and

newborn home visits along with information about child development. Families with young children are connected with resources through an information line and written materials. Help Me Grow also houses Ohio's *Individuals with Disabilities Education Act* Part C early intervention services for infants and toddlers. State funds and federal Part C and Temporary Assistance for Needy Families funds support Help Me Grow, which has served more than 42,000 infants and toddlers since its inception. For more information, visit *http://www.ohiohelpmegrow.org/*.

As part of her "5-Year School Readiness Action Plan," **Arizona** Governor Napolitano successfully secured an $8.7-million increase in fiscal 2004 for Healthy Families Arizona, a preventive home visiting program for families with at-risk newborns. The program aims to promote positive parent-child interaction, improve child health and development, and prevent child abuse and neglect. It is based on the Healthy Families America program model and provides voluntary screening and home visiting services to mothers and their infants who are identified as at risk for child abuse and neglect. Trained family support specialists provide comprehensive assistance with parenting, stress reduction, and assessments of a child's health and development needs. The state budget for Healthy Families Arizona is just over $15 million, and the program serves more than 4,400 families. Funding is allocated primarily from state general funds and the federal Temporary Assistance for Needy Families block grant. A 2003 evaluation indicated the program helped reduce parental stress, improve home environment safety, and increase education and employment levels among parents. For more information, visit *http://www.de.state.az.us/dcyf/opfs/healthy.asp*.

**Missouri** is the birth state of the national Parents as Teachers (PAT) home visiting model that aims to enhance child development and school achievement through parent education. Core services include personal home visits by trained parent educators; parent group meetings; developmental health, vision, and hearing screening; and parental access to available state and local resources. Missouri PAT programs are voluntary and are offered through every school district to all parents. The program is funded with $37.3 million in state general funds and serves more than 150,000 families. See National Home Visiting Models on page 22 for more information on the Parents as Teachers national model. For more information on Missouri PAT, visit *http://www.dese.state.mo.us/divimprove/fedprog/earlychild/ECDA/PAT_INDEX.htm*.

## National Home Visiting Models

States and local communities can adopt several national home visiting program models that incorporate different goals, services, interactions, and providers.

*Healthy Families America* is a national home visiting program designed to promote positive parenting, enhance child health and development, and prevent child abuse and neglect. The program is built on 12 research-based critical elements related to service initiation, service content, and staff characteristics. Healthy Families America is located in more than 440 communities in 35 states, the District of Columbia, and Canada. For more information, visit *http://www.healthyfamiliesamerica.org/home/index.shtml*.

*The Nurse Family Partnership* program provides home visits by registered nurses to first-time mothers. The program seeks to improve maternal health and child development outcomes by promoting health-related behaviors, competent caregiving, pregnancy planning, and educational achievement and employment among new mothers. Nationally, the Nurse Family Partnership is serving families in more than 200 counties across 22 states. **Alabama, Colorado, Louisiana, Missouri, Oklahoma, South Dakota,** and **Wyoming** are among those administering programs through state-level agencies either statewide or in select communities. Program evaluations show significant positive impacts on maternal health and parenting skills, reductions in child injuries and cases of abuse and neglect, and increases in mothers' workforce participation. For more information, visit *http://www.nccfc.org/nurseFamilyPartnership.cfm*.

*Parents As Teachers* (PAT) is a national home visiting model, originally developed in **Missouri**, that aims to enhance child development and school achievement through parent education. Family participation is voluntary, and programs can be local or statewide. PAT can be a stand-alone program or be incorporated into existing programs, such as Early Head Start, Healthy Families, and Even Start. All programs have core services, including personal home visits by trained parent educators; parent group meetings; developmental health, vision, and hearing screening; and parental access to available state and local resources. Evaluations show positive impacts on children's language, social development, and problemsolving and other cognitive skills as well as increases in parents' knowledge about child development. Local PAT programs are now operating in all 50 states, and several states, including **Idaho, Missouri, Nebraska,** and **Oklahoma,** provide support to local programs. For more information, visit *http://www.patnc.org*.

*Home Instruction for Parents of Preschool Youngsters* (HIPPY) is a parent involvement, school readiness program that combines home visits and group meetings. Currently, 167 HIPPY program sites in 26 states and the District of Columbia are serving more than 16,000 children and their families. In several communities, HIPPY programs are offered in partnership with other local programs, including Head Start, Even Start family literacy programs, and parent information and resource centers. The goals of HIPPY are compatible with those of the federal *No Child Left Behind Act*, and Title I is a major source of funding for local HIPPY programs. For more information, visit *http://www.hippyusa.org/*.

*The Parent-Child Home Program* (PHP) is a literacy and parenting program that emphasizes the parent-child verbal interaction critical to early childhood brain development. Trained home visitors visit the families of two- and three-year-olds twice each week for two years. They demonstrate parenting and verbal interaction techniques through play sessions with the parent and the child using carefully chosen books and toys. Rigorous studies of PHP have found significant positive impacts on parent-child verbal interaction, above-norm scores on standardized tests in math and reading in grades two, five, and seven, and higher high school graduation rates among children participating in the program. The Parent-Child Home Program costs approximately $2,000 per family per year and currently operates in 138 sites in **California, Florida, Maine, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, South Carolina,** and **Washington**. For more information, visit *http://www.parent-child.org/home/*.

The federal *Even Start Family Literacy* program, modeled after a successful family literacy program in **Kentucky**, provides grants to all states to plan and implement statewide family literacy initiatives that integrate parenting education, early childhood education, and adult literacy or adult basic education. In 2003 the U.S. Department of Education allocated $250 million to state departments of education, which then awarded competitive subgrants to local partnerships of public and/or private entities. Priority must be granted to programs that are located in low-income areas. States must match the federal funds dollar for dollar with a nonfederal contribution. For more information, visit *http://www.ed.gov/programs/evenstartformula/index.html*.

## Offering Family Support Services

Many states are focusing on connecting families to resources through a single point of entry close to home. The **Oregon** Commission on Children and Families allocates funding to local commissions to support programs for children and families, including local family resource centers. These centers aim to promote easy access to educational information and community resources and seek to serve infants, children, youth, teens, students, seniors, jobseekers, families, new parents, and other adults. They may offer advocacy; special education; parenting education; mental health; substance abuse assessment, counseling, treatment, and support; family strengthening and preservation; and criminal involvement prevention programs and services. Family resource centers are supported by local investments from churches, schools, businesses, service clubs, law enforcement agencies, and on-site service agencies. For more information, visit *http://www.ccf.state.or.us/pageoccflinks.html*.

Family resource networks in 18 **West Virginia** counties offer Starting Points family resource centers that bring together the community's existing early childhood services and programs in one location. These centers provide families with young children better access to support, services, and education. They help link families to early learning opportunities in the community and offer parent education, resource coordination, health and nutrition services, home visiting programs, developmental screening and referral, and family intake and assessment services. They also make parent referrals to counseling, literacy programs, housing assistance, mental health and substance abuse services, or other support services. The resource centers are supported with state funds, private foundation funds, and the federal Community-Based Family Resource and Support Program. For more information, visit *http://www.wvchildrenandfamilies.org/startingpoints/*.

## Conclusion

States recognize the primary role of parents in the lives of their children. Education and outreach efforts help place information directly into parents' hands. For families facing significant obstacles, states can play a more direct role by offering additional supports and services to improve family stability, address risk factors, and promote good parenting skills.

A burgeoning issue is the challenge of supporting non-English-speaking, first-generation American families. Immigrant parents, while working hard to support their children, face language and cultural barriers that can often place their children at increased risk of school difficulties. Research to investigate this issue is ongoing, particularly on the ramifications for children's language, cognitive, and social development. States continue to partner with experts in the research, practice, and policy fields to identify best practices to support all families with young children. ▮

Years of research on child development and early learning show that several interrelated domains of development define school readiness—physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge.[11] School readiness hinges on children's stable relationships with parents and caring adults in safe, nurturing, and stimulating environments throughout the first years of life.[12] Although the family plays the most important role in a child's life, state policies can support parents and other caregivers in promoting children's development. In its final report, the NGA Task Force on School Readiness identifies strategies that governors and states can pursue to promote Ready Children, including:

- ensuring that all children from birth to age five have access to high-quality care and learning opportunities at home and in other settings;
- providing comprehensive services for infants and toddlers;
- expanding high-quality, voluntary preschool opportunities for three- and four-year-olds; and
- addressing the school readiness needs of children with special needs and children in foster care.

## Ensuring High-Quality Care and Learning Opportunities for Young Children

Children receive early care and education experiences through formal and informal settings, including parental care, center-based care, family and neighbor care, and prekindergarten classrooms. Regardless of the setting, the quality of care children receive directly impacts their development.[13] High-quality care is associated with warm and responsive adults, language-rich environments, and ample opportunities for learning and exploring.[14] In formal group settings, quality also hinges on small classes, well-prepared teachers, close teacher-child relationships, and family involvement.[15] Traditional market forces are insufficient to support a healthy supply-and-demand relationship that ensures high-quality, affordable early care and education options for all families. States can help close the market gap by providing incentives and assistance to providers to meet high quality standards, building comprehensive early care and education professional development systems, and offering innovative financing strategies to support quality care environments.

### *Tiered Strategy Systems for Child Care Quality*

More and more states are following the lead of **Georgia, Kentucky, North Carolina, Oklahoma,** and **Pennsylvania** in pursuing tiered strategy systems to improve the quality of early care and education options for families (see Links for State Tiered Strategy Systems on page 27).[16] Such systems typically include some combination of three strategies intended to inform parents, support providers, and positively impact the quality of care. *Tiered reimbursement* is a funding policy under which a state pays a higher child care subsidy reimbursement rate to providers meeting higher standards of quality beyond those for basic licensing. Tiers are typically based on curriculum, child-staff ratios, staff compensation, teacher training and credentials, and other criteria. Tiered reimbursement can be voluntary or mandatory for child care providers receiving state subsidy payments. In its simplest form, a *quality ratings system* is a consumer's guide to child care quality. States match an identifiable symbol (e.g., a gold, silver, or bronze seal or one to five stars) with established criteria indicating the level of quality that a child care setting achieves. The aim is to give parents an easy identifier of high-quality care options in their communities. Quality ratings systems may be voluntary and open to both subsidized and private for-profit care providers, at the state's discretion. They can also be linked to a tiered reimbursement system, so payment levels correspond to the quality rating. Under a *rated licensing system*, the state embeds criteria for successive levels of quality into the requirements for obtaining a child care license. The license issued reflects the level of provider quality, as defined by the state's quality criteria. States can use these three strategies independently or in combination to promote quality.[17]

Most tiered strategy systems are voluntary and include separate criteria for center-based and family-based care settings. States have learned that quality ratings systems that involve more than two levels and that incorporate attainable increments of improvement encourage greater provider uptake rates. For example, **Oklahoma** recognized that the requirements of its three-level Reaching for the Stars quality ratings system were too stringent for many

providers to achieve, so the state added a "transitional rating" to recognize providers actively engaged in quality improvements and encourage them to meet the higher requirements.

States have also found that financial incentives are helpful to encourage providers to participate in a quality ratings system. **Kentucky's** STARS for KIDS NOW quality ratings system links ratings to a tiered reimbursement system and provides a one-time cash award to providers for reaching each successive level of quality. **Pennsylvania's** Keystone STARS program is not linked to a tiered reimbursement system, but providers receive annual merit awards that increase with each successive quality rating achieved. Many centers are using these merit awards to increase compensation.

Several states have adopted a wage supplement model that rewards providers for seeking higher levels of education. The Child Care WAGE$® Project, a national model developed by the nonprofit Child Care Services Association, helps boost worker retention by providing wage supplements for educational achievement every six months, so long as the provider remains employed in the child care program. WAGE$® was first implemented in **North Carolina**, and the model is now licensed in a handful of other states. For more information, visit *http://www.childcareservices.org/TEACH/TEACH_Project.html*. Some states have independently implemented similar wage supplement programs, such as **Georgia's** INCENTIVE$ program.

States have found that technical and financial assistance is also necessary to encourage participation and support providers in reaching higher quality ratings. Stipends and professional development scholarships encourage providers to seek higher levels of quality. **North Carolina's** Star Rated License program offers financial assistance and incentives for training and professional development to providers through the T.E.A.C.H. (Teacher Education and Compensation Helps) Early Childhood® Project. T.E.A.C.H., another project of the Child Care Services Association, provides scholarships to help pay the cost of books, travel, and tuition as well as supports child care center administrators who encourage their employees to seek training. Several other states have adopted T.E.A.C.H. or similar models (visit *http://www.childcareservices.org/TEACH/TEACH_Project.html*). **Oklahoma's** Reaching for the Stars program offers a Child Care Improvement Grant that provides awards to help child care providers meet licensing requirements, extend hours, improve quality, or expand services.

Several states also offer free technical assistance and pay for environmental assessments for providers choosing to participate in a tiered strategy system. Partnerships with resource and referral agencies and institutions of higher education can increase capacity to conduct outreach to parents and providers and conduct rating assessments. (Some states have found that using outside evaluators lends a sense of objectivity and fairness to the rating process.) For example, care providers participating in **Kentucky's** STARS for KIDS NOW are eligible for free technical assistance from regional child care resource and referral agencies and local health departments, which have on staff child care quality coordinators and infant and toddler specialists. In **Oklahoma** the Center for Early Childhood Professional Development at the University of Oklahoma's College of Continuing Education coordinates and conducts the environmental rating assessment of providers.

**Pennsylvania** Keystone STARS offers unique community engagement grants to organizations or provider groups providing local leadership for early care and education. The grantees link providers to information about Keystone STARS. Some grantees have also created ties with public prekindergarten programs in local school districts and have fostered collaboration with Head Start programs. They have enabled local communities to leverage private-sector funds and connect with nonprofit initiatives such as United Way Success by Six. The grantees also connect state administrators to information and input from community voices.

## Links for Information on State Tiered Strategy Systems

Smart Start Georgia (INCENTIVE$, WAGE$ programs)
*http://smartstartga.org/educators_and_professionals/programs/*

Georgia Standards of Care (quality enhancement program)
*http://www.osr.state.ga.us/QI/SoC/about_SoC.html*

Kentucky STARS for KIDS NOW
*http://www.education.ky.gov/KDE/Instructional+Resources/Early+Childhood+Development/default.htm*

North Carolina Star Rated License
*http://ncchildcare.dhhs.state.nc.us/providers/pv_sn2_ov_sr.asp*

Oklahoma Reaching for the Stars
*http://www.okdhs.org/childcare/ProviderInfo/provinfo_stars.htm*

Pennsylvania Keystone STARS
*http://www.dpw.state.pa.us/child/childcare/keystonestarchildcare/default.htm*

The *National Child Care Information Center* offers a Web-based resource with information and links to state tiered strategy systems throughout the nation. See "Tiered Quality Strategies: Definitions and State Systems" at *http://nccic.org/pubs/tiered-defsystems.html.*

### *Professional Development Systems*

States are working collaboratively with institutions of higher education and early care and education professionals to develop and maintain comprehensive professional development systems that support a high-quality workforce. Key features of such systems include financial support and incentives for professional development; qualification and credential requirements, in addition to clear pathways for obtaining them; quality assurance features, such as standards, evaluation processes, and registries for trainers and training; and access and outreach components. Professional development systems can complement and strengthen state quality ratings systems. For example, the **Pennsylvania** Keys to Quality initiative seeks to align the state's professional development system with its Keystone STARS quality ratings system to help providers coordinate quality improvement and educational attainment efforts. The state intends that all professional development and technical assistance be aligned with, as well as support the goals and requirements of, Keystone STARS. For more information, visit *http://www.papathways.org/Default.htm*.

**Kentucky's** Early Childhood Professional Development Framework includes core content describing what early childhood professionals should know and be able to do at entry through attainment of a master's degree across all learning domains. The framework encompasses training and education pathways toward three early childhood professional credentials and outlines articulation agreements among training programs and among courses at different higher education institutions. Kentucky also offers scholarships to encourage providers to pursue professional development opportunities. For more information, visit *http://www.education.ky.gov/KDE/Instructional+Resources/default.htm* and click on the keyword *Early Childhood Development*.

**Arkansas** operates a similar professional development system that incorporates training, financial assistance, and a formal curriculum framework. The Arkansas Division of Child Care and Early Childhood Education has awarded a contract to an institution of higher education to coordinate training programs, provide information and resources, and host a training registry for practitioners and trainers. Arkansas offers a 60-hour course leading to a child care specialist certificate in an area of concentration—infant/toddler, preschool, family day care, or school-age. The state has established a formal curriculum framework, offers professional development scholarships, and provides quality enhancement grants of up to $7,500 to providers. Arkansas also offers business management sessions to promote good business practices among early care and education small business professionals. Most recently, the state has begun offering a 30-hour training program, Pre-K ELLA (Early Literacy in Arkansas) statewide to child care professionals in registered homes, licensed homes, and child care centers. The training seeks to support professionals in providing developmentally appropriate experiences that promote emergent literacy skills

for children ages three to five prior to their entry into kindergarten. For more information, visit *http://www.uark.edu/depts/awecc/index.html*.

### *Support for Informal Care Providers*

Nationally, family, friend, and neighbor care, also referred to as kith-and-kin, informal, or license-exempt child care, serves two-fifths of children below age seven, most of whom are below age three.[18] Historically, state government has played a very limited role in regulating this form of care. Yet, with so many young children in their care, family, friend, and neighbor providers are a largely untapped source to support children's early learning experiences. States and communities can offer these providers information, materials, equipment, and training on nutrition, early learning, child development, and health and safety. States can also include family, friend, and neighbor care representatives in state and local planning and policy bodies. Moreover, they can develop early learning standards that are applicable to informal care settings and offer providers training, guidance, and resources on how to apply these standards in daily activities with children (see Supporting Ready Schools chapter for examples). In addition, states can integrate family, friend, and neighbor care providers into state professional development systems and subsidy reimbursement systems and encourage stronger connections to local and state child care resource and referral networks.[19]

The **Nevada** Children's Cabinet offers free self-guided training modules addressing all domains of child development to informal care providers. Additional resources include newsletters, tip sheets, technical assistance, a literacy calendar, and grants for licensure and equipment. For more information, visit *http://www.childrenscabinet.org/CabinetFrame.htm*.

The Cornell Cooperative Extension and the Early Childhood Program at Cornell University partnered with the **New York** State Office of Children and Family Services to study effective strategies to support continued education for informal providers. Teams of community representatives in six sites conducted focus groups with 40 local informal child care providers. The focus groups informed the development of six newsletters (in English and Spanish) addressing such issues as caring for children with disabilities, handling tax and business issues, teaching good nutrition and healthy habits, developing multicultural programming, and creating stimulating environments for children. For more information, visit *http://www.human.cornell.edu/units/hd/cecp/caregiver.html*.

### *Facility Financing Strategies*

The physical setting of the care environment is an important, but sometimes overlooked, component of quality early care and education. **Connecticut** and **Rhode Island** are two states offering innovative facility financing that combines public and private resources to support high-quality physical settings. Both states partnered with the Community Investment Collaborative for Kids, a program of the national nonprofit Local Initiatives Support Corporation, to offer resources and services for the renovation and construction of quality facilities. The Connecticut Children's Investment Partnership and the Rhode Island Child Care Facilities Fund combine public and private resources to offer innovative financing packages and quality improvement grants. They also offer specialized training workshops on the design and development of child care facilities for architects, early childhood professionals, leaders of nonprofit organizations, and other key stakeholders. For more information, see National Resources for Quality Early Care and Education on page 29.

Similarly, **Arkansas** offers a guarantee loan fund for child care facilities to assist with the development of new facilities or expansion of existing facilities, particularly in low-income, rural areas that demonstrate a need for additional quality child care. Guarantees are available up to $25,000, and they may be used for operating capital as well as capital outlay. For more information, visit *http://www.state.ar.us/childcare/guarloanfund.html*.

## National Resources for Quality Early Care and Education

The *National Child Care Information Center* (NCCIC) provides publications, conference and meeting support, question-and-answer services, and technical assistance and training to states. Supported by the federal Child Care Bureau, NCCIC maintains an online resource library and Web site at *http://nccic.org/*.

*Child Care and Early Education Research Connections* (CCEERC) is a public-private effort to build a Web-based infrastructure to support collaborative research, analysis, and information-sharing among researchers, policymakers, and other key stakeholders. The site serves as a repository of child care research and data through a Web-based archive at *http://childcareresearch.org/discover/index.jsp*. CCEERC is a partnership among the National Center for Children in Poverty at the Mailman School of Public Health, Columbia University; the Inter-university Consortium for Political and Social Research at the Institute for Social Research, the University of Michigan; and the federal Child Care Bureau.

*Community Investment Collaborative for Kids* (CICK), a program of the national nonprofit Local Initiatives Support Corporation, works at the federal, state, and local levels to develop sources of flexible and affordable financing to support the development of child care facilities. CICK has developed technical expertise in crafting statewide programs that address the capital and technical assistance needs of the child care industry in low-income communities. The collaborative also provides project-specific technical assistance, resource materials, and training programs for community development program operators and child care providers on all aspects of child care facility design, development, and finance. For more information, visit *http://www.lisc.org/whatwedo/programs/cick/funds.shtml*.

## Promoting Programs and Services for Infants and Toddlers

The first three years of life are a time of intense brain activity and development. At this stage, infants and toddlers are highly dependent on the adults in their lives and strongly influenced by their surroundings.[20] High-quality, comprehensive birth-to-three programs, such as the federal Early Head Start (EHS) program, can be an important support for infants and toddlers (see National Birth-to-Three Initiatives on page 30). Yet, for most families, such care and services are typically the most expensive and the hardest to find in the private market.[21] Notwithstanding the primary role that parents play in the earliest years of a child's life, states can play a supportive role in informing parents and increasing their options for affordable high-quality infant and toddler care. States can also connect parents and care providers to specialists in infant and toddler health, mental health, and development; expand developmental screening services; and provide parents, caregivers, and early childhood educators with easy access to information on child development in the very early years.

**Kansas** has partnered with the federal government to offer a *state-administered* Early Head Start initiative to pregnant mothers and children from birth to age three. The program seeks to increase the availability and quality of community-based child care for infants and toddlers and to improve professional development opportunities for early child care professionals.[22] Kansas allocates nearly $8 million in Child Care and Development Fund block grant dollars to programs serving 32 counties, and the federal EHS system provides funding for training and technical assistance. Kansas EHS provides full-day, full-year care to 825 children, but the impacts of quality improvement efforts reach an additional 3,000 children in EHS-partnering programs (center- or family-based). The program has resulted in reductions in low-birthweight infants and more EHS children meeting developmental milestones and demonstrating age-appropriate language, according to 2004 indicator data. For more information, visit *http://www.srskansas.org/ISD/ees/head_start.htm*.

In addition to EHS, Kansas provides $1 million to place infant and toddler specialists in all child care resource and referral agencies across the state. The

specialists provide training, consulting, and technical assistance to regulated child care providers on child development, health and safety issues, and best practices in group care settings. They also work with community partners to increase awareness of the importance of brain development and the impact of high-quality care on infants and toddlers. For more information, visit *http://www.srskansas.org/kidsnet/infant-toddler.htm*.

Similarly, **New York** allocates $1.1 million in Child Care and Development Fund dollars to a statewide Infant and Toddler Technical Assistance Network. The network supports 16 technical assistance resource centers and 23 specialists under contract with seven lead child care resource and referral agencies across the state. It provides training and technical assistance to the child care provider community, information on best practices for families and providers, and assistance to the community in expanding comprehensive service delivery for infants, toddlers, and their families. For more information, visit *http://www.nyscccc.org/infant_center.htm*.

To help parents afford the option of staying home with their infants, **Montana's** At-Home Infant Care Program provides subsidies to parents with incomes at or below 150 percent of the poverty level to stay home with their infants for up to two years. Families receive up to $384 per month—an amount equal to the state's child care subsidy payment. Since 2001 the **Missouri** Department of Social Services has administered grants through community-based organizations for the delivery of services and supports to stay-at-home parents of children from birth to age three whose household income is less than 185 percent of poverty. Selected contractors provide comprehensive services and supports in an amount equal to the average cost for subsidized child care for that geographic area. **Utah** provides a $100 nonrefundable tax credit to an income-eligible family that provides full-time, parental care to an infant less than a year old. For more information, visit *http://www.nccic.org/poptopics/stateathome.html*.

## National Birth-to-Three Initiatives

The federal *Early Head Start* program provides funding directly to local programs to improve the early education experiences of low-income infants and toddlers. It seeks to promote healthy prenatal outcomes for pregnant women, enhance the development of very young children, and promote healthy family functioning. Early Head Start (EHS) programs have produced statistically significant, positive impacts on standardized measures of children's cognitive and language development at age three. The program is also associated with favorable effects on children's social and emotional development, parent's skills and behavior, and parental education and job training activities. In addition, it has positive impacts on teen parents and parents who are depressed, two traditionally hard-to-serve groups.[23] Early Head Start serves more than 63,000 low-income families with infants and toddlers—3 percent of those eligible—through 708 community-based programs nationwide. States can provide additional resources to expand and supplement local EHS programs (see the Kansas example on page 29). For more information, visit the Head Start Bureau's Early Head Start Web page at *http://www2.acf.dhhs.gov/programs/hsb/programs/ehs/ehs2.htm* or visit the Web page of the National Early Head Start Resource Center at *http://www.ehsnrc.org/*.

*Better Baby Care* is a national initiative to encourage and support state and local communities in promoting the healthy development of babies, toddlers, and their families. A partnership project of ZERO TO THREE: National Center for Infants, Toddlers and Families, Better Baby Care is a comprehensive, research-based effort. It aims to inform public policy, build public will, advance professional education, and enhance practice so all babies and toddlers will have good health, strong families, and positive early learning experiences. The campaign collaborates with existing national, state, and local organizations to bring attention to the issues and to improve the policies that govern the quality of care as well as parent education, family support, paid family leave, and related policies. For more information, visit *http://www.betterbabycare.org/index.html*.

## Ensuring High-Quality Prekindergarten Programs for Three- and Four-Year-Olds

Growing evidence that high-quality prekindergarten (i.e., preschool) programs help close the achievement gap and improve school readiness is driving increased support for prekindergarten programs for four-year-olds (and often three-year-olds) in many states. Thirty-eight states now invest a total of $2.5 billion to serve nearly 740,000 children nationwide.[24] The quality of a prekindergarten program depends on different elements, including teacher training and certification requirements, program standards (e.g., class size and teacher-child ratios), curriculum standards, and support services to families.[25] Although these programs vary among states, they all share common policy elements related to program, quality, eligibility, governance, funding, and delivery. (See, also, National Resources on State Prekindergarten Policies on page 33.)

### *Program Quality*

Well-educated teachers, small classes and teacher-child ratios, and an appropriate curriculum that is linked to K–12 expectations are all critical features of quality prekindergarten programs. Teachers with four-year college degrees and specialized training in early childhood development or education provide stronger early literacy experiences and are more actively engaged in children's learning than are teachers with lower levels of education.[26] Requiring prekindergarten teachers to have a bachelor's degree, however, could involve significant implications and challenges for the existing early care and education workforce and for the professional development and compensation systems that support them. Currently, 23 states require prekindergarten teachers to hold a bachelor's degree.[27] **New Jersey**, like several other states, has been successful in rolling out a bachelor's degree requirement over time to address the complexities and challenges that such a requirement entails.

Small class and group sizes encourage frequent and positive teacher-child interactions and positively affect children's cognitive and social outcomes.[28] Roughly three-quarters of states with state-funded prekindergarten programs require teacher-child ratios at or below 1:10 and/or group sizes of 20 or fewer children, which experts recommend for four-year-olds. Comprehensive early learning guidelines that are aligned with K–12 standards are critical to guiding curriculum and instruction decisions (see Supporting Ready Schools chapter). **Arkansas'** Early Childhood Education Framework includes program components on family, learning, diversity, and environment with developmental benchmarks for language, physical development, social and emotional development, creative and aesthetic learning, and cognitive and intellectual learning. The framework ties developmental benchmarks with specific strategies and activities for children to help inform curriculum and instruction.

High-quality programs also offer screening and referrals for physical and developmental delays and provide supplemental support services to families. For example, **Alabama's** prekindergarten program offers screening and referral for vision, hearing, general health, and dental health. The state also requires two parent conferences each year and provides services such as parenting support and training, parent involvement activities, health services for children, and transition-to-kindergarten activities.

### *Program Eligibility*

The decision of which children a program will serve drives program design, delivery, and financing decisions. Most states target low-income or at-risk children, though a growing number of states are pursuing voluntary universal programs. **Georgia** introduced the first statewide universal preschool program in 1995, and **Oklahoma** soon followed. In 2002 **Florida** voters approved a constitutional amendment stipulating that all four-year-olds in the state be offered a free preschool education by 2005. **West Virginia** legislation mandates full implementation of universal voluntary prekindergarten statewide by 2013. Age eligibility is another consideration. Seventeen states offer enrollment only to four-year-olds, while 22 states also include three-year-olds.[29]

### *Program Governance*

Who will govern program and policy decisions is also a key question. In many states, the responsibility for preschool programs lies with the state education agency. In other states, this responsibility lies with the department of human services or an independent agency. In **Connecticut** joint governance between the

education agency and the social services agency helps foster partnership, collaboration, and resource-sharing across agencies. **North Carolina's** More at Four Program operates out of the governor's office but is overseen by an interdepartmental task force that includes the departments of public instruction and human services. **Georgia's** newly established Bright From the Start: Georgia Department of Early Care and Learning is an independent state department that houses all early learning and child care programs, including the universal preschool program.

### *Program Funding*

Funding is yet another key consideration. Many states combine state general funds with federal resources, such as Head Start, Title I, Temporary Assistance for Needy Families, and the Child Care and Development Fund. For **Connecticut's** School Readiness prekindergarten program, the state education and social services departments combine funding from several sources, including the Child Care and Development Fund and Temporary Assistance for Needy Families block grants. **Kansas** and **Maryland** combine funds for Part B (Section 619) of the *Individuals with Disabilities Education Act* with additional state funds to create inclusive preschool programs for children with and without disabilities. Many school districts in **Vermont** have used local Title I funds to pay for part-day preschool programs for high-risk children. Some districts have also used the funds to cover transportation costs or to extend preschool through the summer.

Some states rely on revenue streams such as sales taxes, gaming or gambling fees, "sin taxes" (e.g., on alcohol or tobacco), state lottery revenues, or tax-exempt bonds. **South Carolina** began funding preschool for at-risk four-year-olds in 1984 with a one-cent increase in its sales tax. **Arkansas** enacted a tax on beer to continue funding its preschool program, which was originally funded through a dedicated sales tax. In 1998 **California** voters passed Proposition 10, a referendum to impose a 50-cent tax on tobacco products to generate revenue for early childhood programs and services, including prekindergarten programs. Some states require local revenue sources and/or parent fees, but other states specifically prohibit parent fees. For **North Carolina's** More at Four Program, the state pays startup costs in the amount of $500 per child as well as a per-child operating amount for direct services that varies across counties and is linked to the state's low-wealth formula for counties. The budget for the program's state office includes funds for teacher training and scholarships, health insurance, technical assistance, program administration, and evaluation studies. There are no specific requirements regarding the use of local operating funds for direct services to children. However, other resources accessed at the local level must cover approximately half of the direct service operating costs. Communities may use Head Start, Title I, or other funding sources.

### *Program Delivery*

Still other issues for states are how prekindergarten funds will flow to the local level and which local entities will deliver the programs. In some states, such as **New York**, the state education agency allocates funds to school districts to deliver programs in schools or in partnership with private preschool settings, including Head Start programs, nonprofit child care programs, and for-profit child care centers. **Oklahoma's** legislation requires preschool programs to be offered through public schools, but districts have the option to collaborate with Head Start programs and child care centers. In a few states, including **Maine, West Virginia,** and **Wisconsin**, school districts provide prekindergarten programs for three- and/or four-year-olds and claim state K-12 education aid for those children. States can also deliver programs by directly contracting with individual local entities. **Georgia's** Bright From the Start: Georgia Department of Early Care and Learning administers funding directly to public schools, Head Start programs, military bases, and private child care providers that apply for the prekindergarten program.

Finally, states may require a local collaboration council to coordinate services and make decisions on how funds are used. The **Massachusetts** Community Partnerships for Children program requires local Head Start, child care, and public school programs, as well as parents and other community members, to form a community partnership council, develop a proposal, and administer the program.

### National Resources on State Prekindergarten Policies

*Governors' Forum on Quality Preschool*, proceedings, video clips, and briefing papers from the 2003 national event of the National Governors Association Center for Best Practices are available at *http://www.nga.org/center/divisions/1,1188,C_ISSUE_BRIEF^D_5956,00.html.*

State-by-state prekindergarten information is available through these sources:

*The State of Preschool: 2004 State Preschool Yearbook,* from the National Institute for Early Education Research at *http://nieer.org/yearbook/*.

*States' Online Interactive Pre-kindergarten Database,* from the Education Commission of the States at *http://www.ecs.org/clearinghouse/27/24/2724.htm*.

*Quality Counts 2002: Building Blocks for Success,* from Education Week at *http://counts.edweek.org/sreports/qc02/templates/article.cfm?slug=17exec.h21*

## Reaching Children with Special Needs and Children in Foster Care

Children with special needs and those in the child welfare system are at exceptionally high risk of physical, emotional, and developmental delays and are very likely to benefit from school readiness interventions.[30] However, the systems that serve them are often not well connected to early care and education services, and these children are subsequently left out of the school readiness equation. Governors can ensure that all systems that serve young children, including prekindergarten, child care, foster care, mental health, early intervention, and maternal and child health, are connected to one another and recognize their collective role in promoting school readiness for all children. States can align eligibility guidelines and streamline in-take procedures, cross-train professionals in child development, encourage cross-program referrals, and conduct joint outreach and information efforts to parents. They can also integrate service delivery efforts, colocate programs, and partner with community organizations to provide comprehensive services. States can draw on the expertise of several entities to support their initiatives (see National Resources on Children with Special Needs and Children in Foster Care on page 34).

**Minnesota's** Early Childhood Health and Developmental Screening Program is a model universal screening program that supports early detection of health, development, and other factors at age four that may impede a child's growth, learning, and development. School districts are required to screen all children prior to their enrollment in public school. Children are screened for vision, hearing, height and weight, and development in cognitive, social/emotional, fine/gross motor, and speech/language domains. The state offers $2.6 million in categorical funding, and districts draw on other public and private sources to cover additional costs. Of the approximately 60,000 children screened each year, between 17,000 and 18,000 new potential health or developmental problems are identified for further health assessment or education evaluation. The program refers children and their families to Head Start programs, home visiting programs, and adult basic education and family literacy programs. Children identified as having developmental delays are also given priority in the School Readiness Program, Minnesota's state prekindergarten program. For more information, visit *http://education.state.mn.us/html/intro_screening.htm.*

The **Massachusetts** Early Childhood Linkage Initiative (MECLI) seeks to ensure that all children below age three with a newly substantiated abuse or neglect case in the child protection system are referred to the *Individuals with Disabilities Education Act* Part C early intervention (EI) system. The objective is to maximize early identification and intervention for young children who are at heightened risk for serious developmental problems. MECLI is a partnership of the Heller School for Social Policy and Management at Brandeis University, the Massachusetts Department of Social Services (DSS), the Massachusetts Department of Public Health (DPH), and EI service providers. MECLI established three pilot sites in 2002. Personnel in the local DSS area offices and the local EI programs work together to generate and process the referrals. DPH provides electronic administrative data on EI cases, including eligibility, service plan, service delivery, and billing data. Initial results show that the program referred 70 percent of children with newly substantiated abuse or neglect cases to

EI programs; of these, 64 percent was deemed eligible for services. For more information, visit *http://www.heller.brandeis.edu/welcome/research_family_child_center.asp*.

Recognizing the link between children's social and emotional development and school readiness, states are increasingly developing strategies to better connect young children and their families to mental health services. They are supporting these efforts with state funds as well as federal funding sources, such as Medicaid, the Child Care and Development Fund, Temporary Assistance for Needy Families, and Part C (early intervention) of the *Individuals with Disabilities Education Act*. The **Louisiana** Early Childhood Supports and Services (ECCS) program is a multi-agency prevention and intervention program that serves children from birth through age five (and their families) who have been identified as at risk for developing social, emotional, and/or developmental problems. Developmental delays, incidences of abuse or neglect, and exposure to poverty, violence, parental mental illness, and parental substance abuse are qualifying risk factors. ECSS joins local agencies and organizations into networks that provide coordinated, cross-agency screening, evaluation, referral, and treatment. Services include infant mental health screening and assessment, counseling, therapy, child abuse and domestic violence prevention, case management, behavior modification, parent support groups, and use of emergency intervention funds to purchase supports and services that are not otherwise available. The program also serves to build the infrastructure of the parishes (counties) it serves by training human services professionals, agency employees, and education and child care personnel as well as family members and advocates in the specialized area of mental health assessment and intervention. For more information, visit *http://www.ecssla.org/ecss_frame.htm*.

### National Resources on Children with Special Needs and Children in Foster Care

*National Early Childhood Technical Assistance Center*, Frank Porter Graham Child Development Institute, University of North Carolina at Chapel Hill, at *http://www.nectac.org/default.asp*.

*National Technical Assistance Center for Children's Mental Health*, Georgetown University, Center for Child and Human Development, at *http://gucchd.georgetown.edu/*.

*National Clearinghouse on Child Abuse and Neglect Information*, Children's Bureau, Administration for Children and Families, U.S. Department of Health and Human Services, at *http://nccanch.acf.hhs.gov/*.

