



1994

An Empirical Study of the Area Education Agency Cooperative Purchasing Programs as Utilized by the Local School Districts in the State of Iowa

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AN EMPIRICAL STUDY OF THE AREA EDUCATION AGENCY
COOPERATIVE PURCHASING PROGRAMS AS UTILIZED
BY THE LOCAL SCHOOL DISTRICTS
IN THE STATE OF IOWA

by

Paul L. Knudtson

A Dissertation Submitted to the Faculty of the Graduate School of Education
of Loyola University of Chicago in Partial Fulfillment
of the Requirement for the Degree of
Doctor of Education

January

1994

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P.L.K.

VITA

The author, Paul L. Knudtson, is the son of Orvin T. Knudtson and Dorothy (Leliefeld) Knudtson. He was born May 18, 1944 in Guttenberg, Iowa.

His elementary education was obtained at St. Mary's Catholic School in Guttenberg, Iowa. His secondary education was completed in 1962 at St. Mary's Catholic High School, Guttenberg, Iowa.

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CHAPTER 1

Introduction

Enrollment in the public schools of Iowa has decreased from 485,676 students in 1985-86 to 483,396 in 1990-91.¹ Even though the enrollment has remained slightly above or below the 480,000 figure since 1985, Munsterman and Hall noted the steady increase in the personnel cost of operating schools. Just in the six years between 1967 to 1973, the percentage of local district budget being consumed by personnel costs grew nationally from 68% to over 80%.² Expenditures as a percent of the total operating funds for salaries and benefits for Iowa's public schools was 82.8% in 1990. Total revenues for the public schools exceeded \$1.8 billion in 1990 but only \$300 million of that amount was for purchased services, supplies, capital outlay and other expenses.³

When these figures are examined closely, 5.1% of total revenues were available for 1989-90 supplies needed by schools which emphasizes the need for districts to be efficient in their purchasing strategies.⁴ Hallaway and Clarke's research on purchasing in the United States observed local districts as having the opportunity to purchase by cooperating with other districts and saving significant dollars, but instead often choosing to exercise their privilege of independently buying their own supplies and equipment.⁵ Possible explanation for why districts

¹ Iowa Department of Education, "The Annual Condition of Education Report", (November, 1991): pp. 24-27.

² William H. Holloway and Wayne H. Clark, "Cooperative Purchasing in the Public Schools: A Status Report with Comparisons," *Planning & Changing*, (Summer-Fall 1977): pp. 97-107.

³ Iowa Department of Education, "The Annual Condition of Education Report", (November 1991): pp. 28-39.

⁴ *Ibid.*, p. 36.

⁵ William H. Holloway and Wayne H. Clark, "Cooperative Purchasing in the Public Schools: A Status Report with Comparisons," *Planning & Changing*, (Summer-Fall, 1977): 97-107.

may choose not to exercise cooperative purchasing options include the lack of willingness to develop collaborative relations with other districts, the belief that cooperative or joint purchasing strategies lead to inferior product selection, the loss of local control when each district does not control the entire process of purchasing, the belief that cooperative strategies take business out of the local community and the fear of not being able to retain quality service.

Purpose Of The Study

The preparation of students to compete in a global economy, collaborative education, shared decision-making and school transformation are some of the latest trends in the education. Public schools are faced with these and other new demands -- especially from the business and tax paying community -- to be simultaneously responsive to the public's educational needs and to be cost efficient in the management of the entire educational operation.

This study will examine the purchasing methods used by the public school districts in Iowa to acquire their educational supplies. An attempt will be made to identify the different purchasing strategies presently being utilized by the public school districts and these strategies will be correlated with the prices paid for commonly purchased items across the state. To determine what purchasing strategies the public school districts are utilizing, and to collect data on the prices paid for commonly purchased items, the following questions need to be answered:

1. What purchasing strategies are presently being utilized by the public school districts in Iowa?
2. Are the school districts exercising their options as individual districts or are they requesting available services from the area education agencies?
3. What are the public school districts of Iowa presently doing to accomplish the need to be efficient in the use of tax funds allotted for the purchase of supplies and equipment?
4. What are the prices paid to acquire commonly purchased supplies and equipment when different purchasing strategies are utilized?
5. Does the size and/or location of a public school district in Iowa have a bearing on the prices paid for supplies and equipment?

The following hypotheses are proposed to act as a guide to this study, as well as narrow and focus this investigation as to the variables affecting the prices paid for commonly purchased items.

Hypotheses

1. There is no significant difference in the price paid for commonly purchased items as determined by size of the public school district.
2. There is no significant difference in the price paid for commonly purchased items as determined by membership in a buying group.
3. There is no significant difference in the prices paid for commonly

purchased items as determined by the distance from centers of Iowa.

Significance of the Study

Because the state of Iowa has a budget deficit of over \$200 million, state aid flowing to school districts was reduced 7 percent for fiscal year 1991-92. This was followed by a change in the funding formula for the 1992-93 fiscal year. Districts experiencing growth in student enrollment received no additional funds and districts losing students had their funds reduced proportionately. Iowa Legislative action is not presently allowing the school districts to recover lost growth through property taxation. With school district revenues coming primarily from property tax and state aid, districts had but a few options to acquire sufficient funds to operate their programs.

The districts could levy for unexpended budget balances, a Site Levy of \$0.33 per \$1,000 of assessed evaluation and also a levy of \$0.675 per \$1,000 of assessed evaluation for physical plant upkeep. Also, the board of directors could exercise a local option tax equal to 10% of the per pupil cost. As established in 1970, Iowa's school-aid formula annually determines the dollars that will flow from the state. A district's enrollment is used to determine the amount of its budget and the assessed valuation of the property within a district's boundaries determines the state aid and property taxes needed to support the budget. Districts may also receive monies through the AEAs to fund programs and services coordinated through these

regional agencies. Public school districts may increase their budgets through income from local income surtaxes, special levies and miscellaneous income. The local board has the authority by Iowa Code to implement some activities to increase a district's miscellaneous income and to authorize certain levies to specified limit and period of time without the vote of the people. ⁶

A sales tax increase of 1% and a severe cutback in government spending has helped to reduce the \$200 million state deficit but is not helping the school districts fund their programs. Even though local districts will receive an additional \$88 million for fiscal year 1992-93, this amount is \$40 million less than anticipated.

The new standards for Iowa schools as imposed by the state legislature, the state's budget deficit, the changes made in finance formula for K-12 education and the recent transformation of the operation and governance of schools are shaping the districts of Iowa to come in line with successful business practices.

This study will attempt to assist district personnel interpret data to assess their purchasing strategies which may result in the implementation of new strategies or the refinement of existing purchasing procedures to save dollars and increase productivity.

The history and development of providing education to our youth was traced by Knezevich from the early days of public education in this country. This history traces the gradual development of an intermediate agency between the state board of education and the local school district and would assist schools to accomplish the

⁶ Iowa Department of Education, "The Annual Condition of Education Report," (November 1991): 29.

task of public education.⁷

Stephens the noted authority on regional service agencies states that “the development of effective and efficient structures for providing educational opportunities to school-age children and youth in state systems of education has for a long time occupied the attention of educational and political planners and decisions-makers.”⁸

When the AEAs were established by the Iowa General Assembly in 1974, their primary mission was to ensure all children in the state an equal opportunity for a quality education. By offering special education, media service, and other optional programs and services, this mission is being accomplished.

In “Area Education Agency - Structure of Services Study,” the AEAs emphasized their mission of “equity of educational opportunity for all children.”⁹ In a brochure developed in 1989, the directors of the Educational Services Divisions of the AEAs pointed out: “The flexibility of Educational Services funding has allowed each AEA to develop services unique to the needs of the districts. Five critical services consistently offered by all Education Service Divisions of the AEAs are staff development, curriculum, student events, computer and advanced technology, and cooperative purchasing.”¹⁰ It is the goal of the AEAs to offer programs and services that districts would otherwise be unable to afford on their

⁷ Stephen J. Knezevich, “Administration of Public Education - A Sourcebook for the Leadership and Management of Educational Institutions,” 4th ed., New York, NY: Harper & Row, (1984): 190-191

⁸ E. Robert Stephens, “Regional Educational Service Agencies,” Monograph - Educational Research, Inc. (1975): 1

⁹ Iowa Department of Education, Instructional/Educational Services Group, “Area Education Agency Structure of Services Study,” (1989): 1.

¹⁰ Ibid., p. 2

own or at all. Request from the school districts becomes a part of the mission of the AEA's to perform. Districts support the AEAs on a per student basis and these monies allow the AEAs to meet the needs of the schools. If the service requested cannot be provided with the funds available, the districts have the option to pay for the service or to prioritize existing services through advisory councils to the AEAs.

Definition of Terms

Commonly Purchased Items: These items were identified from reviewing similar studies conducted in other States, from districts' purchasing records in Iowa, from AEA cooperative purchasing coordinators across the state, and from an examination of the purchasing records of the Heartland Area Education Agency's Cooperative Purchasing records for the past 10 years.

Cost Efficiency: The price of performing a function in purchasing includes the cost of the product or service acquired and the investment of personnel time. Efficiency is achieved when, all factors considered, the cost of the goods or service is the best possible under the conditions present at the time of acquisition.

Equity: Each district has the right to the same opportunities through the AEAs for the development of quality educational programs.¹¹

Purchasing Strategies: Refers to a district's decision to buy a certain item or supply of items as a single district (individual), with one or more other school

¹¹ Iowa Department of Education, Instructional/Educational Services Group, "Area Education Agency Structure of Services Study: (1989): 5.

districts (collaborative), or as a participant in an AEA cooperative purchasing program (AEA cooperative).

Statement of General Methodology

Instrumentation

A preliminary survey of participating districts' cooperative purchasing records, plus input from AEA cooperative purchasing coordinators provided a list of the 10 commonly purchased equipment and supply items normally purchased by Iowa school districts. Demographic questions were included to correlate pricing information with district student populations and the distance to the closest metropolitan areas of the state, and to determine the responsibility factors and training of the person completing the survey instrument. Prices paid for commonly purchased items were to be obtained from district invoices.

Sampling

The entire state (417 districts) was determined to be an unnecessarily large group and therefore a statistically proportional group of 197 districts was selected for inclusion in the study. A stratified random sampling was used to ensure that the proportion of each school district's student population of small (0-550), medium (551-1,100), and large (1101-9,750) was in the same proportion within each AEA as that population group was in the state.

The even districts with student populations over 9,750 were considered as a

separate population. Packets containing a letter of introduction and explanation, a memorandum to the district's purchaser and the survey form were sent to the district superintendent (Appendix A).

CHAPTER 2

Review of the Literature

Introduction

Purchasing efficiency and its outcome – reduced cost for supplies and equipment – is a major goal of all school districts across Iowa. In the last two decades, the research has shown school districts having to change their total operating procedures to be in line with the changes in our economy. School boards and administrators no longer have exclusive control of all factors in the operation of providing education in their districts. The demographics of Iowa's economy has caused districts to share service cost and pool resources to accomplish standards of education being demanded by the community.

An examination of rural Iowa demographics reveals not only the basis for the economic changes affecting schools, but also helps to explain the shift in the political support base for the funding of education.

The difficulty for the small district lies with the sparsity of its student population and the inclusive economic base for the schools to provide a full-service education. The new curriculum and management standards being placed on the districts by the Iowa General Assembly and parents can only be accomplished in districts with at least two sections of students for each grade. Presently, 70 of Iowa's 417 school districts do not have more than one section of students for each grade level. Whole grade sharing and other collaborative strategies are often the only options available to small districts, short of reorganization. New legislation on open enrollment allows parents to send their children to another school when they

do not receive the same educational options offered by the multi-section school districts.

The shift away from an agrarian and an American economy to a market located around the world has forced rural districts to be more efficient and realistic in their utilization of tax dollars. The option of each district having its personnel choose the what, where and when to buy goods or services without compromise is not germane to the attitude of taxpayers or especially to the future needs of their students.

The Iowa General Assembly established area education agencies (AEAs) in 1974 to assist schools in providing the best equity education with the funds available. These agencies provide specialized services on an economic scale affordable to all districts regardless of their size, location or financial condition.

Regional Service Agencies

As early as 1858, intermediate services were being provided to the over 5,000 school districts in the state of Iowa. County superintendents were appointed to carry out the educational standards set by the state and to coordinate the changes as school districts' population grew and the number of districts continually declined. In 1957, joint-county superintendency was encouraged and in less than two decades the Iowa General Assembly spoke to the need for equity education for all students.¹

¹ E. Robert Stephens, "Intermediate Units: Renewed Interest in the Redesign of Service delivery in State School Systems," Policy Briefs; North Central Regional Educational Laboratory, Report 1 1992, p. 5.

Don Mrdjenovich, superintendent of schools, of Watertown, Wisconsin, found in his research on regional service centers no direct mention of regional or cooperative educational centers in 200 annotated bibliographies featuring the most prominent futurists in North America in 1974. He also pointed out a limit to what extent the public will allow its school district to reduce course offerings or services as a general reaction to the decline in student enrollments.²

Local educators have attempted to meet the needs of all their students by creating alternatives within their own schools and districts. This attempt to create alternative programs within existing schools or establish alternative schools is not often economically possible. It would seem then that another logical consideration would be the creation of alternatives among school districts, mutually planned and coordinated by a cooperative agency. The efforts of each district would be multiplied by the addition of each participating district, and the number of alternatives from which to choose would far exceed any individual undertaking by one district.³

Citing the works of Jencks and Coleman, Weiss concluded that school districts have too many goals, make too many promises that they cannot keep, and in many instances are not the best institutions to deliver the desired services.⁴

Studies done by Stephens, Knezevich, Mrdjenovich, Jencks and Weiss in the late '60s and '70s clearly point out the need for states to establish an education service unit free from the inhibiting restrictions that accompany an organization

² Mrdjenovich, Donald, "Regional Service Centers - A Consumer's viewpoint," Paper presented at the National Conference Sponsored by the National Federation for the Improvement of rural Education, Jan 30 - Feb. 1, 1974.

³ Ibid

⁴ Ibid

with narrow focus, a unit which is free from the inadequacies of finance, personnel, and time and free from the encumbrances of customs that impede innovative, collaborative and cooperative educational efforts.

Stephens, in a paper presented at the National Federation for the Improvement of Rural Education in 1974, summarized the common needs that could be performed most efficiently by the regional service agency.