*Strengthening Families through Early Care and Education* is an initiative of the Center for the Study of Social Policy that seeks to reduce incidents of child abuse and neglect through early care and education programs. The initiative is supported with funding from the Doris Duke Charitable Foundation. For more information, visit *http://www.cssp.org/doris_duke/index.html*.

## Conclusion

States are already providing numerous services and supports to children below age five. The services, programs, requirements, and funding sources are as varied and complex as are children's developmental needs at this stage. There are multiple paths to improving the quality of early care and education experiences for all children in order to achieve school readiness goals.

States can use research and data to help inform decisions and establish spending and policy priorities. Even in the face of tight budgets, they can pursue opportunities to partner with local leaders and private-sector stakeholders in the business, higher education, and philanthropic communities to leverage resources, seed innovation, and pursue common goals. They can also focus more intently on connecting programs, policies, and services that have historically served children and families independently from one another. Setting research-based program standards and expectations for child outcomes can help guide all decisions and maintain a focus on the results for children. ▮

## CONCLUSION

School readiness is a complex policy issue. States are pursuing multiple strategies to support families, schools, and communities in ensuring that children enter kindergarten ready to reach their full potential. They are becoming more sophisticated in using results to inform decisions and in building on and integrating existing programs and infrastructure. States are leading efforts to coordinate programs, services, and policies, support evidence-based practices, and seed innovation at the local level.

Governors can provide leadership over efforts to promote school readiness and focus the talent and energy of public and private stakeholders on a clear vision and common agenda for young children. Specifically, they can focus on building Ready States by supporting a coordinated and comprehensive infrastructure for early childhood, integrating data systems and supporting evaluation efforts to inform decisions, and holding decisionmakers and stakeholders accountable for measurable results. Finally, governors can provide flexibility to local communities to match resources with needs in exchange for positive child outcomes. Through these combined efforts, governors can continue to lead state efforts to build the foundation for children's bright futures. ▮

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NGA Center for
BEST PRACTICES

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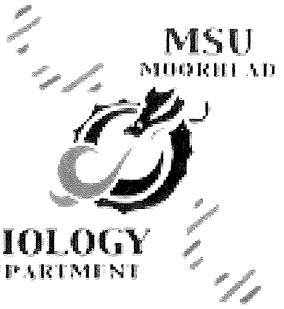
Suite 267
Washington, D.C. 20001-1512
202.624.5300
www.nga.org

# Minnesota State Colleges and Universities

## Minnesota State University Moorhead

### College of Social and Natural Sciences
### Departments of Biology and Chemistry


## *Biochemistry and Biotechnology Emphasis*

A Presentation to the Honorable Members of the Minnesota House of Representatives Higher Education Finance Committee on:

Monday, February 21, 2005

To the Honorable Members of the Minnesota Senate Education Committee on:

Tuesday, February 22, 2005

To the Honorable Members of the Minnesota Senate Higher Education Finance Committee on:

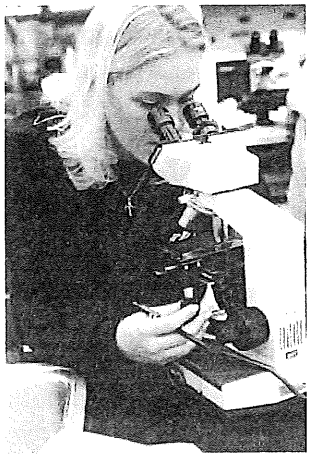
Thursday, February 24, 2005

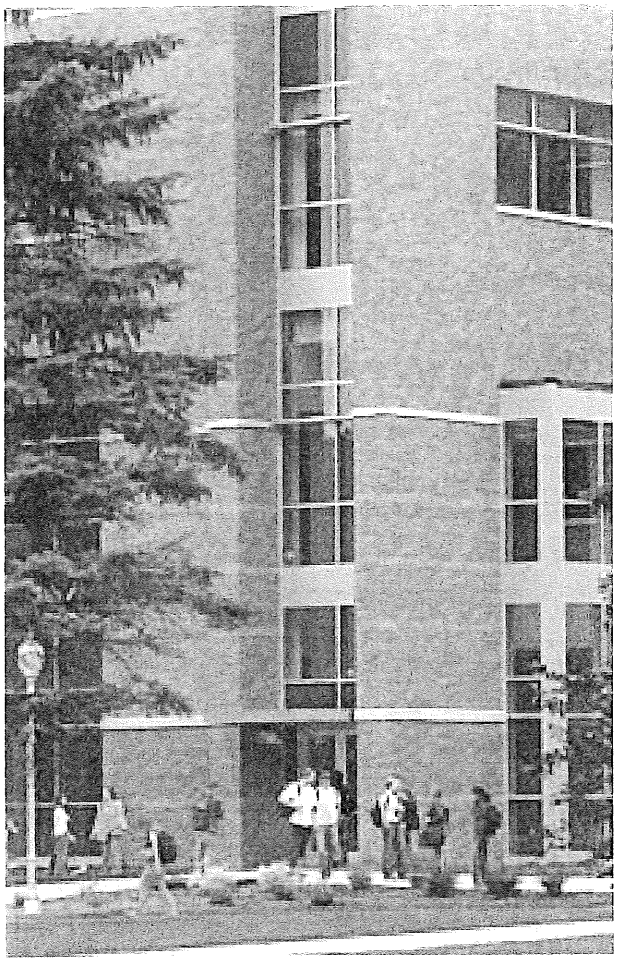
# Thank You!

The students, faculty and administration of MSU Moorhead want to thank:

*-Governor Tim Pawlenty*
*-The Members of the State Legislature*
*-The Taxpayers of the State of Minnesota.*

**The New Science Laboratory Facility is simply outstanding. The facility is providing unprecedented opportunities for enhanced science education and continued growth in the natural sciences at MSUM.**





We look forward to the funding for the renovation of Hagen Hall that will complete the update of the science complex.

## MSUM Faculty Presenters

**MSUM President Roland Barden and the Dean of Social and Natural Sciences Dr. Ronald Jeppson accompanied Biochemistry and Biotechnology Faculty Members Drs. Michelle Malott, Mark Wallert, Ellen Brisch, and Joe Provost to the MnSCU Award Presentation in March 2003.**

**Dr. Mark Wallert.** Dr. Wallert is a Minnesota native. He received his Bachelor's Degree from Southwest State University. Dr. Wallert's Ph.D. is in Physiology from Emory University in Atlanta, Georgia in 1989. He was then a Postdotoral Research Fellow in the Pharmacology Department at the Mayo Clinic. He has been a member of the MSUM Biology Department since 1990. He teaches the first course for biology majors, Cell Biology, and is instrumental in helping new students transition into the department. Dr. Wallert converted the Cell Biology Laboratory to an investigative format during the 1995-96 academic year. Dr. Wallert also teaches Human Physiology a junior level course in the Health and Medical Science Emphasis. In the senior Biotechniques sequence Dr. Wallert teaches cell culture and transfection as well as supervising a research group. Dr. Wallert has chaired the Biochemistry and Biotechnology (B&B) Oversight Committee since it inception in 1997. He has been a major driving force for the incorporation of research into undergraduate education at MSUM. He has been the principle investigator on three NSF-CCLI proposals to enhance teaching in the B&B Emphasis. Dr. Wallert is a member of Project Kaleidoscope Faculty for the 21st Century and is a member of the Education and Professional Development Committee for the American Society of Biochemistry and Molecular Biology. Over the past three years, Dr. Wallert has consulted for the North Dakota Biomedical Research Infrastructure Network. During that time he has co-presented four workshops teaching faculty members from the four-year and tribal college in North Dakota how to incorporate research-based, investigative laboratories into their curriculum. Dr. Wallert also maintains an active research program. In the past 15 years, Dr. Wallert has had 58 different students participate in research obtaining a total of 91.5 years of research experience. Of the 34 students who have graduated from Dr. Wallert's laboratory, 27 have continued on to graduate or professional school. Collectively, these students have been co-authors on 4-refereed publications, 14 nationally presented abstracts and 29 abstracts at the Minnesota Academy of Sciences. Dr. Wallert has received nearly $1,300,000 in grant support while at MSUM.

**Dr. Ellen Brisch.** Dr. Brisch earned her BA in Biology from Oberlin College in 1985, spent five years working as a chef in the Boston area, returned to graduate school to earn a Ph.D. at the University of Kansas in Physiology and Cell Biology in 1995, and was a postdoctoral fellow at the University of Utah from 1996 to 1999. Dr. Brisch was able to attend the Analytical and Quantitative Light Microscopy course at Marine Biology Laboratory at Woodshole MA this past summer. Dr. Brisch joined the Biology Department in the fall of 1999 to start up a Developmental Biology course. Dr. Brisch's research interests are in cell division; specifically in understanding how mitochondria are coordinated and segregated during cell division and also how microtubule assembly is regulated after fertilization. Dr. Brisch is developing collaboration with Dr. Margaret Titus at the University of Minnesota and works two weeks over the summers in her lab. Dr. Brisch teaches Cell and Vertebrate Systems Physiology and Developmental Biology for biology majors, Human Biology for non-majors, Biology of Women which is cross-listed with Women's Studies, and participates in the Biotechniques research courses by teaching a microscopy section and working with a research group. In addition to her courses and research, Dr. Brisch is very active on campus and serves on many University and Programmatic committees. Dr. Brisch's dedication to the value of a liberal arts education has helped her to earn the chair of the University's Liberal Studies Committee.

**Dr. Michelle Malott.** Dr. Malott has been a member of the MSUM Biology Department since 2001. She earned her B.A. in Biology from the University of Windsor in 1990 and her Ph.D. in Biomedical Sciences from Wright State University in 1999. She spent a year as a Postdoctoral Scientist in the Cancer Research Division at Eli Lilly and Co. Her interests as a young undergraduate researcher were in the area of evolutionary biology. These interests broadened into the biomedical sciences when she was a graduate student, as her doctoral work focused on mechanisms regulating DNA replication initiation in mammalian cells. She decided to focus on an undergraduate teaching career at an institution that would support the use of research as a teaching tool in the training of young scientists and was hired by MSUM to do just that. She teaches a junior-level molecular biology course and is actively involved in the B&B emphasis and regularly supervises a group of senior research students in the B&B capstone course. She also is responsible for the sophomore-level genetics class and regularly teaches one of the department's non-major biology classes. She works hard to make the labs associated with her classes, current, relevant and investigative. In addition to her teaching responsibilities, Dr. Malott also maintains an active research program that supports ~ 6 students each year in extracurricular research projects. Her interests and expertise in the molecular area remain broad and her students are involved in both biomedical and molecular ecology research projects. She has been successful in obtaining both internal and external funding to support her research program and is a strong advocate for developing and maintaining collaborative research efforts at MSUM. Dr. Malott also enthusiastically believes in the mission of increasing the participation of under-represented students and women in STEM areas and is involved in a variety of outreach activities to support this.

**Dr. Joseph Provost.** While teaching 12 contact hours a semester, advising students and being involved throughout campus and the community on many committees, Dr. Provost has maintained a successful research program where he has been funded with over $800,000 in awards from the Autism Foundation, the National Science Foundation, the National Institutes of Health and the State of Minnesota. For the past eight years Dr. Provost focused on how G protein coupled signaling pathways cross-talk to signal to growth factor cascades. A new direction that his laboratory has begun is in Autism. In 40-60% of diagnoses, Autism patients are deficient in Tuberous Sclerosis Complex. This is a newly discovered protein that can activate two pathways that both lead to NHE regulation. In all of these efforts undergraduates are fully involved in all phases of the experimentation. Dr. Provost is an active member of Project Kaleidoscope Faculty for the 21st Century. Last year he helped facilitate a North Dakota Biomedical Research Infrastructure Network / Project Kaleidoscope workshop for the North Dakota four-year and tribal colleges on teaching investigative laboratories and incorporating research into the undergraduate curriculum. Dr. Provost is on the board of directors for the Minnesota Academy of Science and is a regular organizer for the Academies Annual Meeting. Dr. Provost also serves as the Northwest Regional Co-Directors for the American Society of Biochemistry and Molecular Biology (ASBMB) Undergraduate Biochemistry and Molecular Biology project. In this position Provost and Wallert are responsible for the coordination of resources for biochemistry and molecular biology courses in the Upper-Midwest. At the 2004 and 2005 ASBMB meeting Dr. Provost is one of the organizers for the undergraduate poster session and is a working member of the ASBMB Educational and Professional Development Committee. The primary purpose for faculty members at MSUM having ongoing research projects is to provide undergraduates a meaningful research experience. In the past six years Dr. Provost has had 28 different students participate in research for a total of 53.5 years of research experience. Of the 18 students who have graduated from Dr. Provost's laboratory, 14 have continued on to graduate or professional school. Collectively, these students have been co-authors on 5-refereed publications, 21 nationally presented abstracts and well over 50 abstracts at the Minnesota Academy of Sciences or Tri Beta Meetings.

**Undergraduate Student Presenters from the MSUM Biochemistry and Biotechnology Emphasis:**

**Jessica Heck.** Jessica is a senior Biochemistry and Biotechnology Major from Moorhead, Minnesota. She will graduate in May 2005. Jessica has been accepted into the Molecular and Cellular Pharmacology program at the University of Wisconsin – Madison. She plans to pursue a Ph.D.

**Dylan Voge** - Dylan is a senior Biochemistry and Biotechnology Major from Wadena, Minnesota. He will graduate in May 2005. Dylan has been accepted into the University Of Minnesota Duluth School Of Medicine.

**Kathleen (Kit) Mitchell** – Kit is a junior Biology Major from Wayzata, Minnesota. Kit is interested scientific writing, particularly in the area of science policy.

**Rachel Sang** – Rachel is a junior Biochemistry and Biotechnology Major from Steven, Minnesota. Rachel is a Goldwater Scholar who plans to pursue and M.D./Ph.D. following graduation from MSUM. Rachel is planning to do summer research at the University of California San Francisco this summer.

# Minnesota is a Biotechnology State!

Minnesota Partnership for Biotechnology and Medical Genomics

UNIVERSITY OF MINNESOTA

MAYO CLINIC

The partnership seeks to position Minnesota as a world leader in biotechnology and medical genomics applications that will result in important new medical discoveries, thereby improving health care for patients and fostering the development of new businesses and jobs in Minnesota.

The goals of the Minnesota Partnership for Biotechnology and Medical Genomics are threefold:

- To produce scientific advances.
- To identify and lead to improvements in health care.
- To provide stimulus for new jobs and an expanded tax base for Minnesota.

**The number one resource required to achieve these goals is a well-educated, well-trained, and enthusiastic population of Minnesota scientists.**

# Who Will Train These Scientists?

## Mayo Graduate and Medical School

- Graduate and Professional Education.
- M.D., Master's, and Ph.D. Programs

## University of Minnesota

- Goal to be one of the top three public research universities in the world in the next 10 years.
- Focus is Graduate and Professional Education
- Undergraduate Education is Traditional

## MnSCU

- Focus is Technical and Undergraduate Education
- Enrollment is 240,000 students per year in credit-based courses
- 130,000 per year in non-credit courses.
- 30,000 graduates per year.

Minnesota
STATE COLLEGES
& UNIVERSITIES

**Successful and Contributing Graduates of the Minnesota State University System**

- Dr. Mark Wallert is from Danube, Minnesota and received his Bachelor's Degree from Southwest State University.
- Dr. Joseph Provost is from Blaine, Minnesota and received his Bachelor's Degree from Bemidji State University.

# Minnesota State University Moorhead

- Primarily Undergraduate Institution
- 7,800 full- and part-time students
- Students enroll in one of 90 programs and receive majors that lead to baccalaureate degrees.
- Dedicated to providing the highest quality education possible at an affordable price.

| Academic Year | 98/99 | 99/00 | 00/02 | 02/02 | 02/03 | 03/04 |
|---|---|---|---|---|---|---|
| MSUM Students | 6,102 | 6,308 | 6,707 | 7,044 | 7,048 | 7,265 |
| Grads | 1,072 | 1,057 | 1,099 | 1,183 | 1,092 | 1,297 |
| Biology Majors | 250 | 262 | 233 | 246 | 272 | 299 |
| Grads | 38 | 41 | 41 | 37 | 44 | 48 |
| Chemistry Majors | 32 | 51 | 67 | 84 | 90 | 109 |
| Grads | 4 | 6 | 8 | 11 | 13 | 18 |
| B&B Emphasis | | 18 | 35 | 40 | 52 | 61 |
| Grads | | 4 | 5 | 7 | 11 | 13 |

# Natural Sciences at MSU Moorhead

The Regional Comprehensive University has a Unique Role in undergraduate science education in Minnesota.

Combines the best educational opportunities from a Major Research Institution with those from Small Independent Colleges.

- Provide broad-based liberal studies experience
- Provide small class size
- Focus is on undergraduate education and quality student-faculty interactions
- Provide students access to a comprehensive science curriculum
- Provide expanded research opportunities.
- All laboratories are taught by faculty members

Biology professor Dr. Ellen Brisch is the chair of the MSUM Liberal Studies Committee

**Unique to the MSUM Model**

- A coordinated science curriculum with research-based, investigative laboratories initiated in year one freshman courses through advanced senior-level courses
- Research experiences for undergraduates directly mentored by Ph.D. faculty.

Drs. Joe Provost and Mark Wallert are both Associate Editors of the Journal of Biochemistry and Molecular Biology Education.

Dr. Chris Chastain regularly reviews manuscripts for the Journal of Plant Physiology.

# The MSU Moorhead Model of Biosciences Education

Over the past ten years, faculty members from MSUM have participated in the national debate about the need for reform in undergraduate education through participation in Project Kaleidoscope (PKAL) Faculty for the 21st Century. PKAL states that the most important attributes of undergraduate programs that attract and sustain student interest in science and Math is a thriving natural science community of students and faculty. This is demonstrated by a commitment to:

*1)* ***Experiential, hands-on, and investigative learning*** *throughout the curriculum from introductory to capstone courses*

*2)* ***Learning that is personally meaningful to students and faculty,*** *makes connections to other fields of inquiry yet, embedded in the context of its own history and rationale, and suggests practical applications relevant to students.*

*3)* ***Learning that takes place in a community where faculty are committed equally to undergraduate teaching and to their own intellectual vitality****, where faculty see students as partners in learning, where students collaborate with one another and gain confidence that they can succeed.*

**The Faculty of the MSUM Biochemistry and Biotechnology Emphasis received the MnSCU Academic and Student Affairs Division Excellence in Curriculum Programming Award in 2003. This is the only academic excellence award given in the MnSCU System anually.**

**The Biology Department at MSUM has created an exciting learning environment that includes research-based, investigative experiences and faculty-student interactions that foster meaningful and vital collaborations.**

In September 2003, the Biology Department underwent an external review by Dr. Randy Moore. Dr. Moore is Professor in the General College at the University of Minnesota, current editor-in-chief of the *American Biology Teacher*, and a nationally recognized expert in undergraduate science education. In his report, Dr. Moore made two observations that reflect upon the quality of the educational environment at MSUM:

1) Summarizing student comments and evaluations of the department, Dr. Moore stated, *"**This level of satisfaction of undergraduates with their department is rare, and is undoubtedly due to the commitment of the faculty to their students.** Although every department at every university claims that it is committed to its students, many aren't. **It was very refreshing to see the commitment of the faculty in the biology department to their students.**"*

2) "The biology department offers many opportunities for students to do independent research. ***This is a major strength of the department, for it provides unique opportunities that are often unavailable at comparable departments.***"

Biology professor, Dr. Brian Wisenden, is an internationally renowned behavioral biologist. He is regularly invited to present his research with MSUM undergraduates at international meetings. Two examples:

- XI European Congress of Ichthyology, Tallinn, Estonia
- Towards a behavioral genetics of zebrafish (NIH). Wood's Hole Marine Biological Station, MA

Dr. Wisenden is also an Associate Editor for the Journal Behaviour. He reviews an average of 2 - 4 articles per week for this and other journals.

# Undergraduate Research

Faculty members throughout the Biology Department share a commitment to undergraduate research. Although, the Biology Department at MSUM has enjoyed a strong academic reputation, it was only from 1995 onward that the Biology Department became committed to transforming itself from a purely teaching department to one that values research as an essential component to an undergraduate education in biology. Since then, each new faculty member hired has contributed momentum for this goal and by 1998, faculty student research had expanded to such a level where we now consider ourselves ***the*** regional leaders of student centered research activity. Here are our numbers that substantiate this claim.

***Since 1995 to the present, the Biology faculty have mentored 407 students in research, resulting in 419 conference presentations, 234 published abstracts, 32 peer reviewed journal papers, 7 scholarly review papers, and 5 book chapters. We believe this is exceptional research productivity from a purely undergraduate institution.***

Biology Faculty/Research Specialty/Years at MSUM/ Students Mentored

- Ellen Brisch - Cell Division - 6 years - 35 students
- Chris Chastain - Plant Physiology - 10 years - 73 students
- Linda Fuselier - Population Genetics - 1 year - 3 students
- Michelle Malott - DNA Replication and Molecular Ecology - 4 years - 27 students
- Richard Pemble - Prairie Ecology - 36 years - 3 Generations of MSUM Biology Students
- Joseph Provost - Signal Transduction of Cancer - 8 years - 64 students
- Donna Stockrahm - Wildlife Ecology - 16 years - 88 students
- Alison Wallace - Plant Ecology and Science Education - 5 years - 23 students
- Mark Wallert - Cell Physiology of Cancer - 15 years - 93 students
- Kathryn Wise - Education Technology - 23 years - 39 students
- Brian Wisenden - Behavioral Ecology - 7 years - 51 students.

# The Biology/Chemistry Double Major: Biochemistry and Biotechnology Emphasis

The recent publication of the National Research Council's report, *BIO 2010: Transforming Undergraduate Education for Future Research Biologists* succinctly frames the history and direction of reform to undergraduate curricula needed to educate the next generation of biological scientists. The executive summary for this report opens with the following statements:

> *"How biologists design, perform, and analyze experiments is changing swiftly. Biological concepts and models are becoming more quantitative, and biological research has become critically dependent on concepts and methods drawn from other scientific disciplines... In contrast to biological research, undergraduate biology education has changed relatively little during the past two decades. The ways in which most future research biologists are educated are geared to the biology of the past, rather than to the biology of the present and future. Like research in the life sciences, undergraduate education must be transformed to prepare students effectively for the biology that lies ahead..."*

Dr. Ellen Brisch collaborates annually in a summer research project in the laboratory of Dr. Margaret Titus in the Department of Molecular and Cellular Biology at the University of Minnesota. This summer MSUM junior Lisa Magstadt will be joining the project.

## Building a Program at the Forefront of National Reform

The BIO 2010 Report concludes with eight recommendations for change in undergraduate biology education.

1) ***Each institution of higher education should reexamine its current courses and teaching approaches to see if they meet the needs of today's undergraduate biology students.***

2) ***Concepts, examples, and techniques from mathematics, and the physical and information sciences should be included in biology courses.***

3) ***Successful interdisciplinary teaching will require new materials and approaches.***

4) ***Laboratory courses should be as interdisciplinary as possible.***

5) ***All students should be encouraged to pursue independent research as early as is practical in their education.***

6) ***Seminar-type courses that highlight cutting-edge developments in biology should be provided on a continual and regular basis throughout the four-year undergraduate education of students.***

7) *Medical school admissions requirements and the Medical College Admissions Test (MCAT) are hindering change in the undergraduate biology curriculum.*

8) ***Faculty development is a crucial component to improving undergraduate biology education.***

Dr. Michelle Malott participated in the NSF-funded, Dartmouth ELSI (Ethical, Legal, and Social Implications of the Human Genome) Course in 2004.
Dr. Ellen Brisch participated in the AQLM (Analytical and Quantitative Light Microscopy) Course at Marine Biological Laboratory at Woods Hole, MA in 2004.
Drs. Shawn Dunkirk, Joe Provost and Mark Wallert are members of Project Kaleidoscope Faculty for the 21st Century.

**Seven of the Bio2010 recommendations are directed toward educational institutions. In the MSUM Biology Department, five of them had been implemented prior to the report being published. The other two are currently being implanted.**

In April 2003, Dr. William H. Heidcamp, Professor of Biology at Gustavus Adolphus College, and President of the North Central District 3 for Beta Beta Beta, the National Biological Honors Society visited MSUM to review the Biochemistry and Biotechnology (B&B) Emphasis. In his summary report Dr. Heidcamp concluded that:

***"There is an excitement within the Biology Department's B&B Emphasis that is contagious. The faculty have it, the students demonstrate it, and visitors quickly pick up on it. The goal of creating an atmosphere of scientific inquiry based on research has clearly been met. The program is going remarkably well and could easily serve as a national model for how to structure an undergraduate program around inquiry and on research as a tool for education."***

## The Annual Biology Research Banquet

Each April, all Biology research students are required to present their research at the MSUM Academic Conference. That night, the Biology faculty hosts the Biology Research Banquet to acknowledge all of the successful research students and roast our seniors. The MSUM President, Vice-President of Academic Affairs, and the Dean of Social and Natural Sciences regularly attend the Banquet.

# Curriculum Development in the Biochemistry and Biotechnology Emphasis

***To our knowledge, the design of the MSUM B&B curriculum is among the first programs nationally to incorporate the investigative laboratory teaching approach in a planned, coordinated fashion in all four years of the biology and chemistry baccalaureate.*** Evidence of our concept as a sound and viable direction for the future is from the funding gained by several faculty members involved in the B&B Emphasis.

Drs. Joe Provost and Mark Wallert are members of the Education and Professional Development Committee of the American Society of Biochemistry and Molecular Biology.
In this capacity, they:

- Are organizing the undergraduate poster competition for the 2005 National Meeting.
- Are organizing a Plenary Session for the 2006 National Meeting.
- Have been invited to present at the International Meeting in Kyoto, Japan in 2006.

Drs. Joe Provost and Mark Wallert have served as consultants to the North Dakota Biomedical Research Infrastructure Network funded by the National Institutes of Health for the past three years.

In this capacity, they have presented 3 Workshops and 2 Invited Presentations training faculty members from the North Dakota Four-Year and Tribal Colleges how to build undergraduate programs around research-based, investigative learning.

# Funding the Biochemistry & Biotechnology Emphasis

***Since 1997, faculty in this program have been the recipient of nearly $1,300,000 in funding. This includes investments in over $500,000 worth of laboratory equipment.*** This equipment is extensively used in freshman through senior biology and chemistry laboratories. This equipment would not have been available to MSUM students without the initiative of the B&B faculty and without the success of our students.

| Grant Type | NSF Funds / MSUM Match | Dates | Title / Authors |
|---|---|---|---|
| ILI | $32,010<br>$118,000 | 8/15/97<br>7/31/99 | **Biotechnology Training Enhancement at Moorhead State University.**<br>Mark A. Wallert, Shawn G. Dunkirk, Chris J. Chastain |
| CCLI | $77,059<br>$77,059 | 4/15/01<br>3/31/04 | **The Biotechnology Emphasis: Integrating Research into Education to Build a Learning Community**<br>Mark A. Wallert, Chris J. Chastain, Ellen Brisch, Joseph J. Provost, Shawn G. Dunkirk |
| MRI | $116,163<br>$ 36,957 | 9/01/01<br>8/31/04 | **Optical Imaging and Fluorescence Microscopy Enhancement**<br>Ellen Brisch, Chris J. Chastain, Joseph J. Provost, Mark A. Wallert |
| CCLI | $95,496<br>$44,312 | 8/15/04<br>8/1/06 | **Incorporating Research-based Investigative Experiences into Freshman Level Cell Biology**<br>Mark A. Wallert |

***Currently, over 600 students per year enroll in classes that utilize this equipment.***

# Collaborations with Biochemistry & Biotechnology Emphasis

The MSUM Biology, Physics and Math Departments recently submitted a $1,450,000 National Science Foundation STEM Enhancement Program grant to increase the number of graduates in these departments. Biochemistry and Biotechnology faculty members have recently been invited to participate in a $2,000,000 comprehensive teaching and research grant.

Drs. Ellen Brisch and Michelle Malott were Keynote Speakers at the 2004 Minnesota State University Mankato Undergraduate Research Conference. Talk entitled "Creating an Active Learning and Instructional Block in Advanced Optical Imaging Techniques."

All Biology Faculty Members Contribute to Student Biochemistry and Biotechnology Projects.

Dr. Wisenden is a regular collaborator developing molecular ecology based biochemistry and biotechnology research projects.

All of the Ecology and Field Biology Faculty, Drs. Fuselier, Stockrahm, Pemble, Wisenden, and Wallace have committed to the incorporation of molecular techniques into their curriculum.

# Barry M. Goldwater Scholarships

In the past four years the Biology Department at MSU Moorhead has had five Barry M. Goldwater Scholars. The Goldwater Scholarship is the top national scholarship in science, engineering, and mathematics. Each year approximately 300 scholarships are awarded nationally.

| | |
|---|---|
| Rachel Sang<br>• 2004-05, 2005-06 Academic Years<br>• Biochemistry and Biotechnology Emphasis<br>• Steven, Minnesota | Nicole Korpi<br>• 2001-02 Academic Year<br>• Biochemistry and Biotechnology Emphasis<br>• Faribault, Minnesota<br>• Ph.D. Candidate University of Wisconsin – Madison, Biomolecular Chemistry |
| Heidi Jo Johnson<br>• 2003-04 Academic Year<br>• Biochemistry and Biotechnology Emphasis<br>• New Town, North Dakota<br>• Ph.D. Candidate, Eppley Cancer Center, University of Nebraska Omaha | Daniel McEwin<br>• 2001-02 Academic Year<br>• Biology Major<br>• Moorhead, Minnesota<br>• Ph.D. Candidate North Dakota State University, Aquatic Ecology |
| Hillary Thronson<br>• 2002-03 Academic Year<br>• Biochemistry and Biotechnology Emphasis<br>• Watertown, South Dakota<br>• M.D. / Ph.D. Candidate University of South Dakota School of Medicine | Lisa Stritz<br>• 2004-05 Nominee<br>• Biochemistry and Biotechnology Emphasis<br>• Bismarck, North Dakota<br>• Plans to pursue M.D. / Ph.D. |

# Success Stories – Graduate/Professional Schools

| | |
|---|---|
| Jessica Heck - Senior<br>• Moorhead, Minnesota<br>• Accepted University of Wisconsin – Madison, Molecular and Cellular Pharmacology | Dylan Voge - Senior<br>• Wadena, Minnesota<br>• Accepted University of Minnesota Duluth School of Medicine – Early Decision Program |
| Justin Voog - 2003 Graduate<br>• Belgrade, Minnesota<br>• M.D. / Ph.D. at the University of California – San Diego<br>• Medical Scientist Training Program Scholarship recipient. 300 MSTP Scholarships are given annually by the National Institutes of Health.<br>• Value approximately $350,000 | James Denker - 2003 Graduate<br>• Battle Lake, Minnesota<br>• Ph.D. Candidate, University of Iowa, Interdisciplinary Biochemistry Cell Biology Program |
| Mario Fernandez- 2003 Graduate<br>• Moorhead, Minnesota<br>• Started at MSUM in the Post-Secondary Education Option program<br>• Ph.D. Program, Eppley Cancer Center, University of Nebraska Omaha | Isaac Manke - 2000 Graduate<br>• Woodbury, Minnesota<br>• Will complete Ph.D. from MIT in May 2005<br>• First professional publication was in the Journal Science. The number one scientific journal in the world. |
| Jason Brown – 2003 Graduate<br>• Aberdeen, South Dakota<br>• Ph.D. Candidate East Carolina University, Interdisciplinary Biological Science | Anojni Nagahawatta – 2003 Graduate<br>• Sri Lanka<br>• Ph.D. Candidate in the Molecular and Cellular Biology Program at the University of Minnesota |

# Success Stories – Employment

| | |
|---|---|
| Kris Mortenson<br>• Working for Cargill | Breann Stoltz<br>• Working for Cargill |
| Julie Vogel<br>• Working for R&D Systems | Christa Randklev<br>• Working for R&D Systems |
| Matt Baumgartner<br>• Working for R&D Systems | Justin Klitzke<br>• Working for Cargill |
| Jeff Clausen<br>• Kodak Bioresearch | Grant Harrington<br>• USDA Laboratory, Fargo N.D. |
| Judi Loy<br>• Working for PRACS | Autumn Dinnel<br>• Working for PRACS |
| Sara Larson<br>• Working for R&D Systems | Bree Hamann<br>• United States Embassy in Japan<br>• Teaches High School Science |

**The MSUM Biochemistry and Biotechnology Emphasis has an excellent placement rate for graduates.**

# Science Outreach

One of our major efforts is to serve as a regional science educational resource for area K-12 teachers and students. The college has an outreach coordinator and started a variety of programs for teachers and students alike. These programs include:

**1) World of Change Workshop.** This workshop is a one-day event for middle and high school teachers to provide them with information on new and better ways to teach science and math with hands-on and research-based activities. In the past five years nearly 350 teachers have participated in these workshops.

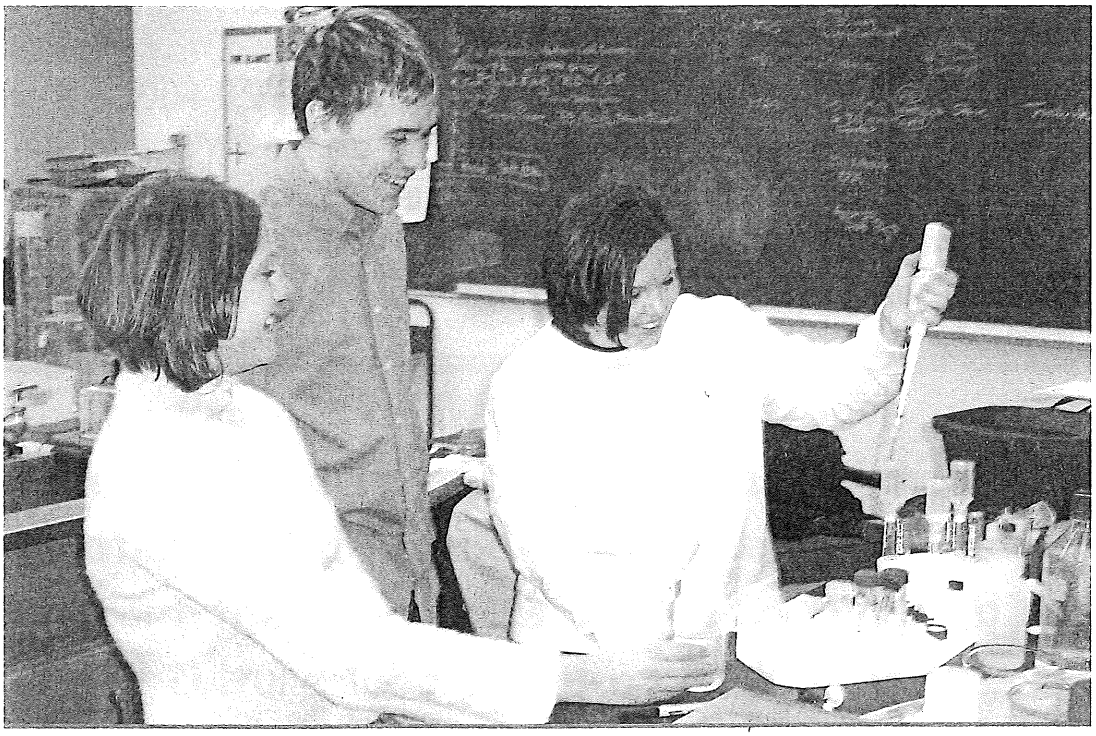
**2) Science and Math Day.** This is a one-day event where area high school teachers bring their students to the MSUM campus to participate in laboratory activities that they could not do in their respective schools. Each visiting student participates in two 3-hour laboratory blocks of their choosing. In the past three years nearly 300 high school students have participated in this event.

**3) Classroom Visits.** This program involves MSUM faculty members visiting K-12 classrooms and bringing all the materials and supplies to do activities and provide laboratory experiences that are typically beyond the scope or the expertise of the teachers.

**In the past five years, College of Social and Natural Science faculty members from MSUM have visited the classes of over 8,000 K-12 students to promote science and Math.**

# College of Social and Natural Science
# Outreach Statistics

| | 99 – 00 | 00 - 01 | 01 - 02 | 02 - 03 | 03 - 04 |
|---|---|---|---|---|---|
| World of Change Participants High School Teachers | 60 | 65 | 81 | 63 | 75 |
| Science and Math Day<br>High School Students<br>Teachers | | 93<br>6 | 90<br>6 | 97<br>7 | Not Available |
| School Visits<br>Student Contacts<br>Teacher Contacts<br>Other Contacts (Parents and Members of Public) | 1846<br>104<br>126 | 1974<br>156<br>249 | 2103<br>197<br>387 | 2227<br>217<br>842 | Not Available |



# High School Research Mentor Program

Over the past five-years MSUM faculty members mentored over 20 students from area high schools. These students conduct research projects in order to compete at the regional, state, and national science fairs. An example of one of our collaborations occurs between Drs. Chris Chastain, Ellen Brisch, Joe Provost, and Mark Wallert and the students of Perham, MN high school and their science teacher Beth Schwarz. Under the mentorship of Drs. Provost and Wallert, the Perham High students participate in cancer research, performing part of their work at their school and part at the MSUM campus.

During the 2003-2004 academic-year seven Perham students worked with Drs. Brisch, Chastain, Provost and Wallert. All of these students qualified to compete at the state science fair after entering their research at the Northwest Regional Science Fair. Three of these students won their state competition and advanced to the Intel International Science Fair. Finally, two of these students competing as a team finished in the top 15% in this prestigious science fair.

During the 2004-05 academic year two additional Perham students are working in the Provost and Wallert laboratory. Kassia Pawlowski and Dani Rastedt will each be presenting at the Northwest Regional Science Fair on February 28, 2005. Following graduation, both plan to attend MSUM and pursue an Emphasis in Biochemistry and Biotechnology

Drs. Joe Provost and Mark Wallert have received funding from the National Science Foundation and a Roland Dille Excellence Award to support these projects, including funds to set up a cell culture laboratory at Perham High School.

# MSUM Regional Science Center

The Regional Science Center is located 15 miles from the MSUM campus along the beach ridges of glacial Lake Agassiz. The site includes 300 acres of native prairie and riparian woodlands along the Buffalo River. The RSC's tallgrass prairie site is adjacent to two larger natural reserves, the Buffalo River State Park (1,200 acres) and the Nature Conservancy's Bluestem Prairie and Scientific Area (3,500 acres). This 5,000-acre tallgrass prairie is the largest managed original tallgrass prairie in Minnesota. The site includes a 13,000 square foot Interpretive Center built in 1992.

Since 1984 the mission of the RSC is to provide programs in natural history and observational astronomy to area K-12 students, college students, area K-12 teachers and the general public.

**Each year over 16,000 K-12 students from 125 schools participate in Regional Science Center Programs.**

Our 4,000 college students from three area colleges and universities use the site for biology field studies as well as telescope viewing in the Feder Observatory. Currently a director, a naturalist, an astronomy coordinator and an office manager staff the Center. Student employees, seasonal employees and over 130 volunteers assist these full-time staff.

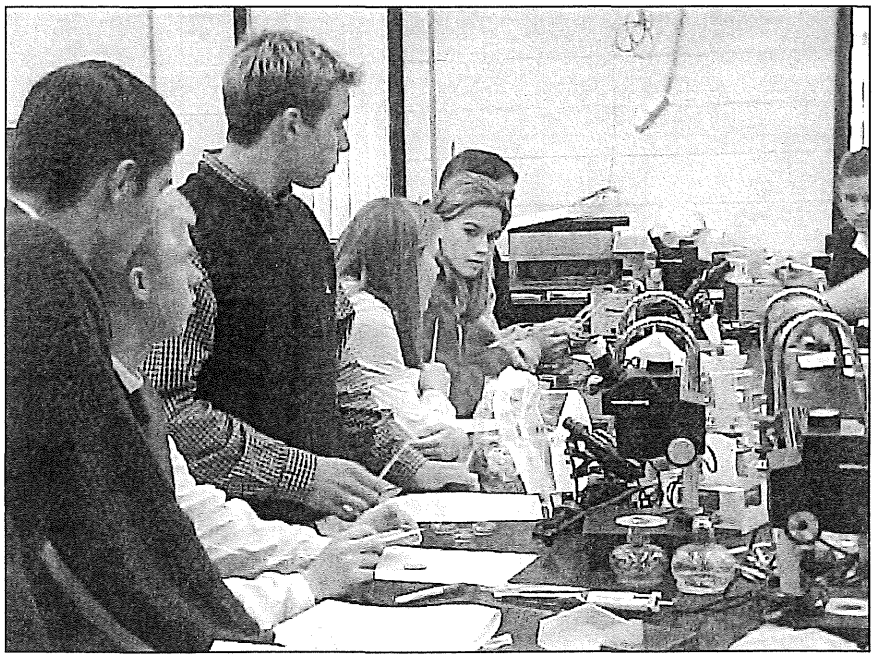
## Training Science Teachers

**The Biology Department has a long history of outreach to in-service and pre-service science teachers.**

**Two current examples are:**

**Drs. Ellen Brisch and Michelle Malott Science Teachers Workshop: "Putting Science in the Middle: Cellular and Molecular Biology Content and Pedagogy for Grades 5 – 9."**

**Drs. Steve Lindaas, Shawn Dunkirk, and Alison Wallace project: "Science in the Middle: Dissemination and Kit Development, Grade 5-9 Basic Biology."**



**A select list of the grants received by the Biology faculty**

## External BBE Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2002 | Ellen Brisch, Mark Wallert, Chris Chastain, Michelle Malott Joe Provost, and Barb Hoppe | Tegrity Web Learner Technology Equipment to Enhance Biotechnology Equipment Training. | $ 30,000.00 | MnSCU Leveraged Equipment Grant | Leveraged Equipment Grant Match Grant |
| 2004 | Joe Provost and Mark Wallert | Adrenergic Activation of NHE Requires PLD in CCL39 Cells. | $197,000 | NIH | NIH - AREA NIH1-R15-HL074924-01A1 |
| 1999 | | ASBMB Undergraduate Faculty and Student Travel Award; $800 | $ 800.00 | ASBMB | Undergraduate Faculty and Student Travel Award |
| 2004 | Mark Wallert | Incorporation of Web Based Teaching Technology to Enhance Freshman Cell Biology Laboratory. | $15,000 | MnSCU | Center for Teaching and Learning |
| 2004 | Judy Peterson, Ronald Jeppson, Joe Provost and Mark Wallert. | MSUM Science Culture and Microscopy Facilities | $30,000 | Anheuser-Busch Foundation Grant | Anheuser-Busch Foundation Grant |
| 1998 | Mark Wallert and Shawn Dunkirk | Biotechnology for High School Teachers | $38,964 | Eisenhower Professional Development Program | Eisenhower Professional Development Program |
| 1996 | Mark Wallert | Investigating Biology for Elementary Teachers | $29,204 | Eisenhower Professional Development Program | Eisenhower Professional Development Program |
| 1994 | Mark Wallert | Isolation of Cardiac Ventricular Myocytes from Suckling Pigs. | $4,185 | North Dakota Experimental Project to Stimulate Competitive Research (NDEPSCoR) | North Dakota Experimental Project to Stimulate Competitive Research (NDEPSCoR) |
| 2004 | Joe Provost | A Biochemical Analysis of Autism. | $1,000 | TriBeta National Research Award. | |
| 2004 | Joe Provost | Student Travel Award | $900 | ASMBM | |
| 2004 | Joe Provost | Advancing the Incorporation of Research and Technology Into MSUM Biochemistry and Biotechnology Courses | $ 15,000.00 | MnSCU | Center for Teaching and Learning Grants |

## External BBE Grants Page 2

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2004 | Mark Wallert and Joe Provost | Regulation of NHE and MAPK Requires PLD. | $197,500.00 | NIH | R15 AREA |
| 2004 | Michelle L. Malott and Ellen Brisch | Putting Science in the Middle: Cellular and Molecular Biology Content an Pedagogy for Grades 5-9. | $ 31,598.00 | | Minnesota Higher Education Services Office |
| 2003 | Joe Provost | Autistic Genetic Exchange, Genetic and cellular materials for autism research. Materials Award. | Materials Award | | |
| 2002 | Ellen Brisch and Michelle L. Malott | Co-PI on proposal with Dr. Michelle Malott for project entitled: Creating an active-learning instructional block in advanced optical imaging techniques. | $ 4,985.00 | MnSCU | CTL Grant |
| 2002 | Mark Wallert and Joe Provost | Involving High School Students in Biomedical Research | $ 10,000.00 | NSF | RUI RET |
| 2002 | Mark Wallert and Joe Provost | Creating a concerted biochemistry problem based laboratory | $ 2,750.00 | MnSCU | Center for Learning and Teaching |
| 2001 | Ellen Brisch, Mark Wallert, Chris Chastain and Joe Provost | Optical Imaging Fluorescence Microscopy enhancemen | $ 116,163.00 | NSF | Major Research Instrumentation Grant |
| 2001 | Joe Provost | Undergraduate Faculty Awards | $ 1,700.00 | American Society of Biochemistry and Molecular Biology | Undergraduate Faculty Award |
| 2001 | Mark Wallert, Joe Provost, Chris Chastain, Shawn Dunkirk | Moorhead State University Biotechnology Emphasis: Integrating | $ 154,790.00 | NSF | CCLI |
| 2000 | Joe Provost | Aldevron LLC Purification of adjuvant for oral vaccines | $2,000 | Aldevron LLC | LLC |
| 2000 | Joe Provost and Mark Wallert | Regulation of MAP Kinase and NHE1 by the G proteins Gq and G13 | $156,341 | NSF | RUI Grant |
| 1999 | Ellen Brisch (PI) | Molecules required for mitochondrial morphology second year of funding awarded | $ 25,000.00 | Primary Children's Medical Center | Research Development Award |

## External BBE Grants Page 3

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 1999 | Joe Provost | ASBMB Undergraduate Faculty and Student Travel Award | $ 800.00 | ASBMB | Undergraduate Faculty and Student Travel Award |
| 1998 | Ellen Brisch (PI) | Molecules required for mitochondrial morphology | $ 25,000.00 | Primary Children's Medical Center | Research Development Award |
| 1993 | Mark Wallert | pH Regulation Cardiac Ventricular Muscle Cells. | $42,468 Match $15,000 | MN-Heart Association | MN-Heart Association |

## Internal BBE Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2004 | Joe Provost | A Biochemical Analysis of Potential Mutations Associated with Autism Syndrome Disorders | $ 1,730.00 | MSUM | Faculty Grant |
| 2004 | Mark Wallert | The role of Urokinase Type Plasminogen Activator in the stimulation of ERK, RhoA and NHE in lung cells.. | $ 1,860.00 | MSUM | Minnesota State University Faculty Research Grant |
| 2003 | Dr. Joseph Provost and Dr. Mark Wallert | A Collaborative MSUM – Perham High School Cancer Research Program,. | $ 3,183.00 | MSUM | Dille Fund for Excellence Award |
| 2003 | Ellen Brisch | PI on proposal entitled: Students Understanding Cancer: Basic research on cell division control mechanisms that regulate microtubule assembly. | $ 1,641.00 | MSUM | Faculty Grant |
| 2003 | Ellen Brisch | Professional Development Award for proposal entitled: Bringing the Worm to MSUM. | $ 850.00 | MSUM | Faculty Grant |
| 2003 | Ellen Brisch | Professional Development Award for proposal entitled: Bringing the Worm to MSUM. | $ 1,036.00 | MSUM | Faculty Grant |
| 2003 | Joe Provost | Role of phospholipase D in MAPK activation. | $2,500.00 | MSUM | Faculty Grant |
| 2002 | Ellen Brisch | Regulation of mitochondria through cell division: Blending classic approaches with novel molecular tools. | $ 3,111.00 | MSUM | Faculty Grant |
| 2002 | Michelle L. Malott | Measuring DNA Damage and Apoptosis in Cells Exposed to Ultra-VioletRadiation. | $ 988.80 | | Dille Fund for Excellence |
| 2002 | Michelle L. Malott | Biochemical Regulation of Cell Division in Cancer Cells. | $ 2,315.00 | | Faculty Research Grant |
| 2001 | Ellen Brisch | Regulation of microtubule assembly by MAPK activity | $ 2,000.00 | MSUM | Dille Excellence Award |
| 2001 | Ellen Brisch | Coordination of organelle dynamics during cell division. | $ 2,000.00 | MSUM | Faculty Grant |

## Internal BBE Grants Page 2

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2000 | Joseph Provost and Mark Wallert. | Hormonal Regulation of Intracellular pH via G Protein Signaling Molecules in Lung Cells | $ 2,164.00 | MSUM | Dille Fund for Excellence Award. |
| 2000 | Mark Wallert | Regulation of NHE1 in neonatal heart cells by Phenylephrine and ATP through RhoA and MAP Kinase. . | $ 2,325.00 | MSUM | Moorhead State University Faculty Research Grant. |
| 2000 | oe Provost and Mark Wallert | Lysophosphatidic acid Transactivation of the Epidermal Growth Factor Receptor - Implications for the Regulation of Cellular signilaing in Lung cells | $ 2,200.00 | MSUM | Faculty Grant - |
| 1999 | Joe Provost | Acquisition of a Centrifuge | $ 27,000.00 | MSUM | Strategic Goals Initiative - |
| 1999 | Mark Wallert | Optimizing Transfection of Neonatal Cardiac Myocytes in Culture. | $ 2,225.00 | MSUM | Moorhead State University Faculty Research Grant |
| 1998 | Mark Wallert | Using Oligodeoxynucleotides to Alter Na-H Antiporter Activity in Cultured Neonatal Heart Cells. . | $1,700 | MSUM | Moorhead State University Faculty Research Grant. |
| 1997 | Mark Wallert, Chris Chastain and Shawn Dunkirk | Development of an Interdisciplinary Concentration in Biotechnology. Drs. | $118,000 | MSUM | Strategic Goals Initiative Award |
| 1995 | Mark Wallert | pH Regulation in Neonatal Ventricular Muscle Cells from Rats | $2,080 | MSUM | Moorhead State University Faculty Research Grant |
| 1991 | Mark Wallert | Homeostatic Mechanisms in Dictyostelium discoideum. | $2,000 | MSUM | Moorhead State University Faculty Research Grant |
| 1990 | Mark Wallert | Chloride Transport Mechanisms in Isolated Cardiac Myocytes. | $2,000 | MSUM | Moorhead State University Faculty Research Grant |
| | | Regulation of RhoA and MAPK by G proteins - | $ 2,300.00 | MSUM | MSU Faculty Grant |
| | | Regulation of Phospholipase D through a Tyrosine Protein Kinase | $ 2,000.00 | MSUM | MSU Faculty Grant |

## External RSC Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2002 | George R. Davis | Teachers Research Network project (a study of the retention of new K-12 math and science teachers in Minnesota) participation grant, SciMathMN | $16,651 | SciMathMN | Teachers Research Network participation grant |
| 2002 | George R. Davis and Matt Craig | C0-PI with Dr. Matt Craig, Seeing is Believing, a physical science exhibit develop project | $ 201,000.00 | NSF | |
| 2001 | George R. Davis | Teachers Research Network project (a study of the retention of new K-12 math and science teachers in Minnesota) participation grant, SciMathMN | $ 19,691.00 | SciMathMN | Teachers Research Network participation grant |
| 2000 | George R. Davis | Teachers Research Network project (a study of the retention of new K-12 math and science teachers in Minnesota) participation grant, SciMathMN | $ 10,398.00 | SciMathMN | Teachers Research Network participation grant |
| 1999 | George R. Davis | Co-PI with four other MSUM faculty a Partners in Technology in teaching grant | $169,000.00 | U.S. Department of Education | Partners in Technology in teaching grant |
| 1999 | George R. Davis | Teachers Research Network project (a study of the retention of new K-12 math and science teachers in Minnesota) participation grant, | $14,223 | SciMathMN | Teachers Research Network participation grant |
| 1998 | George R. Davis | Teachers Research Network project (a study of the retention of new K-12 math and science teachers in Minnesota) participation grant, SciMathMN, $5,000. | $ 5,000.00 | SciMathMN | Teachers Research Network participation grant |
| 1997 | George R. Davis | General operations grant from the Institute of Museum and Library Services for the Regional Science Center. | $ 60,000.00 | Institute of Museum and Library Services | General operations grant |

## External RSC Grants Page 2

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 1997 | George R. Davis | In-kind services from CAMAS-MinnDak 4.5 acre wetland excavation project at Regional Science Center | $ 20,000.00 | CAMAS-MinnDak | |
| 1997 | George R. Davis | Grant from the Minnesota Department of Natural Resources for the 4.5 acre wetland excavation project at Regional Science Center | $ 20,000.00 | Minnesota Department of Natural Resources | |
| 1995 | George R. Davis | Teaching K-8 Science Outdoors in the Red River Valley | $6,930.00 | North Dakota | Eisenhower Grant |
| 1995 | George R. Davis | General operations grant from the for the Regional Science Center | $ 50,490.00 | | Institute of Museum and Library Services |
| 1994 | George R. Davis | Worked with 9 Minnesota colleges and universities and the Governor's Advisory Committee for Environmental Education to develop a $500,000 project to improve the preparation of pre-service K-12 teachers in environmental education. MSUM's share of the two year project is $27,000. | $ 27,000.00 | MN | Governor's Advisory Committee for Environmental Education |
| 1993 | George R. Davis | Private donation for a prairie restoration project for Moorhead 3rd graders | $ 3,000.00 | George Sinner | Private donation |
| 1993 | George R. Davis | Teaching Science K-8 outdoors | $ 13,831.00 | North Dakota | Eisenhower Grant |
| 1993 | George R. Davis and Patricia Simpson | 3. (Co-PI) with Dr. Patricia Simpson at St. Cloud State University a LCMR proposal for environmental education for pre-service K-12 teachers. This proposal was folded in to a combined environmental education LCMR proposal which was funded. | $99,000 | LCMR | |

## External RSC Grants Page 3

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 1992 | George R. Davis | (Co-PI) 1993 Conference on Science Education for Persons with Disabilities | $ 27,538.00 | National Science Foundation: | |
| 1992 | George R. Davis | (Co-PI) MN Department of Instruction/Moorhead Schools | $ 10,000.00 | MN | Department of Instruction |
| 1992 | George R. Davis | MSUM was a dissemination site for science curriculum workshops for elementary education majors | estimated 5000 | National Science Foundation | American Institutes of Research (AIR) |
| 1991 | George R. Davis | Red River Study Project | $ 3,673.00 | North Dakota | Eisenhower Grant: |
| 1991 | George R. Davis | National Science Foundation/BSCS: ENLIST Micros Center | $ 22,000.00 | NSF | BSCS: |
| 1991 | George R. Davis | CHEMS Workshop grant | $ 3,000.00 | Lawrence Hall of Science, Berkeley, CA: | |

## Internal RSC Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 1991 | George R. Davis | Minnesota Eisenhower Grant: Red River Study Project | $2,639.00 | | |
| 1990 | George R. Davis | Bush Grant from MSU for Improvement of Instruction | $ 1,000.00 | MSU | Bush Grant for Improvement of Instruction |

## External EFB Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2002 | Alison Wallace, George Davis, Donna Stockrahm | Planning for a Tallgrass Prairie Field Station | $ 14,000.00 | NSF | |
| 2001 | Brian D. Wisenden | Active Learning outside the classroom: Expansion of undergraduate aquatic research facility | $ 4,915.00 | MnSCU | Center for Teaching and Learning |

## Internal EFB Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2005 | Brian Wisenden | Research training in the behavioral ecology of fish | $ 2,227.00 | MSUM | Faculty Research Grant |
| 2004 | Brian D. Wisenden | Undergraduate research training in fish ecology and evolution | $ 2,050.00 | MSUM | Faculty Research Grant |
| 2003 | Brian D. Wisenden | Evolutionary ecology of Ostariophysan club cells | $ 2,105.00 | MSUM | Faculty Research Grant |
| 2001 | Brian D. Wisenden | Expansion of undergraduate aquatic research facility | $ 2,500.00 | MSUM | MSUM Research grant from Dean |
| 2001 | Brian D. Wisenden | Chemical ecology of predator-prey interactions in aquatic animals | $ 500.00 | MSUM | Faculty Research Grant |
| 1999 | Brian D. Wisenden | A test for a genetic basis for antipredator behavior in fathead minnows | $ 2,300.00 | MSUM | Faculty Research Grant |
| 1999 | Brian D. Wisenden | Chemical ecology of predator-prey interactions in aquatic animals | $ 1,950.00 | MSUM | Dille Fund for Excellence |
| 2005 | Linda Fuselier | Population genetic structure and evolutionary relationships in theliverwort, Marchantia inflexa, $2992 | $ 2,992.00 | MSUM | Faculty Research Grant |
| 2005 | Linda Fuselier | Sex ratios and sexual dimorphism in a migratory dragonfly, the common green darner | $ 2,000.00 | MSUM | Dille Fund for Excellence |
| 2003 | Brian Wisenden | Predator-recognition training of naïve hatchery-reared walleye | $ 248.00 | MSUM | MSUM Alumni Foundation |
| 2003 | Brian Wisenden, Anusha Mishra ad Bre Hamann | The ontogeny of larval antipredator competence and instraspecific brood adoption in convict cichlidsRe Anusha Mishra ad Bree Hamann | $ 150.00 | MSUM | MSUM Biology Research Scholarship |
| 2002 | Brian Wisenden | /Undergraduate research in biology | $ 180.00 | MSUM | MSUM Alumni Foundation |
| 2001 | Brian Wisenden and Michelle L. Malott | The Evolution of Alternative Reproductive Strategies in Minnows. | $ 1,190.00 | MSUM | Faculty Research Grant |
| 1998 | Brian Wisenden | Experiential versus genetic contributions to antipredator behavior in minnows | $ 400.00 | MSUM | MSUM Alumni Foundation Grant |

## Internal EFB Grants Page 2

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2002 | Alison Wallace, George Davis, Donna Stockrahm | Planning for a Tallgrass Prairie Field Station | $ 14,000.00 | NSF | |
| 2001 | Brian D. Wisenden | Active Learning outside the classroom: Expansion of undergraduate aquatic research facility | $ 4,915.00 | MnSCU | Center for Teaching and Learning |

## External BBE/EFB Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2003 | Brian D. Wisenden & Michelle Malott | Molecular Ecology: harmonizing emphases in biotechnology and field biology | $ 4,951.00 | MnSCU | Center for Teaching and Learning |
| 2004 | Brian D. Wisenden and Michelle L. Malott | Linking Research Training to Curriculum Enhancement in Molecular Ecology. | $ 14,988.00 | MnSCU | Center for Teaching and Learning. Learning that Lasts Grant. MnSCU |
| 2004 | Mark Wallert, Ellen Brisch, Michelle Malott, SuEllen Shaw, Patricia Wisenden | Incorporating Research-based Investigative Experiences into Freshman Level Cell Biology | $ 95,496.00 | | NSF, CCLI – Adaptation and Implementation |

## Internal BBE/EFB Grants Page 1

| Year | Authors | Title | Amount Requested | Funding Agency | Funding Agency Division |
|---|---|---|---|---|---|
| 2001 | Brian D. Wisenden & Ellen Brisch | Phenotypic engineering and optimal egg size in a biparental fish | $ 1,300.00 | MSUM | Dille Fund for Excellence |
| 2002 | Brian Wisenden and Ellen Brisch | Co-PI on proposal with PI Dr. Brian Wisenden for project entitled: Phenotypic engineering and optimal egg size in a biparental fish | $ 1,300.00 | MSUM | Dille Excellence Award |
| 2000 | Daniel McEwen (student) and Michelle L. Malott | Inbreeding Depression in a Colony of Black-Tailed Prairie Dogs At Theodore Roosevelt State Park. | $ 1,500.00 | | Dille Fund for Excellence |

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# Minnesota's Bioscience Industry

A FACT SHEET FOR BUSINESSES

## Agricultural and Industrial Biotechnology:

***Minnesota is well positioned with abundant agricultural resources and top industrial biotechnology firms.***

- Minnesota's Agricultural and Industrial Biotechnology industries supply a diverse range of products that include:
  - Agricultural chemicals **(Cargill Inc., Cenex Harvest States)**
  - Specialty cleaning and sanitation preparations **(Ecolab)**
  - Sanitary products **(H.B. Fuller)**
  - Prepared feed and feed ingredients **(Land O'Lakes Agricultural Services, Archer Daniels Midland, Cargill Inc.)**
  - Crop services **(Land O'Lakes Agricultural Services, Syngenta Seeds, Cenex Harvest States)**
  - Biofuels **(Cargill Dow LLC, Minnesota Corn Producers – ADM)**
  - Biopesticides **(Syngenta)**
  - Soybean processing **(ADM, Cenex Harvest States, Ag Processing Inc.)**
  - Plant biopolymers/fibers **(Cargill Dow)**
  - Industrial lubricants **(Cargill Inc.)**

**Top Agricultural and Industrial Biotechnology Companies in Minnesota**

| Company | Annual Sales* (millions) |
|---|---|
| Cargill | $59,894 |
| Cenex Harvest States Oilseed Processing | 4,500 |
| Ecolab | 3,404 |
| Land O'Lakes Agricultural Services | 2,853 |
| H. B. Fuller | 1,256 |

* Sales for Minnesota headquarters or Minnesota-based operations
Source: Corporate Report Factbook 2003
Dun & Bradstreet, company annual reports.

- In Minnesota there are:
  - About 1,300 agricultural and food scientists and technicians, and 2,500 chemist and chemical technicians.
  - About 375 chemistry and more than 200 chemical engineering degrees were awarded in Minnesota in 2000.
- Minneapolis-St. Paul is considered the fifth most knowledge competitive region in the world, according Robert Huggins Associates, a British research firm. Rankings take into account indicators such as the number of IT, biotechnology and engineering employees per 1,000 inhabitants, and the number of patents registered per million people.
- According to research done at the University of Minnesota in 2003, Minnesota farmers are producing **engineered seed crops** valued at $2.2 billion annually.
- Examples of **seed research** include wheat and potato fungal resistance at the University of Minnesota and sugar beet herbicide tolerance at BetaSeed of Shakopee, Minnesota.
- **Cargill Dow LLC** manufactures biodegradable packaging and fibers using corn starch and a special fermentation process that requires 20 to 50 percent less fossil resources. CEO Randy Howard was named to the 2002 *Scientific American* 50, a list of visionary contributors to science and technology.
- **Minnesota Corn Processors** is the second largest domestic producer of ethanol, and merged with Archer Daniels Midland in 2002.
- **Land O'Lakes** provides farmers with:
  - Genetically engineered seeds through its seed company **Croplan Genetics** that produce higher yields through crop inputs and agricultural services.
  - Specialty corn products for animal feeds and consumer food markets developed in conjunction with **Novartis Seeds**.
- Using a solvent process, **Cenex Harvest States** manufactures soy products including edible refined oil, ink, flour, soy meal, fatty acids and lecithin. In 2003, Cenex Harvest States opened its second soybean crushing facility in Fairmont, Minnesota.
- **Ecolab** operates in 40 countries worldwide and manufactures products such as cleaners and hand sanitizers.
- **H.B. Fuller** has developed water-based adhesives and non-woven hygienic technology used in the fabrication of diapers, adult incontinence devices, feminine and disposable medical products.
- In 2003, **Minnesota Soybean Processors** built a new soybean processing plant in Brewster, Minnesota and announced the addition of a biodiesel refinery.
- A project of Positively Minnesota, the Department of Agriculture and the University of Minnesota's Department of Wood and Paper Science, the **Minnesota Biofiber Consortium** brings together leaders of industry, research and agriculture to promote agricultural crops and residues as industrial feedstocks.

| | |
|---|---|
| *University of Minnesota:* *Exceptional Chemistry, Agricultural and Veterinary Studies* | ➤ The University's **College of Agricultural, Food and Environmental Science**, one of the top five colleges of agriculture in the world, enhances agricultural systems through plant genetics and biocontrol of weeds.<br>➤ Studies at the University's Colleges of **Veterinary Medicine and Molecular Veterinary Bioscience**, include genomics, molecular biology, and comparative medicine.<br>➤ The **Chemical Engineering** program is ranked number one by the National Research Council and each year confers about 210 graduate and undergraduate degrees.<br>➤ The $20 million **Cargill Building for Microbial and Plant Genomics** provides a hub for 175 researchers in the genomics of microbes and crop plants. The building opened in 2003. |

# Medical Technology:

***Biotechnology advances use applications developed by the medical technology industry, and Minnesota's medical technology industry is recognized worldwide for being at the forefront of innovation.***

- Minnesota's medical technology industries supply a diverse range of products that include:
  - Cardiovascular technologies such as heart valves, pacemakers, defibrillators and stents **(Medtronic; St. Jude Medical; Guidant Corp; Boston Scientific, Inc.)**.
  - Catheter technologies **(Medtronic; St. Jude Medical; Boston Scientific, Inc.; Deltec, Inc.)**.
  - Drug delivery systems **(3M; Cima Labs, Inc.; Medtronic; Deltec, Inc.)**.
  - Dialysis products **(Minntech)**.
  - Impotence products **(American Medical Systems)**.
  - Electrotherapy **(Medtronic; St. Jude Medical; Compex Technologies, Inc.; Empi Inc.)**.
  - Spinal implants **(Sulzer Spine-Tech)**.
  - Warming products for hypothermia **(Arizant, Inc.)**.
  - Hearing aids **(Starkey Laboratories; Miracle Ear)**.
  - Eyewear lenses **(BMC Industries; Soderberg Opthalmic Services)**.
  - Medical device contract manufacturing **(ev3, Inc.; Lake Region Manufacturing; Medsource Technologies; Surgical Technologies)**.
  - Drug-eluting coating process for medical devices **(SurModics)**.
  - Drug-coated stents **(Boston Scientific, Inc.; Guidant Corp; Medtronic *(under development)*)**.

**Top Medical Technology Manufacturers Operating in Minnesota**

| Company | Annual Sales* (millions) |
|---|---|
| Medtronic, Inc. | $7,665 |
| Guidant Corp. | 3,240 |
| 3M – Health Care | 2,560 |
| Boston Scientific, Inc. | 1,709 |
| St. Jude Medical, Inc. | 1,589 |

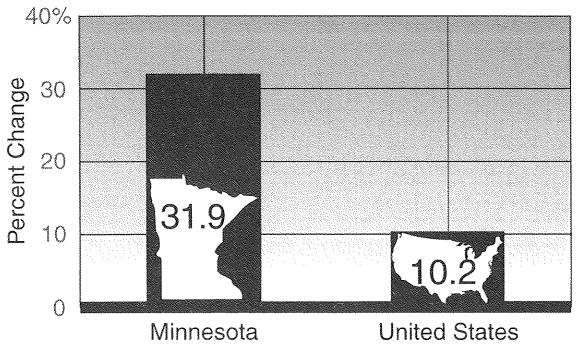
* Sales for Minnesota headquarters or Minnesota-based operations
Source: Corporate Report Factbook 2003
Dun & Bradstreet, company annual reports.

- There are more than 520 FDA approved medical device establishments currently in Minnesota.
- About 2,500 medical device related patents were registered to Minnesota companies between 1997 and 2001.
- According to the Milken Institute, Minnesota has the nation's highest number of investigational medical devices and FDA pre-market approvals of medical devices per 100,000 residents .

*Outstanding opportunities for collaboration*

- **Mayo Clinic**: world's best known health care facility also collaborates with health care and medical technology companies.
- **Industrial Partnership for Research in Interfacial and Materials Engineering (IPRIME):** Facilitates the use of University of Minnesota equipment and staff for its members, which include businesses such as Medtronic, SurModics, and 3M (www.iprime.umn.edu).
- The **University of Minnesota's Biomedical Engineering Institute** combines engineering and health sciences to create new medical devices.

**Employment Growth in Medical Technology Industries*, 1992-2002**




* SIC 384 and 385, NAICS 334510, 334517 and 339111-329115.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Covered Employment and Wages (ES-202).

- Minnesota's medical technology industry employment:
  - Increased 31 percent between 1992 and 2002 to over 21,300 people.
  - Had a concentration of employment over three times the nation's.
  - Ranks second only to California in the medical device industry.
- A number of medical technology companies appeared on the prestigious 2003 Fast 500 prepared by Deloitte and Touche.
  - **Vascular Solutions, Inc.** revenues grew more than 2,300 percent and **Endocardial Solutions Inc.** more than 1,200 percent over five years.
  - **Possis Medical** revenues grew almost 600 percent over five years.
  - **Synovis Life Technologies** was among *Fortune* magazine's 100 Fastest-Growing Companies for 2003.
- Minnesota companies and research institutions have been first in developing many important medical devices:
  - Implantable cardiac pacemaker.
  - Artificial heart valves.
  - Implantable drug transfusion pump.
  - Anesthesia monitor.
  - Blood pumps.
  - Artificial urinary sphincter.
  - In-the-ear hearing aid.
  - Wireless cardiac monitoring system.
- Minnesota medical technology companies have been involved in numerous mergers and acquisitions.
  - **Medtronic, Inc.** announced the acquisition of four companies in 2002, including California-based MiniMed and Medical Research Group, Inc. (MRG). Medtronic made acquisitions totaling nearly $13.9 billion between 1996 and 2002.
  - Since 2002, **ev3, Inc.** has acquired Appriva Medical, Inc. of California and Minnesota's Intra Therapeutics.
  - **Medsource Technologies** acquired Cycam, Inc. of Pennsylvania, while **American Medical Systems** acquired California-based CryoGen, Inc. in 2002.

# Pharmaceuticals: *Minnesota's pharmaceutical industry is vibrant and fast growing.*

- Minnesota's pharmaceutical industry supplies a diverse range of products that include:
  - Cardiology **(Upsher-Smith, 3M, Solvay Pharmaceuticals)**
  - Oncology-related pharmaceuticals **(MGI Pharma)**
  - Dermatology **(Upsher-Smith, 3M)**
  - Gastroenterology, mental health **(Solvay Pharmaceuticals)**
  - Immune system enhancing compounds **(Biopolymer Engineering Inc)**
  - Women's health **(3M, Solvay Pharmaceuticals)**
  - Orally disintegrating dosage forms and contract pharmaceutical manufacturing **(CIMA LABS)**
  - Bioequivalent generic pharmaceuticals **(Paddock Laboratories, Upsher-Smith)**
  - Animal health drugs **(Intervet, Newport Laboratories)**

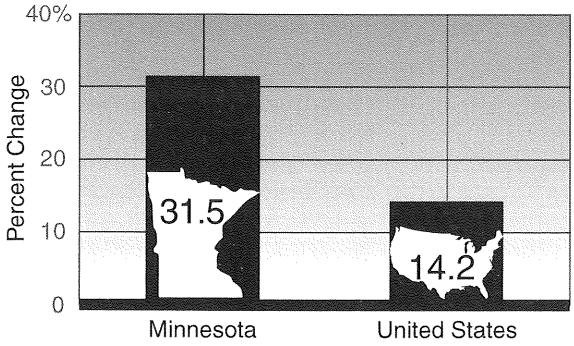
**Top Pharmaceutical Manufacturers Operating in Minnesota**

| Company | Annual Sales* (millions) |
|---|---|
| 3M Pharmaceuticals Inc. | $1,000 |
| Biopolymer Engineering Inc. | 650 |
| Solvay Pharmaceuticals Inc. | 450 |
| Upsher-Smith Laboratories | 177 |
| CIMA LABS Inc. | 77 |

* Sales for Minnesota headquarters or Minnesota-based operations
Source: Corporate Report Factbook 2003
Dun & Bradstreet, company annual reports.

- Minnesota is home to about 9,800 pharmacists and pharmacy technicians, as well as 2,500 chemists and chemical technicians.
- Twenty-nine Minnesota establishments have prescription and over-the-counter drugs currently listed with the FDA.
- Between 1997 and 2001, Minnesota companies registered more than 300 drug patents.

**Employment Growth in the Pharmaceuticals Industry*, 1992-2002**

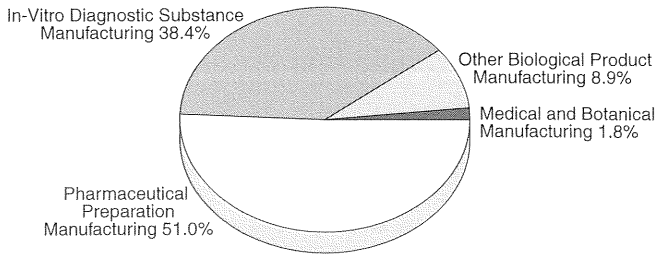



* SIC 283, NAICS 3254

Source: U.S. Department of Labor, Bureau of Labor Statistics, Covered Employment and Wages (ES-202).

- Minnesota enjoys an excellent quality of life:
  - First for a record seven years in a row: Minnesota rated "the Most Livable State" by Morgan Quitno Press.
  - Minnesota was first in the nation for children's well-being according to the 2003 Kids Count Databook.
  - Home ownership rate was tied for first in the country in 2002.

**Minnesota Employment in the Pharmaceuticals Industry*, 2002**




* NAICS 3254

Source: U.S Department of Labor, Bureau of Labor Statistics, Covered Employment and Wages (ES-202).

- Pharmaceutical companies operating in Minnesota are among the best in the nation.
  - In 2003, **3M** was listed among the top 50 pharmaceutical companies by *Pharmaceutical Executive*, while **Upsher-Smith** was named one of the top 100 largest pharmaceutical companies in 2001. **Solvay Pharmaceuticals**, another top 50 pharmaceutical company, has a significant manufacturing facility in Baudette, MN.
  - **CIMA LABS, Inc.** appeared on the prestigious 2003 Fast 500 prepared by Deloitte and Touche with growth of more than 500 percent over five years, and was listed as one of *Fortune* magazine's 100 Fastest-Growing companies in 2003
  - **Biopolymer Engineering, Inc.** engineers natural carbohydrates to enhance immune health. The company has acquired more than 200 U.S. and international patents.
  - Scientists at **3M Pharmaceuticals** research laboratories in St. Paul developed synthetic molecules called Immune Response Modifiers (IRMs) that have potential applications for treating viruses and tumors.

| | |
|---|---|
| *Excellent research and educational institutions* | ➤ The University of Minnesota's College of Pharmacy has programs in the Twin Cities and Duluth, and confers degrees on more than100 students each year in its professional program, while about 375 chemistry degrees and almost 1,400 biological and life sciences degrees were awarded in Minnesota in 2000. |
| *Vanguard in Research* | ➤ Nanocopeia, Inc., a startup company utilizing research developed by U of M professor David Pui and his colleagues, creates nanotechnology devices for drug formulation, gene therapy and tissue regeneration.<br>➤ One of *U.S. News and World Report's* 10 leading innovators for 2001, Dr. Catherine Verfaillie is the director of the Stem Cell Institute at the University of Minnesota. |
| *Educated and motivated workforce:* | ➤ Minnesota's labor force participation rate of 75.7 percent was highest in the country in 2002.<br>➤ Ninth highest percent of population holding bachelors degrees among the states.<br>➤ Tied for second in the percentage of residents who are high school graduates or higher in 2000. |

# Human Health Microbiology:

***Minnesota companies shine in the diverse human health microbiology field.***

- Minnesota's human health microbiology industry supplies a diverse range of products that include:
  - ➤ Contract R&D laboratories **(ATG Laboratories, ViroMed, Apptec Laboratory Services)**
  - ➤ Cell culture products **(ViroMed, Apptec Laboratory Services)**
  - ➤ Immunoassay testing **(Beckman Coulter)**
  - ➤ Cytokine-related reagents **(R&D Systems)**
  - ➤ Hematology controls and calibrators **(R&D Systems)**
  - ➤ Immunoassay and conjugate stablilizers **(SurModics)**
  - ➤ cGMP manufacturing services **(Apptec Laboratory Services)**
  - ➤ Occupational health testing **(Medtox Scientific Inc.)**
- **Minnesota Partnership for Biotechnology and Medical Genomics**: A Minnesota initiative leveraging the scientific leadership of the University of Minnesota and the Mayo Clinic into a powerful research collaboration to position Minnesota as a world leader in biotechnology and medical genomics. (www.mayouminnesotapartnership.org)

**Top Human Health Microbiology Companies in Minnesota**

| Company | Annual Sales* (millions) |
|---|---|
| R&D Systems – Techne Corp. | $145 |
| Protein Design Labs, Inc. | 80 |
| Medtox Scientific Inc. | 52 |
| Viromed Laboratories – LabCorp | 25 |
| Apptec Laboratory Services | 16 |

* Sales for Minnesota headquarters or Minnesota-based operations
Source: Corporate Report Factbook 2003
Dun & Bradstreet, company annual reports.