"These need to equalize and extend educational opportunities for all children and youth in the state system of education; the need to successfully implement the "new technology" in educational processes; the need to improve the quality of educational practice; the need to equalize the financial costs of education; the need to develop, test, and implement a more relevant curriculum; the need to invest substantial resources in the training and retraining of educational personnel; the need for a sophisticated dissemination network to announce and hasten the implementation of effective educational practice; the need to establish a valid research, development, and evaluation network; the need to administer and deliver educational programs and services in the most efficient and effective manner possible to reflect sound cost-benefit/cost-effectiveness principles; the need to develop new mechanisms to promote a healthy interface at all levels among the units of school government and among school government, general government, and the private sector; the need to establish a viable structure of school government as an important prerequisite for the development and maintenance of a sound state system of education; and the need to develop meaningful long-range planning and technical capabilities."⁵

According to Stephens, the term "regional educational service agency" (RESA) is utilized to describe the middle-level agency between the state departments of education and the local public school district. The AEA's (as the RESA's are called in Iowa) encompass a geographic region, frequently extending beyond the political boundaries of any other public governing entity for education. However, the Media and Educational Services divisions of the AEA's do not perform the administrative and regulatory functions for the state. The Special

⁵ E. Robert Stephens, "The Emerging Role of Regional Service Centers" pp.62-63

Education division of the AEAs do perform both state and federal regulatory functions.⁶

Knezevich, in his research of the regional service concept, makes the point that unless all school districts are structured so as to serve 10,000 or more students, there is a need for an effective intermediate unit of educational administration. The sparseness of population in most states, as well as transportation limitations and desires to form community school districts, meant that most reorganized school districts would have fewer than 10,000 students needed to provide a comprehensive and quality program of education at a reasonable cost per pupil. This means that another special unit is necessary to provide special services for a cluster of local school districts either because there are too few pupils in any single reorganized local unit or because the costs for one district alone would be considered to be prohibitive.⁷

In 1974, 15 AEAs were established in Iowa and their mission to ensure equity of opportunity and education for all students in the state became law. This mission is being accomplished by providing a diversity of services including the following:

1. Identification, diagnosis, educational planning, and therapy for children with mental, physical, emotional or learning disabilities, from birth to age 21.
2. Inservice on materials selection, curriculum development, instructional technology, teaching and administrative skills.
3. Staff development courses and computer labs.
4. Administrative data processing.
5. Circulating collections of instructional videos, films, books, software, kits, records, filmstrips with regular van delivery to area schools.
6. Professional development materials, curriculum materials and access to educational databanks.

⁶ Ibid

⁷ Knezevich p. 193

7. Media production, printing, and duplication services.
8. School planning studies, surveys, testing enrollment projections, and program evaluations.
9. Cooperative purchasing of supplies, equipment and technological hardware.⁸

The Iowa Department of Education's Instructional/Educational Services Group study of 1989 recognized "the growing awareness by the business and political community that quality education is critical for all children if America is to maintain its competitive edge in a global, technological society."⁹

The future of the education service agency will ultimately depend on how well services are provided to its clients without infringing on the defined responsibilities of other member agencies in the system.¹⁰

Purchasing and School Fiscal Responsibility

The 1993 fiscal year budget for public schools in Iowa is around \$2.367 billion. This budget is divided into two fund groups that account for school districts' generation and expenditure of funds: the general fund and the schoolhouse fund. In the general fund, the majority of revenues and expenditures is accounted for in the operating fund. The examination of expenditures includes both programs and object category areas.

Revenues come from federal, state, intermediate and local sources. Federal funds are generally provided from programs such as remediation and food

⁸ Stephens, page 5.

⁹ Iowa Department of Education, Instructional /Educational Services Group, "Area Education Agency Structure of Services Study," (1989): 1

¹⁰ Lewis, Rae M., "The Education Service Agency - Where Next," Draft copy from AASA, 1983, p. 18

programs based upon the needs of districts. In addition to these revenues, local school districts may increase budgets through income surtaxes, special levies and miscellaneous income.

The majority of the revenue for school districts is provided by property taxes and state aid and the distribution of these resources is determined by the finance formula. The total enrollment of a district is used to determine the amount of its budget, while the assessed valuation of property determines the state aid and property taxes needed to support the budget.

School districts also receive some services through the AEAs. The funds for these services (approximately \$241 million or 10.2% based upon the 1993 fiscal year estimate) are flow-through monies from each districts' budget and are primarily used to fund programs and services coordinated through the AEAs.

The distribution of total general fund revenues by source for the fiscal years for 1985-86 and 1989-90 are presented in Table 1. While the federal and intermediate (AEA) sources revenue sources remained relatively constant during this five year period, significant shifts occurred in revenues from local and state sources.

From 1985-86 to 1989-90 federal revenues increased nearly 19 percent, although the proportion of total revenues accounted for by federal revenues remained relatively constant at about 2.5 percent. Increases in federal revenue across enrollment categories varied from 4.3 percent in districts with enrollments of 600-999 to more than 30 percent in districts with enrollments of 7,500 and above.¹¹

Intermediate (AEAs) sources of funds for the local districts increased by 28.6% during this same time period, with a fairly balanced distribution of funds by

¹¹ Annual Condition of Education Report Nov.1991 p.30

district enrollment. State contribution increased most significantly, with the greatest increases - nearly 75% - going to districts with enrollments less than 600.¹²

Munsterman and Hall noted that the major portion of a district's funds are expended for the services of professional and non-professional personnel. This cost may range from 65% to 85% of a district's budget with district, state and national averages rapidly approaching the upper limit.¹³

When the total operating expenditures for fiscal year 1990-91 are examined, 82.5% of a district's funds are expended for salaries (67.9%) and benefits (14.6%). Considering the fiscal year 1993 budget for public schools in Iowa is at around \$2.367 billion, \$1.953 billion goes for salaries and benefits.

Table 2 presents the object category expenditures as a percent of total operating expenditures for 1990-91. This data provides the basis of determining the funds expended for purchased services, supplies and capital outlay. The combined object category expenditures for these three groups for 1992-93 fiscal year is 17%, amounting to an estimated \$402 million.¹⁴

The Iowa Department of Education's The Annual Condition Of Education Report of November 1992, states that the total operating expenditures for public schools for 1990-91 to be \$1.97 billion. Table 45 of this report, entitled Object Category Expenditures As A Percent Of Total Operating Fund 1990-91 by Enrollment Category, presents data on expenditures for the purchase of school

¹² Ibid

¹³ Richard E. Munsterman and Arthur V. Hall, "Survey Shows Extensive Use of Cooperative Purchasing," in School Business Affairs, June 1973, pp. 148-151.

¹⁴ Iowa Department of Education, 1992. The Annual Condition of Education Report: A Report on elementary Secondary and Community College Education in Iowa. November, 1992. p.42

supplies.¹⁵ Table 3 has summarized this data to show the percentages by district enrollment.

Jarvis et.al. reported in 1967 that as much as one-fifth of school district revenue is spent for supplies and equipment. Although this represents only 20% of the total operational expenditures of a district, the savings could be significant given a sufficiently large margin of savings derived from cooperative purchasing action.¹⁶ The Condition of Education Report documented that 17.8% of district revenues is spent on supplies and equipment.¹⁷

The school districts of Iowa spent an estimated 5.1% of the total combined object category expenditures, \$1.97 billion, for the purchase of supplies. For the 1990-91 school year, this amounts to \$100,470,000.¹⁸

Purchasing by school districts has become big business and most school board have made it a policy to buy from local merchants when service, quality and price are competitive; however, increasingly many boards are taking the position that they represent the interests of all taxpayers in conducting school business and have no obligation to local merchants if patronizing them is not competitive.¹⁹

Saunders pointed out that "purchasing is public business and only full disclosure and open competition will create public confidence." As schools banded together into larger units in the '50's and '60's, the role of a school supplier ranged

¹⁵ op. cit. p.45

¹⁶ Oscar T. Jarvis, Harold W. Gentry, and Lester D. Stephens, Public School Business Administration and Finance (New York: Parke Publishing Company, Inc., 1967).

¹⁷ Iowa Department of Education, 1992. The Annual Condition of Education Report: A Report on elementary Secondary and Community College Education in Iowa. November, 1992.. p. 45

¹⁸ Ibid., p 42

¹⁹ Lester W. Anderson and Lauren A. Van Dyke p.451

Table 1
Distribution of Total Revenues by Source

<u>Source</u>	<u>1985-1986</u>	<u>1989-1990</u>
Local	53.1%	44.6%
State	43.8%	52.4%
Federal	2.6%	2.5%
Intermediate	0.5%	0.5%

Table 2
Object Category Expenditures As A Percent
Of Total Operating Expenditures
1990-91

Object Category	Percent of Total
Salaries	67.9
Benefits	14.6
Purchased Services	9.7
Supplies	5.1
Capital Outlay	2.2
Other Expenses*	0.5

*Expenditures for redemption of principal, interest, taxes, insurance, expense in lieu of insurance, judgments against local districts and miscellaneous expenditures.

Table 3
Object Category Expenditures As A Percent
Of
Total Operating fund
Object Category: Supplies

<u>State</u>	<u>Enrollment Category</u>						
	<u><250</u>	<u>250-399</u>	<u>400-599</u>	<u>600-999</u>	<u>1,000-2,499</u>	<u>2,500-7,499</u>	<u>7,500+</u>
5.1	6.2	6.5	6.2	6.1	5.4	4.4	3.8

from that of a "peddler" to a very sophisticated service technician. The fragmented system of small school purchasing has evolved into one of departmental responsibilities with definite policies and procedures.²⁰

Politicians often look toward the schools as the answer to all social ills, but also they must solve these problems with little or only one-time grant monies. The necessity to economize is not a new concept with school districts that are often the target of cuts whenever high taxes becomes an issue. In 1956, Linn pointed out the difficulty that school districts were having in the raising of sufficient revenue, and it appeared inexcusable that individual districts should be permitted to waste funds through uneconomical purchasing when a relatively simple procedure of cooperative purchasing would result in the savings of hundreds of thousands of dollars throughout the country.²¹

Public Cooperative Purchasing Collaborative Strategies

School districts in Iowa have utilized a variety of strategies in acquiring products and services needed for their operations. From the concept of having open accounts at the local hardware store or lumberyard to the purchase of materials off of a General Services Administration contract with the state of Iowa, school districts have a variety of purchasing options from which to choose.

Illinois legislation permits joint-powers agreements between state government

²⁰ Saunders, Jr., "Accountability: The big Word In Purchasing" School Business Affairs, march 1961, pp.12-13.

²¹ Henry H. Linn, School Business Administration (New York: the Ronald Press Company, 1956), p.252.

entities. Joint purchasing boards are empowered to accept and/or reject bids on behalf of each respective participating board of education. Kula reported on a joint bids arrangement representing 20,000 Chicago elementary students in which the price accepted by the joint purchasing board included the direct delivery to and the direct billing of each district. Storage space and a shortage of staff required accessing this strategy even though centralized receiving would save shipping cost and some other administrative cost.²²

The Illinois cooperative purchasing strategies as reported by Kula basically concerned the acceptance of bids, with each district issuing its own purchase orders, handling the receipt of its own product and making payment directly to the vendor. Points of saving did result from the shared expense of administrative and clerical time in the processing of bids. Each district did its part in the total process of getting bids under the terms of the specifications involving the price, delivery and payment of the products awarded on the bid.

Another advantage of the Illinois cooperative purchasing process is that the members of the group readily share information regarding products and vendors. There is no advantage to conceal information or data as there would be in the for-profit business community.

As the school districts began to consolidate and reorganize during the '50's and '60's into community and consolidated K-12 districts, the purchase of supplies and equipment became big business and the public demanded full disclosure and accountability. Districts changed their purchasing strategies to become more

²² Kula, Edward J. Cooperative Purchasing Reduces Cost "School Business Affair", v47 n3 p12-13 Mar 81

sophisticated because the dollar volume for purchasing increased and public scrutiny of purchases became more critical. As reported by Saunders, the cost of placing a legal ad, opening bids in public, and making decisions in public is a small price to pay for public confidence.²³

In a survey of high schools in the state of North Dakota, O'Shea not only documented the savings to all schools when cooperative purchasing strategies were utilized, but also pointed out - as did Kula - that the information shared between districts is an additional advantage: "...decisions on the local level could be better decisions as the boards would have more information on supplies and equipment prices on which to base their decisions."²⁴

A two-year study by Patterson of the cost-effectiveness of cooperative programs operated by voluntary consortia of colleges and universities concluded that "there are not many absolutes in cooperative purchasing beyond the first and most important recognition that important cost savings can be realized. The essential elements of the process to realize these savings are: Authority, Leadership, Organization and Savings" He further pointed out that "cooperating groups indicates that additional benefits (shared experiences and information among men and women with similar roles) are truly substantial."²⁵

The 15 AEA's for the state of Iowa facilitate a wide variety of purchasing

²³ Saunders, Frank Jr. Accountability: The Big Word In Purchasing, "School Business Affairs", 47:3)12-13 march 1981.

²⁴ O'Shea, Daniel R. and Pipper, Donald L. Saving Money Through Group Bidding by North Dakota School Districts North Dakota University, Grand Forks. Bureau of Educational Research and Service. November 1976.

²⁵ Patterson, Lewis D. Costing Collegiate Cooperation. A Report on the Costs and Benefits of Interinstitutional Programs with Consortium Case Studies and Guidelines. Council of Interinstitutional Leadership, University, Alabama. October, 1979.

strategies to the school districts. A few of these strategies will be discussed in the following paragraphs.

AEA5, centered in Fort Dodge, Iowa, coordinated a state-wide audiovisual purchasing project in which every school district could submit its purchase orders for items from a comprehensive list. The list of items, the writing of the specifications and the awarding of bids was accomplished by a committee representative of one person from each AEA. The co-op coordinator from AEA5 facilitated the entire process; collect the purchase orders; and troubleshoot issues with the vendors for a fee of 1.5% of the dollar value of the order.

Loess Hills AEA13 headquartered in Council Bluffs, Iowa, also facilitates a state-wide Math/Science project in which a percent discount from standard catalogs is achieved from a formal bidding process. A preliminary survey to determine the past year's expenditures for these types of products for the vendor to determine interest in the project. Over \$200,000+ is purchased each year using this process. Dr. Bruce Holmquist coordinates this yearly rate of discount that includes the direct ordering, delivery and billing according to the terms of the awarded contract. An example would be that all items purchased from a particular science catalog would receive a 25% discount with freight free to the district if the purchase order is over \$25. Any exceptions are usually spelled out (e.g., living or preserved specimens are discounted at 12% plus freight and insurance).

Heartland AEA11 centered in Johnston, Iowa, has provided a cooperative purchasing program with product advisory committees from the participating school districts determining what products will be purchased, at what price and

from which vendor. Awards are based on the "best utility as determined by the school districts."²⁶ Each year product ordering categories for athletics/physical education supplies and equipment (S&E), custodial S&E, instructional and office S&E, audiovisual S&E, and kitchen S&E are purchased. The product categories for paper and non-perishable food is purchased once each semester of the school year.

As can be noted from the different strategies to cooperative purchase products in Iowa, there appears to be a variety of needs being met by the AEAs. O'Shea made reference to the limited set of options school districts in North Dakota are forced to face even when they want to be efficient. He listed some of these options as the size of the district, geographic location, tax base, per capita revenue and distance from the larger cities. Those districts located further from the major cities may be influenced in purchasing decisions by factors such as transportation, limited quantity of purchase, limited inventory of each item and limited choice of material for selection.²⁷

Cooperative Purchasing Concepts and Case Studies

As early as 1794, cooperative purchasing strategies was being practiced in the United States with the Journeyman's Union, and farmers followed with similar efforts in the early nineteenth century.

²⁶ Heartland Area Education Agency Cooperative Purchasing Specifications for vendor bids. Kitchen S&E category. April, 1992.

²⁷ O'Shea p.6

Uxer in his research on small school districts in Texas pointed out that the Legislature verified that a student population of 50,000 is needed in order to economically provide support services to all students. Further, his research pointed out that small districts must utilize every opportunity to cut cost or the district will be forced to reorganize. One example of economy was the purchase of 2,500 cases of cut paper at a savings of 28% when purchased cooperatively.²⁸

School districts in the Sacramento, California, area charged each participating school district a flat fee of \$600 per year to cover the expense of operating a warehouse, computer system, salaries and machine cost. Decisions were made using an advisory committee with members of the committees for each product category becoming responsible for testing of and specifications for a particular product. Using this strategy, this co-op was able to recognize savings of 44-47% below list price.²⁹

After one school district in Michigan conducted a survey of nine school districts and what they paid for four commonly purchased food items, these same districts combined their orders for \$600,000 worth of food products and realized a savings between 8-10%. Another food coop in western Michigan combined its order for \$6 million and reduced its food cost by approximately 40%. The key to continuing this level of savings according to Dodge was the participants' insistence that a vendor will either get all the business for the cooperating districts or would

²⁸ Uxer, John E. Sharing Resources in the Small School. Paper presented at the SW Rural Education Conference (Las Cruces, NM, Nov. 5-6, 1982).

²⁹ Hall, Calvin W. Different Approaches to Shared Services. Paper presented at the Annual Meeting of the American Association of School Business Officials (68th, New Orleans, LA, April 7-10, 1980)

get none of it.³⁰

Zorn summarized both the initial concerns and the resultant benefits that are available to districts that consider using cooperative purchasing strategies:

CONCERNS

Loss of local control
Cheaper price, poor quality
Purchases from large
companies only

BENEFITS

Better business practices
Information sharing
Price, quality & inventory
control
Reduced paper trail
Better service

The 25 districts in Michigan that participated in this cooperative realized savings from 10% to more than 40% on a variety of products.³¹

South Chicago school districts pooled their order for supplies to reduce their cost and also to simplify their procurement process. Kula makes a point of the reduction in the workload of district personnel when there is a consolidation of orders. He also points out the mutual sharing of information between districts has the distinct advantage not having to keep secrets from other schools as happens in the competitive for-profit business environment.³²

O'Shea and Piper in 1976 surveyed the high school districts in North Dakota to determine the prices paid for 10 commonly purchased items. The data collected represented prices received both by the individual districts and as participants of a purchasing group (North Dakota School Study Council). When the prices received by individual districts were compared to prices received via buying groups, the data

³⁰ Dodge, William D. How Nine Schools Combined Their Purchasing Power to Lower Food Bills, American School Board Journal, v170 n8 p27 Aug. 1983.

³¹ Zorn, Robert L. Co-op Buying: You Pool Your Power and Pocket Your Savings, American School Board Journal, 160, 4, 42-43 Apr. 1973.

³² Kula, Edward J. Cooperative Purchasing Reduces Cost "School Business Affair", v47 n3 p12-13 Mar 81

pointed out that the co-ops provided savings of 6-62%. Only one instance of a negative savings occurred with no explanation given.³³

³³ O'Shea, David R. and Pipher, Donald L. Saving Money Through Group Bidding by North Dakota School District. North Dakota University, Grand Forks. Bureau of Educational Research and Services. November 1976.

CHAPTER 3 Presentation of Data

Introduction and Purpose

The purpose of this study was first to identify the different purchasing strategies used by the public school districts in the state of Iowa and then to attempt to discover which strategies result in the most cost-efficient acquisition of products.

The public school districts of Iowa have great diversity in their proximity to urban areas and purchasing centers. Because of these distances, many school districts can acquire needed products and supplies at only slightly less than retail prices.

The first component of the study involved the development of a list of 10 items commonly purchased by school districts across the state. This list of items was then correlated with the three purchasing strategies used by the public school districts: 1) to purchase their items as an individual district; 2) to purchase with another district or districts in a collaborative method; or, because the school districts have the option of receiving support services from their area education agency (AEA), 3) to request and take part in a cooperative purchasing project.

The second component of the study involved the classification of the school districts by student enrollment. This researcher adopted the population ranges from similar studies used by the AEAs and the Iowa Department of Education. School districts with a student population of 0-550 were classified as small; 551-1,100 as medium; 1,101-9,750 as large; and the seven districts with a student population

greater than 9,750 were treated as the largest population group.

Construction of the Questionnaire

From the search of the literature and from discussions with purchasing coordinators from other area education agencies (AEAs) in Iowa and other regional service centers across the United States, a list of 20 commonly purchased items was developed. A preliminary survey of school district purchasing personnel and AEA cooperative purchasing coordinators refined both the list to 10 commonly purchased items and helped focus the demographic questions to support the objective for this study.

Part I of the survey asked for information regarding district's purchasing policy, the training of the district's purchaser, and distance information relative to cities and purchasing centers in Iowa with populations greater than 25,000.

Part II of the survey requested pricing information for the list of 10 items. The three purchasing strategies were defined and the district purchaser was requested to use invoice information for the school year 1991-1992. If more than one strategy was used for the purchase of any item(s), this information could be included.

The list of 10 commonly purchased items used as presented in Part II of the survey was derived from a preliminary list of items circulated to school administrators, business managers, and AEA cooperative purchasing coordinators.

Selection of Sample

Because this researcher decided that it was not necessary to include the entire 417 public school districts in the state of Iowa to achieve the desired information, a random sample of districts by size was chosen. All school districts were first identified as small (0-550), medium (551-1,100), or large (1,101-9,750); and the seven largest (>9,750) were a separate population. An approximate 50 percent sample of each population was picked in proportion to the population within each AEA; the seven largest school districts were considered as a separate population and was taken in total.

The calculations for determining the sample group within each population group from each AEA are presented in Table 4 - Population - Data and Calculations. (The reader is again reminded that the seven largest school districts in the state of Iowa were treated as a separate population and thus removed for the purpose of determining the size of the other sample groups.) A comparative calculation was made for the small, medium, and large population groups to determine the comparability of the representative group to the total population. Because the calculations to determine the sample for each population group frequently resulted in a fraction, the quantity was rounded to the nearest whole number. It was decided that a sample of approximately 200 out of 410 school districts would be surveyed.

The names of the districts were checked against the Iowa Educational Directory 1991-1992 School Year, published annually by the Iowa Department of Education. A flip of the coin determined whether the list of names of the

Table 4
POPULATION - DATA AND CALCULATIONS

DISTRICT SIZE	SMALL	MEDIUM	LARGE	LARGEST	TOTALS
AEA	0-550	551-1,100	1,101-9,750	9,751+	
1	6 / 2.8 / 3 (a)	11 / 5.2 / 5	8 / 3.8 / 4	1	26
2	14 / 6.6 / 7	9 / 4.2 / 4	5 / 2.4 / 2	0	28
3	17 / 8.0 / 8	2 / 0.9 / 1	4 / 1.9 / 2	0	23
4	8 / 3.8 / 4	9 / 4.2 / 4	1 / 0.5 / 1	0	18
5	24 / 11.3 / 11	11 / 5.2 / 5	5 / 2.4 / 2	0	40
6	8 / 3.8 / 4	7 / 3.3 / 3	4 / 1.9 / 2	0	19
7	13 / 6.1 / 6	7 / 3.3 / 3	4 / 1.9 / 2	1	25
9	7 / 3.3 / 3	6 / 2.8 / 3	9 / 4.2 / 4	1	23
10	17 / 8.0 / 8	11 / 5.2 / 5	9 / 4.2 / 4	1	38
11	16 / 7.5 / 8	19 / 8.9 / 9	21 / 9.9 / 10	1	57
12	14 / 6.6 / 7	9 / 4.2 / 4	3 / 1.4 / 1	1	27
13	20 / 9.4 / 9	7 / 3.3 / 3	5 / 2.4 / 2	1	33
14	13 / 6.1 / 6	6 / 2.8 / 3	3 / 1.4 / 1	0	22
15	11 / 5.2 / 5	7 / 3.3 / 3	7 / 3.3 / 3	0	25
16	4 / 1.9 / 2	5 / 2.4 / 2	4 / 1.9 / 2	0	13
Totals	192 (b)	126	92	7	417
Sample Totals	91 (c)	57	42	7	197

(b) The total number of small districts in the state of Iowa.

(c) The rounded proportional sum of small districts in the state of Iowa.

EXPLANATIONS OF VALUES AND CALCULATIONS

(a) For all sequences of three numbers presented in the columns labeled SMALL, MEDIUM, and LARGE:

- The first value represents the number of that size district in the AEA.
- The second value represents the prorated number of that size district in each AEA when compared to the entire state.
- The third value represents the rounded-off number of that size district in each AEA.

EXAMPLE:

(a) 6 / 2.8 / 3

- 6 - The number of small districts served by AEA 1.
- 2.8 - The proration of small districts as compared to the state.
[2.8 = $192/410 \times 6$ = total number of small districts in the state (192) divided by the total number of districts in the state minus the seven largest (417-7=410) times the number of small districts served by AEA 1 (6)].
- 3 - The rounded proration of small districts in AEA 1.

representative groups from each AEA and category group size began with the first or the second name on the alphabetical list for each AEA. When this was determined, every-other district was chosen.

Collection of Data

A packet of materials was sent to the superintendent of each district in the sample group in April 1992. Included was an explanation to the superintendent, a memorandum for further explanation to the district purchaser, and the two-part survey (see Appendix A). The person completing the survey was asked to return the survey to this researcher no later than May 12, 1992.

The surveys were sent in April 1992 because this would come after spring breaks and the Easter holiday and is considered a less busy time of year for most school districts. Although many spring sports activities were beginning at this time, most persons involved with the survey would not be adversely affected.

Table 5 breaks down the districts' responses to the survey. Of the 197 surveys mailed, 121 (61.2 percent) were returned. Surveys were rejected in 18 instances because of improper responses or if only one part of the survey was completed. Usable surveys for further evaluation numbered 103 (52.28 percent) of the original 197 mailed.

Collection and Treatment of Data

The information collected from the respondents on Part 1 of the survey is presented in two segments. The first section presents the responses to the

Table 5
Districts' Responses to the Survey

AEA	Small	Medium	Large	Largest	TOTALS	% Returned
SUREYS RETURNED/MAILED						
1	1/3	3/5	1/4	1/1	6/13	46.15
2	4/7	1/4	1/2	0/0	6/13	46.15
3	6/6	1/1	0/2	0/0	7/11	63.64
4	0/4	2/4	1/1	0/0	3/9	33.33
5	7/11	4/5	1/2	0/0	12/18	66.67
6	2/4	2/3	2/2	0/0	6/9	66.67
7	4/6	2/3	2/2	1/1	9/12	75
9	1/3	1/3	3/4	1/1	6/11	54.55
10	3/6	1/5	1/4	1/1	6/18	33.33
11	7/8	8/9	10/10	1/1	26/28	92.86
12	3/7	4/4	0/1	1/1	8/13	61.54
13	5/9	2/3	1/2	1/1	9/15	60
14	2/6	3/3	1/1	0/0	6/10	60
15	4/5	2/3	2/3	0/0	8/11	72.73
16	1/2	1/2	1/2	0/0	3/6	33.33
TOTALS	50/91	37/57	37/42	7/7	121/197	61.42
USABLE	42/91	30/57	25/42	6/7	103/197	52.28

PERCENT RETURN: 61.42%

PERCENT USABLE RETURNS: 52.28%

questions about the person responsible for district purchasing and the purchasing policies of the districts. The data is organized according to the population group (i.e., small, medium, large, and largest within each of the AEAs).

The second section of Part 1 presents data on the distance to four cities, in Iowa and in neighboring states, that have populations over 25,000 and from which the districts purchase products. Again, the data is organized by the four population groups (see Appendix B).

Using the Apple Microsoft Works Version 2.0, separate data records for Part 2 numbered from 1-787 were developed for each item of the 10 commonly purchased items. The data file is organized first by the AEA from which districts received their services, the districts' code number, the item number assigned to the list of 10 commonly purchased items, and the price they paid for the item utilizing one of the three purchasing strategies: individual, collaborative or cooperative (see Appendix C).

The data presented in Appendix C is organized to allow the reader to interpret the purchase of 10 different items by utilizing three different strategies according to four population groups. The Item No. column is numbered from 1- 40 and can be interpreted by knowing that Item No. 1 lists the prices paid for the first item on the product survey list by each of the small districts in the sample group; Item No.11 by the medium; Item No. 21 by the large; and Item No. 31 by the largest.

The same process of presenting data was used for product items numbered 2-10. The last item would then be Item 10 for prices paid for the tenth product

item on the product survey by each of the small districts; Item 20 by the medium districts; Item 30 by the large, and Item 40 by the largest.

Appendix C presents the data for Part 2 of the survey in total and is the basis for the examination of each of the hypotheses. The following statistical indicators (plots, summary statistics, and tests of significance) were used:

1. "Notched" box plots
2. Two-dimensional graphs
3. Descriptive measures (mean, standard deviation, standard error)
4. 95 percent confidence intervals for the mean
5. T-test (unequal variances/Satterthwaite)
6. P-value (corresponding to t)

The "notched" box plot is a variation of the traditional box plot introduced by Tukey (1977). The traditional box plot is illustrated in Figure 1.¹

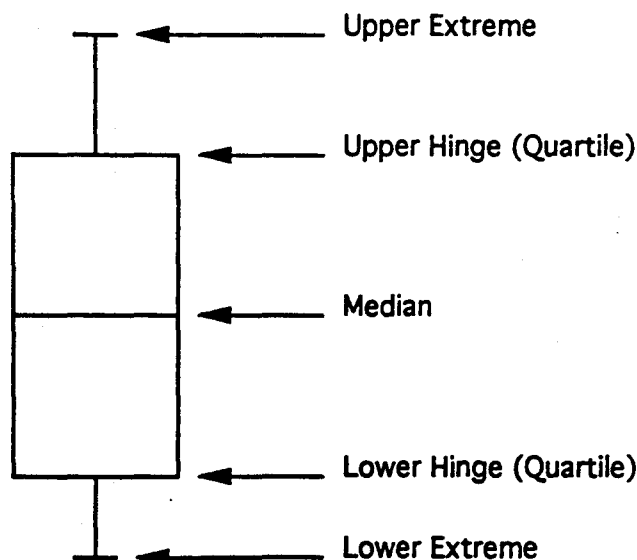


Figure 1 - Configuration of a Box Plot

¹Tukey, J.W. (1977). Exploratory Data Analysis. Reading, MA: Addison-Wesley Publishing Co.

The box plot is essentially a diagram of the critical characteristics of a distribution – the middle 50 percent of the data, including the median (center line) and quartiles (the top and bottom of the box), the expected range under normality (the “whiskers”), and any “outliers,” data values outside the expected range. Outliers may be either “mild” (denoted “*”) or “extreme” (denoted “o”), depending on how far outside the expected range they are. “Notched” box plots include, in addition, notches indicating the 95 percent confidence interval of the median, to provide a kind of “gap gauge” for judging the significance of the difference between two or more box plots, an exploratory tool analogous to performing a t-test on the means.²

Two-dimensional graphs were used to assess the relationships of the purchasing prices of the various items and size of district. This simple graphical tool provided an illuminating picture of such relationships and how they differed for the different purchasing strategies.