- About 1,500 biological and life sciences degrees were awarded in Minnesota in 2000.
- Minnesota is home to about 1,300 biological scientists and technicians, as well as more than 2,800 life scientists and other science technicians.
- Firms in Minnesota are exploring new advances in microbiology:
  - ➤ **R&D Systems-Techne Corp.** manufactures purified cytokines (proteins), antibodies, and assay kits as well as whole-blood hematology controls and calibrators. The company has been listed among the Top 25 Medical Technology Companies as of 2003 by *The Business Journal.*
  - ➤ **Beckman Coulter Inc.** manufactures in vitro immunodiagnostic systems for allergies, infectious diseases, immunology, hormones, and serum proteins.
  - ➤ **Protein Design Labs, Inc.** has antibodies in clinical development for autoimmune and inflammatory conditions, asthma and cancer.

| | |
|---|---|
| *Exceptional Biological Research Facilities* | ➤ The University of Minnesota provides state-of-the-art imaging and advanced genetic analysis facilities to companies through the "Biotech Mall" known as "Biodale".<br>➤ Between 1998 and 2002, more than $300 million was invested in genomics and biotechnology at the University of Minnesota.<br>➤ The University of Minnesota has the Biotechnology Institute, Developmental Biology Center, Biomedical Engineering Institute, and the Biomedical Genomic Center. The Mayo Clinic has the Genomics Research Center. |

# Bioscience Industry Assistance:

- Minnesota's 2003 Legislature created the **Bioscience Zone**. The zone, which will have two sub-zones located near the University of Minnesota and the Mayo Clinic, will provide tax incentives to existing and start-up bioscience companies (www.mnpro.com).
- The **Minnesota Bioscience Council** makes recommendations to the Governor and Legislature on economic development initiatives aimed at supporting the growth of Minnesota's bioscience industry. The Bioscience Council is made up of bioscience industry leaders, University of Minnesota and Mayo Clinic officials, venture capitalists, and legislators, and is staffed by the Department of Employment and Economic Development (www.positivelyminnesota.com).
- **Bioscience associations** include MNBIO (www.minnesotabiotech.org), the Society for Biomaterials (www.biomaterials.org), Medical Alley (www.medicalalley.org), and Minnesota Technology (www.minnesotatechnology.org).

positively Minnesota
Department of Employment and Economic Development
500 Metro Square, 121 7th Place East
Saint Paul, Minnesota 55101-2146 USA

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6 T H A N N U A L

# STUDENT ACADEMIC CONFERENCE

## Conference Program & Abstracts

**Wednesday, April 14, 2004**

Comstock Memorial Union
Minnesota State University Moorhead

**Volume VI**

*The MSUM showcase of Academic Achievement*

www.mnstate.edu/acadconf

Minnesota State University moorhead

# Table of Contents



## Purpose

The purpose of the Student Academic Conference is to showcase the work and talent of MSUM students through presentations, posters, and creative works at a one-day conference held annually at MSUM in April in the Comstock Memorial Union. All students are encouraged to submit presentation applications. We strive to accommodate all students who wish to be presenters. Parents, friends, prospective students, alumni, employers and the university community are welcome to attend the conference to witness the excitement of intellectual exchanges among our students.

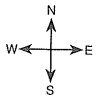
## Sponsors

This conference exists because of the work of the entire university community, both in terms of financial and moral support. Supporters include: Strategic Grant Initiatives Fund, President's Office, Academic Affairs, Student Affairs, Administrative Affairs, Alumni Foundation, Inter Faculty Organization, MSUAASF, AFSCME, Student Senate, Campus Activities Board, Student Activities Budget Committee, and Sodexho Services.

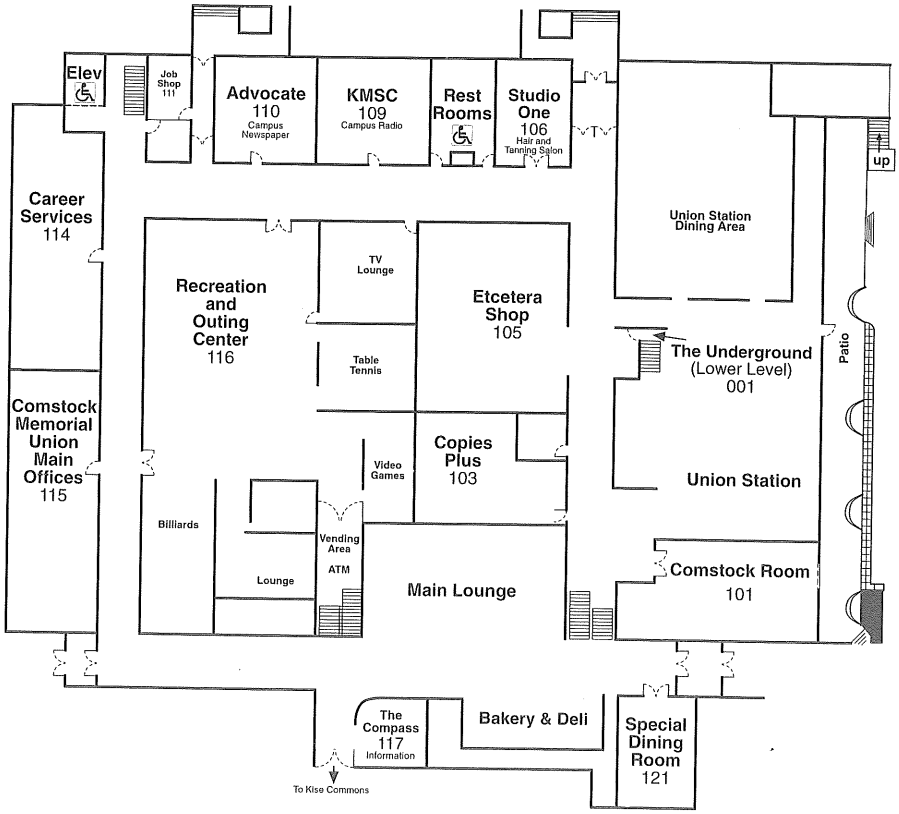
www.mnstate.edu/acadconf

# Comstock Memorial Union Map

Comstock Memorial Union




First Floor

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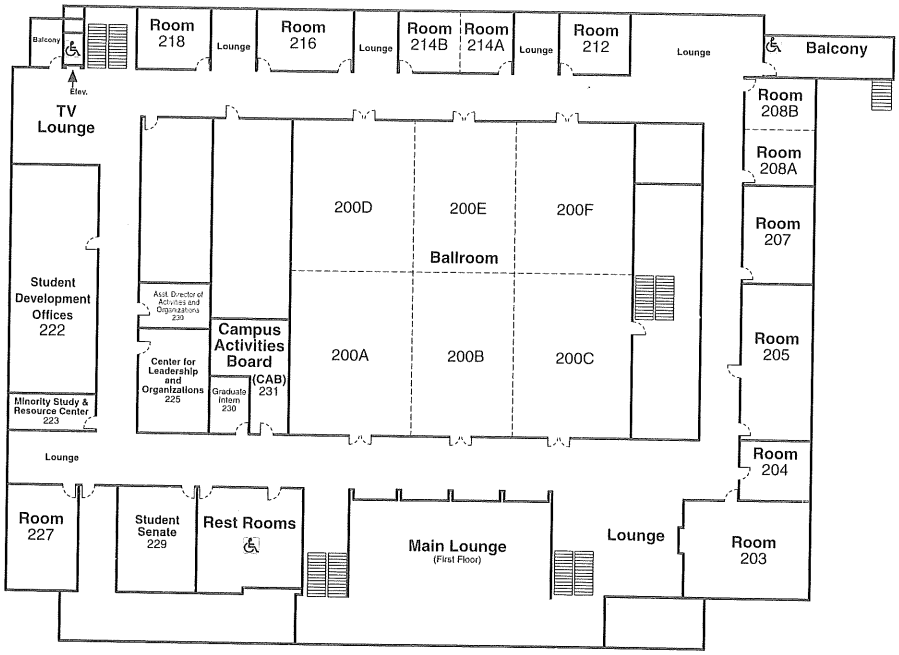
Second Floor

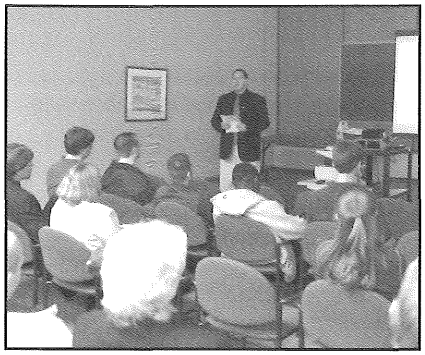


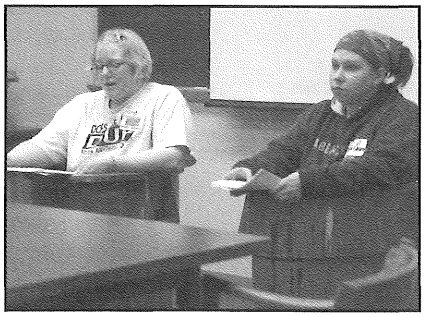

Comstock Memorial Union is a smoke-free environment

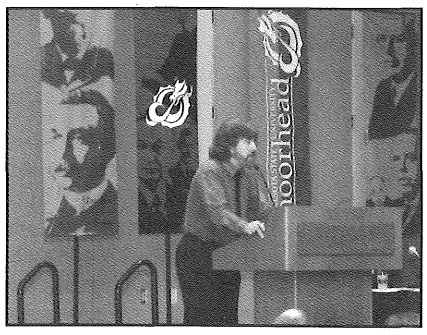
# How the Conference got Started

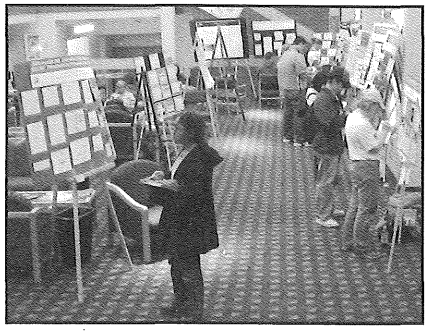
## Conference Highlights

2004 139 Presentations / 253 Presenters
2003 156 Presentations / 258 Presenters
2002 151 Presentations / 234 Presenters
2001 133 Presentations / 241 Presenters
2000 139 Presentations / 218 Presenters
1999 107 Presentations / 170 Presenters









Minnesota State University Moorhead has developed a program to encourage undergraduate research in all disciplines through the development of the Student Academic Conference. The idea of such a conference was suggested by Dr. Andrew Conteh, Political Science, during a class in spring semester of 1998 when he said, "few students have the opportunity to present at national or regional conferences." This got MSUM graduate student Ryan Sylvester thinking, and he went back to Dr. Conteh proposing that the Student Academic Conference be started. The two of them met frequently over the summer to plan and outline the mission and concept of the conference.

The two initiated meetings with the President, Vice Presidents, and Academic Deans to request support. The conference was well-supported financially and in spirit. With the endorsement of administration, the conference planners developed a list of faculty and staff from across campus representing every discipline and division and invited them to be part of the Student Academic Conference steering committee.

The conference format includes a luncheon for presenters featuring an MSUM alumnus keynote speaker on the topic of undergraduate research. The keynote is followed by a panel response composed of four undergraduate students who are selected by each academic Dean to represent their respective division (Arts & Humanities, Education & Human Services, Business & Industry, and Social & Natural Sciences). Following the luncheon there are two or three presentation sessions of approximately an hour and half each in length. Most presentations in a session are 17 minutes in length (12 minutes to present and 5 minutes for questions) but accommodations are made for specific time requests such as 30, 45, or even 60 minute workshops or panel discussions. There are 15 break-out rooms used for simultaneous presentations so attendees have to determine ahead of time which presentations they wish to attend. Throughout the conference, poster presentations are on display in the main lobby area where the conference is held.

Dr. Conteh remains the primary conference organizer with the assistance of studens, various campus personnel and the advice of the two steering committees. Applications to present are made available during fall semester and are due in mid-February. The conference strives to feature presentations from all academic majors across campus and to allow any student to participate. Applications are screened by the Program sub-group of the steering committee. Presentations are grouped loosely by common themes, but careful attention is paid to ensure sessions are not homogenous. This is done to promote the conference theme of sharing ideas across disciplines. The way presentations are scheduled presents attendees with the opportunity to hear multiple presentations from different disciplines within a session. Every attempt is made to accommodate audio visual requests of presenters.

There is no fee for the presenters. Presenters have the opportunity to attend the conference luncheon (at no cost) featuring the keynote speaker and student panelists. Funding for the conference has come from across campus in the past (Alumni Foundation, Academic Departments, Academic Deans, Vice Presidents, President) but, recently, the conference applied for a Strategic Initiative Grant and will operate off of the grant for another year. The conference will then be added to the regular budget of the university. The major costs to the conference are the conference luncheon for presenters, printing of the conference program with presentation abstracts, and funding for travel and hosting of the keynote speaker. Additional costs include: certificates, conference posters, conference information postcards, name tags, and other printing costs. The total per year has been less than $4,000, but with increased participation, costs have increased each year.

Conference planners are now preparing for the 7th Student Academic Conference to be held in April 2005. Each year has seen progressive positive involvement from presenters, faculty, staff, and attendance at the conference.

# Letter from the President

Greetings:

At Minnesota State University Moorhead, our students develop into proficient scholars and artists as evidenced by the annual MSUM Student Academic Conference.

This conference highlights student work inspired by the involvement and encouragement of our faculty. Essentially all of the research papers, creative works, group projects, and other student presentations are created under the personal supervision of an involved faculty mentor. Personal interaction between MSUM students and faculty is instrumental to high achievement by both.

Students who participate in the Student Academic Conference experience the intellectual pleasure of presenting to a genuinely interested audience of other students, faculty, and members of the community. In addition, they face the challenge of defending their ideas in a supportive community of student and faculty scholars. Such experiences only strengthen the undergraduate learning experience.

Congratulations to all who contribute to the conference as student participants, faculty mentors, conference planners, and supporters. Thank you for your role in continuing Minnesota State University Moorhead's mission to foster excellence in teaching and learning.

Sincerely,

Roland Barden

Roland E. Barden, Ph.D.
President

# Letter from the Vice President of Academic Affairs

Conference Participants:

There are so many reasons that the Minnesota State University *Student Academic Conference* became a tradition after its initial offering. Student learning and excellent faculty teaching are what we are about, and nothing is more appropriate for us to celebrate than student achievements in scholarship, research, and creative activity.

It seems that more and more attention is focused on institutional collaborations and partnerships. In that context, it is so important always to remember that the most significant collaboration is between student and teacher, learner and mentor. Today, we all have the opportunity to learn from the results of so many truly special partnerships.

As you make your selections and visit the poster sessions, be certain to ask the student presenters questions about what they have accomplished and what each envisions the next step to be. Also, please take time to thank the faculty mentors for their efforts – without them the rewarding day you have ahead of you would never have happened.

Yours truly,

Bette G. Midgarden

Bette Midgarden
Vice President

# Letter from the Vice President of Student Affairs

Welcome!
The Student Academic Conference provides an excellent opportunity to bridge the classroom experience with the out of class learning environment. The "laboratories" that exist on campus through services, residence halls, leadership programs, employment, student activities, and organization involvement are there to complement what is learned in the classroom. These experiences are rich with opportunity for students to apply what has been taught in the classroom and can assist in developing students in a variety of meaningful ways. The participation in the Conference can bring all facets of learning together in an inspiring and informative experience for all, whether presenting or reviewing the hard work of others. Thank you for taking the time to be involved and in making the MSUM campus a place where academic and student success can flourish.

Warren Wiese

# Letter from the President of the Student Senate

Salutations,

Higher education provides individuals with countless opportunities to develop socially and intellectually, but rarely are these individuals allowed to professionally demonstrate this development prior to graduation. Committed to excellence, Minnesota State University Moorhead guarantees every student the right to showcase their skills at the annual academic conference.

Students who participate in the academic conference receive due recognition for hard work, but perhaps more importantly, they learn to communicate their ideas and thoughts to peers. An individual may possess the greatest ideas in the world, but if they are unable to effectively communicate, the greatness will be lost in translation.

Each and every student participating in the academic conference is certain to learn and grow from the experience. It is precisely this above and beyond learning ethic that makes the students participating in this event some of the best on campus.

In closing, I applaud all participating students for your continued dedication to academics and taking advantage of this great opportunity to showcase your skills.

Sincerely,

Travis Maier
President, Student Senate

# Letter from the President of IFO

Metamorphoses are no less remarkable for being frequent, and one of those routine miracles is the process that changes a former high school student into a poised, thoughtful professional. The Student Academic Conference both recognizes and celebrates the transformation. While ultimately students educate themselves, faculty are still there to nudge, cajole, instruct and sometimes even inspire them. Events like the Conference give us the pleasure of watching our students make us proud.

Cindy Phillips
President, MSUM Inter Faculty Organization

# Letter from the President of Alumni Foundation

Dear Future Alumni,

The mission of the Minnesota State University Moorhead Alumni Foundation is to develop relationships and provide funding to advance academic excellence.

It is truly a pleasure for the Alumni Foundation to support students like you who exemplify academic excellence. Knowledge is exciting, but it becomes even more powerful when shared with others. Your willingness to present the results of scholarly activity speaks well of your commitment to a lifetime of learning.

You are accomplished students. I know that you will become successful alumni.

Sincerely,

Mark Vanyo
President, MSUM Alumni Foundation

# Conference Schedule

**Wednesday, April 14, 2004**

**7:30 a.m.** **Poster Set-Up—Registration/Information Table—CMU Main Lounge**

**10:30 a.m.** **Presenter Registration—Registration/Information Table—CMU Main Lounge**

**11:15 a.m.** **Seating for the Luncheon—CMU Ballroom**

**11:30 a.m.** **Luncheon Starts (Welcome and Introductions)—CMU Ballroom**
Menu: Grilled Chicken Fettuccini Alfredo [Chicken] or Grilled Portabella Mushroom Alfredo [Vegetarian]
Luncheon is for presenters and invited guests. Tickets can be purchased by sending an e-mail to acconf@mnstate.edu noting your meal choice by 04/03/2004. Tickets are $6.50. Individuals can attend the presentation portion of the luncheon without purchasing luncheon tickets.

**11:50 a.m.** **Keynote Speaker—CMU Ballroom**
Mr. Thomas C. Proehl
Managing Director, Guthrie Theater, Minneapolis, MN.

**12:20 p.m.** **Student Panelists—CMU Ballroom**
Chris Hames, Education & Human Services
Ben Hanson, Arts & Humanities
Heidi Petersen, Business & Industry
Stephanie Corneliussen, Social & Natural Sciences

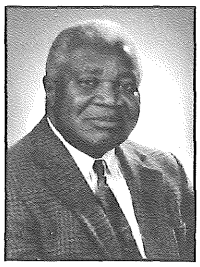
**1:00 p.m.** **Presentation Session 1 and Poster Session 1—Various CMU Rooms and Poster Display Area**

**2:20 p.m.** **Break**

**2:30 p.m.** **Presentation Session 2 and Poster Session 2—Various CMU Rooms and Poster Display Area**

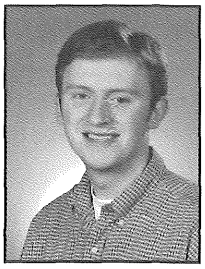
**4:00 p.m.** **Closing Social —CMU Main Lounge**
Refreshments sponsored by Counseling and Career Services.
Presenters should attend to pick up their conference certificate.

# Conference Organizers And Steering Committee



## Conference Advisor

**Dr. Andrew Conteh**
*Professor of Political Science*



## Conference Organizers

**Jan Krasny**
*Student Organizer,*
*Residence Life Department*

**Linda Palmer**
*Student Organizer*

**Cindy Preston**
*Assistant to the Vice President*
*for Academic Affairs for*
*Special Projects*

## Steering Committee

| | |
|---|---|
| Andrew Conteh | Political Science |
| Layne Anderson | Comstock Memorial Union |
| Theresa Carson | Communication Studies, Film Studies, and Theatre Arts |
| David Olday | Sociology & Criminal Justice |
| Helen Sheumaker | American Multicultural Studies & Humanities |
| Harry Weisenberger | Education Foundations |
| Gregory Stutes | Economics |
| Cynthia Preston | Academic Affairs |
| Dean Palmer | OAS Intermediate |
| Steven Bolduc | Economics |
| Yahya Fredrickson | New Center |
| Judy Peterson | Alumni Foundation |
| Oh-Hee Lee | Elementary and Early Childhood |
| Lian Ng | Mathematics |
| Ruth Marie Newton | Elementary and Early Childhood |
| Linda Palmer | Student |
| Jan Krasny | Student |

## Conference Volunteers

Angela Boser, Barb Seiler, Barbara Rath, Becky Boyle, Betty Gunderson, Brian Smith, Britt Tatman Ferguson, Brittney Goodman, Bruce Roberts, Carol Sibley, Chris Chastain, Cliff Schuette, Craig Ellingson, Cristina Mitrovici, Dave Olday, David Crockett, Dawn Hammerschmidt, Deb Lewis, Diane Wolter, Elizabeth Evenson, Ellen Brisch, Greg Stutes, Greg Toutges, Harry Weisenberger, Henry Chan, Jane Gudmundson, Janet Haak Aarness, Jean Hollaar, Jim Hatzenbuhler, Joe Provost, John Benson, Karen Mehnert-Meland, Karl W. Leonard, Kathryn Wise, Kathy Scott, Kevin Carollo, Konrad Czynski, Kris Benson, Kristi Alverson, Larry Schwartz, Laurie Blunsom, Layne Anderson, Linda Winkler, Marie Swanson, Phyllis May-Machunda, Roland Barden, Sandi Schuette, Sandy Pearce, Shawn Dunkirk, Shirlee Holland, Stephen Giedosh, Steve Bolduc, SuEllen Shaw, Theresa Carson

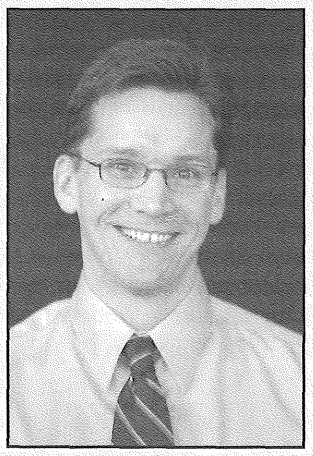
## Want to Get Involved?

If you are interested in being a part of the steering committee for the Student Academic Conference next year, a conference volunteer, or interested in being a student organizer, please send an e-mail expressing your interest to acconf@mnstate.edu

# Keynote Speaker

**Keynote:** ***"Giving Back: A Question of Responsibility Enhancing Community"***

**Each year an MSUM alumnus is selected to deliver the keynote address to conference attendants. This person is selected by the conference steering committee following a review of nominations received from members of the MSUM campus community. This year's keynote speaker is:**

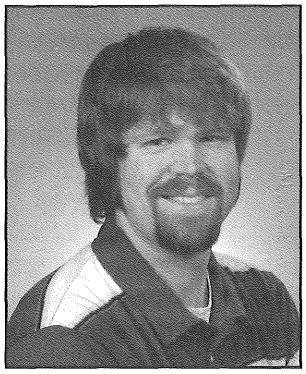


**Thomas C. Proehl**
**Managing Director**

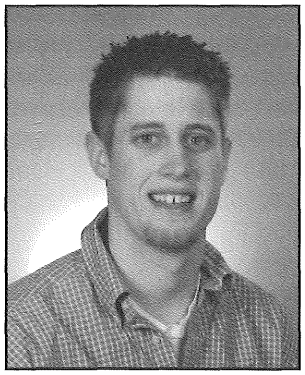
Having served as Guthrie Theater general manager for the past four years, Tom Proehl was named managing director in March 2003. He began his career at the Guthrie Theater as box office reservationist in 1984 prior to working for the La Jolla Playhouse and later moving to New York City in 1987. While in New York, Proehl held management positions with Playwrights Horizons, The Dramatists Guild, and Theatre for a New Audience. Before returning to Minneapolis he served as founding managing director of New York's Signature Theatre Company, collaborating with artistic director James Houghton and producing seasons of works by playwrights Lee Blessing, Edward Albee, Horton Foote, Adrienne Kennedy, Sam Shepard, Arthur Miller and John Guare. Mr. Proehl received his BA in Theatre from Minnesota State University, Moorhead and was recently awarded an outstanding alumni award. He received his MFA in Arts Administration from CUNY/Brooklyn College where he also served as an adjunct lecturer. Mr. Proehl continues to advise numerous New York based theater companies including The Foundry Theatre, Cherry Lane Theatre, SoHo Repertory Theatre and Signature Theatre Company. Tom also serves on the Executive Committee of the League of Resident Theatres and on the Board of Directors of The Playwrights' Center.

# Student Panelists

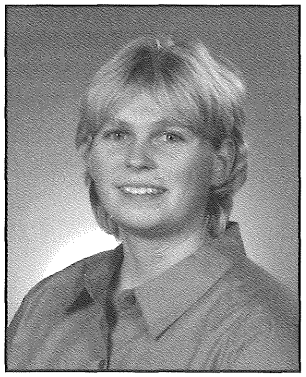
Each year four student panelists are selected to respond to the keynote address. These four students represent the four academic divisions of the university: Arts & Humanities, Social & Natural Sciences, Business & Industry, and Education & Human Services. These students are selected by the Dean of each academic division following a review of nominations received from members of the MSUM campus community. This year's panelists include:



**Ben Hanson** has been a student at MSUM for only two years. He completed his freshman year 2001-2002 at St. John's University in Collegeville, MN. In 2002 he decided to return home to where he grew up to attend MSUM and become an English/Mass Communications major. Ben is in his junior year at MSUM, but plans on attending the University of Alaska in Anchorage next fall through the National Student Exchange program. He hopes to experience a fresh perspective on life and learning through this amazing opportunity to live and study in a new and different culture. This experience will complement his studies here at MSUM greatly. Ben has worked at the local Fargo-Moorhead YMCA for the past four years in various positions. He started off as a camp counselor and waterfront director for Camp Cormorant, and he currently coaches the youth swim team, working with ages 6-18. Ben enjoys working with kids of all ages, entertaining those around him and generally being the most hilarious person he knows.



**Chris Hames** will be graduating this May with a bachelor degree in social work. He is a member of Phi Kappa Phi, the national interdisciplinary honor society, as well as other departmental organizations. He has most recently won an award for Outstanding Student Contribution for his work with the People Escaping Poverty Project. This service-learning award is given annually to one student within the four-college area. He is currently enjoying an internship at MeritCare hospital, and hopes to gain further experience in the field before attending graduate school. His passions lie in social research and he has aided professors during summer months with their independent studies. His interest in social work was stirred after an extensive motorcycle trip throughout the country of Mexico. Though the motorcycle now lies in pieces near the border of Guatemala, he will always remember the trip as a life-changing experience.



**Heidi Petersen** an accounting and economics major, has been an active student at MSUM since her freshman year. As a freshman and sophomore, she was actively involved in her respective Hall Councils and became a member of the Resident's Conduct Committee and Dining Service Committee. As a sophomore, she was President of Alpha Lambda Delta (ALD), a sophomore Honor Society, and Treasurer of SPURS, a volunteer organization. In 2002, she became involved with the Student Activities Budget Committee (SABC), and believes it is a committee where she can make the most difference for all MSUM students. Last fall, Heidi was elected President of the Financial Management Association of which she has been a member for two years. She also serves on the University Budget and Planning Committee. Through her campus involvement, Heidi has augmented her education with invaluable real world experiences that make her a better overall student at MSUM.

**Stephanie Corneliussen** is a senior psychology major. She plans to attend graduate school this fall to pursue a doctorate in clinical psychology. Stephanie is a member of Psi Chi, the National Honor Society in Psychology. She currently works as a research assistant at the Neuropsychiatric Research Institute in Fargo. Stephanie is a non-traditional student. She earned a B.S. degree in Mass Communications (journalism emphasis) in 1981, and worked as a professional journalist for over 20 years. Most of her journalism education was completed at Moorhead State University. She frequently wrote about social and psychological issues, and finally decided to become a psychologist (instead of always interviewing them). Stephanie is married, has two children, and lives in Hawley.

## • CMU 101

### Session 1

| | | |
|---|---|---|
| 1:00 pm | 7 | An Economic Study Of Household Income |
| 1:20 pm | 10 | Parent-Child Communication Program: Case Study #10 |
| 1:40 pm | 17 | The Scots are not English: Understanding Contemporary Scottish Identity |
| 2:00 pm | 22 | Solutions to Meinong's Theory of Objects |

### Session 2

| | | |
|---|---|---|
| 2:30 pm | 18 | Student Voices Through Poetry, Music and the Visual Arts: Responses to an Alternative Education Service Learning Project |
| 2:50 pm | 38 | Commercial Banking: Nationally and Locally |
| 3:10 pm | 71 | Deadly Diseases Among Us |

## • CMU 121

### Session 1

| | | |
|---|---|---|
| 1:00 pm | 140 | China's One Child Policy: The Changing Face of Family Planning |
| 1:20 pm | 127 | Sports Economics |
| 1:40 pm | 124 | Signature Quilt |
| 2:00 pm | 133 | Women's Empowerment |

### Session 2

| | | |
|---|---|---|
| 2:30 pm | 113 | Reproductive Ecology of Fathead Minnows (Pimephales promelas): The Effect of Nest Type on Reproductive Success |
| 2:50 pm | 111 | Digital Manipulation, Has it Gone Too Far? |
| 3:10 pm | 103 | Fraud in the United Way |
| 3:30 pm | 92 | Early Fraternal Organizations of Clay County |

## • CMU 200A

### Session 1

| | | |
|---|---|---|
| 1:00 pm | 5 | Theatre of the Absurd |
| 1:20 pm | 53 | Breathing, How it Works! |

### Session 2

| | | |
|---|---|---|
| 2:30 pm | 105 | Stars and Stuff: an Introduction to Astrophysics |
| 3:20 pm | 110 | Mental Retardation |
| 3:40 pm | 31 | Greek Theatre |

## • CMU 200C

### Session 2

| | | |
|---|---|---|
| 2:30 pm | 108 | Portrait Drawing Demonstrations: Methods and Meanings |

## • CMU 200D

### Session 1

| | | |
|---|---|---|
| 1:00 pm | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism |
| 2:00 pm | 30 | Commedia Dell'arte |

### Session 2

| | | |
|---|---|---|
| 2:30 pm | 136 | Shakespearean Theatre |
| 2:50 pm | 28 | Alike, but not the Same: A Lesson on Human Genetic Variation. |

*Numbers correspond with abstract listings beginning on page 28*

- **CMU 203**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 23 | The Parent-Child Communication Program: Case Study #9 |
| 1:20 pm | 98 | Advanced Optical Imaging-Experiences at Looking Through the World With Different Lenses (objectives). |
| 1:40 pm | 100 | Constitutionality of the USA PATRIOT ACT |
| 2:00 pm | 114 | The Wine Industry |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 116 | Fraud: How to Make a Million Stealing from Your Employer |
| 2:50 pm | 119 | Parent-Child Communication Program |
| 3:10 pm | 35 | Extensions of Synthetic Division |

- **CMU 205**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 1 | Some Multiplication Tricks |
| 1:45 pm | 16 | Being Genderqueer in a Binary Gender System: A Discussion About Gender |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 88 | Parent-Child Communication Program Case Study #2 |
| 2:50 pm | 3 | Isabella and Bolinda Tuylendina |
| 3:10 pm | 4 | Multiplication Made Easy |

- **CMU 207**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 34 | Keith Haring: Success and Controversy in Mass Exposure |
| 1:20 pm | 27 | Ethics: An Imperative Part of Any Business |
| 1:40 pm | | The Influence of Self-Generated Hand Gestures on Recall |
| 2:00 pm | 48 | The Parent-Child Communication Program, Case Study #8 |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 57 | The Correlation of the Proportion of Errors between Staggered Spondaic Word and SCAN-C tests |
| 2:50 pm | 65 | A Look at the Changing Music Industry from an Economic Perspective |
| 3:10 pm | 123 | The Implications of Selective Abortion in the Case of Disability: Integrating Disability Right and Reproductive Freedom |
| 3:30 pm | 79 | Racism and MSUM |

- **CMU 208**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 8 | The Parent-Child Communication Program: Case Study #7 |
| 1:20 pm | 32 | Comparison of teacher certification procedures in U.S.A. and Russia |
| 1:40 pm | 41 | Small Group Decision Making |
| 2:00 pm | 68 | The Malady of Fibromyalgia |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 72 | Relating the Biological, Ecological and Societal Values in Order to Bring Attention to the Overall Importance of Virgin Prairie Land to Our Region and Nation as a Whole. |
| 2:50 pm | 76 | The Determinants of Homeownership in the United States of America |
| 3:10 pm | 82 | Parent-Child-Communication-Program Case Study #10 |
| 3:30 pm | 87 | Clay County Italian Immigration: Italian Influence on Local Beauty Industry |

*Numbers correspond with abstract listings beginning on page 28*

- **CMU 214**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 139 | Child Labor |
| 1:20 pm | 135 | Gender Differences in Physical, Verbal, and Social Bullying of Elementary Students |
| 1:40 pm | 106 | Vetoing the Engenderment of the Frozen Human Embryo: A Feminist Argument for the Regulation of Reproductive Technologies and the Abolition of Forced Motherhood |
| 2:00 pm | 102 | Target: Upscale Discounting and Power Relationships |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 85 | Parent-Child Communication Program: Case Study #1 |
| 2:50 pm | 75 | Anti-Germanism in Clay County |
| 3:10 pm | 42 | Portfolio Assessment of Young Children |
| 3:30 pm | 39 | Is Casino Gambling Profitable to the State? |

- **CMU 216**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 26 | Parent-Child Communication Program (PCCP) - Case Study #4 |
| 1:20 pm | 78 | Language Disorders: The Elements and Instituting a Classroom Model. |
| 1:40 pm | 89 | The Recent Changes in the Immigration and Asylum System of the United Kingdom and Thei Detrimental Effects |
| 2:00 pm | 90 | Predictions in Daily Lives - Can They Be Justified? |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 93 | Web Research: Advertising, Public Relations-Marketing, News, Television, and Radio Online |
| 2:50 pm | 95 | Investigating DNA Replication Origins in C. elegans. |
| 3:10 pm | 99 | The United States Beer Industry |
| 3:30 pm | 109 | NMR Study of Magnetic Molecules |

- **CMU 218**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 43 | The Parent-Child Communication Program: Case Study #5 |
| 1:20 pm | 91 | Developmental and Behavioral Ontogeny of Antipredator Behavior in Cichlid Larvae |
| 1:45 pm | 132 | Spectroscopy and the Spectroscope |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 14 | Nonny's Flair: An Examination of a Children's Book Illustrator. |
| 3:00 pm | 19 | Loving the Tummy |
| 3:30 pm | 36 | Shakespeare's Tragedies and Histories |

- **CMU 227**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 138 | Marxism, Revolution, and Reform |
| 1:20 pm | 134 | Colorful History of Moorhead School: Oak Port. |
| 1:40 pm | 129 | Genocide and the Normality of the Perpetrators of Evil |
| 2:00 pm | 128 | Racing Through Time: A Historical Look at Horses in Clay County |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 126 | French Settlement in Clay County |
| 2:50 pm | 125 | Cost/Benefit Analysis of a Twins stadium in Minneapolis |
| 3:10 pm | 120 | The role of NHE1 in Balb-c rat tumorgenesis |
| 3:30 pm | 117 | Expression of Mitochondrial Genes in Wheat (Triticum aestivum L.) |

*Numbers correspond with abstract listings beginning on page 28*

- **Kise Line D**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 13 | Topics in the American Renaissance |
| 2:05 pm | 52 | Phospholipase D Regulates Stress Fiber Formations By Phenylephrine Stimulation in CCL39 cells |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 29 | A Lesson in Genetic Probability |
| 3:30 pm | 74 | The Rise of Korean Nationalism Leading Up to the Samil |

- **Underground**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 112 | Form Follows Function: Why Animals Look the Way They Do |

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 121 | Rape as a Weapon of War: Reproductive Issues Concerning Women in War |

- **Main Lounge**

**Session 1**

| | | |
|---|---|---|
| 1:00 pm | 44 | Chemical Characterization of Ostariophysan Alarm Substance |
| 1:00 pm | 37 | Mental Illness and Inmates |
| 1:00 pm | 33 | Aseptic Technique |
| 1:00 pm | 2 | Guided Notes in Mathematics Classes |
| 1:00 pm | 6 | The Social Problem of Battered Women |
| 1:00 pm | 45 | Children's Literature - A cooperative study |
| 1:00 pm | 9 | Assessing the Function of PPDK in C3 Plants Using Arabidopsis thaliana TDNA Gene Knockouts |
| 1:00 pm | 58 | Effect of Environmental Stresses on Corn Root Respiration |
| 1:00 pm | 21 | Mary Crowdog/"Lakota Woman" |
| 1:00 pm | 15 | Providing Health Care in Nicaragua: Nursing Student's Experience |
| 1:00 pm | 24 | Are you interested in becoming a Certified Nursing Assistant? |
| 1:00 pm | 25 | Cell Cycle Genes and Their Effects on Mitochondrial Inheritance and Dynamics |
| 1:00 pm | 12 | Orchid Habitat in Northern Minnesota |
| 1:00 pm | 61 | Short-Term Effects of Removing Energy (sucrose) Supply to Growing Corn Roots. |
| 1:00 pm | 55 | A Glimpse Into the World of a Systems Analyst |
| 1:00 pm | 59 | Can corn root respiration be stimulated by pre-treating corn roots in iron fertilizer? |
| 1:00 pm | 46 | Investigation of a Novel Method to Purify Plasmid DNA |
| 1:00 pm | 56 | An Initial Biochemical Analysis of Autism |
| 1:00 pm | 54 | Is Mitochondrial Inheritance Tissue Specific? A New Look at the mtDNA Dogma from a Cell Biology Perspective. |
| 1:00 pm | 51 | How Do First-Syllable Characteristics Affect Visual Word Recognition of Long Words? |
| 1:00 pm | 11 | Intravenous Catheters Used in the Intensive Care Unit |
| 1:00 pm | 50 | Phospholipase D Regulates Stress Fiber Formation By Phenylephrine Stimulation in CCL39 cells |
| 1:00 pm | 49 | The Changing Face of St.Francis de Sales |
| 1:00 pm | 47 | The Influence of Prayer and Religious Beliefs on Measures of Life Satisfaction |
| 1:00 pm | 60 | Do Elevated Levels of Potassium Ion in the External Medium of Corn Roots Stimulate Respiration and Therefore ATP Synthesis? |

*Numbers correspond with abstract listings beginning on page 28*

**Session 2**

| | | |
|---|---|---|
| 2:30 pm | 94 | How do MAPK/ERK Kinases Regulate Microtubule Spindle Formation? |
| 2:30 pm | 137 | Special Problem in Education: Reaching Out to Adopted Minorities |
| 2:30 pm | 131 | NMR Line Widths as a Signature of Crystal Geometry and Dynamics. |
| 2:30 pm | 130 | Rates of Groundwater Cadmium Attenuation in Gravels Impregnated with Glacial Clay in the Red River Valley |
| 2:30 pm | 122 | Growth Curve of Staphylococcus Epidermidis |
| 2:30 pm | 118 | The Conversion of MDH to LDH Through Site Directed Mutagenesis |
| 2:30 pm | 115 | Mothers and Unfair Pre-Natal Care. |
| 2:30 pm | 107 | A Test of the Anti-Pathogen Hypothesis for the Function of Perciform Club Cells |
| 2:30 pm | 104 | Can Some Predators Avoid Being Chemically Labeled by Their Prey? |
| 2:30 pm | 101 | The Car Problem; Whether to Buy or Lease. |
| 2:30 pm | 69 | Genetic Diversity Influencing Survival Among Declining Populations of Black-tailed Prairie Dogs. |
| 2:30 pm | 96 | Phenylephrine Activates Na+-H+ Exchangers via Bifurcating Pathways Involving RhoA and ERK as Downstream Effects of Different Protein Kinase C Isoforms |
| 2:30 pm | 62 | Effect of Aluminum Ion on Corn Root Respiration |
| 2:30 pm | 86 | Modeling of Upper-Level Degrees Earned Among Different Races |
| 2:30 pm | 83 | Seeing the Unseen with Geophysical Methods |
| 2:30 pm | 81 | Nocturnal Behavioral Response to Chemical Alarm Cues by Tetra Fish |
| 2:30 pm | 80 | Comparison of Growth Rates and Survival of Painted Turtles (Chrysemys picta) in Clay County, Minnesota |
| 2:30 pm | 77 | Designing Physical Anthropology Labs: An Exercise in Active Learning |
| 2:30 pm | 73 | Green Fluorescent Protein Purification and Polyclonal Antibody Production in Rabbits |
| 2:30 pm | 70 | Effects of Oxidative Stress on Saccharomyces cerevisiae FKH1 Transcription Factor Knockou |
| 2:30 pm | 67 | The Role of PKC in RhoA Activation and Stress Fiber Formation |
| 2:30 pm | 66 | Cohabitation and Divorce |
| 2:30 pm | 64 | The Relationship of Root Cell Membranes "Leakiness" on Root Tissue Respiration Rate |
| 2:30 pm | 63 | Survey of Wild Turkey (Meleagris gallopavo) Distribution in Cass and Clay Counties |
| 2:30 pm | 97 | Exploring the Roles of Nurse Practitioner in Rural Health Care |

*Numbers correspond with abstract listings beginning on page 28*

# Alphabetical List Of Presenters

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Ahonen | Adam | 18 | Student Voices Through Poetry, Music and the Visual Arts: Responses to an Alternative Education Service Learning Project | 101 | 2:30 pm |
| Alemadi | Shireen | 113 | Reproductive Ecology of Fathead Minnows (Pimephales promelas): The Effect of Nest Type on Reproductive Success | 121 | 2:30 pm |
| Alemadi | Shireen | 107 | A Test of the Anti-Pathogen Hypothesis for the Function of Perciform Club Cells | Main Lounge | 2:30 pm |
| Alles | Amal | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism | 200D | 1:00 pm |
| Almer | Marin | 57 | The Correlation of the Proportion of Errors between Staggered Spondaic Word and SCAN-C tests | 207 | 2:30 pm |
| Al-Rifai | Moneer | 109 | NMR Study of Magnetic Molecules | 216 | 3:30 pm |
| Anania | Amanda | 46 | Investigation of a Novel Method to Purify Plasmid DNA | Main Lounge | 1:00 pm |
| Andel | Chad | 7 | An Economic Study Of Household Income | 101 | 1:00 pm |
| Andersen | Rachel | 75 | Anti-Germanism in Clay County | 214 | 2:50 pm |
| Anderson | Leah | 23 | The Parent-Child Communication Program: Case Study #9 | 203 | 1:00 pm |
| Anderson | Amber | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Baukol | Angela | 41 | Small Group Decision Making | 208 | 1:40 pm |
| Beer | Melissa | 83 | Seeing the Unseen with Geophysical Methods | Main Lounge | 2:30 pm |
| Bengtson | Jennifer | 77 | Designing Physical Anthropology Labs: An Exercise in Active Learning | Main Lounge | 2:30 pm |
| Bentley | Vusya | 134 | Colorful History of Moorhead School: Oak Port. | 227 | 1:20 pm |
| Bentz | Kristin | 103 | Fraud in the United Way | 121 | 3:10 pm |
| Bichler | Christian | 101 | The Car Problem; Whether to Buy or Lease. | Main Lounge | 2:30 pm |
| Blaeser | Alissa | 136 | Shakespearean Theatre | 200D | 2:30 pm |
| Boyd | Amber | 75 | Anti-Germanism in Clay County | 214 | 2:50 pm |
| Boyer | Andrea | 14 | Nonny's Flair: An Examination of a Children's Book Illustrator. | 218 | 2:30 pm |
| Breikjern | Nicholle | 18 | Student Voices Through Poetry, Music and the Visual Arts: Responses to an Alternative Education Service Learning Project | 101 | 2:30 pm |
| Burgad | Derick | 73 | Green Fluorescent Protein Purification and Polyclonal Antibody Production in Rabbits | Main Lounge | 2:30 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Burnside | Tabitha | 67 | The Role of PKC in RhoA Activation and Stress Fiber Formation | Main Lounge | 2:30 pm |
| Butler | Devin | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Byklum | Tami | 15 | Providing Health Care in Nicaragua: Nursing Student's Experience | Main Lounge | 1:00 pm |
| Charles | Lang | 18 | Student Voices Through Poetry, Music and the Visual Arts: Responses to an Alternative Education Service Learning Project | 101 | 2:30 pm |
| Christianson | Sarah | 17 | The Scots are Not English: Understanding Contemporary Scottish Identity | 101 | 1:40 pm |
| Church | Kinsey | 14 | Nonny's Flair: An Examination of a Children's Book Illustrator. | 218 | 2:30 pm |
| Collins | Ashley | 37 | Mental Illness and Inmates | Main Lounge | 1:00 pm |
| Colquhoun | Thomas | 64 | The Relationship of Root Cell Membranes "Leakiness" on Root Tissue Respiration Rate | Main Lounge | 2:30 pm |
| Cook | Trevor | 126 | French Settlement in Clay County | 227 | 2:30 pm |
| Cooper | Adriane | 71 | Deadly Diseases Among Us | 101 | 3:10 pm |
| Cotton | Rose | 57 | The Correlation of the Proportion of Errors between Staggered Spondaic Word and SCAN-C tests | 207 | 2:30 pm |
| Cox | Jesse | 60 | Do Elevated Levels of Potassium Ion in the External Medium of Corn Roots Stimulate Respiration and Therefore ATP Synthesis? | Main Lounge | 1:00 pm |
| Crabtree | Shannon | 121 | Rape as a Weapon of War: Reproductive Issues Concerning Women in War | Undersground | 2:30 pm |
| Crabtree | Shannon | 123 | The Implications of Selective Abortion in the Case of Disability: Integrating Disability Right and Reproductive Freedom | 207 | 3:10 pm |
| Dahl | Faith | 70 | Effects of Oxidative Stress on Saccharomyces cerevisiae FKH1 Transcription Factor Knockout | Main Lounge | 2:30 pm |
| Daley | Brittany | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Denker | James | 118 | The Conversion of MDH to LDH Through Site Directed Mutagenesis | Main Lounge | 2:30 pm |
| Deutsch | Tiffany | 93 | Web Research: Advertising, Public Relations-Marketing, News, Television, and Radio Online | 216 | 2:30 pm |
| Dinnel | Autumn | 25 | Cell Cycle Genes and Their Effects on Mitochondrial Inheritance and Dynamics | Main Lounge | 1:00 pm |
| Dollerschell | Mark | 1 | Some Multiplication Tricks | 205 | 1:00 pm |
| Donner | Jeni | 104 | Can Some Predators Avoid Being Chemically Labeled by Their Prey? | Main Lounge | 2:30 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Drew | Shantell | 81 | Nocturnal Behavioral Response to Chemical Alarm Cues by Tetra Fish | Main Lounge | 2:30 pm |
| Duval | Matthew | 67 | The Role of PKC in RhoA Activation and Stress Fiber Formation | Main Lounge | 2:30 pm |
| Easton | Amanda | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Easton | Amanda | 106 | Vetoing the Engenderment of the Frozen Human Embryo | 214 | 1:40 pm |
| Easton | Amanda | 121 | Rape as a Weapon of War: Reproductive Issues Concerning Women in War | Undersground | 2:30 pm |
| Ehlers | Bethany | 44 | Chemical Characterization of Ostariophysan Alarm Substance | Main Lounge | 1:00 pm |
| Elkin | Nicole Elkin | 100 | Constitutionality of the USA PATRIOT ACT | 203 | 1:40 pm |
| Erik | Block | 18 | Student Voices Through Poetry, Music and the Visual Arts: Responses to an Alternative Education Service Learning Project | 101 | 2:30 pm |
| Fanfulik | Lisa | 119 | Parent-Child Communication Program | 203 | 2:50 pm |
| Feir | Dan | 70 | Effects of Oxidative Stress on Saccharomyces cerevisiae FKH1 Transcription Factor Knockout | Main Lounge | 2:30 pm |
| Fick | Steven | 30 | Commedia Dell'arte | 200D | 2:00 pm |
| Finke | Tiffany | 12 | Orchid Habitat in Northern Minnesota | Main Lounge | 1:00 pm |
| Flaat | Cole | 136 | Shakespearean Theatre | 200D | 2:30 pm |
| Flake | Shelley | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Fohl | Michael | 60 | Do Elevated Levels of Potassium Ion in the External Medium of Corn Roots Stimulate Respiration and Therefore ATP Synthesis? | Main Lounge | 1:00 pm |
| Foss | Nick | 30 | Commedia Dell'arte | 200D | 2:00 pm |
| Frank | Greta | 30 | Commedia Dell'arte | 200D | 2:00 pm |
| Frykman | Jon | 112 | Form Follows Function: Why Animals Look the Way They Do | Underground | 1:00 pm |
| Frykman | Jon | 62 | Effect of Aluminum Ion on Corn Root Respiration | Main Lounge | 2:30 pm |
| Funk | Shamus | 86 | Modeling of Upper-Level Degrees Earned Among Different Races | Main Lounge | 2:30 pm |
| Gaa | Courtney | 42 | Portfolio Assessment of Young Children | 214 | 3:10 pm |
| Gabel, Jr. | William | 55 | A Glimpse Into the World of a Systems Analyst | Main Lounge | 1:00 pm |
| Geray | Katie | 63 | Survey of Wild Turkey (Meleagris gallopavo) Distribution in Cass and Clay Counties | Main Lounge | 2:30 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Gertsen | Lee | 69 | Genetic Diversity Influencing Survival Among Declining Populations of Black-tailed Prairie Dogs. | Main Lounge | 2:30 pm |
| Gilleshammer | Lindsay | 78 | Language Disorders: The Elements and Instituting a Classroom Model. | 216 | 1:20 pm |
| Glur | Darren | 38 | Commercial Banking: Nationally and Locally | 101 | 2:50 pm |
| Gomez | Eric | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Gomez | Eric | 36 | Shakespeare's Tragedies and Histories | 218 | 3:30 pm |
| Goonawardena | Roshani | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism | 200D | 1:00 pm |
| Goonewardena | Roshani | 82 | Parent-Child-Communication-Program Case Study #10 | 208 | 3:10 pm |
| Goos | Gwen | 121 | Rape as a Weapon of War: Reproductive Issues Concerning Women in War | Undersground | 2:30 pm |
| Goos | Gwen | 123 | The Implications of Selective Abortion in the Case of Disability: Integrating Disability Right and Reproductive Freedom | 207 | 3:10 pm |
| Grabowska | Sarah | 40 | The Influence of Self-Generated Hand Gestures on Recall | 207 | 1:40 pm |
| Grawunder | Greg | 113 | Reproductive Ecology of Fathead Minnows (Pimephales promelas): The Effect of Nest Type on Reproductive Success | 121 | 2:30 pm |
| Greenley | Jill | 9 | Assessing the Function of PPDK in C3 Plants Using Arabidopsis thaliana TDNA Gene Knockouts | Main Lounge | 1:00 pm |
| Gruber | Natasha | 63 | Survey of Wild Turkey (Meleagris gallopavo) Distribution in Cass and Clay Counties | Main Lounge | 2:30 pm |
| Gruber | Natash W. | 80 | Comparison of Growth Rates and Survival of Painted Turtles (Chrysemys picta) in Clay County, Minnesota | Main Lounge | 2:30 pm |
| Guajardo | Pablo | 79 | Racism and MSUM | 207 | 3:30 pm |
| Gubareva | Irina | 32 | Comparison of teacher certification procedures in U.S.A. and Russia | 208 | 1:20 pm |
| Guiles | Pamela | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Guthmiller | Michelle | 23 | The Parent-Child Communication Program: Case Study #9 | 203 | 1:00 pm |
| Hamann | Bree L. | 91 | Developmental and Behavioral Ontogeny of Antipredator Behavior in Cichlid Larvae | 218 | 1:20 pm |
| Hannig | Melissa | 42 | Portfolio Assessment of Young Children | 214 | 3:10 pm |
| Hanson | Amanda | 62 | Effect of Aluminum Ion on Corn Root Respiration | Main Lounge | 2:30 pm |
| Hartung | Ashley | 37 | Mental Illness and Inmates | Main Lounge | 1:00 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Haugen | Inga | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Haugen | Inga | 36 | Shakespeare's Tragedies and Histories | 218 | 3:30 pm |
| Haverberg | Eric | 105 | Stars and Stuff: an Introduction to Astrophysics | 200A | 2:30 pm |
| Haynes | Angela | 85 | Parent-Child Communication Program: Case Study #1 | 214 | 2:30 pm |
| Heck | Jessica | 95 | Investigating DNA Replication Origins in C. elegans. | 216 | 2:50 pm |
| Hendricks | Jacqueline | 135 | Gender Differences in Physical, Verbal, and Social Bullying of Elementary Students | 214 | 1:20 pm |
| Hendrickson | Jodi | 104 | Can Some Predators Avoid Being Chemically Labeled by Their Prey? | Main Lounge | 2:30 pm |
| Hendrickson | Jodi | 58 | Effect of Environmental Stresses on Corn Root Respiration | Main Lounge | 1:00 pm |
| Herath | Shanaka | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism | 200D | 1:00 pm |
| Herman | James | 132 | Spectroscopy and the Spectroscope | 218 | 1:45 pm |
| Hilton | Kristi | 87 | Clay County Italian Immigration: Italian Influence on Local Beauty Industry | 208 | 3:30 pm |
| Hoepfner | Jennifer | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Hoff | Amanda | 26 | Parent-Child Communication Program (PCCP) - Case Study #4 | 216 | 1:00 pm |
| Hohenstein | Janet | 134 | Colorful History of Moorhead School: Oak Port. | 227 | 1:20 pm |
| Holmberg | Heidi | 137 | Special Problem in Education: Reaching Out to Adopted Minorities | Main Lounge | 2:30 pm |
| Holzer | Chrissie | 21 | Mary Crowdog / "Lakota Woman" | Main Lounge | 1:00 pm |
| Huber | Cassandra | 10 | Parent-Child Communication Program: Case Study #10 | 101 | 1:20 pm |
| Hugh | Emily | 51 | How Do First-Syllable Characteristics Affect Visual Word Recognition of Long Words? | Main Lounge | 1:00 pm |
| Huseby | Nathan | 28 | Alike, but not the same: A lesson on human genetic variation. | 200D | 2:50 pm |
| Imdieke | Aimee | 111 | Digital Manipulation, Has it gone too Far? | 121 | 2:50 pm |
| Jacobs | Sarah | 43 | The Parent-Child Communication Program: Case Study #5 | 218 | 1:00 pm |
| Jeske | Dustin | 39 | Is Casino Gambling Profitable to the State? | 214 | 3:30 pm |
| Jetvig | Tessa | 29 | A Lesson in Genetic Probability | Kise Line D | 2:30 pm |
| Jetvig | Tessa | 61 | Short-Term Effects of Removing Energy (sucrose) Supply to Growing Corn Roots. | Main Lounge | 1:00 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Jinadasa | Ludmi | 82 | Parent-Child-Communication-Program Case Study #10 | 208 | 3:10 pm |
| Jinadasa | Ludmi | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism | 200D | 1:00 pm |
| Jinadasa | Pat | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism | 200D | 1:00 pm |
| Johnson | Heidi | 70 | Effects of Oxidative Stress on Saccharomyces cerevisiae FKH1 Transcription Factor Knockout | Main Lounge | 2:30 pm |
| Johnson | Jessica | 50 | Phospholipase D Regulates Stress Fiber Formation By Phenylephrine Stimulation in CCL39 cells | Main Lounge | 1:00 pm |
| Johnson | Ann | 86 | Modeling of Upper-Level Degrees Earned Among Different Races | Main Lounge | 2:30 pm |
| Johnson | Jessica | 52 | Phospholipase D Regulates Stress Fiber Formations By Phenylephrine Stimulation in CCL39 cells | Kise Line D | 2:05 pm |
| Johnson | Lindsey | 3 | Isabella and Bolinda Tuylendina | 205 | 2:50 pm |
| Jost | Gretchen | 14 | Nonny's Flair: An Examination of a Children's Book Illustrator. | 218 | 2:30 pm |
| Kapsner | Katie | 99 | The United States Beer Industry | 216 | 3:10 pm |
| Karunadharma | Pabalu | 117 | Expression of Mitochondrial Genes in Wheat (Triticum aestivum L.) | 227 | 3:30 pm |
| Keisacker | Jessica | 34 | Keith Haring: Success and Controversy in Mass Exposure | 207 | 1:00 pm |
| Keller | Chelsea | 2 | Guided Notes in Mathematics Classes | Main Lounge | 1:00 pm |
| Kleffer | Holly | 72 | Relating the Biological, Ecological and Societal Values in Order to Bring Attention to the Overall Importance of Virgin Prairie Land to Our Region and Nation as a Whole. | 208 | 2:30 pm |
| Kippen | Kadie | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Kizima | Geniece | 48 | The Parent-Child Communication Program, Case Study #8 | 207 | 2:00 pm |
| Klassen | Tracy | 119 | Parent-Child Communication Program | 203 | 2:50 pm |
| Kleindl | Jessica | 97 | Exploring the Roles of Nurse Practitioner in Rural Health Care | Main Lounge | 2:30 pm |
| Knudson | Tanya | 68 | The Malady of Fibromyalgia | 208 | 2:00 pm |
| Knutson | Julie | 58 | Effect of Environmental Stresses on Corn Root Respiration | Main Lounge | 1:00 pm |
| Kock | Cindi | 24 | Are you interested in becoming a Certified Nursing Assistant? | Main Lounge | 1:00 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Kopel | Heidi | 88 | Parent-Child Communication Program Case Study #2 | 205 | 2:30 pm |
| Kubista | Shelly | 42 | Portfolio Assessment of Young Children | 214 | 3:10 pm |
| Larson | Ryan | 27 | Ethics: An Imperative Part of Any Business | 207 | 1:20 pm |
| Larson | Sara | 9 | Assessing the Function of PPDK in C3 Plants Using Arabidopsis thaliana TDNA Gene Knockouts | Main Lounge | 1:00 pm |
| Larson | Tom | 28 | Alike, but not the same: A lesson on human genetic variation. | 200D | 2:50 pm |
| Larson | Tom | 59 | Can corn root respiration be stimulated by pre-treating corn roots in iron fertilizer? | Main Lounge | 1:00 pm |
| Lein | Christina | 5 | Theatre of the Absurd | 200A | 1:00 pm |
| Lembke | Candace | 53 | Breathing, How it Works! | 200A | 1:20 pm |
| Leopold | Carrie | 58 | Effect of Environmental Stresses on Corn Root Respiration | Main Lounge | 1:00 pm |
| Levorsen | Alicia | 73 | Green Fluorescent Protein Purification and Polyclonal Antibody Production in Rabbits | Main Lounge | 2:30 pm |
| Lhotka | Michele | 130 | Rates of Groundwater Cadmium Attenuation in Gravels Impregnated with Glacial Clay in the Red River Valley | Main Lounge | 2:30 pm |
| Liberda | Chris | 65 | A Look at the Changing Music Industry from an Economic Perspective | 207 | 2:50 pm |
| Lien | Tammy | 25 | Cell Cycle Genes and Their Effects on Mitochondrial Inheritance and Dynamics | Main Lounge | 1:00 pm |
| Lindeman | Jennifer | 108 | Portrait Drawing Demonstrations: Methods and Meanings | 200C | 2:30 pm |
| Linstad | Jayne | 101 | The Car Problem; Whether to Buy or Lease. | Main Lounge | 2:30 pm |
| Lipp | Amanda | 73 | Green Fluorescent Protein Purification and Polyclonal Antibody Production in Rabbits | Main Lounge | 2:30 pm |
| Lisa | Streitz | 54 | Is Mitochondrial Inheritance Tissue Specific? A New Look at the mtDNA Dogma from a Cell Biology Perspective. | Main Lounge | 1:00 pm |
| Lof | Kay | 15 | Providing Health Care in Nicaragua: Nursing Student's Experience | Main Lounge | 1:00 pm |
| Mastel | Tracy | 63 | Survey of Wild Turkey (Meleagris gallopavo) Distribution in Cass and Clay Counties | Main Lounge | 2:30 pm |
| Mastel | Tracy | 69 | Genetic Diversity Influencing Survival Among Declining Populations of Black-tailed Prairie Dogs. | Main Lounge | 2:30 pm |
| Matteson | Ben | 31 | Greek Theatre | 200A | 3:40 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Mau | Jen | 43 | The Parent-Child Communication Program: Case Study #5 | 218 | 1:00 pm |
| McCamant | Virginia | 71 | Deadly Diseases Among Us | 101 | 3:10 pm |
| McColley | Patrick | 5 | Theatre of the Absurd | 200A | 1:00 pm |
| McCoy | Austin | 98 | Advanced Optical Imaging-Experiences at looking through the world with different lenses (objectives). | 203 | 1:20 pm |
| McCracken | Amanda | 83 | Seeing the Unseen with Geophysical Methods | Main Lounge | 2:30 pm |
| Medhus | Jared | 93 | Web Research: Advertising, Public Relations-Marketing, News, Television, and Radio Online | 216 | 2:30 pm |
| Meier | Kierston | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Metcalf | Alison | 67 | The Role of PKC in RhoA Activation and Stress Fiber Formation | Main Lounge | 2:30 pm |
| Mies | Julie | 4 | Multiplication Made Easy | 205 | 3:10 pm |
| Mikelson | Valerie | 108 | Portrait Drawing Demonstrations: Methods and Meanings | 200C | 2:30 pm |
| Mische | Hannah | 124 | Signature Quilt | 121 | 1:40 pm |
| Mishra | Anusha | 96 | Phenylephrine Activates Na+-H+ Exchangers via Bifurcating Pathways Involving RhoA and | Main Lounge | 2:30 pm |
| Pfeifer | Kate | 61 | Short-Term Effects of Removing Energy (sucrose) Supply to Growing Corn Roots. | Main Lounge | 1:00 pm |
| Pfeifer | Kate | 29 | A Lesson in Genetic Probability | Kise Line D | 2:30 pm |
| Plattner | Alycia | 55 | A Glimpse Into the World of a Systems Analyst | Main Lounge | 1:00 pm |
| Pudil | Samantha | 136 | Shakespearean Theatre | 200D | 2:30 pm |
| Quade | Katie | 42 | Portfolio Assessment of Young Children | 214 | 3:10 pm |
| Rajapakse | Pushpakantha | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism | 200D | 1:00 pm |
| Ranguma | Sonnia | 122 | Growth Curve of Staphylococcus Epidermidis | Main Lounge | 2:30 pm |
| Ranstrom | Lindsay | 47 | The Influence of Prayer and Religious Beliefs on Measures of Life Satisfaction | Main Lounge | 1:00 pm |
| Reames | Cory | 1 | Some Multiplication Tricks | 205 | 1:00 pm |
| Richgels | Erin | 86 | Modeling of Upper-Level Degrees Earned Among Different Races | Main Lounge | 2:30 pm |
| Ringstrom | Bruce | 129 | Genocide and the Normality of the Perpetrators of Evil | 227 | 1:40 pm |
| Roberson | Brianne | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Rodke | Stephanie | 10 | Parent-Child Communication Program: Case Study #10 | 101 | 1:20 pm |
| Ronderos | Dave S. | 96 | Phenylephrine Activates Na+-H+ Exchangers via Bifurcating Pathways Involving RhoA and ERK as Downstream Effects of Different Protein Kinase C Isoforms | Main Lounge | 2:30 pm |
| Roshau | Jessica | 66 | Cohabitation and Divorce | Main Lounge | 2:30 pm |
| Rud | Courtney | 104 | Can Some Predators Avoid Being Chemically Labeled by Their Prey? | Main Lounge | 2:30 pm |
| Rufsvold | Tracey | 88 | Parent-Child Communication Program Case Study #2 | 205 | 2:30 pm |
| Ruzicka | Amy | 85 | Parent-Child Communication Program: Case Study #1 | 214 | 2:30 pm |
| Rzaszutak | Mariya | 71 | Deadly Diseases Among Us | 101 | 3:10 pm |
| Sandbek | Adam | 102 | Target: Upscale Discounting and Power Relationships | 214 | 2:00 pm |
| Sander | James | 92 | Early Fraternal Organizations of Clay County | 121 | 3:30 pm |
| Sanders | Meridith | 114 | The Wine Industry | 203 | 2:00 pm |
| Sang | Rachel | 50 | Phospholipase D Regulates Stress Fiber Formation By Phenylephrine Stimulation in CCL39 cells | Main Lounge | 1:00 pm |
| Sang | Rachel | 52 | Phospholipase D Regulates Stress Fiber Formations By Phenylephrine Stimulation in CCL39 cells | Kise Line D | 2:05 pm |
| Santana | Castel | 118 | The Conversion of MDH to LDH Through Site Directed Mutagenesis | Main Lounge | 2:30 pm |
| Sawarynski | Megan | 131 | NMR Line Widths as a Signature of Crystal Geometry and Dynamics. | Main Lounge | 2:30 pm |
| Schmit | Joanna M. | 80 | Comparison of Growth Rates and Survival of Painted Turtles (Chrysemys picta)in Clay County, Minnesota | Main Lounge | 2:30 pm |
| Semelis | Katie | 108 | Portrait Drawing Demonstrations: Methods and Meanings | 200C | 2:30 pm |
| Sherman | Brandon | 140 | China's One Child Policy: The Changing Face of Family Planning | 121 | 1:00 pm |
| Shrestha | Binod | 101 | The Car Problem; Whether to Buy or Lease. | Main Lounge | 2:30 pm |
| Shreve | Aaron | 89 | The Recent Changes in the Immigration and Asylum System of the United Kingdom and Their Detrimental Affects | 216 | 1:40 pm |
| Simmons | Jindallay | 124 | Signature Quilt | 121 | 1:40 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Simms | Ava-Gaye | 19 | Loving the Tummy | 218 | 3:00 pm |
| Simms | Ava-Gaye | 94 | How do MAPK/ERK Kinases Regulate Microtubule Spindle Formation? | Main Lounge | 2:30 pm |
| Skjoiten | Kara | 8 | The Parent-Child Communication Program: Case Study #7 | 208 | 1:00 pm |
| Skolte | Jill | 56 | An Initial Biochemical Analysis of Autism | Main Lounge | 1:00 pm |
| Sletten | Jessica | 133 | Women's Empowerment | 121 | 2:00 pm |
| Smith | Sarah Jane | 93 | Web Research: Advertising, Public Relations-Marketing, News, Television, and Radio Online | 216 | 2:30 pm |
| Smith | Rachael | 112 | Form Follows Function: Why Animals Look the Way They Do | Underground | 1:00 pm |
| Splonskowski | Beth | 87 | Clay County Italian Immigration: Italian Influence on Local Beauty Industry | 208 | 3:30 pm |
| Stanina | Jaynae | 11 | Intravenous Catheters Used in the Intensive Care Unit | Main Lounge | 1:00 pm |
| Stein | Erika | 115 | Mothers and unfair pre-natal care. | Main Lounge | 2:30 pm |
| Stinar | Kari | 8 | The Parent-Child Communication Program: Case Study #7 | 208 | 1:00 pm |
| Stroh | Julie | 3 | Isabella and Bolinda Tuylendina | 205 | 2:50 pm |
| Takahashi | Mika | 108 | Portrait Drawing Demonstrations: Methods and Meanings | 200C | 2:30 pm |
| Teske | Rich | 59 | Can corn root respiration be stimulated by pre-treating corn roots in iron fertilizer? | Main Lounge | 1:00 pm |
| Thompson | Andy | 118 | The Conversion of MDH to LDH Through Site Directed Mutagenesis | Main Lounge | 2:30 pm |
| Thronson | Hillary | 120 | The role of NHE1 in Balb-c rat tumorgenesis | 227 | 3:10 pm |
| Trautwein | Jessica | 35 | Extensions of Synthetic Division | 203 | 3:10 pm |
| Tripathi | Virendra | 90 | Predictions in Daily Lives - Can They Be Justified? | 216 | 2:00 pm |
| Tweed | Jeremy | 127 | Sports Economics | 121 | 1:20 pm |
| Vave | Rebecca | 74 | The Rise of Korean Nationalism Leading Up to the Samil | Kise Line D | 3:30 pm |
| Veslede | Heide | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Villarreal | Angie | 78 | Language Disorders: The Elements and Instituting a Classroom Model. | 216 | 1:20 pm |
| Wananu | Moses | 56 | An Initial Biochemical Analysis of Autism | Main Lounge | 1:00 pm |
| Wasche | Rachel | 101 | The Car Problem; Whether to Buy or Lease. | Main Lounge | 2:30 pm |

*Numbers correspond with abstract listings beginning on page 28*

| Last Name | First Name | Presentation | Title | Room | Time |
|---|---|---|---|---|---|
| Weerasekara | Akila | 94 | How do MAPK/ERK Kinases Regulate Microtubule Spindle Formation? | Main Lounge | 2:30 pm |
| West | Megan | 31 | Greek Theatre | 200A | 3:40 pm |
| Westerfield | Eli | 16 | Being Genderqueer in a Binary Gender System: A Discussion About Gender | 205 | 1:45 pm |
| Wijesighe | Samadhi | 84 | Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism | 200D | 1:00 pm |
| Wilder | Gina | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |
| Wittmier | Megan | 49 | The Changing Face of St.Francis de Sales | Main Lounge | 1:00 pm |
| Zillgitt | Jessica | 36 | Shakespeare's Tragedies and Histories | 218 | 3:30 pm |
| Zillgitt | Jessica | 13 | Topics in the American Renaissance | Kise Line D | 1:00 pm |

*Numbers correspond with abstract listings beginning on page 28*

# Abstracts

## 1
**Title:** Some Multiplication Tricks
**Presenter(s):** Mark Dollerschell, Cory Reames
**Department:** Mathematics
**Advisor:** Geok Ng
**Abstract:** A presentation of how to perform some multiplication without the use of calculators. The techniques learned can be applied to everyday situations.

## 2
**Title:** Guided Notes in Mathematics Classes
**Presenter(s):** Chelsea Keller
**Department:** Mathematics
**Advisor:** Kristine Montis
**Abstract:** I will be displaying a poster on guided notes in mathematics classes, and I will also be telling about and displaying information on my experience as a co-presenter at the RCML (Research Council on Mathematics Learning) Conference in Oklahoma City. The presentation that Dr. Kristine Montis and I will be doing at the RCML Conference is on guided notes as a means of success at the secondary and college levels.

## 3
**Title:** Isabella and Bolinda Tuylendina
**Presenter(s):** Lindsey Johnson, Julie Stroh, Danielle Peterson
**Department:** Education
**Advisor:** Brian Smith
**Abstract:** We have applied our knowledge of the human condition to twin first grade girls, applying major psychologists and their theories to the girls' lives and actions.

## 4
**Title:** Multiplication Made Easy
**Presenter(s):** Julie Mies, Andrea Mumm
**Department:** Mathematics
**Advisor:** Geok Ng
**Abstract** Multiplication made easy by "tricks" or "shortcuts". Methods that are presented are functional and fast.

## 5
**Title:** Theatre of the Absurd
**Presenter(s):** Natalie Novacek, Christina Lein, Patrick McColley
**Department:** Theatre Arts
**Advisor:** Theresa Carson
**Abstract:** We will discuss the rise of absurdism and the important playwrights of the movement. We will also be performing 2 short scenes from absurdist plays.

## 6
**Title:** The Social Problem of Battered Women
**Presenter(s):** Kelly Nerby
**Department:** Sociology
**Advisor:** Sue Humphers-Ginther
**Abstract:** Woman battery is a social problem in our nation today although not many hear about it. It is a major cause of injury, disability, and death among American women, as among many world wide. In most cases today police officers refuse to arrest a man for beating his wife, and most courts refuse to prosecute them. Battery continues to exist because it reflects basic cultural and political forces in our society and around the world. What exactly are we teaching our kids who have to sit back and watch this violence in their own home? In the last decade we have made some advances in helping these women but there is still more that can be done. People need to know how they can help abused women to get out of the relationship safely, or if they themselves need help getting out.

## 7
**Title:** An Economic Study Of Household Income
**Presenter(s):** Chad Andel
**Department:** Economics
**Advisor:** Oscar Flores-Ibarra
**Abstract:** Using economic theory and regression analysis I will discuss how a college graduate's household income is expected to depend on chosen independent variables.

## 8
**Title:** The Parent-Child Communication Program: Case Study #7
**Presenter(s):** Kari Stinar, Kara Skjoiten
**Department:** SLHS
**Advisor:** Dr. Louis De Maio
**Abstract:** The study we conducted was one of twelve studies that analyzed the effect of the Parent-Child Communication Program on a mother with a child that has delayed language. Dr. Louis De Maio developed the Parent-Child Communication Program (PCCP) in 1998 to teach parents a method that will promote their child's communication and language. This study compared the mother's use of questions before and after the training program.

## 9

**Title:** Assessing the Function of PPDK in C3 Plants Using Arabidopsis thaliana TDNA Gene Knockouts
**Presenter(s):** Sara Larson, Jill Greenley
**Department:** Biology
**Advisor:** Chris Chastain
**Abstract:** Pyruvate, orthophosphate dikinase (PPDK) is an enzyme involved in the photosynthetic process of C4 plants. The function of PPDK in C3 plants has yet to be discovered. Here, we aim to determine whether PPDK plays a secondary role (not necessary for plant survival) or primary role (necessary for plant survival) in plant metabolism. Our hypothesis is if PPDK plays only a secondary role in plant metabolism, then Arabidopsis plants lacking PPDK may be able to survive and grow, although, illustrating an inferior phenotype with low vigor. We will test our hypothesis by obtaining plants that lack PPDK through using TDNA gene knockouts. Arabidopsis thaliana plants have been chosen for this study as they are an ideal C3 plant with available PPDK TDNA gene knockout lines. An ArabiPatch apparatus will be used to cultivate Arabidopsis plants. Leaf tissue will be extracted to determine if PPDK is present using Western blot analysis. Identified mutants will be cultivated in stressed environments. Failure to germinate will result in cultivation in nutrient-rich agar or the use of heterozygote plants.