Descriptive statistics include the mean, standard deviation, and standard error. These are used, in addition to the “notched” box plots, to provide a statistical picture of the data on prices under the different purchasing strategies. These statistics were also used to compute 95 percent confidence intervals for the mean and t-tests of difference between the two primary strategies, individual and cooperative.

The “unequal variances” or Satterthwaite test was used. This is similar to the classical t-test, but does not require equal variances in the two comparison

² McGill, R., Tukey, J.W. and Larsen, W.A. (1978). Variations in box plots. The American Statistician, 32 (1), 12-16.

groups. Moser and Stevens (1992) recommend this over the classical t-test (and the "sometimes t" test, which uses a preliminary test for equality of variances), based on extensive calculations for various values of the sample sizes, variance ratio, standardized difference in population means, and significance levels. They found that it had the highest power and maintained the "size" (maximum probability of a Type 1 error) as the established level (typically, .01 or .05).³

³ Moser B.K. and Stevens, G.R. (1992). "Homogeneity of variance in the two-sample mean test". The American Statistician, 46 (1), 19-21.

CHAPTER 4

Findings

Introduction

The basic goal of this study was to determine which purchasing strategy (individual, collaborative, or cooperative) resulted in the best price for 10 items commonly purchased by public school districts in the state of Iowa. To accomplish this goal, a two-part survey was developed to determine a stratified random sample of public school districts in Iowa. The survey was directed to the district's purchaser in an effort to collect both demographic data about the purchaser and the district, and to increase the probability of acquiring accurate pricing information (see Appendix A).

Because the thesis of this research focused on cooperative purchasing programs at area education agencies (AEAs) in Iowa, the survey was developed and the data collected from a statistically proportional group of districts by size (small, medium, large, and largest) from within the geographical areas of the 15 AEAs.

The superintendent of each district was advised of the intent of the study and asked to have the district's purchaser (the person with primary responsibility for purchasing supplies and equipment for the district) complete the two-part survey. Part 1 of the survey asked the purchasers to answer three questions regarding their job responsibilities. Questions of whether the purchaser had any formal training and if the acquisition of supplies and equipment was the purchaser's only responsibility were considered relevant to the study.

Part I of the survey also contained a three-item section regarding the district's policies on purchasing. The approximate distance from each district to the four closest communities with a population greater than 25,000 was included to acquire correlated data on the location of the districts to the prices paid. Seventeen Iowa, one Nebraska, and one South Dakota communities were determined to have this population. Each district was also afforded the opportunity to provide the name of four additional communities from which they may purchase if they were not included in the previous list. It is pointed out that these questions do not specifically request the distance to purchasing centers with a population of 25,000 or more, but only ask for the identity and distance to population centers. It was only an assumption of this researcher that because a community has 25,000 people that it would also be a purchasing center.

Finally, the district purchaser was asked to provide actual invoice information for prices paid for 10 commonly purchased items. It was requested that the prices quoted would be from the 1991-1992 fiscal year (July 1, 1991 through June 30, 1992). The second dimension to this pricing information was the strategy used to acquire these items; i.e., was it purchased directly from a vendor (individual), did a group of districts pool their needs together (collaborative), or did the district utilize an AEA cooperative purchasing program (AEA cooperative).

From a total population of 417 public school districts in Iowa, a stratified random sampling of 197 districts was identified as the survey's sample group to include 50 small (0-550 students), 37 medium (551-1,100 students), 37 large (1,101-9,750 students), and the seven largest (>9,750 students). The seven largest

districts in the state were treated as a separate population group and were not considered in the statistical determination of the size of the other three sample groups.

Surveys were returned by 66.5 percent of the districts -- 65.3 percent of the small, medium, and large populations groups and 100 percent of the seven largest districts. Usable information from Part I of the survey was returned by 59.4 percent of the districts. 52.3 percent of the surveys returned had Part II data usable for the determination of pricing information.

The analysis of the first eight questions of the demographic data requested in Part I is presented in Appendix B. Column 1 indicates the AEAs and was used to organize the rest of the data. The districts' responses to those questions has been summarized in Columns 2 through 6c by the small, medium, large and largest population groups used in this study. A narrative of these questions will follow and reference will be made to the column numbers from Appendix B.

Column 2 - The position of the person completing the survey - The results show that superintendents are listed as the primary purchaser in 43 percent of the cases. As the size the of the district changes from small to large, business managers or clerical workers appear to assume the responsibilities of a purchaser. As the size of the district increases, the task of purchasing supplies and equipment moves more toward persons with training in business management or who have specific job responsibility for purchasing. The data on these questions from the 117 districts on these questions are presented in Table 6.

Table 6**PART I, QUESTION 1: POSITION OF PERSON COMPLETING SURVEY.**

Position	POPULATION GROUP				Totals
	Small	Medium	Large	Largest	
Board Secretary	6	4	1	-	11
Bookkeeper	1	-	-	-	1
Business Manager	1	-	11	-	12
Bus.Mngr/Bd.Secretary	-	1	-	-	1
Principal	1	1	-	-	2
Secretary	2	-	2	-	4
Purchasing Clerk	-	-	1	-	1
Purchasing Manager	-	-	-	4	4
Superintendent	34	27	6	1	68
Not Listed	5	3	3	2	13
Totals	50	36	24	7	117
Percent of Total	42.74	30.77	20.51	5.98	100

Column 3 - Are you a formally trained purchasing specialist - 13 out of 197 respondents indicated that they have received formal training for purchasing. Of these 13 "yes" responses, 6 were from the largest district.

Column 4 - Is purchasing your sole responsibility - Only four persons indicated that purchasing was their only responsibility and three of these four were from the seven respondent districts composing the largest population group.

Column 5 - Relative to all supplies and equipment purchased by your district on a yearly basis, what percentage of the total is as a result of a bidding process - Of the 36 districts in the small district group, 27 percent of their purchases were through a bidding process. Medium districts' data on the average indicated a 32.3 percent of their purchases were acquired through bidding. This figure was 49.5 percent for the large and 36 percent for the largest group. For the total survey population of 84 districts, 34 percent of all purchases were acquired through the bidding process. It should be noted that there are many different strategies available for the local school districts to acquire their supplies and

equipment.

Column 6 - Does your district have board policy for purchases - Less than 1 percent of the 197 responding districts indicated they did not have board policy governing the purchasing activities of their districts. Of the 21 districts stating they did not have board policy governing purchasing, 19 (or 90.4) percent were from school districts with a student population less than 1,100.

Column 6a - District policy stating the dollar amount above which bids must be acquired - The average dollar amount for the 39 small school districts was \$12,600 before bids were to be sought. This average dropped to \$11,800 for the 31 medium districts; \$10,146 for the 24 large districts and then rose to an average of \$17,000 for the 7 largest districts in the state. The state-wide average for the 101 school districts responding to this question was \$12,074.

Column 6b - District policy requiring local purchasing "all things considered equal" - 69 percent of the 45 small school districts responding to this question acknowledged the local preference clause in their purchasing policy. Medium sized schools with 34 districts reported a slightly higher frequency with 70 percent while the 24 large districts responded a 79 percent rate and the largest with 78 percent. Of the 110 school districts responding to this question, 79 districts indicated they had policies governing the purchase of supplies and equipment from local vendors when all factors were considered equal.

Column 6c - Preferential policy for in state manufacturers or vendors - 20 of 45 small districts (or 44 percent) reported a state preference clause in their purchasing policy, while 56 percent (or 19 of 34) medium districts responded such

a policy. Large districts responded such a policy in 13 of 24 districts or 54 percent and in the largest districts 6 of 7 districts or 86 percent reported such a policy.

The second section of Part I requested the school districts to list the names and distances to the nearest four communities with a population of 25,000 people or more. This researcher provided the names of the 17 Iowa communities with populations in this range. One Nebraska and one South Dakota community were also identified as being within service distance. Table 7 presents the average distances to the population centers for each of the four study groups. The average distance was calculated by dividing the sum of the distances for each population group by the number of responding districts for all of the AEAs. The average was determined to be 60.76 miles to the nearest community with a population equal to or greater than 25,000. (The full report for these distances can be studied in Appendix B, page 88.)

TABLE 7
PART 1: DISTANCE TO CITIES WITH A POPULATION GREATER THAN 25,000

POPULATION	POPULATION			
	SMALL	MEDIUM	LARGE	LARGEST
ALL AEAs	0-550	551-1,100	1,101-9,750	>9,750
Average miles	65	61	56	54
Average Distance - 60.76 miles				

The last section on Part 1 of the survey requested the respondent to list the names of up to four communities from which the district purchases products if other than those listed previously. Table 8 lists by group size the number of different locations, the total, and the average distance to these purchasing locations. These figures do relate specifically to the location of communities where purchases were made. However, it can be stated that the majority of locations from which

districts purchased had a population greater than 1,000 people. The locations most frequently mentioned contained populations greater than 35,000 people by a margin of 10 to 1. No definite conclusions can be drawn because of the difference in the statements requesting distance information to population centers and purchasing centers. As was stated in the cover letter to superintendents, the district's identity

TABLE 8
PART 1: DISTANCE (IN MILES) TO PURCHASING CENTERS

ALL AEAs Locations	POPULATION			
	SMALL 0-550	MEDIUM 551-1,100	LARGE 1,101-9,750	LARGEST >9,750
	100	82	53	16
Total Distance	5917	6679	5540	1616
Average Distance	59.17	81	104.5	101

would not be revealed. Information will be presented by the population of the districts of similar size and the AEA where the district is located.

Analysis of Hypotheses

The statistical analysis of data requires the reader to become reacquainted with how the data were presented for interpretation. Table 9, Statistical Analysis of the Ten Commonly Purchased Items, is arranged according to the survey list of ten commonly purchased items numbers in order of presentation from 1 to 10 and then by the four district population groups. The first column in Table 9 labeled **Item & Group** is numbered such that the unit's position refers to the commonly purchased item number and the ten's position refers to the student enrollment group. In the ten's position, there will be no number referring to the small districts (0-550 students), a 1 referring to the medium districts (551-1,100 students), a 2 for large

districts (1,101-9,750) and a 3 for the largest districts (the seven districts with over 9,750 students). The exception is that 10, 20, 30 and 40 represent the tenth product item purchased by the largest school districts.

Hypothesis 1

Hypothesis 1 states that there is no significant difference in the price paid for commonly purchased items as determined by size of the public school district.

This hypothesis was examined from within each of the purchasing strategies, individual and cooperative, and the four population groups. Four groups with each of the 10 items and two strategies were statistically compared. Contiguous grouping of data was utilized where box plots and variance data suggested its appropriateness.

Individual Purchasing Strategy

Item 1: (8.5" Rubber Playground Ball) A significant difference was observed when the data were examined using a two-sample t-test with unequal variances. A P-value of 0.0122 was calculated.

A "notched" box plot was constructed for all of the original data. A similarity of the plots for groups 1 and 11 was observed and the same similarity occurred with groups 21 and 31. The decision was made to combine the data for 1 and 11 (N=25+13) and 21 and 31 (N=14+5) and create new box plots labeled 1 and 21. The resultant P-value indicated that small/medium school districts (1 & 11)

Table 9

STATISTICAL ANALYSIS OF THE TEN COMMONLY PURCHASED ITEMS

Item & Group	N	Mean (Individual)	N	Mean (Coop)	Std. Error (Difference)	Unequal Variance t	P-Value
1	25	5.082	10	1.767	0.650	5.098	0.000
11	13	4.989	11	1.745	0.492	6.592	0.000
21	14	3.419	6	1.642	0.677	2.626	0.020
31	5	2.694	0				
2	24	1.063	14	0.649	0.155	2.672	0.011
12	15	0.83	14	0.459	0.085	4.352	0.001
22	15	0.778	10	0.435	0.144	2.380	0.032
32	6	0.572	0				
3	20	0.483	17	0.299	0.026	6.968	0.000
13	11	0.445	12	0.340	0.057	1.823	0.096
23	16	0.379	5	0.332	0.049	0.975	0.341
33	6	0.320	0				
4	8	8.440	28	6.138	0.999	2.305	0.047
14	5	10.758	20	5.691	1.302	3.892	0.012
24	10	6.909	12	5.547	0.491	2.777	0.017
34	5	5.738	1				
5	8	21.269	32	17.897	1.166	2.891	0.020
15	2	16.850	20	17.308	0.816	-0.561	0.599
25	9	19.972	11	17.268	0.729	2.339	0.035
35	4	17.813	2	18.575	1.816	-0.420	0.747
6	14	24.934	17	10.208	2.325	6.332	0.000
16	7	22.569	11	9.483	5.921	2.210	0.069
26	12	17.062	6	9.083	2.806	2.843	0.015
36	2	9.750	0				
7	15	251.386	12	280.574	23.598	-1.237	0.227
17	8	275.786	10	289.933	20.051	-0.706	0.490
27	11	265.182	6	269.820	17.482	-0.265	0.796
37	3	286.000	3	276.677	17.789	0.524	0.637
8	8	12.78	0				
18	6	8.743	6	4.457	1.991	2.153	0.084
28	5	5.204	3	4.720	1.016	0.476	0.659
38	6	3.465	0				
9	21	16.246	7	13.727	0.634	3.973	0.001
19	13	15.487	7	13.244	0.422	5.309	0.000
29	11	14.268	5	13.242	0.359	2.857	0.013
39	3	13.843	0				
10	21	7.894	15	4.371	0.603	5.844	0.000
20	11	6.785	12	4.209	0.661	3.897	0.003
30	13	5.598	12	4.735	0.648	1.333	0.195
40	6	4.420	0				

paid significantly more for playground balls than did the large and largest school districts (21 & 31). (See Appendix D, page 110).

Item 2: (Pencils, No. 2, one dozen) From the box plots, it is evident groups 2, 12, and 22 experienced similar individual price variation, while that of group 32 was considerably smaller. Thus, the groups with similar variation were tested for price differences using ANOVA. The difference between groups 2, 12, and 22 were marginally significant ($.05 < P < .10$), with group 2 having the largest mean. Group 2 was found to be significantly greater than group 32 ($P = .009$) using a t-test.

This would indicate that school districts with populations less than 550 students pay significantly more for pencils than do districts with larger student populations (see Appendix D, page 111).

Item 3: (White chalk, 12 sticks) The box plots for this item and the multiple comparisons of the data for groups 3, 13, 23, and 33 presented evidence of similar variance of the data and significant differences between 3 and 13, 3 and 23, 3 and 33 but no significance between 13, 23 and 33.

An examination of the raw data points to a diversity of prices paid for chalk. When the demographic information is correlated with the prices paid for this item, it should be noted that many small and medium sized districts purchase chalk from school supply houses offering a simple 15 percent discount and free freight on large orders.

The ANOVA and the t-test indicates a significant difference between the prices paid for chalk by the small districts with the price decreasing as the size of the district increases (see Appendix D, page 112).

Item 4: (Computer paper, 1M sheets) The ANOVA indicated a significant difference between the prices paid by the small and medium sized districts when compared to the largest and when the small is compared with the large. However, no significance difference was indicated between the small and the medium districts. This may be due to the relative small number of responses from these two groups (small N=8 and medium N=5).