## 10

**Title:** Parent-Child Communication Program: Case Study #10
**Presenter(s):** Cassandra Huber, Stephanie Rodke
**Department:** SLHS
**Advisor:** Louis De Maio
**Abstract:** The study we conducted was one of twelve that analyzed the effect of the Parent-Child Communication Program on a mother with a child that has delayed language. Dr. Louis De Maio developed the Parent-Child Communication Program (PCCP) in 1998 to teach parents a method that will promote their child's communication and language. This study compared the mother's use of questions before and after the training program.

## 11

**Title:** Intravenous Catheters Used in the Intensive Care Unit
**Presenter(s):** Jaynae Stanina
**Department:** Nursing
**Advisor:** Donna Heald
**Abstract:** I plan to research, plan, and present the different uses and styles of intravenous (IV) ports/catheters used on adults in the hospital setting on critical patients. The presentation will be posted on poster/bulletin board visual with detailed explanation of each port/catheter on pamphlets provided with the use of PowerPoint. As a nursing student obtaining my baccalaureate degree, I participated in a ninety-hour clinical preceptorship in an adult intensive care unit. During this time, I got to work first hand with patients who had a variety of IV catheters for various reasons. I would like the opportunity to be able to explain the different types of IV catheters and answer questions regarding the topic.

## 12

**Title:** Orchid Habitat in Northern Minnesota
**Presenter(s):** Tiffany Finke
**Department:** Anthropology/Earth Science
**Advisor:** Paul Sando
**Abstract:** My presentation will be based on information collected during a botany internship with the Minnesota DNR. The internship began in May 2003 and ended in August 2003. I used a Garmin GPS in the field and GIS Arcview software in the lab to create a GIS analysis of orchids found throughout northern Minnesota.

## 13

**Title:** Topics in the American Renaissance
**Presenter(s):** Amanda Easton, Brittany Daley, Amber Anderson, Devin Butler, Shelley Flake, Heide Veslede, Kierston Meier, Jennifer Hoepfner, Brianne Roberson, Jessica Zillgitt, Eric Gomez, Gina Wilder, Inga Haugen, Pamela Guiles, Kadie Kippen
**Department:** English
**Advisor:** Sheila Coghill
**Abstract:** This session will be a multiple-student presentation of a variety of topics students researched for their major course papers in English 322: (1)The American Renaissance. Topics include, but are not limited to: (1) The Ethos of Redemption Through Death: Paradigms and Parallels in Harriet Beecher Stowe's Uncle Tom's Cabin & Nathaniel Hawthorne's "Rappacini's Daughter" (2) "Like the Picture of Some Bright Angel Stopping to Reclaim a Sinner": Harriet Beecher Stowe's Use of Redemption to Reorganize Culture in Uncle Tom's Cabin (3) "Nevermore": Suffering in the Literature of Misery and the Creation of Literature of Isolation in Emily Dickinson's Poetry and Melville's Bartleby The Scrivener (4) Subverting Conventionality: Establishing Minority Identity in Frederick Douglass's The Meaning of the Fourth of July for the Negro and Harriet Beecher Stowe's Uncle Tom's Cabin (5) "Have You Ever Lost a Child?": The Power of Motherhood in Stowe's Uncle Tom's Cabin and Hawthorne's Scarlet Letter (6) Volcanoes, the Other and the Poetry of the Precipice: Emily Dickinson's and Walt Whitman's Poetry of Subversion (7)The Soul's Journey To Transformation By Way of Retreat: Emotion and Ratiocination in Susan Warner's Wide, Wide, World and Edgar Allen Poe's The Purloined Letter (8) "O, Had I the Wings of the Morning, I'd Fly Away to Cannan's Shore": Harriet Beecher Stowe's Subversion of the Sentimental Heroine Convention in Constructing Uncle Tom and Edgar Allen Poe's Characterization of Roderick Usher in The Fall of the House of Usher.

## 14

**Title:** Nonny's Flair: An Examination of a Children's Book Illustrator.
**Presenter(s):** Kinsey Church, Gretchen Jost, Andrea Boyer
**Department:** Elementary Education
**Advisor:** Carol Sibley
**Abstract:** Our slide show presentation examines the background of Nonny Hogrogian, a children's book illustrator. This includes an in-depth analysis of selected picture books, including those that have won the Caldecott Award.

## 15

**Title:** Providing Health Care in Nicaragua: Nursing Student's Experience"
**Presenter(s):** Tami Byklum, Kay Lof
**Department:** Nursing
**Advisor:** Jane Bergland
**Abstract:** Overview of health care in Nicaragua and our experiences as health care providers in this country.

## 16

**Title:** Being Genderqueer in a Binary Gender System: A Discussion About Gender
**Presenter(s):** Eli Westerfield
**Department:** Sociology
**Advisor:** Deb White
**Abstract:** In theory, transgender is a challenge to the social construction of gender. In practice, it usually is not. Transgendered people—in one way or another—place themselves outside the conventional female/male dichotomy. However, transgendered people live in a world that recognizes only female and male, a world where they have to be one or the other. People who live openly as transgendered still have gender attributions made about them by the casual passerby, even if they passerby has questions about the person's gender identity. This is because there is the belief that everyone can and must be classified as being either female or male. How can a self-identified transgendered/genderqueer person earn and maintain a transgender identity, when non-transgendered people feel the need to attribute a specific gender to that person?

## 17

**Title:** The Scots are Not English: Understanding Contemporary Scottish Identity
**Presenter(s):** Sarah Christianson
**Department:** History
**Advisor:** Margaret Sankey
**Abstract:** During a recent Independent Study in Scotland, I met many Scots that took offense at the slightest mention of anything related to England. I was determined to find out why. This presentation discusses some of the major historical events that helped to shape this aspect of contemporary Scottish identity.

## 18

**Title:** Student Voices Through Poetry, Music and the Visual Arts: Responses to an Alternative Education Service Learning Project
**Presenter(s):** Nicholle Breikjern, Adam Ahonen, Lang Charles, Block Erik
**Department:** Foundations of Ed
**Advisor:** Steve Grineski
**Abstract:** Students enrolled in Steve Grineski's Social Foundations of Education class complete a service learning project with students from the Red River Area Learning Center (RRALC). Over the course of the semester, these teacher education students participate in community-based recreational activities and provide academic tutoring with the RRALC students. As a culminating assignment, students prepare a project that responds to the alternative education experience and describe what they learned. Nicholle Breikjern will discuss an interview she conducted with a RRALC student and share a poster she created. Charles Lang will show a sculpture and talk about how it captures his ideas about alternative education, Erik Block will perform an original musical composition that reveals his thinking about the difficulties many alternative education students face and Adam Ahonen will share a piece of art and accompanying poem that highlights the importance of high teacher expectations for alternative education students.

## 19

**Title:** Loving the Tummy
**Presenter(s):** Ava-Gaye Simms
**Department:** MSUM Peer Health Educators
**Advisor:** Lynn Peterson
**Abstract:** This presentation aims to educate and to teach students that "Loving the Tummy" is an essential part of a healthy lifestyle. Students will learn that nutritional information is readily available and they will be enlightened on how to use these resources. In addition, students will be encouraged to think about what they eat through interactive games that place participants in realistic settings and require group participation. Students will see that eating healthy can be delicious and fun.

## 21

**Title:** Mary Crowdog/"Lakota Woman"
**Presenter(s):** Chrissie Holzer
**Department:** Center for Multidisciplinary Studies
**Advisor:** Yayha Frederickson
**Abstract:** The study of Multi-Cultural American Literature, with a poster presentation on Mary Crowdog and her published works "Lakota woman". Integrating traditional Native American art with passages from her book and information about her origins, it brings to life her struggles and accomplishments being a female American Indian in the United States.

## 22

**Title:** Solutions to Meinong's Theory of Objects
**Presenter(s):** Peter Montecuollo
**Department:** Philosophy
**Advisor:** Phil Mouch
**Abstract:** Alexius Meinong attempts to solve one of the major problems in the philosophy of language: the problem of negative existentials. This problem arises when we attempt to make meaningful statements about things which do not exist. For instance, the statement "Pegasus has wings" is a claim that there exists a thing such that it is Pegasus and it has wings. But since there is no such thing that exists and is Pegasus, and there has never been a thing such that it existed and was Pegasus, then how is it possible to mean anything by the statement? Meinong, however, attempts to solve this problem by positing different levels of existence. This theory has some very good insights into the problem of negative existentials, but he also runs into some serious problems. This presentation is an attempt to explicate how these existence levels work and to reconcile the problems Meinong faces in his theory. The goal is to demonstrate that Meinong's theory could work, thus allowing us to make meaningful statements about negative existentials.

## 23

**Title:** The Parent-Child Communication Program: Case Study #9
**Presenter(s):** Michelle Guthmiller, Leah Anderson
**Department:** Speech/Language/Hearing Sciences
**Advisor:** Louis De Maio
**Abstract:** Our study was one of twelve that analyzed the effect of the Parent-Child Communication Program on a mother with a child that has delayed language. Dr. Louis De Maio developed the Parent-Child Communication Program (PCCP) in 1998 to teach parents a method that will promote their child's communication and language. This study compared the mother's use of questions before and after the training program.

## 24

**Title:** Are you interested in becoming a Certified Nursing Assistant?
**Presenter(s):** Cindi Koch
**Department:** Nursing
**Advisor:** Donna Heald
**Abstract:** Offering a job opportunity that may promote a further interest in a nursing career. A 75 hour class could give good wages - to help pay tuition and possibly advance person into a health care field. CNA's are a vital part of Long Term Care and would benefit the community!

## 25

**Title:** Cell Cycle Genes and Their Effects on Mitochondrial Inheritance and Dynamics
**Presenter(s):** Tammy Lien, Autumn Dinnel
**Department:** Biology
**Advisor:** Ellen Brisch
**Abstract:** Mitochondria are responsible for cellular respiration. As they are essential for life, it is critical that they are transported from mother to daughter cell during division. Previous research has shown that mitochondria are transported along the cytoskeleton; they move, fuse, and separate while anchored to the cytoskeleton (Boldogh, 2001). Thus, the cytoskeleton plays an important role in the morphology and distribution of mitochondria throughout the cell cycle. Under normal conditions mitochondria appear as reticular tube-like structures located at the cortex of the cell. Under abnormal conditions, morphology takes on different forms, and mitochondria can begin to aggregate, or clump abnormally (McCoy, Johnson, Risan, 2003). These mutations are usually associated with some loss of function. The work we propose is based on previous research where proteins closely associated to the mitochondria were mutated (membrane associated proteins involved with fusion and fission of membranes) and morphological as well as distribution changes were observed (Brisch, 2001). However the changes were never associated with specific phases of the cell cycle. We plan to mutate three cell cycle genes, cdc28, swe1, and bub1. We will use a TS Degron/ PCR approach to generate temperature-sensitive cell cycle specific mutants. After successful transformation, we will examine mitochondrial morphology and distribution regarding our mutations via microscopy and fluorescent staining.

## 26

**Title:** Parent-Child Communication Program (PCCP) - Case Study #4
**Presenter(s):** Heidi Mork, Amanda Hoff
**Department:** Speech-Language Hearing Science (SLHS)
**Advisor:** Louis J. DeMaio, Ph.D.
**Abstract:** For our research project we are studying whether a mother's use of facilitative techniques increases after Parent-Child Communication Program (PCCP) training . Specifically, we are evaluating and comparing a mother's use of facilitative techniques in conversation with her preschool child before formal training with PCCP and after formal training with PCCP. Our ultimate goal is to determine if the mother's use of facilitative techniques has increased. Facilitative techniques include input, feedback, and revision components. These techniques improve a child's language when used by a mother during conversation. We hypothesize that the mother's use of facilitative techniques will increase after formal PCCP training.

## 27

**Title:** Ethics: An Imperative Part of Any Business
**Presenter(s):** Ryan Larson
**Department:** Accounting
**Advisor:** James Hansen
Abstract:We will look at how to be an ethical person. Also, we will explore why companies are getting in trouble. Why is this a problem now and what can our country do about it? Finally, we will analyze some of the steps and procedures that have already been taken in solving this ethical crisis in our country.

## 28
**Title:** Alike, but not the same: A lesson on human genetic variation.
**Presenter(s):** Nathan Huseby, Tom Larson
**Department:** Biology
**Advisor:** Alison Wallace
**Abstract:** A class wide inventory of human traits to compare and contrast the similarities and differences of these traits.

## 29
**Title:** A Lesson in Genetic Probability
**Presenter(s):** Kate Pfeifer, Tessa Jetvig
**Department:** Biology
**Advisor:** Alison Wallace
**Abstract:** Participants will explore the relationship of genotype and phenotype, and the role of probability in genetics through an activity.

## 30
**Title:** Commedia Dell'arte
**Presenter(s):** Greta Frank, Steven Fick, Nick Foss
**Department:** Communication Speech, Film, and Theatre Arts
**Advisor:** Theresa Carson
**Abstract:** A short presentation of the history of Commedia Dell'arte, and then an acting presentation of this style of Theatre.

## 31
**Title:** Greek Theatre
**Presenter(s):** Megan West, Ben Matteson
**Department:** Communication Speech, Film and Theatre Arts
**Advisor:** Megan West
**Abstract:** An introduction to Greek Theatre and a performance in the portrayal of this type of acting style.

## 32
**Title:** Comparison of teacher certification procedures in U.S.A. and Russia
**Presenter(s):** Irina Gubareva
**Department:** Education
**Advisor:** Dean Mollerud
**Abstract:** In my presentation I'm going to compare the procedures of teacher certification in Russia and the USA and point out the priorities in the area of teacher preparation in both countries.

## 33
**Title:** Aseptic Technique
**Presenter(s):**
**Department:** Nursing
**Advisor:** Donna Heald
**Abstract:** Poster presentation describing the history, importance, and examples of aseptic technique.

## 34
**Title:** Keith Haring: Success and Controversy in Mass Exposure
**Presenter(s):** Jessica Keisacker
**Department:** Art
**Advisor:** Anna Arnar
**Abstract:** Keith Haring is, arguably, one of the most widely-distributed artists in the contemporary Art world. He was able to connect people with his works and messages in all demographic sectors. His activist art not only informed but created interest among the masses about issues surrounding intolerance, drug-addiction and AIDS. Keith Haring's views on mass production/ distribution were controversial and revolutionary in the 1980's. I plan to discuss the formal qualities of his art, how his technique created a universal race and message and how the Pop Shop and other distribution plans created part the Keith Haring's legacy and controversy in the High Art arena.

## 35
**Title:** Extensions of Synthetic Division
**Presenter(s):** Jessica Trautwein
**Department:** Mathematics
**Advisor:** Derald Rothmann
**Abstract:** Most students usually encounter the basic synthetic division techniques in beginning algebra classes. There they use it to divide a polynomial Pn(x) by a factor of the form x-a, obtaining a quotient Qn-1(x), remainder r, and byproduct Pn(a). In this presentation I will show how repeated synthetic division can be used to evaluate derivatives of Pn(x) at x=a. Some possible applications of these extensions will also be discussed.

## 36

**Title:** Shakespeare's Tragedies and Histories
**Presenter(s):** Jessica Zillgitt, Inga Haugen, Eric Gomez
**Department:** English
**Advisor:** Sandy Pearce
**Abstract:** Shakespeare's Tragedies and Histories A brief sketch of the papers we will be presenting:(A History) A Tragedy of Errors: The Misconception of Richard the Second as a Tragic Hero The most humorous element about the King Richard the Second lies in the dichotomy of his mouth and brain. In most instances the organ of the brain and mechanics of the mouth work in conjunction and compliment the other. Yet, poor Richard surrounds himself with sycophants and toadies all the while spouting the most beautiful metered poetry. Stupidity does not equate to tragedy. Though The Necessary Shakespeare by David Bevington titles Shakespeare's play The Tragedy of Richard the Second, the character of Richard the Second clearly does not conform to the criterion of a tragic hero according to the Aristotelian model. Using four common criterions from Aristotle's Poetics, and evaluating Richard the Second's characteristics will show the error in this play's classification. (The Tragedy) The Cost of Linen in Othello Size really does matter. The smaller the piece, the more significant it is. In Othello, larger textiles, such as standards and sheets, are actually less important than a single handkerchief. The significance of textiles in the play occurs in an inverse proportion to their size and normal importance. A single handkerchief costs the lives of Cassio, Roderigo, Desdemona and Othello, whereas reputations buy wedding sheets and standards. This paper examines fabric references within Othello, specifically standards, sheets, and small pieces of apparel. (The other History) Shakespeare's Use of Traitors to Demonstrate Leadership of Kings in His Histories The kings in Shakespeare's second series of plays dedicated to the history of England present a large variety of personality traits and leadership methods. Evaluating the manner in which each king approaches subjects who conspire to disobey or destroy his reign reflects many of the differences in the leadership of the kings. These differences impact how audiences view each king's competence as a ruler. A comparison of the three kings' approaches to traitors illustrates the superiority of King Henry V's leadership qualities over those of King Henry IV and King Richard II.

## 37

**Title:** Mental Illness and Inmates
**Presenter(s):** Ashley Collins, Ashley Hartung
**Department:** Sociology
**Advisor:** Susan Humphers-Ginther
**Abstract:** People with mental illnesses are treated as maybe victims of a sickness in the mind. They are many times given as much help and love as others can provide. Although there are many inmates who are living with a mental illness. These people are treated as being the horrible criminals that prey on the victims. They are not treated as the victims as others with mental illnesses are. In many of these cases these inmates are affected by a mental illness that take over some of their criminal actions. Should these inmates be in prisons as criminals or psychiatric hospitals as victims?

## 38

**Title:** Commercial Banking: Nationally and Locally
**Presenter(s):** Darren Glur
**Department:** Economics (senior seminar, 498)
**Advisor:** Oscar Flores
**Abstract:** This presentation will focus on national and local banks. It will demonstrate certain strategies involved in order to maintain business and increase profits. The local market will also be compared to the national market to determine if the local Fargo-Moorhead banks are following the same trends that the national banking industry is following.

## 39

**Title:** Is Casino Gambling Profitable to the State?
**Presenter(s):** Dustin Jeske
**Department:** Economics
**Advisor:** Oscar Flores
**Abstract:** This presentation will attempt to explain if the state profits from the operation of Native American Casinos. (Using regression analysis)

## 40

**Title:** The Influence of Self-Generated Hand Gestures on Recall
**Presenter(s):** Sarah Grabowska
**Department:** Psychology
**Advisor:** Magdalene Chalikia
**Abstract:** The combination of hand gestures and speech is a possible means to facilitating communication and learning, which has been supported by research. Very few studies have measured the effects of self-generated hand gestures on cognitive functions. My research analyzes the influence of self-generated hand gestures on word recall.

## 41

**Title:** Small Group Decision Making
**Presenter(s):** Angela Baukol
**Department:** Speech Communication
**Advisor:** Tim Borchers
**Abstract:** I will be presenting a research paper discussing the problem solving and decision making processes within a small group. The presentation will discuss how effective these processes are when used by a small group in the workplace.

## 42

**Title:** Portfolio Assessment of Young Children
**Presenter(s):** Shelly Kubista, Courtney Gaa, Erin Muff, Melissa Hannig, Katie Quade
**Department:** Elementary and Early Childhood Education
**Advisor:** Karen Danbom
**Abstract:** Our session will look at the benefits of ongoing, observational assessments of young children. We have created portfolios using multiple methods of assessment. We observed a Hispanic, bilingual child and a child with Down syndrome. Early childhood characteristics provide evidence that this method is more reliable than standardized testing of young children. Portfolio assessments initiate excellent conversations with parents, as opposed to reading scores from standardized testing results.

## 43

**Title:** The Parent-Child Communication Program: Case Study #5
**Presenter(s):** Sarah Jacobs, Jen Mau
**Department:** SLHS
**Advisor:** Louis DeMaio
**Abstract:** The study we conducted was one of twelve that analyzed the effect of the Parent-Child Communication Program on a mother with a child that has delayed language. Dr. Louis De Maio developed the Parent-Child Communication Program (PCCP) in 1998 to teach parents a method that will promote their child's communication and language. This study compared the mother's use of questions before and after the training program.

## 44

**Title:** Chemical Characterization of Ostariophysan Alarm Substance
**Presenter(s):** Bethany Ehlers
**Department:** Biology
**Advisor:** Brian Wisenden
**Abstract:** The Ostariophysi is a group of freshwater fishes that include the minnows, tetras, catfishes and suckers. Collectively, they comprise about 64% of all freshwater fish species in the world. One feature that all of these fish have in common is the presence of specialized cells in their skin that contain an alarm substance. When the fish is attacked by a predator, these cells are ruptured and the substance is released. Nearby fishes smell the chemical and adopt antipredator behaviors that reduce their probability of being captured by the predator. The chemical nature of alarm substance is not well understood. Some evidence points toward a small molecule, other evidence suggests that it is a large molecule such as a protein. In this study, we used dialysis tubing to separate skin extract of zebra danios into large and small molecules and tested if each fraction retained the ability to invoke a fright behavior in zebra danios. Understanding the chemical nature of this signaling system will contribute to greater understanding of the ecology of this dominant group of fishes.

## 45

**Title:** Children's Literature - A cooperative study
**Presenter(s):** John Myers
**Department:** Elementary and Early Childhood Education
**Advisor:** Barb Worman
**Abstract:** The presentation will discuss a project I was involved in concerning children's literature. Literature has a drastic effect on children's lives and it is something that is a necessity in order to grow and mature. Cooperative learning involves both give and take in children's lives.

## 46

**Title:** Investigation of a Novel Method to Purify Plasmid DNA
**Presenter(s):** Amanda Anania
**Department:** Biology
**Advisor:** Dr. Mark Wallert & Dr.Joseph J. Provost
**Abstract:** Plasmid DNA is a small DNA containing self-reproducing element that exists outside the chromosome, such as in particular types of bacteria. They have the potential to alter a hereditary characteristic when introduced into another bacterium. Plasmid DNA is used in many biotechnology applications. Thus, there is a high demand for pure and inexpensive DNA that is easy to produce. The current state of purification of plasmid DNA takes around 8 hours to complete and is expensive because most commercially available kits are not reusable. We are working with a new material that can decrease the time involved with plasmid purification, cut the costs, and is reusable. Endotoxin is a bacterial protein that commonly co-purifies with DNA and is a potential problem for using the DNA with mammalian cells and for gene therapy. This new kit will decrease the amount of endotoxin without using detergents or other potentially dangerous compounds used in many kits. By using this new material, we hope to achieve comparable yields and purity obtained by the popular conventional methods/kits. Ultimately, the process can be beneficial in the aid of production of such important substances such as insulin or other biotechnology produced proteins.

## 47

**Title:** The Influence of Prayer and Religious Beliefs on Measures of Life Satisfaction
**Presenter(s):** Lindsay Ranstrom
**Department:** Sociology
**Advisor:** Sue Humphers-Ginther
**Abstract:** Although the topic seems to be a bit taboo in our present society, there seems to be a documented relationship between religious practices, membership in a church family, and a personally fulfilling religious experience with life satisfaction and health of people even today. Moreover, prayer as a part of this experience serves an important function in the lives of many. In particular, it influences satisfaction and health of these individuals in many different and personal ways. As Ted Mitchell (2000) asserts, research has pointed out that when individuals are recovering from surgery or other health related problems, those who did not draw comfort and strength from religious practices (perhaps prayer and interactions with other believers) were seven times more likely to die within six months of the surgery. It is by these types of empirical findings that suggest that faith and religion play a larger part in human life than is often thought. In my examination of these relationships, I plan to use the GSS (General Social Survey) as my source of data collection. My research will focus on the correlation between prayer and life satisfaction, as this may have implications into bettering the lives of many people around the world. I will incorporate the findings of the survey with present research in this field to make up the base of my examination and following paper and poster presentation. After analyzing and interpreting the data found here and the literature, I hope to be able to understand the relationship and influence prayer has on the greater forces of well being in our society and also why some people are dedicated to these practices while others refuse to engage themselves or simply remain indifferent to the topic and its' potential influence on their life.

## 48

**Title:** The Parent-Child Communication Program, Case Study #8
**Presenter(s):** Geniece Kizima, Sarah Palmer
**Department:** Speech/Language/Hearing Sciences
**Advisor:** Louis De Maio
**Abstract:** The purpose of the study was to evaluate the effectiveness of the Parent-Child Communication Program (PCCP) in training parents as language facilitators. The program was developed by Dr. Louis J. De Maio in 1998 and is currently used at Minnesota State University Moorhead's Speech, Language and Hearing Clinic. The study evaluated the effectiveness of the therapy in reducing the frequency of questions asked by the parent during interaction with their child. Results show the program helped the parent reduce the number of questions asked during communication with the child, resulting in the parent being a responder rather than conversation initiator - thus promoting language development in the child.

## 49

**Title:** The Changing Face of St.Francis de Sales
**Presenter(s):** Megan Wittmier
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** We will be presenting the history of the many changes that have occurred over many years in the Catholic church of St. Francis de Sales

## 50

**Title:** Phospholipase D Regulates Stress Fiber Formation By Phenylephrine Stimulation in CCL39 cells
**Presenter(s):** Kit Mitchell, Jessica Johnson, Rachel Sang
**Department:** Biology
**Advisor:** Joseph Provost/Mark Wallert
**Abstract:** Stress fiber formation is an important event in regulating the cell growth and migration of cells. G protein-coupled receptors induce stress fiber formation through a variety of mechanisms. Several studies implicate Gq in the activation of stress fibers however the mechanism is unknown. In endothelial cells, migration requires both ERK and phospholipase D (PLD) activity. We report here that the addition of the specific a1-adrenergic agonist, phenylephrine (PE) to CCL39 fibroblasts induced stress fiber formation similar to that found with cells treated with lysphosphatidic acid (LPA). PE induced stress fibers were significantly inhibited in cells treated with the MEK inhibitor PD98059, or primary alcohols. To investigate the signaling pathway mediating the adrenergic receptor, we examined the ability of PE to activate a number of potential signaling intermediates. Addition of PE induced a three-fold increase in PLD activity and a large increase in ERK phosphorylation. Moreover, PE activation of ERK was blocked by the addition of 1-butanol but not 2-butanol. Finally, activation of ERK by PE was attenuated when cells expressed a dominant negative RhoA. These data suggest that PE-stimulated stress fiber formation is mediated by ERK activation and that this pathway is likely activated by action of PLD. Additional evidence for the role of alpha 1-adrenergic receptors in regulating cell growth is shown by assaying wound healing rates in the presence or absence of 1- and 2- butanol. Specifically, evidence has shown that PE stimulation affects the rates of wound healing in scratch assays. Taken together, these results indicate a novel role for PLD in activation of the ERK growth pathway to stimulate early cellular events induced by PE. This work was supported by a MSU Moorhead Faculty Grant, NSF - DUE 0088654 and MRI - DBI 0110537

## 51

**Title:** How Do First-Syllable Characteristics Affect Visual Word Recognition of Long Words?
**Presenter(s):** Emily Hugh
**Department:** Psychology
**Advisor:** Christine Malone
**Abstract:** This study was conducted to see if neighborhood size affected the reaction time of word recognition. Neighborhood similarity is defined as the number of other words that have all but one letter in common with the original word. We hypothesize that larger neighborhoods will facilitate faster word recognition. Words will be presented on a computer screen. Participants will have to identify the word as quickly as possible. Reaction time and accuracy will be analyzed.

## 52

**Title:** Phospholipase D Regulates Stress Fiber Formations By Phenylephrine Stimulation in CCL39 cells
**Presenter(s):** Jessica Johnson, Rachel Sang
**Department:** Biology
**Advisor:** Mark Wallert/Joseph Provost
**Abstract:** Stress fiber formation is an important event in regulating the cell growth and migration of cells. G protein-coupled receptors induce stress fiber formation through a variety of mechanisms. Several studies implicate Gq in the activation of stress fibers however the mechanism is unknown. In endothelial cells, migration requires both ERK and phospholipase D (PLD) activity. We report here that the addition of the specific a1-adrenergic agonist, phenylephrine (PE) to CCL39 fibroblasts induced stress fiber formation similar to that found with cells treated with lysphosphatidic acid (LPA). PE induced stress fibers were significantly inhibited in cells treated with the MEK inhibitor PD98059, or primary alcohols. To investigate the signaling pathway mediating the adrenergic receptor, we examined the ability of PE to activate a number of potential signaling intermediates. Addition of PE induced a three-fold increase in PLD activity and a large increase in ERK phosphorylation. Moreover, PE activation of ERK was blocked by the addition of 1-butanol but not 2-butanol. Finally, activation of ERK by PE was attenuated when cells expressed a dominant negative RhoA. These data suggest that PE-stimulated stress fiber formation is mediated by ERK activation and that this pathway is likely activated by action of PLD. Additional evidence for the role of alpha 1-adrenergic receptors in regulating cell growth is shown by assaying wound healing rates in the presence or absence of 1- and 2- butanol. Specifically, evidence has shown that PE stimulation affects the rates of wound healing in scratch assays. Taken together, these results indicate a novel role for PLD in activation of the ERK growth pathway to stimulate early cellular events induced by PE. This work was supported by a MSU Moorhead Faculty Grant, NSF - DUE 0088654 and MRI - DBI 0110537

## 53

**Title:** Breathing, How it Works!
**Presenter(s):** Candace Lembke
**Department:** Biology
**Advisor:** Alison Wallace
**Abstract:** Differences between negative pressure and positive pressure breathing. Mechanisms of getting oxygen into the lungs and than into the blood system.

## 54

**Title:** Is Mitochondrial Inheritance Tissue Specific? A New Look at the mtDNA Dogma from a Cell Biology Perspective.
**Presenter(s):** Streitz Lisa
**Department:** Biology
**Advisor:** Ellen Brisch
**Abstract:** Mitochondria play critical roles in the generation of metabolic energy (ATP) in eukaryotic cells. ATP is essential in driving many of the reactions that take place in the body. The role of a mitochondrion is to maximize and control the production of ATP. Furthermore, these cytoplasmic organelles make their own circular DNA, which is referred to as mitochondrial DNA (mtDNA). It is important to note that there is a distinction between nuclear DNA and mtDNA. While nuclear DNA encodes most of the proteins that drive mitochondrial processes, some critical ATP-producing enzymes are encoded in the mitochondrial genome. Mitochondria are extremely important to study because almost any mutation in mtDNA leaves an organism somewhat debilitated, by causing mitochondrial myopathy. Mitochondria have been thought to be maternally inherited for over twenty years. Results from previous experiments show that a child's mtDNA will be identical to that of the mother. Does this mean that there is no paternally inherited DNA? Perhaps not, however researchers have mainly focused on testing mtDNA in blood samples. To examine if inheritance patterns differ between tissues, Heidi Jo Johnson, Austin McCoy and Jen Risan began planning an experimental approach and protocol development to test our hypothesis. Our hypothesis is that blood and muscle tissue will inherit mitochondria from different parents. The approach I am using to test my hypothesis is to sequence the mtDNA taken from two different strains of mice. Next, I plan to cross the parent mice and sequence the mtDNA of their offspring. I will be sequencing mtDNA from the blood as well as from the muscle tissue to see if mtDNA inheritance is, indeed, tissue-specific. Currently, I have completed mitochondrial isolation from different tissues and mtDNA extraction. Verifying the specificity of mitochondria is an important step for figuring out what cellular mechanisms are required to direct the mitochondria into different tissues. This may open a whole new way of looking at mitochondrial inheritance and ultimately show us how this system is regulated.

## 55

**Title:** A Glimpse Into the World of a Systems Analyst
**Presenter(s):** William Gabel, Jr., Alycia Plattner
**Department:** CSIS
**Advisor:** Daniel Brekke
**Abstract:** This presentation will demonstrate the skills that we learned in the Systems Analysis and Database Design courses that are offered in the Computer Science and Information Systems Department. Our focus will be on the data modeling aspect of the System Development Life Cycle.

## 56

**Title:** An Initial Biochemical Analysis of Autism
**Presenter(s):** Jill Skolte, Moses Wananu
**Department:** Biology
**Advisor:** Joseph Provost
**Abstract:** Autism is a pervasive developmental disorder with a collection of behavioral symptoms including dysfunction in social interaction and communication in affected children. Autism is associated with sensory disturbances, obsessive-compulsive-like behavior, lack of bonding to caregivers and motor disturbances. We have obtained lymphocyte cells from children with and without autism and are going to test them for several proteins which may be altered in children with autism. While there is little understanding of the biochemical basis for the cause of autism, one phenomenon of this disorder is the formation and development of neural synapses. A significant percentage of people with autism display chromosomal alterations in chromosomes 9 or 15. The genes associated with these abnormalities code for two proteins called hamartin and tubarin. These proteins are very closely related and when functioning normally, regulate the small G-protein RhoA. RhoA is an important signaling molecule which regulates cytoskeletal structure, important for cell growth and development. RhoA also activates the sodium-hydrogen exchanger (NHE), and NHE may act as an anchor for cytoskeletal proteins. Thus alteration in either RhoA or NHE would significantly impact the development of neural cells as they mature. We intend to test for RhoA activation levels in our cells and for NHE activity. With this research we hope to gain an understanding of one potential cause of autism.

## 57

**Title:** The Correlation of the Proportion of Errors between Staggered Spondaic Word and SCAN-C tests
**Presenter(s):** Marin Almer, Rose Cotton
**Department:** SLHS
**Advisor:** Louis De Maio
**Abstract:** This presentation studies the relationship between two auditory processing disorder tests. A random assessment of twelve children from the Minnesota State University Moorhead-Auditory Processing Disorders clinic was done in which we compared the results of the SSW and SCAN tests to see if they could be used interchangeably in screening and diagnosing Auditory Processing Disorder.

## 58

**Title:** Effect of Environmental Stresses on Corn Root Respiration
**Presenter(s):** Julie Knutson, Jodi Hendrickson, Carrie Leopold
**Department:** Biology
**Advisor:** Dr. Chris Chastain
**Abstract:** Plant roots are subject to a wide array of environmental stresses such as drought, salinity, flooding, and extremes of temperature. In this study, we sought to determine which of the above environmental stresses are the most acute and which are the most benign. We selected root tissue respiration rate as a comparative measure of how stress can effect the health and function of the root as a whole, since respiration is a processes directly tied to the central process of energy (ATP) production in the corn root cells. Presented will be comparative measurements of root respiration rates on root tissue obtained from 3 day old corn root seedlings that have been subjected to simulated drought, salinity, flooding, and high/low temperature stress.

## 59

**Title:** Can corn root respiration be stimulated by pre-treating corn roots in iron fertilizer?
**Presenter(s):** Tom Larson, Rich Teske
**Department:** Biology
**Advisor:** Chris Chastain
**Abstract:** Respiration in corn roots is due to the uptake of O2 by cellular mitochondria. This in turn leads to synthesis of ATP by the mitochondria that is required for the physiological functions of the root. This study was conducted to see if supplementing corn roots with large doses of iron fertilizer can stimulate the rate of respiration via increasing the iron containing enzymes of the mitochondria. Respiration measurements will be performed on root tissue obtained from 3-day old germinated corn seedlings using an oxygen electrode. Data from these measurements, along with other indirect biochemical measurements of root mitochondrial function, will be presented.

## 60

**Title:** Do Elevated Levels of Potassium Ion in the External Medium of Corn Roots Stimulate Respiration and Therefore ATP Synthesis?
**Presenter(s):** Justin Noehre, Michael Fohl, Jesse Cox
**Department:** Biology
**Advisor:** Chris Chastain
**Abstract:** Potassium (K+) is a major plant mineral nutrient that plants extract from the soil using an ATP-dependent cell membrane-mediated process. We sought to test the concept that as roots are exposed to higher amounts of K+ in the soil, they also should need to produce increased amounts of ATP. This in turn should necessitate a higher respiration activity in order for the mitochondria to meet the demand for more ATP synthesis. In order to investigate this proposed link between high K+ and respiration, we utilized root tissue from three day old corn seedlings germinated and grown in the presence of high or low amounts of KCl. Respiration rates were measured using an O2 electrode. Other assessments of the putative effects of high levels of K+ on corn root respiration will include the use of respiratory inhibitors and enzyme analysis.

## 61

**Title:** Short-Term Effects of Removing Energy (sucrose) Supply to Growing Corn Roots.
**Presenter(s):** Tessa Jetvig, Kate Pfeifer
**Department:** Biology
**Advisor:** Chris Chastain
**Abstract:** Roots must obtain their food (sucrose) from the photosynthetic portions of the plant leaves via the phloem. In certain cases, such as short term water stress or phloem disease, roots can be cut off from this energy source and essentially have to scale back on energy requiring physiological functions such as extraction of mineral nutrients from the soil. In order to investigate the rapidity on how terminating energy (sucrose) supply to growing root can effect production of cellular energy in the root, we measured respiration rates in 3 day old corn seedling roots that had been excised from the kernel they grow from and receive sucrose from until the leaf emerges. The data gained from this study will be used to predict the interdependence of sucrose supply to the root and the ability of the root to produce its own cellular energy (ATP) for fueling energetic physiological processes such as extraction of minerals from the soil.

## 62

**Title:** Effect of Aluminum Ion on Corn Root Respiration
**Presenter(s):** Jon Frykman, Amanda Hanson
**Department:** Biology
**Advisor:** Chris Chastain
**Abstract:** Various metal ions found in soils are actually toxic to plant growth. One such metal ion is aluminum, which has a striking inhibitory effect on growth of roots. In this study, we examined the relationship between root cell respiration and aluminum toxicity in corn roots. As the central energy producing process in the cell, we expect (mitochondrial) respiration to be a site of aluminum poisoning that may explain inhibition of root growth. Data will be presented showing respiration rates of growing corn roots treated with aluminum ions (Al 3+) compared to untreated controls.

## 63

**Title:** Survey of Wild Turkey (Meleagris gallopavo) Distribution in Cass and Clay Counties
**Presenter(s):** Natasha Gruber, Katie Geray, Tracy Mastel
**Department:** Biology
**Advisor:** Dr.Donna Bruns-Stockrahm
**Abstract:** The Minnesota Department of Natural Resources (DNR) is currently working on a wild turkey (Meleagris gallopavo) reintroduction program in northwestern Minnesota. To determine the current populations of wild turkeys in Cass County, North Dakota, and Clay County, Minnesota, we distributed surveys along the Red River in the Georgetown, Kragnes, Oakport, Kurtz, and Holy Cross Townships of Clay County, and along the Sheyenne River in the Harwood and Reed Townships of Cass County. Information about the survey was also placed in the Barnesville Recorder and in The Fargo Forum, and those interested contacted us. Surveys were also filled out at the annual meeting of the local chapter of the National Wild Turkey Federation. We received a total of 64 usable surveys and 11 usable emails. A total of 537 birds were reported sighted, with 59 identified as toms (male) and 94 identified as hens (female). However, because we have no way of knowing if some of the turkeys were sighted more than once, the actual number reported is probably inflated. Through this survey, we have discovered a thriving population of wild turkeys in Cass and Clay Counties, and a hunting season may be opened in the area. In the future, we plan to continue surveying residents as well as using GIS techniques to predict if human interactions with wild turkeys are increasing.

## 64

**Title:** The Relationship of Root Cell Membranes "Leakiness" on Root Tissue Respiration Rate
**Presenter(s):** Thomas Colquhoun
**Department:** Biology
**Advisor:** Chris Chastain
**Abstract:** The relationship of root cell membranes "leakiness" on root tissue respiration rate Plant roots are subject to many agents in the soil that can cause transient holes or leaks in the outer cell membranes. Such agents include pathogenic fungi and extremes of cold and heat. In response, the plant must respond by repairing damaged membranes. We propose this repair response must be accompanied by an increase in energy (ATP) production by the root cell mitochondria. To test this hypothesis, we examined how respiration rate in corn roots responded to certain detergents that effectively "punch holes" in the membrane. These results will be displayed along with other enzyme based data that will illustrate how the central cell process of respiration is involved in maintaining cell membrane integrity.

## 65

**Title:** A Look at the Changing Music Industry from an Economic Perspective
**Presenter(s):** Chris Liberda
**Department:** Economics
**Advisor:** Oscar Flores
**Abstract:** The introduction of digital music and peer-to-peer file sharing has had an enormous impact on the music industry. In this presentation I will look at how changes in technology have changed the form of good that music has taken. I will incorporate economic tools and analysis to quantify the effects that certain technological changes have had on music and the implications that arise.

## 66

**Title:** Cohabitation and Divorce
**Presenter(s):** Jessica Roshau
**Department:** Sociology
**Advisor:** Dr. Sue Humphers-Ginther
**Abstract:** To examine the relationship between cohabitation and divorce. Focusing on various living arrangements and how they effect relationships later in life. While looking at the current divorce rate in relation to the struggles of today's family.

## 67

**Title:** The Role of PKC in RhoA Activation and Stress Fiber Formation
**Presenter(s):** Alison Metcalf, Tabitha Burnside, Matthew Duval
**Department:** Biology
**Advisor:** Joseph Provost
**Abstract:** Stress fiber formation in Chinese hamster lung fibroblasts (CCL39) requires activation of both RhoA and the sodium-hydrogen exchanger (NHE). We have recently demonstrated that Extracellular-Signal Regulated Kinase (ERK) and NHE are activated in response to the a1-adrenergic agonist phenylephrine (PE). Our initial data also indicates that PE stimulates the translocation of RhoA to the plasma membrane, while traditional a1-adrenergic stimulation acts through Protein Kinase C (PKC). In this study we plan to investigate the role of PKC in RhoA and stress fiber activation. We will test the effects of three PKC inhibitors: bisindolylmaleimidine I (BIM), Go6976, and Ro-31-8220. BIM is a derivative of the general PKC inhibitor straurosporine that acts as a competitive inhibitor for the ATP-binding site of PKC. It is highly specific for PKCa, bI, bII, g, d, and e isozymes. Go6976 is an indolocarbazole that specifically inhibits PKCa by blocking Ca2+ binding. Finally, Ro-31-8220 is a staurosporine analogue that inhibits active membrane-bound PKC 12.5 times better than cytosolic PKC. In all of our experiments, Phorbol-12-myristate-13-acetate (PMA) is our positive control. PMA directly activates PKC by mimicking diacylglycerol thereby bypassing a PE requirement. To measure the ability of PE to activate RhoA, EGFP-tagged RhoA is used to observe translocation. Unstimulated control cells display RhoA dispersed throughout the cytoplasm, while PMA stimulated cells show RhoA predominantly associated with the plasma membrane. To measure the role of PKC in RhoA stimulation, PE treatment will be done in the presence and the absence of PKC inhibitors. Once RhoA translocation is characterized, we will then investigate the role of PKC in stress fiber formation. We propose that PKC is required for the activation of RhoA and ultimately the formation of stress fibers.

## 68

**Title:** The Malady of Fibromyalgia
**Presenter(s):** Tanya Knudson
**Department:** Physical Education-Athletic Training
**Advisor:** Dawn Hammerschmidt
**Abstract:** An introduction to the facts on fibromyalgia, and discussion on the controversies of the disease.

## 69

**Title:** Genetic Diversity Influencing Survival Among Declining Populations of Black-tailed Prairie Dogs.
**Presenter(s):** Tracy Mastel, Alisha Pagel, Lee Gertsen
**Department:** Biology
**Advisor:** Michelle Malott
**Abstract:** The populations of black-tailed prairie dogs are steadily declining due to a variety of human-impact factors such as habitat alteration, recreational shooting, and agricultural control. A study on genetic diversity could provide valuable insight on survival of black-tailed prairie dogs in future generations. We are using PCR to examine micro-satellites in order to compare the DNA of black-tailed prairie dogs between and among prairie dog towns from Theodore Roosevelt National Park. Micro-satellites are areas of the genome that are highly variable between individuals and can be used as markers of genetic variability in populations. We are presenting our results and conclusions thus far on this topic. In our continuation of research with black-tailed prairie dog DNA we hope to determine whether or not genetic invariability could potentially cause a population decline to the point of extinction.

## 70

**Title:** Effects of Oxidative Stress on Saccharomyces cerevisiae FKH1 Transcription Factor Knockout
**Presenter(s):** Heidi Johnson, Faith Dahl, Dan Feir
**Department:** Biology
**Advisor:** Michelle Malott
**Abstract:** Forkhead proteins are known to play a role in regulating early development, cell differentiation, and cell cycle progression in many different eukaryotic cells. FOXO3a is a protein from the forkhead FOXO family of human transcription factors. Transcription factors play an important role in regulating cell cycle, cell death, and oxidative stress. They bind DNA through a winged-helix structure. Once translocated into the nucleus, they are able to induce the transcription of genes necessary for these specific functions in the cell. Saccharomyces cerevisiae is a model organism commonly used to study many of these fundamental processes. FKH1 and FKH2 are yeast forkhead transcription factor proteins in S. cerevisiae yeast cells. Although there have been limited studies on FKH1 and FKH2, the conserved DNA binding domain among transcription factors suggests that the yeast transcription factors will behave in a similar fashion to that of FOXO3a. Therefore, FKH1 and FKH2 could be used as a means to study the role of forkhead transcription factors in cellular response to oxidative stress. Bioinformatic analysis will be preformed to obtain the conservation between these three forkhead proteins. Preliminary data has suggested that oxidative stressors, such as hydrogen peroxide, cause DNA damage to cells. When the cell is exposed to hydrogen peroxide, FOXO3a initially inhibits the process of apoptosis, possibly allowing the cell to repair its damaged DNA. We hypothesize that FKH1 and FKH2 will behave in a similar manner. We will focus on the FKH1 protein while performing experiments with wild type strains along with mutated strains lacking the FKH1 gene.

## 71

**Title:** Deadly Diseases Among Us
**Presenter(s):** Adriane Cooper, Mariya Rzaszutak, Virginia McCamant
**Department:** Biology
**Advisor:** Alison Wallace
**Abstract:** Infectious diseases continue to be a major cause of human suffering and death. This event is a high school level group activity which will allow students to compare and contrast emerging and re-emerging infectious diseases, how they are transmitted, and other common characteristics of each disease.

## 72

**Title:** Relating the Biological, Ecological and Societal Values in Order to Bring Attention to the Overall Importance of Virgin Prairie Land to Our Region and Nation as a Whole.
**Presenter(s):** Holly Kleffer
**Department:** Biology
**Advisor:** Chris Chastain
**Abstract:** My goal is to illustrate to a general audience the importance of our lands heritage, Virgin Prairie Land. I plan to do so by stating the interrelationships between the biological ecological and societal viewpoints. Together these three topics come together to further prove that this rare and beautiful resource should be preserved and protected by both the law and the general public. With the knowledge of such importance of this vast resource I hope to instill both hope and action. We can overcome the blatant disregard for this precious gem and begin to appreciate our regions gift, Virgin Prairie Land.

## 73

**Title:** Green Fluorescent Protein Purification and Polyclonal Antibody Production in Rabbits
**Presenter(s):** Derick Burgad, Alicia Levorsen, Amanda Lipp
**Department:** Biology/Chemistry
**Advisor:** Dr. Joseph Provost
**Abstract:** The gene that encodes the green fluorescent protein (GFP) comes from Aequorea victoria. This gene was transformed and expressed in Escherichia coli. A lysate solution of the GFP expressing E.coli was then prepared for purification and injected subcutaneously into rabbits for polyclonal antibody production. The purpose of this experiment was to produce rabbit specific polyclonal antibodies toward a highly purified preparation of the antigen GFP. The purification process involved dialysis to reduce the salt concentration and the use of two different chromatography columns. The first an IEC column containing DEAE Sephacel, to fractionate the sample based on charge and the second step was a SEC column using Sephadex S-100 beads to fractionate the proteins by size. Following the purification through each column, the fractions were collected and analyzed by the Bradford method to determine protein concentration. The final protein sample was then concentrated using a Centriprep YM-10 centrifugal filter unit. Analysis was performed on the final sample to determine purity by an SDS-PAGE gel. The final sample was then emulsified using complete freunds adjuvant and a boost with incomplete freunds adjuvant. Four weeks post injection sera was isolated. The titer of the sera was tested by both Western blot and an ELISA.

## 74

**Title:** The Rise of Korean Nationalism Leading Up to the Samil
**Presenter(s):** Rebecca Vave
**Department:** History
**Advisor:** Henry Chan
Abstract:On March 1, 1919 the people of Korea gathered in Pagoda Park in Seoul, as well as in various other places across Korea, in a moving demonstration of their longing for independence. It has been said that Korean nationalism was born in that movement, now called the Samil. In this paper, I trace the rise of Korean nationalism leading up to the Samil. I contend that the nationalistic fervor of the Samil Movement was not born in a day. It was painfully grown from the seeds of the legacies of the past, the disparaging Yi Dynasty, and foreigner encounters, particularly the oppressive Japanese colonization.

## 75

**Title:** Anti-Germanism in Clay County
**Presenter(s):** Amber Boyd, Rachel Andersen
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** Germans are and have been one of the largest ethnic groups in Clay County. However, the German culture, people, and language have not always been accepted and desired additions to the community. World War I created an anti-German movement that spread across the nation and this area of the country was no exception. This is a research project for the American Studies Senior Seminar (AMST419) and focuses on the local attitude changes towards German people and things during the WWI era.

## 76

**Title:** The Determinants of Homeownership in the United States of America
**Presenter(s):** Heidi Petersen
**Department:** Economics
**Advisor:** Dr. Oscar Flores-Ibarra
**Abstract:** This presentation uses regression analysis to determine the different factors that affect the percentage of citizens who become homeowners in the United States of America. It is a time series analysis with data from 1971 to 2001.

## 77

**Title:** Designing Physical Anthropology Labs: An Exercise in Active Learning
**Presenter(s):** Jennifer Bengtson
**Department:** Anthropology and Earth Science
**Advisor:** Rinita Dalan
**Abstract:** The Department of Anthropology and Earth Science has recently restructured its introductory physical anthropology course in order to provide a more effective learning environment for students. This has been accomplished through the use of several small interactive lab sessions, complemented by an expanded and improved collection of primate and hominid fossil casts purchased through a grant from the Center for Teaching and Learning. These activities have improved learning in subjects like primate taxonomy and early hominid evolution and have provided an opportunity for students to work more closely with their instructor and classmates. As a lab assistant, I have been active in designing the labs and working with students during the sessions. The experience has expanded my knowledge of the subject, improved my ability to work with students, and reinforced my desire to continue my education in this field. I look forward to conducting research as well as working an academic setting in the future, and I believe this experience will prove invaluable to my accomplishment of those goals.

## 78

**Title:** Language Disorders: The Elements and Instituting a Classroom Model.
**Presenter(s):** Lindsay Gilleshammer, Angie Villarreal
**Department:** Speech/Language/Hearing Sciences
**Advisor:** Louis De Maio
**Abstract:** This presentation will focus on identification (assessment), intervention, and facilitation of classroom models. We will present how the speech language pathologist along with the teacher come up with individual input that essentially affects the delivery of quality services for a child. We will also focus on instituting a classroom model.

## 79

**Title:** Racism and MSUM
**Presenter(s):** Pablo Guajardo
**Department:** American Multicultural Studies and the Humanities
**Advisor:** Phyllis Phyllis May-Machunda
**Abstract:** For any institution there is an inherent resistance to change. I will demonstrate what I learned about the effect racism has had on the student body, the nature of the University and efforts made to change that nature over the course of several decades. This will involve interviews with students and faculty past and present, surveys of the student body and several of the documents dealing with this issue back.

## 80

**Title:** Comparison of Growth Rates and Survival of Painted Turtles (Chrysemys picta)in Clay County, Minnesota
**Presenter(s):** Joanna M. Schmit, Natasha W. Gruber
**Department:** Biology
**Advisor:** Donna M. Bruns and Jerome Stockrahm
**Abstract:** Painted turtles (Chrysemys picta) were live-trapped during the summer and early fall of 2001, 2002, and 2003 in Clay County, Minnesota, to study growth rates, recapture rates between years, population characteristics, and movements. In 2001, 2 sloughs (< 2 km apart) were trapped, 2.7 ha and 6.2 ha, respectively. For 2002 only, a third slough (<1 ha) that was positioned between the first 2 sloughs was added to the study. For each captured turtle, outer scutes were notched for individual identification. Turtles were weighed, sexed and measured for length and width of carapace, then released. For 2001, data for 250 turtles were analyzed. In 2002, a total of 118 turtles were trapped where 75 were new animals (37 males, 30 females, 8 juveniles) and 43 (34 males, 9 females) were recaptured turtles from 2001. In 2003, a total of 190 turtles were trapped where 42 were new animals (20 males, 18 females, 4 juveniles) and 147 (107 males, 35 females, 1 juvenile, plus 4 females observed away from the sloughs) were recaptured turtles. In spite of intense trapping effort, trapping success between 2001, 2002, and 2003 varied greatly. Possible reasons for these differences, including mortality factors will be investigated. Growth rates and survival rates will be discussed.

## 81

**Title:** Nocturnal Behavioral Response to Chemical Alarm Cues by Tetra Fish
**Presenter(s):** Shantell Drew
**Department:** Biology
**Advisor:** Brian Wisenden
**Abstract:** Fish detect the presence of an active predator by chemical cues that are released when a predator attacks and injures its prey. Prey species can also use these alarm cues to associate the smell of the predator with danger, and later recognize the predator's presence by its smell even before it attacks. Both the response to chemical alarm cues, and learned recognition of predator odor have obvious survival benefits. Study of alarm responses to alarm cues have been conducted exclusively during daylight hours. Many predators are nocturnal and feed at night. In this study, we tested if tetra fish (Pristella) show a behavioral response to chemical alarm cues at night. Using room light timers, we shifted the day/night cycle of tetras so that we could study nocturnal behavior during the day. We gave the fish the odor of a another fish species, a cichlid, and either water or tetra alarm cues . We recorded activity and vertical distribution - two measures of antipredator behavior. This tested if tetras give an overt behavioral response to alarm cues at night, and if they already recognize cichlid odor as an indicator of danger. We changed the water and retested the same fish several days later, this time with only cichlid cues. This tested for learned recognition of cichlid odor as dangerous. We found no evidence of an overt behavioral response to alarm cues at night, nor any evidence of recognition learning during daylight conditions. This result suggests that the alarm reaction and recognition learning may be conditional upon the presence of light. Attentiveness to chemosensory indicators of predation risk may occur only when awake.

## 82

**Title:** Parent-Child-Communication-Program Case Study #10
**Presenter(s):** Ludmi Jinadasa, Roshani Goonewardena
**Department:** Speech-Language-Hearing Science Department
**Advisor:** Dr. Louis De Maio
**Abstract:** The study we conducted was one of twelve studies that analyzed the effects of the Parent-Child Communication Program on a mother with a child who has language delay. Dr. Louis De Maio developed the Parent-Child Communication Program (PCCP) in 1998 to teach parents a method that will promote their child's communication and language development.In this study we analyzed the mother's use of Initiations, Responses and questions before and after PCCP training.

## 83

**Title:** Seeing the Unseen with Geophysical Methods
**Presenter(s):** Amanda McCracken, Melissa Beer
**Department:** Anthropology/Earth Science
**Advisor:** Rinita Dalan
**Abstract:** Ongoing research has been directed toward uncovering secrets that the Hopewell Culture (200 BC-AD 500) of the Midwest have left behind. The Hopewell Culture created hundreds of mounds and earthworks throughout the Mississippi River valley, but our area of interest is the earthworks located in Ross County Ohio at the Hopeton archaeological site. Due to site degradation, traditional archaeological methods are not sufficient to answer questions about where an earthwork was and how it was built. By means of geophysical methods, we are able to "see" what cannot be seen with the naked eye on the surface or in archaeological excavations. This presentation will focus on the geophysical methods used as well as the answers that have been produced from our research.

## 84

**Title:** Sri Lanka: Facts about the Culture, Life style, Education, Civil War and Terrorism
**Presenter(s):** Ludmi Jinadasa, Roshani Goonawardena, Shanaka Herath, Pushpakantha Rajapakse, Amal Alles, Pat Jinadasa, Samadhi Wijesighe
**Department:** Office of International Programs
**Advisor:** Kim Gillette
**Abstract:** Sri Lanka is a country in Southern Asia. It is an Island in the Indian Ocean, South of India. Sri Lanka is a county slightly larger than West Virginia but the population exceeds 19 Million. We have 17 Sri Lankan students as well as 3 Faculty members currently at MSUM. This will be a great experience to know about SRI LANKA.

## 85

**Title:** Parent-Child Communication Program: Case Study #1
**Presenter(s):** Angela Haynes, Amy Ruzicka
**Department:** Speech Language Hearing Sciences
**Advisor:** Louis De Maio
**Abstract:** This presentation is on a case study on the Parent-Child Communication Program, developed by Dr. Louis De Maio. The program teaches parents how to talk with their children to facilitate their children's communication. We measured the number of questions the mother asked her child before training and the number she asked after training and compared the two amounts to see if she decreased her amount of questions asked. The results show that she significantly decreased the amount of questions asked to her child.

## 86

**Title:** Modeling of Upper-Level Degrees Earned Among Different Races
**Presenter(s):** Ann Johnson, Erin Richgels, Shamus Funk
**Department:** Mathematics
**Advisor:** Ellen Hill
**Abstract:** A comparison of the number of upper-level degrees earned per year among different races. Analysis of different degrees earned will be made regarding to degrees vs. time, and the number of degrees earned by different races will be compared against each other. Statistical analysis may be provided as well.

## 87

**Title:** Clay County Italian Immigration: Italian Influence on Local Beauty Industry
**Presenter(s):** Beth Splonskowski, Kristi Hilton
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** Clay county has a variety of different ethnic groups that have located in this region. This project will focus on the Italian immigration into the area, particularly Dilworth. It will also take a look at the impact that the Italian's had on the beauty industry. This project is for the multicultural web museum and will outline the family history and the timeline of their success in the local beauty industry.

## 88

**Title:** Parent-Child Communication Program Case Study #2
**Presenter(s):** Heidi Kopel, Tracey Rufsvold
**Department:** SLHS
**Advisor:** Louis DeMaio
**Abstract:** This case study analyzed the effect of the Parent-Child Communication Program (PCCP)on a mother and child pair in which the child was diagnosed with a language delay. PCCP promotes child communication and language and was developed by Dr. Louis DeMaio. We analyzed the mother's use of questions before and after the training program.

## 89

**Title:** The Recent Changes in the Immigration and Asylum System of the United Kingdom and Their Detrimental Affects
**Presenter(s):** Aaron Shreve
**Department:** Political Science
**Advisor:** Andrew Conteh
**Abstract:** This presentation looks at the recent changes in immigration and asylum policy in the United Kingdom. Most of the changes have come about as a result of the Nationality, Immigration, and Asylum Act. I will discuss the reasons for change in policy, specific changes in policy, and the detrimental affects of the policy changes.

## 90

**Title:** Predictions in Daily Lives - Can They Be Justified?
**Presenter(s):** Virendra Tripathi
**Department:** Philosophy
**Advisor:** Ted Gracyk
**Abstract:** From a simple task of making the morning cup of coffee to driving to work, we all make innumerable predictions in our lives. More often than not, our predictions are right. But, rightness of a prediction need not justify the prediction. In a philosophical analysis, the groundings for predictions come apart. This presentation discusses the problems for predictions issuing from such a philosophical analysis and the choice of the route it takes.

## 91

**Title:** Developmental and Behavioral Ontogeny of Antipredator Behavior in Cichlid Larvae
**Presenter(s):** Bree L. Hamann, Anusha Mishra
**Department:** Biology
**Advisor:** Wisenden Brian & Ellen Brisch
**Abstract:** Cichlids are unusual among fishes in having prolonged care of their eggs and developing young for up to 6 weeks. This is an enormous investment because of the energy spent defending the young against predators, lost foraging opportunities, and lost opportunities to reproduce again until the brood of young reaches independence. The duration of brood care is determined by the antipredator competence of the young. Here, we use video playback analysis to measure the speed and distance of the startle response of convict cichlid, Archocentrus nigrofasciatus, young at increments of development. The degree of calcification is measured by developmental staining procedures, which produces a red coloration in bones and a blue coloration in cartilage. We correlate the capacity for behavioral avoidance of predator attack with the degree of calcification of the skeleton. We show that skeletal calcification determines antipredator competence in this species, and that, in turn, determines patterns of parental care. These data have implications for the evolution of egg size in cichlid fishes.

## 92

**Title:** Early Fraternal Organizations of Clay County
**Presenter(s):** James Sander
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** The projects goal is to analysis the impact of Early Civic Fraternities in Clay County. The project with examine how Clay county fit in to the national scheme of fraternal growth and how the county differed. The project will also look into the type of citizens that belonged to civic fraternities.

## 93

**Title:** Web Research: Advertising, Public Relations-Marketing, News, Television, and Radio Online
**Presenter(s):** Sarah Jane Smith, Jared Medhus, Tiffany Deutsch
**Department:** Mass Communications
**Advisor:** Regene Radniecki
**Abstract:** The year 2001 marked a pivotal milestone for the Internet. In that year over 50 million people in the U.S. were connected to the Internet from home. The Net had come of age, reaching critical mass as a communication medium in record time. Our study takes a look at how the mass media use the Internet and the World Wide Web. Specifically, we will focus on how traditional mass media — news outlets, the television and radio industries, and media professionals in the advertising, public relations, and marketing fields adopted the new medium and how they are using it to reach current and new audiences.

## 94

**Title:** How do MAPK/ERK Kinases Regulate Microtubule Spindle Formation?
**Presenter(s):** Sumeda Nandadasa, Ava-Gaye Simms, Akila Weerasekara
**Department:** Biology
**Advisor:** Ellen Brisch
**Abstract:** The mitotic spindle formation is the key process that allows the segregation of the newly replicated chromosomes into two poles. Microtubules (MT) are the key components of which the mitotic spindle is formed. Understanding Microtubule assembly is important to understanding spindle fiber regulation. In our study we are trying to understand how microtubule assembly is regulated, what key proteins are involved, what gives the signal for microtubule sub-particles to assemble and disassemble? In earlier experiments we have found that there are two key proteins involved and they are sized 44 and 48KD. By antibody tests we predict that these proteins are in the Mitogen Activated Protein Kinase (MAPK) family and Extracellular Receptor Kinase (ERK) family by using specific antibodies. By using a collaboration of protein assay techniques together with western blot techniques we plan to further analyze these two proteins and to identify them using protein micro sequencing.

## 95

**Title:** Investigating DNA Replication Origins in C. elegans.
**Presenter(s):** Jessica Heck, Diane Nelson
**Department:** Biology
**Advisor:** Michelle Malott
**Abstract:** In order to ensure that only one complete copy of the entire genome is accurately replicated before mitosis, DNA replication is initiated at multiple locations in the genome called replication origins. Replication origins are of great importance to the regulation of DNA replication and make it impressively efficient. These initiation sites must be uniformly distributed throughout the genome in order to replicate the entire genome within a limited time period. The human c-myc sequence may be involved in the regulation of replication initiation. The human c-myc gene is a proto-oncogene that has been extensively characterized with regard to promoter regulation and chromosomal structure. DNA replication has been demonstrated to initiate within a 2.4 kb region upstream of the c-myc gene in human cells growing in culture. In addition, these sequences, when put into a plasmid and transected into human cells, are able to direct the replication of the plasmid once per cell cycle. The ability of these sequences of DNA to initiate the replication of a larger piece of DNA, such as a plasmid independently of a chromosome, is referred to as autonomously replicating ability. The c-myc sequences allow plasmids to replicate independently of the chromosome, and are thus said to be autonomously replicating sequences (ARS). In order to more fully understand replication initiation in metazoan cells, we propose to examine the c-myc sequences that act as replication origins in the model organism C. elegans, a small nematode. C. elegans are an ideal organism for this type of study because their entire genome is sequenced and has been used extensively to study molecular processes and genetic activities. We intend to work to develop a method to study the initiation of DNA replication within a 2.4 kb fragment of the human c-myc gene using C. elegans as a model organism.

## 96

**Title:** Phenylephrine Activates Na+-H+ Exchangers via Bifurcating Pathways Involving RhoA and ERK as Downstream Effects of Different Protein Kinase C Isoforms
**Presenter(s):** Dave S. Ronderos, Anusha Mishra
**Department:** Biology
**Advisor:** Mark Wallert & Joseph J. Provost
**Abstract:** In Chinese hamster lung fibroblasts (CCL39), Phenylephrine (PE) activates both ERK and the Na+-H+ exchanger (NHE) to regulate stress fiber formation. PE activation of a1-adrenergic receptors activates conventional isoforms of protein kinase C (PKC). Previous research from our laboratory indicates that PE addition leads to activation of RhoA in CCL39 cells. Additionally, general PKC inhibitors such as staurosporine and BIM have been shown to block both RhoA and ERK activity in cells treated with PE. Multiple PKC isoforms are differentially regulated by a variety of cell membrane receptors to control diverse cellular functions. The focus of this study was to determine which PKC isoform(s) are involved in the PE activation of RhoA and ERK. Using enhanced green fluorescent protein tagged-PKC isoforms, we investigated the ability of PE to stimulate PKC translocation using the conventional PKC isoforms a, b1, b2 and g. Our experiments show that PE activates multiple PKC isoforms. This finding allows for the possibility that distinct PKC isoforms are responsible for the independent activation of ERK and RhoA. Dominant/negative PKC constructs and specific PKC inhibitors are also used to examine the potential role for different PKC isoforms in the regulation of the RhoA-ROCK pathway and the ERK pathway. Our research has also shown that activation of ERK, RhoA and NHE are all required for stress fiber formation by PE in CCL39 cells. Defining a role for multiple PKC isoforms in the regulation of stress fiber formation would dramatically improve our understanding of this process.

## 97

**Title:** Exploring the Roles of Nurse Practitioner in Rural Health Care
**Presenter(s):** Jessica Kleindl
**Department:** Nursing
**Advisor:** Donna Heald
**Abstract:** A look at the roles and importance of nurse practitioners in the rural health setting. How they improve care and benefit local hospitals, as well as, a look at obstacles they face.

## 98

**Title:** Advanced Optical Imaging-Experiences at looking through the world with different lenses (objectives).
**Presenter(s):** Austin McCoy
**Department:** Biology
**Advisor:** Ellen Brisch
**Abstract:** This talk will be a personal statement on my experiences helping to set up an advanced optical imaging set up in the biology department. I have learned many imaging techniques and Simple PCI software abilities. I also helped teach others how to use the microscopy set up and software. I will highlight the problems solving strategies I developed when working with this new technology.

## 99

**Title:** The United States Beer Industry
**Presenter(s):** Katie Kapsner
**Department:** Economics
**Advisor:** Oscar Flores
**Abstract:** This presentation discusses the United States Beer Industry. There will be an overview of the beer industry over the years, and a close look at the industry today. It primarily focuses on growth in exports and imports.

## 100

**Title:** Constitutionality of the USA PATRIOT ACT
**Presenter(s):** Nicole Elkin Elkin
**Department:** Political Science
**Advisor:** Andrew Conteh
**Abstract:** Overview of the USA PATRIOT ACT, as well as views of its constitutionality from sources including judges, senators, and professors. Also how this Act is seen from international organizations and other nation states.

## 101

**Title:** The Car Problem; Whether to Buy or Lease.
**Presenter(s):** Christian Bichler, Rachel Wasche, Binod Shrestha, Jayne Linstad
**Department:** Mathematics
**Advisor:** Ellen Hill
**Abstract:** Using dynamical systems to aid in the decision of buying or leasing a car. The benefits and drawbacks of each decision will be presented in the project. Also, the costs involved in each decision will be evaluated.

## 102

**Title:** Target: Upscale Discounting and Power Relationships
**Presenter(s):** Adam Sandbek
**Department:** Speech Communication
**Advisor:** Tim Borchers
**Abstract:** Research based paper discussing the implications of Target as an upscale discounter. A rhetorical criticism is conducted using Marxist principles with an attempt to better understand how Target's practices influence power relationships.

## 103

**Title:** Fraud in the United Way
**Presenter(s):** Kristin Bentz
**Department:** Accounting
**Advisor:** James Hansen
**Abstract:** I'll be talking about the fraud that occurred approximately two years ago in the United Way Foundation.

## 104

**Title:** Can Some Predators Avoid Being Chemically Labeled by Their Prey?
**Presenter(s):** Jeni Donner, Jodi Hendrickson, Courtney Rud
**Department:** Biology
**Advisor:** Brian Wisenden
**Abstract:** We know from previous studies that minnows can detect the diet of predators by chemical alarm cues in minnow skin that survive the digestive system of the predator. This chemical labeling should put pressure on the predators to mask or breakdown these signaling molecules to avoid alerting the prey of their presence and improving further success of the predator. We are testing two predators, the northern pike and the largemouth bass. Pike are known to be chemically leaky in that the prey can detect alarm substance of ingested prey; however bass have never been tested. Evolutionarily, bass are much more advanced than pike. But are bass as chemically leaky as pike, or do bass have a mechanism for blocking the effect of chemical labeling by minnow prey? We tested this idea on zebra danios in the laboratory by injecting into their tanks the alarm substance made up of the digestive wastes of the pike and bass on a diet of zebra danios or swordtails (a non-minnow species). AS controls, we used blank water, and undigested skin extracts of zebra danios and swordtails. We measured activity and vertical distribution, which commonly change during antipredator behavior. If the zebra danios respond to the bass on a zebra danio diet then we can conclude that bass give off a chemical label that can be detected by the prey. If the danios do not have a response to Bass on a danio diet, then we can conclude that they can block chemical labeling.

## 105

**Title:** Stars and Stuff: an Introduction to Astrophysics
**Presenter(s):** Eric Haverberg
**Department:** Physics
**Advisor:** Alison Wallace
**Abstract:** An introduction to the fundamentals of Astrophysics. Topics to include gravity, light and stellar evolution.

## 106

**Title:** Vetoing the Engenderment of the Frozen Human Embryo: A Feminist Argument for the Regulation of Reproductive Technologies and the Abolition of Forced Motherhood
**Presenter(s):** Amanda Easton
**Department:** Women's Studies
**Advisor:** Tracy Scholl
**Abstract:** This presentation will represent a feminist argument for the regulation of reproductive technologies and the abolition of forced motherhood.

## 107

**Title:** A Test of the Anti-Pathogen Hypothesis for the Function of Perciform Club Cells
**Presenter(s):** Shireen Alemadi
**Department:** Biology
**Advisor:** Brian Wisenden
**Abstract:** Minnows and other species in the group called "Ostariophysi" possess specialized club cells in their skin that release an alarm chemical when the minnow is injured in an attack. Members of the evolutionary advanced perch family (non-Ostariophysans) possess similar cells that arose independently from the minnow line of fish evolution. These cells in both groups present a problem to evolutionary biologists because it is not clear how individuals that invest in these cells benefit from the costly investment in these cells. Other individuals benefits from the alarm signal when they die, but why do these fishes make the cells in the first place? In addition to antipredator responses, some researchers speculate that these cells may play a roll as an antipathogenic agent (against skin parasites), or in protecting the fish from the adverse effects ultraviolet (UV) radiation. Both parasitism and UV exposure increases the rate of healing of damaged tissue in exposed locations. We tested for the effect of skin parasitism on the proliferation of club cells in yellow perch, Perca flavescens. The amount of club cells and mucus cells present on the back of the neck (nape) and side (flank) increased with increases in the degree of parasitism. We also compared the distribution of club cells on different parts of the body. Results showed that club cell density was highest on the nape, intermediate on the flank, and least numerous on the bottom. The same result was also seen in the number of mucus cells in each section of fish. These data provide support for a healing function of club cells. Club cells were most abundant in the nape where UV radiation is most intense, and club cells were most abundant in fishes exposed to high rates of parasitism.

## 108

**Title:** Portrait Drawing Demonstrations: Methods and Meanings
**Presenter(s):** Katie Semelis, Valerie Mikelson, Mika Takahashi, Jennifer Lindeman
**Department:** Art and Design
**Advisor:** Sherry Lee Short
**Abstract:** This dynamic portrait drawing demonstration will be presented by four students from the Department of Art and Design. Every 15 minutes of the first hour, one of the students will give a formal presentation on her work, including its historical influences, style, and intent. The second hour will be an informal, open session; as the work is being completed, visitors are invited to observe, ask questions, and view other examples of the students' finished work.

## 109

**Title:** NMR Study of Magnetic Molecules
**Presenter(s):** Moneer Al-Rifai
**Department:** Physics
**Advisor:** Ananda Shastri
**Abstract:** This presentation is based on an internship at Ames Lab,IA where we studied the nuclear magnetic resonance behavior of magnetic molecules. Our research focused on studying the proton NMR of these magentic molecules (V12) at different magnetic fields and different temperatures (4.2-300K). To analyze this behavior, it is important to understand how the spin dynamics and the spin relaxation rate depend on the magnetic field and temperature.

## 110

**Title:** Mental Retardation
**Presenter(s):** Maggie Mork
**Department:** SLHS-Speech Language, Hearing Communications
**Advisor:** Louis DeMaio
Abstract:Mental retardation (MR) is defined as having substantial limitations in present functioning. People with MR can be further diagnosed as having mild, moderate, severe, or profound severity. Language is one of the most impaired areas for a child with MR. They have issues with pragmatics, semantics, syntax/morphology, phonology, and comprehension. Their difficulty in these areas depends on their severity. The possible causal factors for MR include biological, social-envioronmental, and processing factors. In conclusion, mental retardation is a very complex diagnosis that is often misunderstood.

## 111

**Title:** Digital Manipulation, Has it gone to Far?
**Presenter(s):** Aimee Imdieke
**Department:** Mass Communication
**Advisor:** Martin Grindeland
**Abstract:** My presentation will be on the the issue of digital manipulation. I will be speaking about the extremes that this issue has been taken to, and the opinions and ethics behind it. I will be presenting examples of various kinds of manipulations to correspond with my presentation, to help aid the audience in understanding the issue.

## 112

**Title:** Form Follows Function: Why Animals Look the Way They Do
**Presenter(s):** Rachael Smith, Jon Frykman
**Department:** Biology
**Advisor:** Alison Wallace
**Abstract:** This workshop will be an activity exploring evolution as a high school life science student would experience it. Hands-on activities and discussions will cover topics such as natural selection and genetics.