It is evident that as the district size increases prices paid for computer paper decreases and is supported by the data (see Appendix D, page 113).

Item 5: (Xerographic bond paper, 5M sheets) The box plots for Item 5 indicates variance that permitted the grouping of the data for 15, 25 and 35. A two-sample t-test was calculated between group 5 (N=8) and combined groups of 15, 25 and 35 (N=2+9+4). The resultant P-value of 0.0388 indicates a significant difference between the small population group (districts under 551 students) and the medium/large/largest population group (districts over 550 students).

School districts with enrollments under 550 paid significantly more for xerographic bond paper than did the larger districts (see Appendix D, page 114).

Item 6: (Paper towels, 4M singlefold) The box plots did not indicate that groups should be combined nor was the variance of the plots similar to indicate the use of ANOVA. A t-test conducted between groups 6 and 16, 6 and 26, 6 and 36 and significant differences were noted between 6 and 26, and 6 and 36 but the t-test for 6 and 16 was not significant.

The mean values in Table 9 for item 6 indicates that price decreases for paper towels as the size of the district increases. The significant differences of the

t-test also addresses this point with some reservation on group 16 possibly due to only 7 responses from the medium districts.

The data indicates districts with enrollments under 1,100 do pay significantly more for paper towels than do the larger districts (see Appendix D, page 115).

Item 7: (VCR, player/recorder) The box plots clearly indicate a similarity in the variances between the 4 groups of data. An ANOVA indicted no significant difference in the prices paid for this item between any of the groups (see Appendix D, page 116).

Item 8: (Janitor's corn broom) Because of the similarity of the variances in the prices paid by the small and medium districts and by the large and largest districts, the two sets of data were grouped. The results of a two sample t-test indicated a P-value of 0.0003. There was a highly significant difference between the prices paid by the small/medium districts for brooms as compared to the large/largest districts. The districts with student populations under 1,100 paid significantly more for brooms than did districts with larger populations (see Appendix D, page 117).

Item 9: (Applesauce) The combined data for the small and medium districts were statistically compared with the combined data representing the large and largest districts with the resultant P-value of 0.0005.

The small/medium districts paid significantly more for this product than did the large/largest districts (see Appendix D, page 118).

Item 10: (Envelopes, size 10 Reg. #24) The examination of the box

plots presented a variance between each of the four groups but an ANOVA was conducted to determine significance using this statistical method. The data for the medium and large districts had similar variances and were combined. The subjective interpretation of the ANOVA and the box plots suggested that the medium, large and largest districts be statistically treated against the small districts. A t-test provided this researcher with a P-value of 0.0041 indicating a high degree of significance.

The small districts paid significantly more for envelopes than did the medium, large and largest districts (see Appendix D, page 119, 120 and 121).

Cooperative Purchasing Strategy

Reference is again made to Table 9 for the N values for each item within each district population group. It is specifically noted that the largest districts indicated their participated in the purchase of only two of the ten items.

Item 1: (8.5" Rubber Playground Ball) The largest districts did not purchase this item through an AEA cooperative. The box plots for small and medium districts were combined and a two sample t-test was conducted between group 1 and 21 which indicated a P-value of 0.3073. This clearly indicates no significant difference between the prices paid by the small, medium and large districts for this item (see Appendix E, page 123).

Item 2: (Pencils, No. 2 - one dozen) Since the largest district did not purchase this item through an AEA Coop, the box plots for the medium and large districts were combined and a two sample t-test was conducted. A P-value of

0.0538 indicates a moderately significant difference between the prices paid for this item (see Appendix E, page 124). As the district size increased the mean prices paid decreased from \$0.64 to \$0.459 and \$0.435.

Item 3: (White chalk, 12 sticks) The box plots indicated the variances to combine the data together for districts size 13 and 23 into one box plot. After this was done, the t-test was conducted and a P-value of 0.0339 was determined for district size 3 and 13 (see Appendix E, page 125). A reverse correlation is evident with the small districts paying less for chalk than the medium and large districts. This researcher has examined many bids for chalk and has witnessed a wide range of prices. The quality issue of being dust-free and the ability to use it on art paper are determiners of price. I would suspicion that had the brand of chalk been the same, the prices would have indicated an inverse correlation between the size of the district and the prices paid.

Item 4: (Computer paper, 1M sheets) Only one of the largest school districts purchased this item through a coop and since no statistical calculation of differences can be determined the largest district's size (33) data was dropped.

The mean and standard error values for district size 4, 14 and 24 do not indicate further statistical treatment. There is no significant differences in the prices paid for the three groups in this comparison (see Appendix E, page 126).

Item 5: (Xerographic bond paper, 5M sheets) Because the variance indicated in the box plots were very similar, an ANOVA was calculated with a resultant P-value of 0.4945. No significant differences were noted as size of the districts increased (see Appendix E, page 127).

Item 6: (Paper towels, 4M singlefold) None of the largest districts purchased this item through an AEA coop. Because the variance for district size 16 and 26 were similar, the data was combined. A t-test for the two groups 6 and 16 was run. A P-value of 0.1878 indicates no significant differences between the prices paid by the districts (see Appendix E, page 128).

Item 7: (VCR, player/recorder) The prices paid by the 4 groups for this item evidenced very little variance and the ANOVA determined a P-value of 0.8269. There is no significant difference in the prices paid by all school districts for this item. Even with the inclusion of serious outliers the significant differences were not apparent (see Appendix E, page 129).

Item 8: (Janitor's corn broom) No data was provided by the small and largest districts. The t-test for the medium and large districts indicated no significant differences (see Appendix E, page 130).

Only one of the AEAs in the state offers a cooperative program for the purchase of brooms. This is supported by the data presented in Appendix C.

Item 9: (Applesauce) The largest districts again did not purchase this item through an AEA coop purchasing strategy. The box plots for the medium and large districts had very similar variances and thus the data from these two groups were combined.

A t-test was run and the P-value was determined to be 0.3237 indicating no significant differences between the different size districts and the prices paid for this item (see Appendix E, page 131).

Item 10: (Envelopes, size 10 Reg. #24) The largest school districts did not

purchase this item through an AEA Coop. The box plots for this item were such that an ANOVA was run with a resultant P-value of 0.4042. Then the small and medium districts' data were combined and statistically compared to the large districts' data. A t-test with a resultant P-value of 0.7200 verified the fact of no significant difference in the prices paid for this item as the size of district changes (see Appendix E, page 132 and 133).

The analysis of the data from the context of prices paid for 10 commonly purchased items by four district population groups is summarized in Table 9 (see Chapter 4, page 46). The purchasing strategies of districts obtaining these 10 items as a individual districts was compared with the strategy of when products were purchased through an AEA Cooperative. The P-value was determined by using a two-sample t-test when applicable or an ANOVA was utilized to determine the significant differences.

Hypothesis 1 stated that there is no significant difference in the price paid for commonly purchased items as determined by size of the public school district.

The hypothesis did not clarify whether the intent was to determine this difference on the bases of purchasing as an individual district, in collaboration with other districts or as a result of a district's participation in an AEA cooperative purchasing program. Therefore, the data is presented from the position of the data received.

The data as summarized in Table 10 shows with few exceptions that when the list of 10 commonly purchased items are purchased on an individual basis, districts

Table 10

Hypothesis 1: Significant Differences

ITEM NO.	ITEM DESCRIPTOR	PURCHASING STRATEGY	STATISTICAL p-value	PURCHASING STRATEGY	STATISTICAL p-value
1	8.5" playground ball - each	INDIVIDUAL YES	0.0122	COOPERATIVE NO	0.3073
2	Pencils, No. 2 - 1 dozen	YES	0.0009	NO	0.0538
3	White chalk - 12 sticks	NO (1) (1) ANOVA		YES (2) (2) INVERSE CORRELATION	0.0339
4	Computer paper - 1M sheets	YES (3) (3) ANOVA	????	NO	0.7715
5	Xerographic bond paper - 5M sheets	YES	0.0388	NO	0.4945
6	Paper towels - 4M sheets	YES (4) (4) NO 6 & 16 0.7182	6/36 0.0000 6/26 0.0368	NO	0.1878
7	VCR player/recorder - each	NO (5) (5) ANOVA		NO	0.8269
8	Janitor's corn broom - each	YES	0.0003	NO	0.3632
9	Applesauce - 6 No. 10 cans	YES	0.0005	NO	0.3237
10	Envelopes - 5M 10 regular white	YES	0.0041	NO	0.72

generally pay less as the size of the district increases. Therefore, when the purchasing strategy was Individual, the null hypothesis is rejected.

When the districts acquired the ten commonly purchased items through an AEA cooperative, there was no significant differences in the prices for the four district population groups. Therefore, when the purchasing strategy was Cooperative, the null hypothesis was accepted.

Hypothesis 2

Hypothesis 2 stated there is no significant difference in the price paid for commonly purchased items as determined by membership in a buying group.

Reference is made immediately to Table 9 to focus the interpretation of the data and aid in the understanding of how Hypothesis 2 was addressed. The first column in Table 9 labeled **Item & Group** is numbered such that the unit's position refers to the commonly purchased item number and the ten's position refers to the student enrollment group. Thus, a (1) in the units position refers to the first item listed in the survey of the ten commonly purchased items and 01 refers to the small districts' purchases of item 1. The (2) in the unit position refers to the second item and so on through Table 9 until (0) in the unit position refers to the tenth item. 10 refers to the smallest district purchasing item 10, 20 refers to the medium sized district purchasing item 10 and this scheme continues until 40 indicates the largest district purchasing item 10.

The second hypothesis is asking for a comparison of the prices paid for products when the product is purchased as an individual district in comparison to acquiring the product through a AEA cooperative program. Statistically this has been handled by comparing the prices paid for each of the ten commonly purchase items and for each of the four population group sizes.

Table 9 presents the P-value for the statistical differences between the Individual and Cooperative purchasing strategies for each line product item and district size. Note that when a (0) appears in an (N) column, no statistical treatment was possible. The sum of (N) for Item 1 and Mean (Individual) is 57. This value appears as the (N) value for the Column marked Individual in Table 11. The same process is used to determine the (N) value for Mean (Coop) for use in the same table. The (N) value for all ten items and the two strategies is thus derived from Table 9 for use in Table 11.

The second dimension of this hypothesis was to compare the prices paid for each of the ten product items not considering district sizes but rather only the strategies of Individual and Cooperative. The prices paid by all school districts for each of the ten items is compared to the prices paid when these same items were purchased through a AEA coop. Table 11 presents the P-value statistically determined by a two-sample t-test for each of the ten commonly purchased items.

Table 11 "ITEM 1"		BALL - PURCHASING STRATEGIES	
Statistical Indicator	Individual	Cooperative	
N	57	27	
Mean	4.443	1.73	
Standard Deviation	2.755	0.237	
Standard Error	0.365	0.046	
95% Confidence Interval (Mean)	3.712 - 5.174	1.636 - 1.824	
t (unequal variance)	7.376		
P-value	0		

Table 11 "ITEM 2"		PENCILS - PURCHASING STRATEGIES	
Statistical Indicator	Individual	Cooperative	
N	57	38	
Mean	0.875	0.522	
Standard Deviation	0.497	0.235	
Standard Error	0.066	0.038	
95% Confidence Interval (Mean)	0.743 - 1.007	0.445 - 0.600	
t (unequal variance)	4.63		
P-value	0		

Table 11 "ITEM 3"		CHALK - PURCHASING STRATEGIES	
Statistical Indicator	Individual	Cooperative	
N	53	34	
Mean	0.425	0.319	
Standard Deviation	0.15	0.053	
Standard Error	0.021	0.009	
95% Confidence Interval (Mean)	0.384 - 0.466	0.300 - 0.337	
t (unequal variance)	4.724		
P-value	0		

Table 11 "ITEM 4"		COMPUTER PAPER - PURCHASING STRATEGIES	
Statistical Indicator	Individual	Cooperative	
N	27	61	
Mean	7.802	5.866	
Standard Deviation	2.52	1.565	
Standard Error	0.485	0.2	
95% Confidence Interval (Mean)	6.805 - 8.799	5.465 - 6.267	
t (unequal variance)	3.689		
P-value	0.001		

Table 11 "ITEM 5"		
BOND PAPER - PURCHASING STRATEGIES		
Statistical Indicator	Individual	Cooperative
N	23	65
Mean	19.385	17.63
Standard Deviation	2.666	1.762
Standard Error	0.556	0.219
95% Confidence Interval (Mean)	18.232 - 20.538	17.194 - 18.067
t (unequal variance)	2.938	
P-value	0.006	

Table 11 "ITEM 6"		
PAPER TOWELS - PURCHASING STRATEGIES		
Statistical Indicator	Individual	Cooperative
N	35	34
Mean	20.894	9.775
Standard Deviation	10.94	1.89
Standard Error	1.849	0.324
95% Confidence Interval (Mean)	17.136 - 24.652	9.115 - 10.434
t (unequal variance)	5.923	
P-value	0	

Table 11 "ITEM 7"		
VCRs - PURCHASING STRATEGIES		
Statistical Indicator	Individual	Cooperative
N	37	30
Mean	263.57	281.153
Standard Deviation	57.363	41.734
Standard Error	9.434	7.62
95% Confidence Interval (Mean)	244.438 - 282.702	265.570 - 296.736
t (unequal variance)	-1.45	
P-value	0.152	

Table 11 "ITEM 8"		
BROOMS - PURCHASING STRATEGIES		
Statistical Indicator	Individual	Cooperative
N	25	9
Mean	8.06	4.544
Standard Deviation	5.467	0.527
Standard Error	1.129	0.176
95% Confidence Interval (Mean)	5.730 - 10.391	4.140 - 4.950
t (unequal variance)	3.076	
P-value	0.005	

Table 11 "ITEM 9"		APPLESAUCE - PURCHASING STRATEGIES	
Statistical Indicator	Individual	Cooperative	
N	46	19	
Mean	15.437	13.422	
Standard Deviation	1.895	0.748	
Standard Error	0.274	0.172	
95% Confidence Interval (Mean)	14.887 - 15.987	13.061 - 13.782	
t (unequal variance)	6.24		
P-value	0		

Table 11 "ITEM 10"		ENVELOPES - PURCHASING STRATEGIES	
Statistical Indicator	Individual	Cooperative	
N	51	39	
Mean	6.661	4.433	
Standard Deviation	2.472	0.97	
Standard Error	0.346	0.155	
95% Confidence Interval (Mean)	5.966 - 7.357	4.119 - 4.747	
t (unequal variance)	5.872		
P-value	0		

As the P-values are examined in Table 9, the values indicate the significant difference between the prices paid for each of the ten product items and the four different district population groups when either of the two purchasing strategies of Individual and Cooperative are utilized. In Table 11, the price paid for each of the ten items considering the purchasing strategies of Individual and Cooperative produced a second set of P-values.

Table 12 presents the P-values comparing the two possible considerations for the prices paid for ten commonly purchased items.

When the data for each of the ten commonly purchased items is considered without consideration to the size of the district, it can be observed that with the exception of Item 7, the VCRs, prices received from the AEA Cooperative is significantly lower than the prices paid on an individual district basis.

The data from Table 9 supplements the data in Table 12 by providing the mean prices for all items purchased by the districts either individually or through a coop.

Even though the P-values may not indicate a significant difference in Table 12, 0.0960 for Item & Group 13, the Mean values from Table 9 do show the trend of

Table 12

P-values

Item & Group	N Individual	N Coop	P-Value Individual/Coop	Sum N Individual	Sum N Coop	P-value by Item Individual/Coop
1	25	10	0.000	57	27	0.0000
11	13	11	0.000			
21	14	6	0.020			
31	5	0	----			
2	24	14	0.011	57	38	0.0000
12	15	14	0.001			
22	15	10	0.032			
32	6	0	----			
3	20	17	0.000	53	34	0.000
13	11	12	0.096			
23	16	5	0.341			
33	6	0	----			
4	8	28	0.047	27	61	0.0010
14	5	20	0.012			
24	10	12	0.017			
34	5	1	----			
5	8	32	0.020	23	65	0.0060
15	2	20	0.599			
25	9	11	0.035			
35	4	2	0.747			
6	14	17	0.000	35	34	0.0000
16	7	11	0.069			
26	12	6	0.015			
36	2	0	----			
7	15	12	0.227	37	30	0.1520
17	8	10	0.490			
27	11	6	0.796			
37	3	3	0.637			
8	8	0	----	25	9	0.0050
18	6	6	0.084			
28	5	3	0.659			
38	6	0	----			
9	21	7	0.001	48	19	0.0000
19	13	7	0.000			
29	11	5	0.013			
39	3	0	----			
10	21	15	0.000	51	39	0.0000
20	11	12	0.003			
30	13	12	0.195			
40	6	0	----			

a lower price being paid for that item than did the small districts. This is not the case in Table 9 for Item & Group 35 but the N value is very small and could be the cause of this price.

The data for item 7, VCRs, could be erroneous due to the wide range of prices available for this product item. Again the N is relatively small in the large and largest districts.

The data for item 8, brooms, had a small N for the individual purchasing strategy and the small and largest districts did not purchase the item through a coop.

Hypothesis 2 states that there is no significant difference in the price paid for commonly purchased items as determined by membership in a buying group.

The accumulative data presented in Table 12, with the exception of item 7, clearly indicates a significant difference in the prices paid for products when purchased through the AEA coop strategy. Hypothesis 2 is rejected. The prices paid for 9 of the 10 commonly purchased items is significantly lower when acquired through a buying group.

A third purchasing strategy was a part of the survey but the data were not sufficient for statistical analysis for item 5. The ANOVA on the data indicates a significant difference between the mean prices paid through the coop strategy (\$17.27) and the individual strategy (\$18.97). The mean value for the collaborative purchasing strategy (\$17.50) was not significantly different from either the individual or the coop prices (see Appendix F, page 134).

Because of the lack of data, the statistical analysis and the inclusion of the

Collaborative purchasing strategy was dropped from consideration in the examination of Hypothesis 2.

Hypothesis 3

Hypothesis 3 states there is no significant difference in the prices paid for commonly purchased items as determined by the distance from the purchasing centers of Iowa.

Part I of the survey asked two specific questions regarding the distance to communities with a population greater than 25,000 persons and to list the names and distances to communities other than those listed in the first questions from which they purchase product. It is repeated again here that the first question does not specifically ask for the names of cities with a population greater than 25,000 from which the districts purchased their supplies and equipment.

Hypothesis 3 asks if there is a significant difference in prices when the factor of distance to purchasing centers is considered. In order to examine any possible correlation between the distance to purchasing centers and the prices paid for supplies and equipment (S&E), Tables 7 and 8 were developed. Table 7 lists the distance to communities of populations greater than 25,000 persons while Table 8 specifically addresses the distance to locations utilized for the acquisition of S&E.

As is indicated in Table 7, the average distance to the population centers with a population greater than 25,000 decreases as the district size goes from small to the largest. This would indicate that communities with the larger populations would tend to be closer together.

Table 8 indicates that as the size of the district increases so does the distance to other purchasing centers. From the raw data, it was observed that as districts became larger there was a clear indication of purchasing from the larger communities located at greater distances.

Referring back to Table 9, the Mean (Individual) prices paid for the ten commonly purchased items went down as the size of the district increased in eight out of ten product areas. Although the statistical treatments did not indicate consistently significant differences as the district size went from small to the largest for the purchase of each of the 10 items, a trend was definitely indicated.

Because the two questions on Part 1 of the survey regarding the distances to communities of 25,000 and purchasing centers were not clear and could contain overlapping information, no clear conclusions can be drawn for Hypothesis 3.

It is left for the reader to draw any inferences from the data presented for Hypothesis 3 and from the statistical treatment of the data portrayed for Hypotheses 1 and 2.

CHAPTER 5

Summary, Conclusions, Limitations, and Recommendations for Further Research

Summary

This study was conducted to determine the prices paid for 10 commonly purchased items by the public school districts in Iowa when different purchasing strategies are used. The school districts were divided into four population groups within the boundaries of the 15 area education agencies (AEA). The sample population consisted of a stratified random sample of 197 public school districts. The four district population groups were chosen in the same proportion within each AEA as that population was in the state. Data was gathered by means of a one-page two-part survey. Part 1 of the survey addressed demographic information regarding the person completing the survey, district policies regarding purchasing, and distance information for population centers and purchasing centers. Part 2 of the survey requested pricing information for the purchase of 10 product items. The prices paid for the items was to be from 1991-1992 invoices and the price was to be recorded in one of three columns indicating whether that items was purchased by the district alone (individual), with other districts (collaborative), or through an AEA purchasing (cooperative).

Three hypotheses were tested. The first hypothesis focused on the price paid for commonly purchased items as determined by the size of the public school district. Using the descriptive technique of notched box plots and statistical treat-

ments of ANOVA and t-test, it was determined that there was a significant difference between the prices paid for commonly purchased items and the size of the district. On eight of the 10 commonly purchased items, there was a significant difference in the prices paid as the size of the district changed. When the size of the the district increased from small to the largest district, the prices reduced significantly.

The second hypothesis addressed the differences in the price paid for commonly purchased items when the public school districts belonged to a buying group. When all the school districts were pooled together into the four population groups and the prices they paid for each of the 10 survey items was tabulated as a single group, a significant difference in prices was noted. However, in a careful examination of the mean prices paid for items as the size the the districts increased, it was observed that the AEA cooperative price and the largest school districts' prices were not significantly different. The three purchasing strategy options for this study were for the districts to buy the common items as an individual district, in collaboration with another district(s), or through an AEA cooperative purchasing program.

As the data in Appendix F indicates, the purchase of xerographic paper was the only instance when one of the survey product items was acquired using the collaborative strategy. Sufficient data was available to allow for statistical treatment. In this case, the significant difference was between the individual and the coop strategies. As the size of the public school districts in Iowa became larger, the price paid for commonly purchased items decreases. This is not the case

when the procurement of product is through an AEA coop. The price paid through the coop strategy is generally lower than even the largest district but it is not considered statistically significant, as was shown for Item 25, when a collaborative strategy is used.

Hypothesis 3 addressed the differences in the prices paid for commonly purchased items when the distance from school districts and purchasing centers in the state were considered. Two questions in Part 1 of the survey addressed this issue, but due to the wording of these questions the data collected could not be utilized to accept or reject the hypothesis. No statistical test was conducted on the distance data. The average distance to purchasing centers was determined for each of the four population groups. The mean price paid by the districts as the size of the district went from small to the largest is observed to decrease. As the average distance to the purchasing centers increased, so did the size of the school district. It is logical to assume that as the size of the district increases so would the volume of their purchasing needs increase and therefore the distance to purchasing centers for the large districts does not appear to affect price. There is an inverse relationship with the price paid by districts and the distance to purchasing centers. The largest districts on the average are further away from purchasing centers and have the lowest prices. Also it was observed that as the district size decreases it is more common to purchase locally and from communities near to the district.

Conclusions

1. As the size of the the public school districts increases, the prices paid for

nine of the ten commonly purchased items are significantly lower (see Table 9, page 46). Districts should collaborate and cooperate with other districts and their Area Education Agencies to gain the obvious advantage of volume purchasing.

2. When a public school district participates in a buying group, whether it is with other districts or as a participant of an AEA cooperative purchasing program, the prices are significantly less. The data as presented in Table 9, page 46, clearly points out the advantage to all districts, regardless of size, of participating in cooperative purchasing strategies.

3. The size of the public school district and the distance to the purchasing centers has a direct correlation. The larger the district or the size of the purchasing group, the less dependent they are on the distance to the purchasing centers. The volume advantage of collaborative and cooperative purchasing strategies overcomes the disadvantages of district size, volume of product that can be purchased, and distance to purchasing centers.

Discussion

Although research has shown the advantages of purchasing strategies emphasizing cooperative strategies, participation appears to be determined more by the political pressures being placed on the administration of a district. The relationship that exists between a district's administrative personnel and other districts' or AEA staff is more important than the price differences on commonly purchased items. If there is a high level of trust between districts and with the AEA, the more likely there will be collaboration on purchasing projects.

Research points out consistently that participation in the decision making

process for cooperative projects will dispel most of the opposition to joint purchasing ventures. Advisory committees consisting of district personnel that actually use the different product items will create credibility and ownership for cooperative ventures. Simply being a member of a committee is not sufficient, but when district personnel feel they are a vital part of the process and they can see where their membership and input actually has meaning, the advantages of prices can then be recognized.

District personnel must be able to experience the advantages of sharing in the decision-making process and recognize the advantages to their district and to education in general when lower prices for goods and less administrative cost is to their benefit.

Perhaps one of the most significant trends in Iowa for the 1990s has been the requirement that school districts must do more with less money and that they must be accountable for each dollar expended. Repeating what has been discussed in the literature on purchasing, districts no longer have the luxury of purchasing whatever they want without consideration of more economical and efficient methods of purchasing.

Limitations

The superintendent of each school district selected the person to fill out the survey, both the demographic and the purchasing information. This person could have been an individual with the most time available for such a survey or it could have been a person wanting to place the district in the best possible light regarding

its purchasing practices.

Even though the rate of return for both the demographic portion of the survey - Part 1 - and the price information for the commonly purchased items - Part 2 - was considered good, the N value for many items was very small. Also, the list of the commonly purchased items were not consistently appropriate for the survey's intent.

Recommendations for Further Research

Additional study in regard to purchasing strategies that would save districts monies and extend the findings from this study include the following:

1. A follow-up study to determine how the training of district personnel affects purchasing strategies utilized and the prices paid for commonly purchased items.
2. A study of the impact of the economic conditions of the state on the purchasing decisions by districts of various sizes.
3. A study to determine if linkages exist between the position of the person responsible for purchasing and participation in a cooperative purchasing strategy.
4. A study to determine the factors that may interfere with collaborative purchasing strategies between school districts.
5. A study of the impact of state-level legislation on the purchasing policies of local school districts.
6. A study to determine why large school districts are unwilling to participate in cooperative purchasing programs.

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

- Anderson, Lester W. and Van Dyke, Lauren A. Secondary School Administration. Boston, Massachusetts: Houghton Mifflin Company, 1972.
- Benson, Charles W. and Barber, Jerry R. Intermediate Educational Units and Their Promise for Rural Education. ERIC/CRESS. National Educational Laboratory Publishers, Inc. Austin, Texas. March, 1974.
- Fearon, Harold E., Dobler, Donald W. and Killen, Kenneth H. The Purchasing Handbook. Fifth Edition. New York, New York: McGraw-Hill, Inc., 1993
- Hoy, Wayne K. and Miskel, Cecil G. Educational Administration. Theory, Research and Practice. 2nd Edition. New York, New York: Random House, Inc. 1982.
- Johns, Roe L., and Morphet, Edgar L. The Economics & Financing of Education. A Systems Approach. 3rd Edition. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1975.
- Johns, Roe L., and Morphet, Edgar L. The Economics & Financing of Education. A Systems Approach. 3rd Edition. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1975.
- Johns, Roe L., Morphet, Edgar L. and Alexander, Kern The Economics & Financing of Education. A Systems Approach. 4th Edition. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1983.
- Knezevich, Stephen J. Administration of Public Education: A Sourcebook for the Leadership and Management of Educational Institutions. 4th Edition. New York, New York: Harper & Row, Publishers, 1984.

Periodicals

- Brown, Oliver. "Pages and Pages on How to Cut School Costs - - Wisely." American School Board Journal. October, 1978.

Dodge, William D. "How Nine Schools Combined Their Purchasing Power to Lower Food Bills." The American School Board Journal. 170:8:27, August, 1983.

Ficklen, Ellen. "Hometown Versus Outside Cows (and Other Tales About Pressure to Buy Local)." The American School Board Journal. Vol.:No.:38-44, April, 1987.

Ornstein, Allan C. "Trimming the Fat, Stretching the Meat for 1990s School Budgets." The School Administrator. pp. 20-21. October, 1989.

Dissertations

Clark, Wayne Herbert. "A Descriptive-Comparative Study of Cooperative Purchasing Practices in the Unified School Districts of the State of Kansas." Unpublished doctoral dissertation, University of Kansas, 1975.

Hardin, C.E. "Guidelines for Cooperative Purchasing for Public School Districts in the United States." Unpublished doctoral dissertation, University of Denver, 1969.

Public Documents

Iowa Department of Education and Area Education Agencies 1 - 16. Statewide Needs Assessment Study of Area Education Agency Services. 1986.

Iowa Department of Education, Instructional/Educational Services Group. Area Education Agency Structure of Services Study. Des Moines, Iowa. 1989.

Iowa Department of Education. The Annual Condition of Education Report: A Report on Elementary, Secondary and Community College Education in Iowa. 1991.

Iowa Department of Education. The Annual Condition of Education Report: A Report on Elementary, Secondary and Community College Education in Iowa. 1992.

Other Sources

- Benson, Charles W. and Barber, R. Jerry. "Intermediate Educational Units and Their Promise for Rural Education." ERIC/CRESS, National Education Laboratory Publishers, Inc., Austin, Texas. 1974.
- Firestone, William A., Rossman, Gretchen B. and Wilson, Bruce L. "The Study of Regional Educational Service Agencies: Summary of Findings." National Institute of Education. September, 1983.
- Kula, Edward J. "Cooperative Purchasing Reduces Cost." School Business Affairs. 47:3:12-13, March, 1981.
- Levis, Rae M. "The Education Service Agency - Where Next." Draft Copy from American Association of School Administrators. Wayne, Michigan. 1983.
- Millard, Joseph E. and Berrie, Phillip J. "Heartland Area Education Agency 11 Educational Services Division Priorities Questionnaire Results." Johnston, Iowa. 1990.
- McNiel, Robert C. "Educational Service Agencies: Perspective on ESA Operations, 1990." American Association of Educational Service Agencies. Arlington, Virginia: 1990.
- Mrdjenovich, Donald. "Regional Service Centers. A Consumer's Viewpoint." Paper presented at the national conference sponsored by the National Federation for the Improvement of Rural Education. Las Vegas, Nevada, January 30 - February 1, 1974.
- Stephens, E. Robert. "Intermediate units: Renewed Interest in the Redesign of Service Delivery in State School Systems." Policy Briefs, North Central Regional Educational Laboratory, Report 1, 1992.
- Stephens, E. Robert. Regional Educational Service Agencies. Educational Research Service, Inc. Monograph. Arlington, Virginia: 1975.
- The Emerging Role of Regional Service Centers. Proceedings of the Second National Conference of NFIRE The National Federation for the Improvement of Rural Education. Austin, Texas. 1974.