## 113

**Title:** Reproductive Ecology of Fathead Minnows (Pimephales promelas): The Effect of Nest Type on Reproductive Success
**Presenter(s):** Shireen Alemadi, Greg Grawunder
**Department:** Biology
**Advisor:** Brian Wisenden & Michelle Malott
**Abstract:** Animal mating systems include monogamy (M:F), polygyny (M:FF), polyandry (MM:F) and promiscuity (MM:FF). Here, we report preliminary findings of our study of variation in the mating system of a promiscuous fish, the fathead minnow (Pimephales promelas). Males establish a territory under submerged sticks or floating objects, chase away rival males and court females. Successful males may receive eggs from several females, and each female may deposit eggs in more than one nest. Males eat little during this time and often resort to eating their own eggs to sustain themselves. For this reason, females prefer to lay eggs in nests that already contain eggs. New, fresh males can therefore sire more eggs if they evict the half-starved resident male of a nest that contains eggs, than if they start a new nest on their own. We studied a population of fathead minnows in Budd Lake, MN, in Itasca State Park. We found that the type of nest strongly influenced the number of eggs received. Nests formed on the underside of lily pads contained significantly more eggs than nests formed on the underside of submerged sticks. Lily pad nests offered much more surface area for egg deposition. Eggs in lily pad nests were typically deposited in a single layer whereas eggs on the underside of sticks were often glued to each other in multiple layers. Stacking eggs would limit access to oxygen and potentially hinder egg development and hatch success. Male-male fighting was observed frequently, particularly around lily pad nests. We hypothesize that lily pad nests are more likely to contain eggs sired by multiple males due to nest takeovers. To test for multiple paternity, we developed DNA fingerprinting methods that we will eventually use to match the DNA of the male guarding the nest with the DNA of the eggs contained in his nest.

## 114

**Title:** The Wine Industry
**Presenter(s):** Meridith Sanders
**Department:** Economics
**Advisor:** Oscar Flores
**Abstract:** This presentation will take a look at the present state of the wine industry and the changes that have been taking place.

## 115

**Title:** Mothers and unfair pre-natal care.
**Presenter(s):** Erika Stein, Gretchen Omdahl
**Department:** Sociology
**Advisor:** Sue Humphers-Ginther
**Abstract:** Our presentation will demonstrate the difficulties of obtaining adequate pre-natal care based on different factors such as age, race, and ethnicity.

## 116

**Title:** Fraud: How to Make a Million Stealing from Your Employer
**Presenter(s):**
**Department:** Accounting
**Advisor:** James Hansen
**Abstract:** Fraud costs U.S. businesses $600 Billion a year. Fraud schemes will be discussed, such as the outrageous "Crazy Eddie $120 Million Rip-off", which included all five principle types. The accounting profession's reaction to fraud will also be detailed.

## 117

**Title:** Expression of Mitochondrial Genes in Wheat (Triticum aestivum L.)
**Presenter(s):** Pabalu Karunadharma
**Department:** Biology MSUM & Plant Sciences NDSU
**Advisor:** Khwaja Hossain & Shahryar Kianian
**Abstract:** Nuclear and organelle genomes in plants play an important role in expression of productivity traits. The sub cellular genomes - mitochondria and chloroplast - only code for a small number of genes but they are unique and irreplaceable for the regulation of the cellular processes in plants. Mitochondrian is the center for energy synthesis and serves essential functions in the development of the plant. Mutations of mitochondrial genes lead to many changes in the plant development such as cytoplasmic male sterility (CMS) which is observed in as many as 150 plant species. Also there are many conserved sequences among the mitochondrial genomes of plant species. Wild species is the usual reservoir of genes for improvement of pest resistance, grain quality and agronomic fitness of any cultivated species. The genes affecting nuclear-cytoplasmic (NC) interactions seem to affect gene transfer from wild to a cultivated species. Analysis of gene expression in mitochondria will provide valuable information in understanding these NC interactions in the cell. So far seventy-eight mitochondrial genes have been identified in wheat. These genes are identified from several cDNA sequences. The purpose of this study is to isolate these mitochondrial genes and compare them with other mitochondrial genomes from grass species such as rice and maize

## 118

**Title:** The Conversion of MDH to LDH Through Site Directed Mutagenesis
**Presenter(s):** James Denker, Andy Thompson, Castel Santana
**Department:** Biology
**Advisor:** Joseph Provost
**Abstract:** Malate Dehydrogenase (MDH) is an enzyme that is involved in the pathways of the Krebs Cycle, carbohydrate, fatty acid, and amino acid metabolism. The role of MDH is to catalyze the reduction of oxaloacetate (OAA) to malate via oxidation of NADH to NAD+. Lactate Dehydrogenase (LDH) is a glycolitic pathway enzyme, which catalyzes the conversion of pyruvate to lactate. Upon alignment and examination of the amino acid sequences of yeast, and watermelon MDH isoforms, we found that their active site amino acid residues 102 and 171 are conserved. When the sequences of these isoforms are aligned with that of Bacillus stearothermophilus LDH (BsLDH) differences were found at or near these key sites (102:MDH-arginine, LDH-glutamine; 170: MDH-valine, LDH-alanine; 172: MDH-alanine, LDH-phenylalanine). The goal of this project is to shift the substrate specificity of yeast and watermelon MDH isoforms through saturation mutations, which should result in nearly every possible amino acid substitution at each of these key sites. A shift in substrate specificity from OAA to pyruvate, will in essence, convert MDH into LDH. Mutants of the yeast, and watermelon MDH will be constructed using the Stratagene Quickchange mutagenesis kit employing degenerate oligos with a highly efficient, long range polymerase to create site directed mutants for both the yeast mitochondrial and watermelon glycoxisomal isosymes. The resulting mutants will be assayed for specific enzyme/substrate interactions (MDH functioning vs. LDH functioning). We will develop a nitrocellulose filter assay system or, alternatively, we will create a stop time, spectrophotometeric enzymatic assay to measure the catalytic rates of the reactions. Once mutation has been obtained, a Sanger-dideoxy DNA sequencing reaction will be performed in order to confirm the amino acid changes made to the resulting mutants and the specific kinetic changes in the mutants will be measured.

## 119

**Title:** Parent-Child Communication Program
**Presenter(s):** Lisa Fanfulik, Tracy Klassen
**Department:** Speech-Language-Hearing Sciences
**Advisor:** Louis DeMaio
**Abstract:** Parents play a crucial role in facilitating communication and language development in their child. A child's parent is usually their first communicative partner, so ideally they would speak with their child in a way that aids language rather than impedes it. In order to facilitate language development in a language-impaired child, it is important that parents "tune in" to their own communication style. For this reason, many therapy programs for language-impaired children are giving parents a central role in therapy. Teaching parents more effective ways of communicating with their child helps facilitate language development.

## 120
**Title:** The role of NHE1 in Balb-c rat tumorgenesis
**Presenter(s):** Hillary Thronson
**Department:** Biology
**Advisor:** Joseph Provost
**Abstract:** The sodium hydrogen exchanger (NHE1) is an ion transport protein with a wide variety of functions, one of which is intracellular pH regulation. Aberrant NHE1 activity can facilitate both tumor formation and metastasis by changing the internal and external environments of a cell. This study will attempt to determine of there is a correlation between exchanger function and tumorgenesis in Balb-c rats using cell lines with varying levels of NHE1 activity. CCL39 cells have normal NHE1 activity, while PS127 cells overexpress NHE1 and PS120 cells completely lack the exchanger. Previous studies have shown that an aggressive cell line (DMS 114) derived from a human pulmonary carcinoma will cause tumor formation in nude mice when injected into mammary fat pads (Waalkes, Bhalchandra). This study will use a similar cell line (DMS 79) derived from a pulmonary carcinoma as a positive control. Groups of rats will be injected subcutaneously with one of the aforementioned cell lines and sacrificed two and four weeks after injections to detect the presence and severity of tumors throughout the animals' bodies.

## 121
**Title:** Rape as a Weapon of War: Reproductive Issues Concerning Women in War
**Presenter(s):** Shannon Crabtree, Gwen Goos, Amanda Easton
**Department:** Women's Studies
**Advisor:** Tracy Scholl
**Abstract:** Paper addressing the issue of women's reproductive rights and women as a weapon of war.

## 122
**Title:** Growth Curve of Staphylococcus Epidermidis
**Presenter(s):** Sonnia Ranguma
**Department:** Biology
**Advisor:** Kathryn Wise
**Abstract:** The presentation will show the experiments I did on determining the growth and generation time of staphylococcus epedermidis at 37 degrees. The poster will show the procedure I used and the what I observed in order to come up with a growth curve showing all the different phases.

## 123
**Title:** The Implications of Selective Abortion in the Case of Disability: Integrating Disability Right and Reproductive Freedom
**Presenter(s):** Gwen Goos, Shannon Crabtree
**Department:** Women's Studies
**Advisor:** Tracy Scholl
**Abstract:** This will be a panel discussion on 3 papers written by Women's Studies Seniors all on the subject of Reproductive Rights. My portion of the discussion looks at selective abortion in the case of disability and what consequences abortions of this type have in the social context.

## 124
**Title:** Signature Quilt
**Presenter(s):** Hannah Mische, Jindallay Simmons
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** We will be researching and visually documenting a signature quilt. Information will be compiled for a historical web site. We will be documenting the ethnicity and occupations of the creators of this community signature quilt.

## 125
**Title:** Cost/Benefit Analysis of a Twins stadium in Minneapolis
**Presenter(s):** Ian Perkins
**Department:** Economics
**Advisor:** Oscar Flores
**Abstract:** I am going to see what the cost and the benefits are going to be to the city of Minneapolis, if its Twins stadium project is approved by the state government

## 126
**Title:** French Settlement in Clay County
**Presenter(s):** Trevor Cook
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** Both French Canadian and French nationals settled in Clay County, Minnesota, since the county's origin. I will report on the impact that each of these groups has made in shaping the county.

## 127
**Title:** Sports Economics
**Presenter(s):** Jeremy Tweed
**Department:** Economics
**Advisor:** Oscar Flores-Ibarra
**Abstract:** I will be identifying the costs, benefits, and the economic impact of a city that decides to build a new sports venue in a downtown area.

## 128
**Title:** Racing Through Time: A Historical Look at Horses in Clay County
**Presenter(s):** Kayla Muehler
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** From racing on the frozen Red River to aiding in plowing fields, horses were an integral part of life in Clay County. Prior to automobiles, people depended on horses for labor, transportation, and entertainment. This presentation will focus on artifacts, photographs, and the history of horses in the Red River Valley.

## 129
**Title:** Genocide and the Normality of the Perpetrators of Evil
**Presenter(s):** Bruce Ringstrom
**Department:** History
**Advisor:** Dieter Berninger
**Abstract:** The vast majority of genocide participants are ostensibly normal people, who embrace the moral precepts of their culture. Yet their actions as perpetrators accord with neither their normality nor their moral precepts. This paper explores the mechanics of transforming average people into participants of genocide.

## 130
**Title:** Rates of Groundwater Cadmium Attenuation in Gravels Impregnated with Glacial Clay in the Red River Valley
**Presenter(s):** Michele Lhotka
**Department:** Anthropology and Earth Sciences
**Advisor:** Russ Colson
**Abstract:** Cadmium is a naturally occurring metal that is used industrially in batteries, ceramics, and dental materials. It can also be found in cigarettes, coffee, tea, refined foods, water pipes and others. Cadmium is toxic when present in high levels to all mammals. It is most toxic when inhaled and is a probably carcinogen to humans and animals. Cadmium gets deposited in soils from improper disposal and because it naturally occurs in the Earth. The experiment reported here examines how cadmium concentrations in an aqueous solution will change with time due to reactions with sediment. Glacial till from one of the most recent deposits was collected from the Buffalo River Regional Science Center. Cadmium chloride aqueous solutions will be exposed to glacial till and gravel for times varying from one day to ninety days. We plan to measure the decrease in cadmium concentration with time as a means to establish how rapidly cadmium attenuation might occur in natural aquifers in the Red River Valley. The results will be presented at the conference.

## 131
**Title:** NMR Line Widths as a Signature of Crystal Geometry and Dynamics.
**Presenter(s):** Megan Sawarynski
**Department:** Physics and Astronomy
**Advisor:** Joe Ross (Texas A&M)
**Abstract:** A poster presenting the research that was developed during my summer 2004 internship with Texas A&M's Institute for Quantum Studies. We were looking at Type I Clathrates to determine where the elements "sit" in the cage-like structure by using the line shapes and the relaxation times of two samples.

## 132
**Title:** Spectroscopy and the Spectroscope
**Presenter(s):** James Herman
**Department:** New Center
**Advisor:** Dennis Jacobs
**Abstract:** This presentation will focus on the relevance and use of spectroscopes in human society, beginning with the earliest times to the present. It examines the study of spectroscopy in contemporary society, and provides some projections of possible future trends. The presentation will also include a demonstration of the use of a spectroscopy.

## 133
**Title:** Women's Empowerment
**Presenter(s):** Jessica Sletten
**Department:** Political Science
**Advisor:** Andrew Conteh
**Abstract:** There are many different discussions about rights, especially the rights of women. What does this really mean? What are the real goals of women's rights and how far do they really extend? Today I will take a look at women's rights and the different aspects of this concept. Such as, what women's rights are and what has been done to protect them. Also, what are some of the problems faced with implementing these rights and problems faced by the women fighting this battle. These are some of the issues not widely talked about or as often as they should be. Hopefully with awareness this will become a larger topic of debate and with debate something greater will be done about this issues, and true liberation of women can be reached.

## 134
**Title:** Colorful History of Moorhead School: Oak Port.
**Presenter(s):** Janet Hohenstein, Vusya Bentley
**Department:** American Studies
**Advisor:** Helen Sheumaker
**Abstract:** This presentation will touch upon the ethnic, language, student population and historical background of Oak Port School in Moorhead, Minnesota. We will encompass the effect on specific background culture and what teaching they used to pass on their culture. Students with many backgrounds have been taken for granted in the United States as a whole. However, the history of Oak Port School portrayed it otherwise.

## 135
**Title:** Gender Differences in Physical, Verbal, and Social Bullying of Elementary Students
**Presenter(s):** Jacqueline Hendricks
**Department:** Counseling and Student Affairs
**Advisor:** Patricia Neuman
**Abstract:** The presentation will provide an overview of gender research related to bullying behavior in school children and highlight the results of my thesis project, which examined the gender differences in physical, verbal, and social bullying behavior in upper elementary students. In addition, the influence of gender on admission to bullying and willingness to inform school professionals about violent incidents was examined.

## 136
**Title:** Shakespearean Theatre
**Presenter(s):** Samantha Pudil, Alissa Blaeser, Cole Flaat
**Department:** Theatre
**Advisor:** Theresa Carson
**Abstract:** Look back on who Shakespeare was, what his plays were like and what he did for theater as a whole. There will also be a short scene performed

## 137

**Title:** Special Problem in Education: Reaching Out to Adopted Minorities
**Presenter(s):** Heidi Holmberg
**Department:** Multicultural Studies
**Advisor:** Helen Klassen, Dr.
Abstract:I will prepare a poster presentation on the problem of reaching out through the school system to children who have been adopted by a family of a different ethnic background. How should one give them pride in their heritage and in who they are without alienating them, their family, or their classmates? How does one teach these children that they are special without making them feel even more isolated, especially in a community that is predominantly white? These are questions that will be answered.

## 138

**Title:** Marxism, Revolution, and Reform
**Presenter(s):** Peter Montecuollo
**Department:** Philosophy
**Advisor:** Randy Cagle
**Abstract:** Karl Marx believed that capitalist oppression was to be overthrown, and subsequently superseded by communism, wherein oppression is eliminated. However, there is much debate about the way in which such a task can be actualized. In fact, the debate focuses on whether revolution or reform is the best way in which to bring about communism. In this presentation, I will explain Marx's position along with demonstrating why it is that revolution presents a better case for actualizing the communist goal.

## 139

**Title:** Child Labor
**Presenter(s):** Njeri Mwangi
**Department:** Political Science
**Advisor:** Andrew Conteh
**Abstract:** My paper is on child labor. It defines what child labor is and the different forms that exist. It also looks at what the United Nations along with the International Labor Organization are doing to eliminate child labor all over the world.

## 140

**Title:** China's One Child Policy: The Changing Face of Family Planning
**Presenter(s):** Brandon Sherman
**Department:** East Asian Studies
**Advisor:** Henry Chan
**Abstract:** A common problem facing developing countries today is the taxes on resources caused by overpopulation. China holds the distinction of a negative total fertility rate (TFR), which is generally found only in developed countries such as the United States of America and Germany. The reasons for China's negate TFR, however, differ from those of developed countries. This presentation will examine the historical development of family planning policy in China and the structure and methods of its implementation. It will discuss some of the failures and successes of the policies, and address some of the international dialogue concerning the policies. Lastly, it will discuss some of the reforms that the policies have undergone in the last decade. Ultimately, the presentation hopes to provide an introductory overview of the family planning in China and the "One Child" policy.

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MINNESOTA STATE UNIVERSITY moorhead

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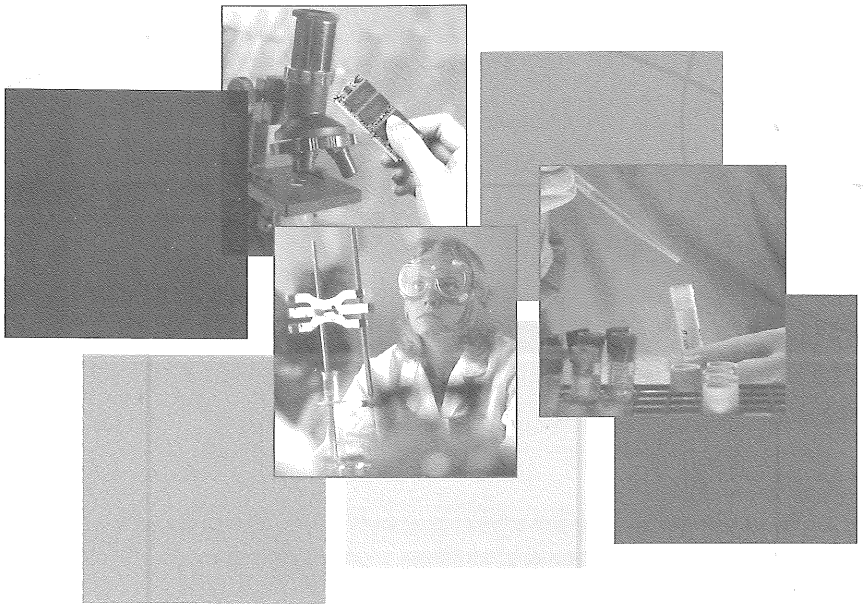

# Biomedical Technology

## Design Your Future

### BIOMEDICAL TECHNOLOGY PROGRAMS

***"...Minnesota's medical technology industry is recognized worldwide for being at the forefront of innovation".***[1]

The Biomedical Technology Programs at Anoka-Ramsey Community College prepare students to work or advance in the medical device industry. Program graduates work in a variety of positions in this dynamic industry, depending upon their background and interests. Some become members of teams that develop or manufacture devices like implantable cardiac pacemakers, artificial heart valves or in-the-ear hearing aids. Others may be involved in clinical research to study the effectiveness and safety of such devices.

Anoka-Ramsey Community College has worked closely with partners in the medical device industry to create three unique Biomedical Technology Programs, designed to support industry growth. These industry partners have helped to develop and review program curricula to ensure that students have the education needed by the device industry. In addition, the programs provide professional challenges that entice creativity and satisfy students' desire to improve the quality of life for others.

***"In 2000, there were over 2,800 businesses in Minnesota in biotechnology and related industries, employing nearly 60,000 people...."***[2]

### PROGRAM HIGHLIGHTS:

- *Biomedical faculty are industry professionals who bring real industry experience to the classroom.*
- *Students can choose their own pace—starting with the technician certificate, building to the AS degree, and continuing on to complete a four-year baccalaureate program.*
- *An internship provides hands-on application of course material in an industry setting.*
- *Regional employers are recruiting our students and graduates.*
- *No other biomedical program of this type exists in the state of Minnesota.*

---

[1] MN Department of Employment and Economic Development, Industry Fact Sheet, BCD-00680, 2/04 - 500

[2] MN Department of Trade and Industry, Industry Fact Sheet, BCD-0068M, 2/03.

# Educational Excellence Designed for Your Future


**Cambridge Campus**
300 Polk Street South
Cambridge
Minnesota
55008
Telephone: 763-689-7000
Facsimile: 763-689-7050

**Coon Rapids Campus**
11200 Mississippi Blvd. NW
Coon Rapids
Minnesota
55433
Telephone: 763-427-2600
Facsimile: 763-422-3341


## Three Program Options:

### Biomedical Technician Certificate — 33 credits

This program prepares students for entry-level positions or for advancement in the biomedical device and product industry. The certificate program is designed to meet the needs of students who may have no prior background, as well as students with advanced degrees. Depending upon prior education and experience, graduates will work in a wide variety of positions in manufacturing, product development and testing.
Starting salaries typically range from $25,000–$40,000.

Additionally, the certificate program provides the foundation for the A.S. degree program below, and many of the courses transfer to four-year institutions. Program Core Courses are offered in the evening. Most other courses are available in the evening or online.

**Program Core Requirements — Credits: 12**

- Introduction to Biomedical Devices/Industry 2
- Design & Manufacturing in the Medical Device Industry 3
- Introduction to Medical Device Regulations/Ethics 3
- Field Experience & Seminar with a biomedical company 4

**Additional Requirements — Credits: 21**

- Medical Terminology 2
- The Human Body 4
- Human Relations in the Workplace 3
- Career Development 2
- College Writing & Critical Reading 4
- Introductory Statistics I 3
- Introduction to Speech Communication 3

### Biomedical Technologist Associate in Science — 62 credits

This degree program prepares students for entry-level positions in biomedical companies and for transfer to programs at various four-year universities. The 62-credit Associate in Science degree builds on the 33-credit Biomedical Technician Certificate, adding additional coursework in science and technology, problem-solving, critical analysis, oral and written communication, and interpersonal skills. "Hands-on" learning is a key component, including a field experience with a local biomedical company. Graduates typically start at salaries that range from $28,000–$40,000, depending upon prior experience.

### Clinical Research Professional Certificate — 24 credits

This program is designed for students who have already completed an RN (AS, AD, BSN) degree or a bachelor's degree in pharmacology, biology or related field, and plan to work in clinical research positions within biomedical or other health-related companies. Graduates will work in research monitoring, clinical research coordination, clinical data management, and regulatory affairs. Classes include 15 credits in specific biomedical coursework that include introduction to clinical research and a field experience with a biomedical company. The remaining nine credits are taken in microbiology, statistics, and pharmacology. Starting salaries range from $35,000–$55,000, depending upon prior experience.

Contact: Carole Fuller, Biomedical Programs Director, 763-576-4640 or carole.fuller@anokaramsey.edu

**This document can be made available in different formats upon request.**
**Please call 763-576-4640 or 1.800.627.3529 (TTY/TDD)**

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| INSTITUTION | PROJECT/REQUEST | LOCATION |
|---|---|---|

# Anoka-Ramsey Community College

Cambridge,
Coon Rapids

Biomedical Device Manufacturing

$1,500,000

## Project at a Glance

- Meet expanding industry needs in the biomedical device manufacturing fields
- Expand biomedical technology education to accommodate the rapid pace of technological change
- Provide options in biomedical device technology education to serve traditional degree-seeking students, degree-holders who need to update skills and retrain dislocated workers with varied skill sets

## Project Description

Minnesota is home to some of the world's largest biomedical device manufacturing companies:

- Medtronic ($7.6 billion in annual sales)
- 3M's Medical Products division ($3.5 billion in annual sales)
- Saint Jude ($1.5 billion in annual sales)

Source: Dunn & Bradstreet's "Corporate Report Fact Book 2003."

Minnesota also is home to manufacturing and research and development operations for other industry leaders, including Guidant and Boston Scientific, plus hundreds of small to midsize firms that have grown and thrive in the Minneapolis-St. Paul region.

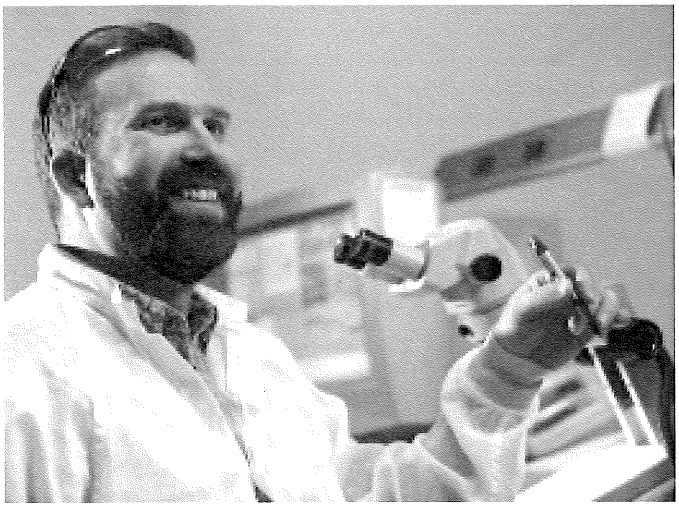
Anoka-Ramsey Community College has developed unique academic programs serving this industry including:

- High-end clinical research professional certificate program
- Biomedical technologist associate degree
- Biomedical technician certificate program

This project will support expansion of the college's credit programs to better serve the biomedical device manufacturing industry, accommodate the rapid pace of technological change and provide a higher education option for traditional degree-seeking students looking to work in the industry, degree-holders with work experience in software design, computer applications, engineering and health care, and dislocated workers.

**Proposed program initiatives to serve industry needs include:**

- Developing a clinical data manager certificate program. Clinical data management is a new skill mix that combines clinical research, software development, database management, and an understanding of complex regulatory and insurance reimbursement requirements.



*David Yalch, senior manufacturing technician at Medtronic, Inc., entered the biomedical field as a graduate of Anoka-Ramsey Community College.*

It is essential for companies of all sizes that are developing, designing, prototyping or preparing to market new or re-designed products.

- Design a center for microsurgery and telemedicine. This is an important new arena for health care providers and medical device professionals that has arisen due to the development of long-term implantable health-monitoring devices and the ever decreasing size of medical devices. The center is used for research of pharmaceuticals and medical devices. Further, the center is anticipated to be used for monitoring chronic health conditions in humans.
- Create national skill standards. All of Minnesota's large and many small and midsize medical device companies have national and international operations, vendors and service or equipment providers. Yet, there is no current method of assuring consistent education for individuals entering the industry. Anoka-Ramsey Community College through its partnership with the Medical Device Cluster group (funded through the U.S. Department of Education) is ideally suited to lead the effort to create national and international skill standards.

## Anoka-Ramsey Community College: A Strong Business and Industry Partner

Anoka-Ramsey Community College, with campuses in Cambridge and Coon Rapids, is committed to developing relationships with business and industry that are mutually beneficial and that contribute to the long-term growth and success of the business or industry. The college benefits as well by gaining insight into evolving technologies and other drivers of industry change that inform college curriculum, ensuring that graduates are well-prepared for entering the workforce.

The college is engaged with business and industry through:

- Identification of training and development needs and resources.

  Customized training specialists assist business and industry with training and consulting. Specialists work with companies to deliver educational or training programs at the worksite or on campus. The college offers flexible credit, noncredit and customized programs and sources to meet business and industry's needs.

- Enhancing economic development locally and statewide.

  In order to remain a world-class competitor in the global marketplace, Minnesota must develop a world-class workforce. Anoka-Ramsey Community College works with local governmental agencies and the Anoka County Economic Development Partnership to address these challenges. The college provides learning opportunities for the beginning worker, dislocated worker and incumbent worker to enhance business growth and employee productivity.

- Participation in Chambers of Commerce.

  Anoka-Ramsey Community College participates in civic organizations such as Rotary, Kiwanis, North Suburban Women's Club, Lions and more. Participation in these endeavors demonstrates commitment to the long-term growth and sustainability of the many communities served by the college.

- Placement of skilled employees.

  Business and industry hire students as interns and graduates as employees. Some students choose to transfer to other colleges to complete bachelor's degrees; these students also fit employment needs of area companies and have been hired while they continue their education.

### Lead Institution:

Anoka-Ramsey
Community College
www.anokaramsey.edu
President Patrick Johns
Phone: (763) 422-3435

### Project Contact:

Rosie Mortenson
Dean of Continuing Education
& Customized Training
Phone: (763) 422-3301
rosie.mortenson@anokaramsey.edu

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# Minnesota Job Skills Partnership Grants

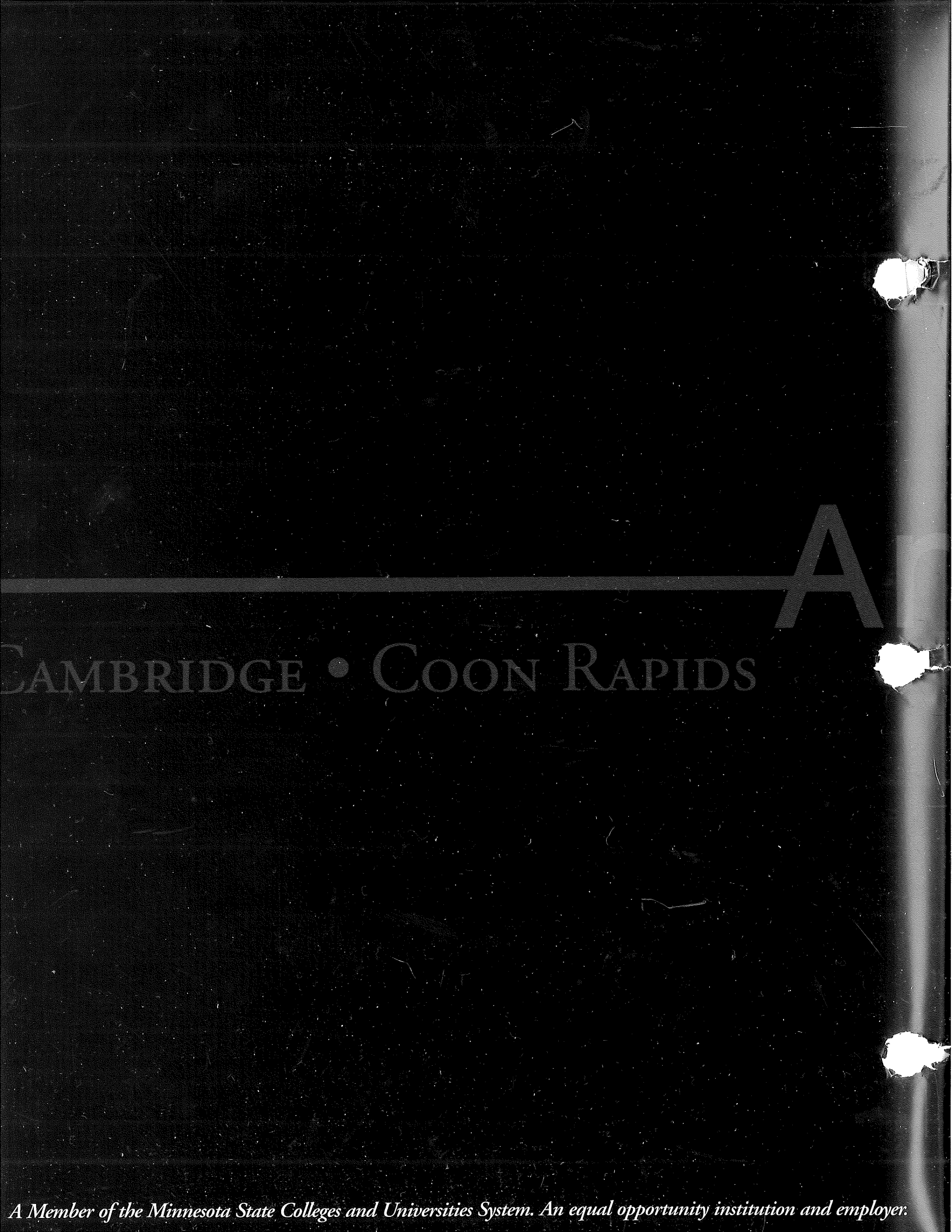
The Minnesota Job Skills Partnership grants are a tremendous opportunity for businesses and education institutions to partner and provide training to company employees and expand college capacity. Anoka-Ramsey Community College is a leader in the grant development and management process. Our approach is to help businesses explore a broad range of their workforce development needs – then capture these needs in a realistic, yet innovative training plan and compelling grant application.

The process has proven rewarding for our business partners and has resulted in ARCC's procuring over five million dollars to serve the needs of businesses in the Twin Cities region and East Central Minnesota. ARCC has one of the most experienced MJSP grant writers on staff. Our grant managers are seen as a true resource to our business partners.

*For information on the Minnesota Job Skills Partnership and ARCC's grant development resources, please contact Jess Niebuhr at 763.422.3414 or jess.niebuhr@anokaramsey.edu.*

| | | |
|---|---|---|
| 1997 – 12/99 | ARCC Coon Rapids Campus with **Possis Medical, Inc.** (Project closed 1999) | $200,000 |
| 10/98 – 04/02 | ARCC Coon Rapids Campus with **The John Roberts Co**. providing all levels of training in printing, print processes, and brand identity. (Project closed 2002) | $205,160 |
| 07/99 – 2/04 | ARCC Coon Rapids Campus with **Mercy Hospital** providing training in electronic documentation of health care records and basic computer use. (Project Closed 2004) | $385,000 |
| \/99 – 10/03 | ARCC Coon Rapids Campus with **Possis Medical, Inc**. providing assistance in the transition from a research firm to a manufacturing firm. (Project Closed 2003) | $305,827 |
| 05/00 – 2/04 | ARCC Cambridge Campus with **East Central Allied Health Consortium** providing supervisory training targeted at reducing turnover and creating a more stable and rewarding work environment. (Project Closed 2004) | $285,000 |
| 11/00 – 7/05 | ARCC Coon Rapids Campus with **Mercy and Unity Hospitals** developing a new patient care plan and developing accessible education options for mid-career health professionals. | $379,800 |
| 11/00 – 10/03 | ARCC Coon Rapids with **Data Sciences, International** providing the resources to assist a company experiencing significant growth and transitioning from design, development and manufacture of medical device/monitoring equipment for animals to approaching the FDA for product approval in humans. (Project Closed 2003) | $329,863 |
| 09/01 – 07/04 | ARCC Coon Rapids with **Boston Scientific SCIMED** developing computer based training for medical device industry scientists, engineers and other professionals. (Project Closed 2004) | $400,000 |
| 04/02 – 04/05 | **Minneapolis Speaker Company (MISCO)** Project includes worker preparation courses and instruction on the basic concepts of loud speakers. Training on line assembly of speakers for various uses and installations. Additionally ARCC will provide instruction on world-class manufacturing and leadership. Includes training on computer aided testing for individuals who perform final product testing and training on the Robot XYZ assembly machine (MISCO's 1st robotic assembly machine.) | $189,515 |
| 04/02 – 04/05 | **American Medical Systems** Develop web-based training on AMS products; pathology of incontinence, E.D., and obstructive relief urology. Project includes development of web based certificate programs for ARCC. | $356,365 |
| 04/02 – 04/05 | **ADC Telecommunications** Provide Cisco Network Associate, Network Professional | $201,979 |

| | | |
|---|---|---|
| | and Design Professional training, plus, CD enhanced blended learning for customer service individuals needing familiarity with ADC products, services and processes. | |
| 11/02 – 11/05 | **MedSource Technologies** Brooklyn Park facility is undergoing significant change. ARCC will assist through training in many areas, including Swiss machining, laser welding, supervisory and management skills, quality, SPC, and other areas as needed. | $240,000 |
| 6/03 – 6/06 | **OakRiver Technology** is a medical device engineering solutions firm. Partnership includes extensive training on OakRiver Technology business processes, including Root Cause Analysis, Manufacturing Process Development, FDA requirements of Good Manufacturing Principles, Technical Engineering Processes and Product Development, Production, Workmanship Excellence, Supply Chain Management and Successful Business Culture. | $242,126 |
| 6/03 – 6/06 | **3M** Stillwater's partnership is designed to help 3M Stillwater respond to the ever increasing need for efficiency and lower production costs in the automotive indust Training includes: production processes, preventative and corrective actions, quality stand and statistics and electronic databases and communication, plus "Green Belt Light", and introduction to Six Sigma Language. | $315,345 |
| 6/03 – 6/06 | **E & O Tool & Plastics, Inc.** is a full service original equipment Manufacturer (OEM). The partnership is designed to improve productivity processes, including training on Cell Technology, Lean Manufacturing, Theor Constraint and Making the Transition to a Lean Environment. | $100,000 |
| 6/03 – 6/06 | Training for **CIMA LABS, Inc.** a pharmaceutical company, includes operator training on five primary production processes, plus training on data collection, statistical processes, the drug development process, Train-the-Trainer and project management. | $360,000 |
| 6/03 – 6/06 | **Synovis Interventional Solutions** is a medical device manufacturing company. The partnership is designed to provide training for Synovis employees as the company grows rapidly and transitions to new product lines and begins to market products under the Synovis brand. | $310,000 |
| 12/03 – 02/07 | **Transoma Medical** (formerly DSI) is a world leader in manufacturing telemetric devices for implantation in research animals. The company has developed a product for long term implantation in humans to monitor congestive heart disease. The partnership includes a wide variety of training topics, including but not limited to: telemedicine, bioethics, FDA approval and compliance, US and European labeling requirements, understanding insurance reimbursement process, understanding the drug development process, and sleep studies. | $378,222 |
| 6/04 – 6/07 | **Cambridge Medical Center and Grandview Christian Ministries** ARCC will provide training to help improving processes and productivity at both facilities. Training will also be provided on lifting equipment and transitioning to "no-lift" environments, to reduce patient and employee injuries and worker's compensation insurance premiums. Part of the grant will be to create a lifting lab on the Cambridge Campus as a demonstration and training site for the partner facilities, the college, and perhaps other area health care providers. | $399,846 |
| 10/04-10/05 | **Top Tool Company** - ARCC will develop and provide training to company employees in a range of topics focused on process improvement, budgets and forecasting, statistical analysis and company specific procedures. | $49,444 |
| **Total Grant Dollars** | | **$5,584,048** |

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