Uxer, John E. Sharing resources in the small school. Paper presented at the Southwestern Rural Education Conference. Las Cruces, New Mexico: November 5-6, 1982.

Zorn, Robert L. Coop buying. You pool your power and poicket your savings. American School Board Journal. 160:4:42-43, April, 1973.

ERIC Documents

Cooper, Lloyd G. ; and Others. School Purchase Practice In Texas. 21p. ERIC, 1964. ED011803 RC000999.

Decker, Robert H.; McCumsey, Norman L. The Iowa Shared Superintendency: The School Board President's Perspective. 32p. ERIC, 1990. ED326364 Rc017911.

Dodge, William D. How Nine Schools Combined Their Purchading Power to Lower Food Bills. v170 n8 p27. ERIC, 1983. EJ285280 EA16615.

Firestone, William A.; and Others. Only a Phone Call Away: Local Educators' Views of Regional Educational Service Agencies. ERIC, 1983. ED241585 TM840132.

Gonder, Peggy. Cutting Cost: Successful Ways to Reduce School Expenditures. Current Trends in School Policies & Programs. Education U.S.A. Special Report. 65p. ERIC, 1977. ED133909 EA009179.

Hall, Calvin W. Dofferent Approachers to Shared Services 101p. ERIC, 1980. ED208556 EA014113.

Holloway, William H., and Clark, Wayne H. Cooperative Purchasing in the Public Schools: A Status Report with Comparisons. Planning and Changing 8, 2-3, 97-107. ERIC, 1977. EJ169800 EA509199.

Kula, Edwin J. Cooperative Purchasing Reduces Costs. School Buisness Affairs. v47 n3 p12-13. ERIC, 1981. EJ245730 EA514274.

- Matika, Francis. Cooperative Purchasing Saved Our Schools \$450,000 in One Year. American School Board Journal, v173 n2 p34-35. ERIC, 1986. EJ331376 EA19685.
- Martisko, Les; Shaw, Glen. Co-ops Let You Put More Eggs (And Everything Else) in One Basket. American School Board Journal, v173 n2 p33-34. ERIC, 1986. EJ331375 EA519684.
- O'Shea, Daniel R., and Piper, Donald I. Saving Money Through Group Bidding by North Dakota School Districts. ERIC, 1976. ED173926 EA011932.
- Patterson, Lewis D. Costing Collegiate Cooperation. A Report on the Costs and Benefits of Interinstitutional Programs with consortioun Case Studies and Guideliines. 449p. ERIC, 1979. ED180341.
- Root, Paul. School Improvement in Arkansas. 8p. ERIC, 1987. ED310902 RC17178.
- Saunders, Frank, Jr. Accountability: the Big Word in Purchasing. v47 n3 p12-13. ERIC, 1981. EJ245730 EA514274.
- Uxer, John E. Sharing Resources in the Small School. 17p. ERIC 1982. ED224669 RCO13723.
- Zorn, Robert L. Co-op Buying: YOU Pool Your Power and Pocket Your Savings. American School Board Journal, 160, 4, 42-43. ERIC, 1973. EJ075614 EA5033601.

APPENDIX A

LETTER OF EXPLANATION TO THE SUPERINTENDENTS

EXPLANATION TO PERSON COMPLETING SURVEY

TWO-PART SURVEY

April 20, 1992

Dear Superintendent:

Perhaps you are aware that many of the Iowa Public School Districts purchase school supplies and equipment cooperatively through various combined purchasing strategies. How significant the savings remains to be determined.

I am enrolled in the Educational Leadership and Policy Studies Doctoral Program at Loyola University of Chicago and will be using the results of this survey as the basis of my dissertation. It is the purpose of this study to analyze possible savings in selected areas of school supply purchases by examining the various purchasing strategies and other relative demographic information.

With your assistance in completing the information requested on the attached survey, I will develop a cross section of data which can be compared with other districts and regions across Iowa. Although information is being collected randomly by size of district in each of the fifteen Area Education Agencies (AEA), school districts will not be identified by name in the reporting of the data. Information will be reported by AEA, grouped by student population, and by the purchasing strategy exercised by responding districts. It is my intent to develop data which will support or reject purchasing strategies that can lead to the purchase of supplies and equipment at a significant savings to public school districts.

Your assistance will automatically place you on the mailing list to receive the results of this study which could possibly assist your district in future purchasing decisions.

It is requested that the district's purchaser complete the attached two-part survey. The data requested relative to prices paid for a selected list of items commonly purchased by school districts each year should come from actual district invoices for fiscal year 1991-1992.

I know how busy you and your staff are, so I ask that you complete this survey right away and return it no later than May 1, 1992, in the enclosed, self-addressed envelope. Your assistance will be helpful to me, but more importantly, could aid districts across the state in making purchasing decisions.

Sincerely,


Paul L. Knudtson

End.

Memorandum

TO: District Purchaser
FROM: Paul L. Knudtson, Educational Leadership and Policy Studies Doctoral Student
DATE: April 18, 1992
RE: Attached Survey in Two Parts

As a practicing school administrator in the State of Iowa for the past sixteen years and during my doctoral studies at Loyola University of Chicago, I have become keenly interested in the diversity of purchasing strategies utilized by the public school districts. The purpose of my study is to identify the strategies utilized by public school district and to further analyze what factors influence these strategies. This is a timely issue in view of the budget problems faced by every school district.

I would appreciate your contribution to this study by filling out the attached two-part survey. Your prompt response and return of this survey in the enclosed postage-paid envelope by May 1, 1992 will enable me to summarize and report back to all participating districts prior to the beginning of the 1992-1993 school year.

Part 1 of the attached survey is preliminary in nature to collect demographic information of possible factors affecting the use of different purchasing strategies by districts across the State of Iowa.

Part 2 is requesting price information for a list of ten commonly purchased items. The price paid for each item during the 1991-1992 fiscal year should be placed in the column representing the purchasing strategy used by your district to acquire that product. If more than one strategy is used, please indicate the different prices in the respective columns.

For the purpose of this study, a purchasing strategy is defined as the buying group to which your district normally purchases supplies and equipment. These strategies are: 1) Your district purchases on its own (**Individual**); 2) Purchased with one or more other school district(s) (**Collaborative**); or, 3) Purchase as a participant in an Area Educational Agency Cooperative Purchasing Program (**AEA Cooperative**).

Thank you for your prompt response. The schools of Iowa can benefit from the information you are willing to share.

District: _____ AEA: _____

Part I

All information provided will be considered confidential. Districts will not be identified by name. Group data will be presented according to the prices paid for the ten commonly purchased items, by the purchasing strategy and by the distance from cities with a population of 25,000 or greater.

Position of person completing survey: _____

1. Are you a formally trained purchasing specialist? Yes No

2. Is purchasing your sole responsibility? Yes No

Relative to all supplies and equipment purchased by your district on a yearly basis, what percentage of the total is as a result of a bidding process? _____%

Does your district have board policies for purchasing? Yes No

1. The dollar amount above which bids must be acquired: \$ _____

2. Requiring local purchasing "all things considered equal"? Yes No

3. Preferential policy for in state manufacturers or vendors? Yes No

From the following list of cities with a population greater than 25,000, please provide the name and distance to the four cities located closest to your district.

Ames	Bettendorf	Burlington	Cedar Falls	Cedar Rapids	Clinton
Council Bluffs	Davenport	Des Moines	Dubuque	Fort Dodge	Iowa City
Marshalltown	Mason City	Sioux City	Waterloo	West Des Moines	
Omaha, Nebr.	Sioux Falls, S.D.				

A. _____ B. _____

C. _____ D. _____

Also list the names of up to four communities from which your district purchases product if other than those listed above.

A. _____ B. _____

C. _____ D. _____

If your district would like to have a summary of this study upon completion, please so indicate: Yes No

Part II is located on the back of this sheet.

Part II

The price paid for each item during the 1991-1992 fiscal year should be placed in the column representing the purchasing strategy used by your district to acquire that product. If more than one strategy is used, please indicate the different prices in the respective columns.

Individual - Your district purchases on its own.

Collaborative - Purchased with one or more other school district(s).

AEA Cooperative - Purchase as a participant in an Area Educational Agency Cooperative Purchasing Program.

Part II			
Strategy/Item	Individual	Collaborative	AEA Cooperative
1 - Ball - 8.5" Rubber Playground			
12 - No. 2 Pencils with Eraser			
12 Sticks - White Chalk			
1,000 Sheets - Computer Paper 20# Bond Continuous, Regular Perf 8.5x11			
5,000 Sheets - Xerographic Bond Dual Purpose 20# White 8.5x11			
4,000 Towels - Singlefold Paper			
1 - VCR Player/Recorder			
1 - Janitor's Corn Broom 24#			
6 - No. 10 Cans Applesauce Grade A			
500 - Envelopes, Size 10 Regular 24# White			

APPENDIX B

SURVEY - PART ONE

Purchaser Data

and

Distance to Population Centers

Small District Demographic Data - All AEAs - Survey, page 1

Definition of Columns:

- 1 - AEA.
 2 - Position of person completing survey.
 3 - Are you a formally trained purchasing specialist?
 4 - Is purchasing your sole responsibility?
 5 - Relative to all supplies and equipment purchased by your district on a yearly basis, what percentage of the total is as a result of a bidding process?
 6 - Does your district have a board policy for purchasing?
 6a - The dollar amount above which bids must be acquired.
 6b - Requiring local purchasing "all things considered equal."
 6c - Preferential policy for in state manufacturers or vendors.

1	2	3	4	5	6	6a	6b	6c
1	----	No	No		No			
2	----	No	No	20	Yes	\$25000.00	Yes	Yes
	Superintendent	No	No	0	Yes	\$10000.00	Yes	Yes
	Superintendent	No	No	5	-	\$25000.00	No	Yes
	Superintendent	No	No	30	No	\$5000.00	Yes	No
3	Secretary	No	No	75	Yes	\$500.00	Yes	No
	----	No	No	-	Yes	\$25000.00	Yes	Yes
	Bus. Manager	No	No	-	Yes	\$2000.00	No	No
	Superintendent	No	No	5	Yes	\$25000.00	Yes	Yes
	Superintendent	No	No	15	Yes	\$10000.00	No	No
	Superintendent	No	No	1	Yes	\$25000.00	No	No
4	Superintendent	No	No	20	Yes	\$1000.00	Yes	No
	Superintendent	No	No	20	Yes	\$5000.00	Yes	Yes
5	Superintendent	No	No	-	No	----	Yes	Yes
	Bd. Secretary	No	No	5	Yes	\$5000.00	Yes	No
	Superintendent	No	No	50	Yes	\$2000.00	Yes	No
	Superintendent	No	No	50	Yes	\$2500.00	Yes	No
	Superintendent	No	No	10	Yes	\$10000.00	No	No
6	Superintendent	No	No	50	No	\$5000.00	No	No
	Superintendent	No	No	25	No	----	No	No
	Superintendent	No	No	25	Yes	----	No	No
	Bd. Secretary	No	No	-	yes	----	No	No
7	Superintendent	No	No	50	Yes	\$25000.00	Yes	Yes
	Superintendent	No	Yes	-	No	\$25000.00	No	No
9	Bd. Secretary	No	No	25	Yes	----	Yes	No
10	Bd. Secretary	No	No	10	Yes	\$10000.00	No	No
	Bookkeeper	No	No	10	No	----	No	No
	----	No	No	-	Yes	----	-	-

1	2	3	4	5	6	6a	6b	6c
11	Principal	No	No	-	Yes	\$5000.00	Yes	No
	Bd. Secretary	No	No	0	Yes	\$25000.00	Yes	No
	Superintendent	No	No	50	No	\$500.00	Yes	No
	Superintendent	No	No	90	Yes	\$25000.00	Yes	Yes
	Superintendent	No	No	80	Yes	\$25000.00	Yes	Yes
	Supt. Secretary	No	No	0	No	---	-	-
	Superintendent	No	NO	-	Yes	\$5000.00	Yes	Yes
12	Superintendent	No	No	1	Yes	\$25000.00	Yes	No
	Superintendent	No	No	20	Yes	\$25000.00	No	No
	Superintendent	No	No	-	Yes	\$15000.00	Yes	Yes
13	Superintendent	No	No	50	yes	\$25000.00	Yes	Yes
	Superintendent	No	No	-	Yes	\$5000.00	Yes	Yes
	Superintendent	No	No	-	Yes	\$2000.00	Yes	Yes
	Superintendent	No	No	10	Yes	\$25000.00	Yes	No
	Bd. Secretary	No	No	5	No	---	-	-
14	Superintendent	No	No	-	Yes	\$1500.00	Yes	Yes
	---	No	No	-	Yes	\$5000.00	Yes	Yes
15	Superintendent	No	No	10	Yes	\$500.00	Yes	Yes
	Superintendent	No	No	10	No	---	No	No
	Superintendent	No	No	30	Yes	\$5000.00	-	-
	Superintendent	Yes	No	90	Yes	\$5000.00	Yes	Yes
16	Superintendent	No	No	25	yes	\$25000.00	Yes	Yes

Medium District Demographic Data - All AEAs - Survey, page 1

Definition of Columns:

- 1 - AEA.
 2 - Position of person completing survey.
 3 - Are you a formally trained purchasing specialist?
 4 - Is purchasing your sole responsibility?
 5 - Relative to all supplies and equipment purchased by your district on a yearly basis, what percentage of the total is as a result of a bidding process?
 6 - Does your district have a board policy for purchasing?
 6a - The dollar amount above which bids must be acquired.
 6b - Requiring local purchasing "all things considered equal."
 6c - Preferential policy for in state manufacturers or vendors.

1	2	3	4	5	6	6a	6b	6c
1	Superintendent	No	No	10	No	\$25000.00	Yes	Yes
	Superintendent	No	No	-	No	\$0.00	Yes	Yes
	Superintendent	Yes	No	10	No	----	Yes	Yes
2	Superintendent	No	No	58	Yes	\$25000.00	Yes	No
3	Superintendent	No	No	-	Yes	\$20000.00	No	No
4	----	No	No	95	Yes	\$0.00	Yes	No
	Superintendent	No	No	20	-	\$10000.00	No	Yes
5	Superintendent	No	No	40	No	\$5000.00	Yes	No
	Superintendent	No	No	50	Yes	\$5000.00	No	No
	Superintendent	No	No	-	Yes	\$5000.00	No	Yes
6	Superintendent	Yes	No	-	Yes	\$1000.00	Yes	No
	Superintendent	No	No	5	No	\$0.00	No	Yes
7	Superintendent	No	No	75	Yes	\$0.00	Yes	Yes
	Dist. Secretary	No	No	5	Yes	\$5000.00	Yes	Yes
9	Superintendent	No	No	1	No	\$25000.00	No	Yes
10	Superintendent	No	No	0	No	\$0.00	No	No
11	Superintendent	No	No	70	Yes	----	Yes	Yes
	----	No	No	-	Yes	\$5000.00	Yes	Yes
	----	No	No	-	Yes	\$25000.00	Yes	Yes
	Superintendent	No	Yes	-	Yes	\$25000.00	No	No
	Bd. Secretary	No	No	-	Yes	\$1000.00	Yes	No
	Superintendent	No	No	-	Yes	\$25000.00	Yes	Yes
	Superintendent	No	No	25	Yes	\$4000.00	Yes	No
	Superintendent	No	No	75	Yes	\$25000.00	Yes	Yes
12	Superintendent	No	No	10	Yes	\$5000.00	Yes	Yes
	Superintendent	No	No	10	Yes	\$25000.00	Yes	No
	Superintendent	No	No	70	Yes	\$25000.00	Yes	Yes
	Superintendent	No	No	35	Yes	\$6000.00	Yes	No
13	Superintendent	Yes	No	-	Yes	\$5000.00	No	No
	Bus. Man/Bd. Sec	No	No	5	No	----	-	-

1	2	3	4	5	6	6a	6b	6c
14	Superintendent	No	No	-	Yes	\$10000.00	Yes	Yes
	Bd. Secretary	No	No	2	No	----	No	No
	Superintendent	Yes	No	50	Yes	\$25000.00	Yes	Yes
15	Secretary	No	No	-	Yes	----	-	-
	Bd. Secretary	No	No	4	Yes	\$2500.00	Yes	Yes
16	Superintendent	No	No	50	Yes	\$25000.00	No	No

Large District Demographic Data - All AEAs
Definition of Columns:

- 1 - AEA.
 2 - Position of person completing survey.
 3 - Are you a formally trained purchasing specialist?
 4 - Is purchasing your sole responsibility?
 5 - Relative to all supplies and equipment purchased by your district on a yearly basis, what percentage of the total is as a result of a bidding process?
 6 - Does your district have a board policy for purchasing?
 6a - The dollar amount above which bids must be acquired.
 6b - Requiring local purchasing "all things considered equal."
 6c - Preferential policy for in state manufacturers or vendors.

1	2	3	4	5	6	6a	6b	6c
1	Bd. Secretary	No	No	-	Yes	\$5000.00	Yes	No
2	Finance Director	No	No	80	Yes	\$1000.00	Yes	Yes
4	Superintendent	No	No	90	Yes	\$5000.00	Yes	Yes
6	Supt. Secretary	No	No	33	Yes	\$25000.00	Yes	Yes
	Superintendent	No	No	40	Yes	\$25000.00	No	Yes
7	----	No	No	70	Yes	\$5000.00	Yes	No
	Purchasing Clerk	No	No	-	Yes	\$2000.00	No	No
9	Bus. Coordinator	No	No	75	Yes	\$5000.00	Yes	Yes
	----	Yes	No	30	Yes	\$25000.00	Yes	No
	Bus. Manager	No	No	-	Yes	\$5000.00	No	No
11	Superintendent	No	No	75	Yes	\$25000.00	Yes	Yes
	Superintendent	No	No	25	Yes	\$5000.00	Yes	No
	Bus. Manager	No	No	25	Yes	\$4000.00	Yes	Yes
	Bus. Manager	No	No	50	Yes	\$5000.00	Yes	Yes
	Bus. Manager	No	No	10	No	\$5000.00	Yes	No
	Bus. Manager	No	No	5	Yes	\$5000.00	Yes	No
	Bus. Manager	No	No	70	Yes	\$25000.00	No	Yes
	Bus. Manager	No	No	-	Yes	\$25000.00	Yes	Yes
	Bus. Manager	Yes	No	10	Yes	\$1000.00	Yes	Yes
13	Supt. Secretary	No	No	70	Yes	\$500.00	Yes	No
14	Superintendent	No	No	-	Yes	\$5000.00	Yes	Yes
15	Purchasing Dir.	No	No	95	No	\$5000.00	No	No
	----	No	No	18	Yes	\$25000.00	Yes	No
16	Superintendent	No	No	70	Yes	\$5000.00	Yes	Yes

XLarge District Demographic Data - All AEAs

Definition of Columns:

- 1 - AEA.
- 2 - Position of person completing survey.
- 3 - Are you a formally trained purchasing specialist?
- 4 - Is purchasing your sole responsibility?
- 5 - Relative to all supplies and equipment purchased by your district on a yearly basis, what percentage of the total is as a result of a bidding process?
- 6 - Does your district have a board policy for purchasing?
- 6a - The dollar amount above which bids must be acquired.
- 6b - Requiring local purchasing "all things considered equal."
- 6c - Preferential policy for in state manufacturers or vendors.

1	2	3	4	5	6	6a	6b	6c
1	Executive Director	Yes	No	20	Yes	\$25000.00	Yes	Yes
7	Superintendent	Yes	No	25	Yes	\$25000.00	Yes	Yes
9	----	Yes	Yes	-	Yes	\$25000.00	Yes	Yes
10	Purchasing Mngr.	Yes	No	50	Yes	\$25000.00	No	No
11	Purchasing Agent	No	Yes	-	Yes	\$4000.00	Yes	Yes
12	----	Yes	Yes	75	Yes	\$5000.00	No	Yes
13	Purchasing Director	Yes	No	10	Yes	\$10000.00	Yes	Yes

SURVY - PART I, DISTANCE TO CITIES WITH 25,000 OR GREATER POPULATION

POPULATION AEA	SMALL 0-550	MEDIUM 551-1,100	LARGE 1,101-9,750	LARGEST >9,750
1	270/4 (a) 67.5 (b)	839/12 69.9	225/4 56.3	270/4 67.5
2	912/15 60.8	225/4 56.3	260/3 86.7	----
3	2106/24 87.75	226/3 75.3	----	----
4	----	527/6 87.8	417/4 140.3	----
5	2079/27 77	765/12 63.8	178/4 44.5	----
6	317/8 39.6	334/7 47.7	400/8 50	----
7	502/16 31.38	348/7 49.7	382/8 47.8	200/4 50
9	182/4 45.5	142/4 35.5	433/12 36.1	81/3 27
10	523/10 52.3	145/4 36.3	200/4 50	213/4 53.3
11	1429/27 52.9	1129/31 36.4	1670/36 46.4	89/3 29.7
12	745/12 62.1	1400/16 87.5	----	380/4 95
13	1294/20 64.7	482/8 60.3	390/4 97.5	4/1 4
14	660/8 82.5	981/12 81.8	268/4 67	----
15	1255/16 78.4	679/8 84.9	717/8 89.6	----
16	175/4 43.8	203/4 50.8	239/4 59.8	----
Col. Totals	12449/195	8425/138	5779/103	1237/23
Averages	65	61	56	54
SUM TOTALS	27890/459	Average distance to nearest city - 60.76 miles		

Explanation of data:

- (a) - 270/4 = Four small districts in AEA 1 have a combined distance of 270 miles to the nearest city with a population of 25,000 persons or greater.
- (b) - 67.5 miles is the average distance from a small district in AEA 1 to a population center greater than 25,000 people.

APPENDIX C

SURVEY - PARTTWO

Price Data for Ten Commonly Purchased Items

by

Population Group and Area Education Agency

	AEA	District	Item No.	Individual	Collaborative	Coop
1	1	460	1	5.54	•	•
2	1	551	1	5.54	•	•
3	1	568	1	5.18	•	•
4	2	190	1	•	•	1.97
5	2	216	1	•	•	1.97
6	2	257	1	5.08	•	•
7	3	260	1	2.85	•	•
8	3	266	1	5.50	•	•
9	3	291	1	5.54	•	•
10	3	442	1	2.90	•	•
11	5	125	1	2.50	•	•
12	5	176	1	10.50	•	•
13	5	240	1	5.81	•	•
14	5	266	1	4.15	•	•
15	5	336	1	3.00	•	•
16	5	361	1	3.25	•	•
17	6	214	1	•	•	2.19
18	6	304	1	•	•	1.55
19	7	408	1	•	•	1.55
20	7	548	1	•	•	2.24
21	10	190	1	5.54	•	•
22	11	234	1	1.85	•	•
23	11	337	1	•	•	1.55
24	11	415	1	•	•	1.55
25	11	474	1	1.96	•	•
26	11	498	1	•	•	1.55
27	11	513	1	•	•	1.55
28	11	546	1	1.85	•	•
29	12	363	1	4.01	•	•
30	13	269	1	4.63	•	•
31	13	359	1	5.18	•	•
32	13	379	1	3.38	•	•
33	13	392	1	5.16	•	•
34	14	311	1	16.95	•	•
35	15	418	1	9.20	•	•
36	1	460	2	1.20	•	•
37	2	190	2	•	•	.96
38	2	216	2	.96	•	•
39	2	257	2	1.13	•	•
40	2	214	2	3.10	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
41	3	260	2	•	•	.89
42	3	266	2	2.89	•	•
43	3	291	2	2.88	•	•
44	3	442	2	.89	•	•
45	5	125	2	.48	•	•
46	5	176	2	.96	•	•
47	5	220	2	.73	•	•
48	5	266	2	.84	•	•
49	5	336	2	1.20	•	•
50	5	361	2	.25	•	•
51	6	214	2	•	•	.42
52	6	304	2	•	•	.91
53	7	408	2	•	•	.91
54	7	473	2	•	•	.41
55	7	536	2	1.26	•	•
56	7	548	2	•	•	1.58
57	10	190	2	1.10	•	•
58	11	234	2	•	•	.43
59	11	337	2	.24	•	•
60	11	415	2	•	•	.42
61	11	474	2	•	•	.42
62	11	498	2	•	•	.42
63	11	513	2	•	•	.42
64	11	546	2	•	•	.42
65	12	363	2	1.08	•	•
66	13	269	2	1.13	•	•
67	13	293	2	1.04	•	•
68	13	359	2	1.29	•	•
69	13	379	2	1.00	•	•
70	13	392	2	1.49	•	•
71	14	311	2	•	•	.47
72	15	418	2	.96	•	•
73	15	469	2	.88	•	•
74	1	460	3	.59	•	•
75	2	190	3	•	•	.27
76	2	216	3	•	•	.27
77	2	257	3	•	•	.27
78	3	214	3	.61	•	•
79	3	260	3	•	•	.38
80	3	266	3	.60	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
121	5	240	4	•	•	6.23
122	5	266	4	•	•	6.07
123	5	336	4	•	•	6.30
124	5	361	4	•	•	5.10
125	6	214	4	•	•	5.76
126	7	536	4	•	•	5.76
127	7	548	4	•	•	5.76
128	10	190	4	•	•	5.85
129	10	484	4	•	•	5.85
130	10	506	4	•	•	5.85
131	11	234	4	•	•	5.15
132	11	337	4	11.98	•	•
133	11	415	4	•	•	5.61
134	11	474	4	•	•	5.15
135	11	498	4	•	•	5.15
136	11	513	4	•	•	5.40
137	11	546	4	•	•	5.15
138	12	363	4	•	•	5.99
139	13	269	4	•	•	5.72
140	13	359	4	•	•	5.54
141	13	379	4	10.43	•	•
142	13	392	4	•	•	5.54
143	14	311	4	•	•	5.60
144	15	212	4	•	•	9.04
145	15	418	4	6.08	•	•
146	15	469	4	10.29	•	•
147	1	160	5	•	•	17.90
148	2	190	5	•	•	21.20
149	2	216	5	•	•	20.20
150	2	257	5	•	•	15.00
151	3	260	5	•	•	18.43
152	3	266	5	18.50	•	•
153	3	291	5	18.60	•	•
154	3	442	5	18.40	•	•
155	5	125	5	•	•	17.48
156	5	176	5	•	•	18.64
157	5	220	5	•	•	18.60
158	5	240	5	•	•	18.64
159	5	266	5	•	•	18.00
160	5	336	5	27.00	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
161	5	361	5	•	•	16.50
162	6	214	5	•	•	19.07
163	6	304	5	•	•	17.05
164	7	408	5	•	•	17.05
165	7	473	5	18.65	•	•
166	7	536	5	23.00	•	•
167	7	548	5	•	•	18.65
168	10	190	5	•	•	17.32
169	10	484	5	•	•	19.88
170	10	506	5	•	•	17.32
171	11	234	5	•	•	17.55
172	11	337	5	•	•	17.55
173	11	415	5	•	•	17.10
174	11	474	5	•	16.95	•
175	11	498	5	•	•	17.55
176	11	513	5	•	•	17.55
177	11	546	5	23.00	•	•
178	12	363	5	•	•	18.07
179	13	269	5	•	•	15.35
180	13	293	5	•	•	15.35
181	13	359	5	•	•	18.07
182	13	379	5	•	•	22.80
183	13	392	5	•	•	18.07
184	14	311	5	•	•	17.50
185	15	212	5	•	•	17.19
186	15	418	5	23.00	•	•
187	15	469	5	•	•	16.08
188	1	460	6	29.50	•	•
189	2	190	6	•	•	10.23
190	2	216	6	•	•	10.23
191	2	257	6	31.00	•	•
192	3	214	6	15.00	•	•
193	3	266	6	29.50	•	•
194	3	291	6	29.50	•	•
195	3	442	6	19.20	•	•
196	5	176	6	•	•	10.58
197	5	220	6	24.80	•	•
198	5	240	6	•	•	10.58
199	5	266	6	38.50	•	•
200	5	336	6	•	9.50	•

	AER	District	Item No.	Individual	Collaborative	Coop
201	6	214	6	•	•	11.80
202	6	304	6	•	•	8.42
203	7	408	6	•	•	8.42
204	7	473	6	•	•	18.10
205	7	536	6	17.33	•	•
206	7	548	6	18.29	•	•
207	10	190	6	•	•	10.76
208	10	484	6	•	•	10.76
209	10	506	6	•	•	10.76
210	11	234	6	•	•	8.54
211	11	337	6	•	•	8.54
212	11	415	6	•	•	10.19
213	11	474	6	•	•	8.54
214	11	498	6	•	•	8.54
215	11	513	6	•	•	8.54
216	13	293	6	21.50	•	•
217	13	392	6	16.20	•	•
218	14	311	6	41.25	•	•
219	15	469	6	17.50	•	•
220	1	460	7	200.00	•	•
221	2	190	7	•	•	272.44
222	2	216	7	•	•	272.44
223	3	214	7	•	•	277.73
224	3	266	7	350.00	•	•
225	3	442	7	345.00	•	•
226	5	176	7	•	•	276.40
227	5	240	7	269.00	•	•
228	5	266	7	279.00	•	•
229	5	336	7	200.00	•	•
230	6	214	7	•	•	268.47
231	6	304	7	225.00	•	•
232	7	408	7	225.00	•	•
233	7	548	7	•	•	268.47
234	10	190	7	•	•	360.00
235	10	506	7	•	•	362.00
236	11	234	7	395.00	•	•
237	11	415	7	•	•	264.40
238	11	498	7	•	•	280.00
239	11	513	7	220.00	•	•
240	12	363	7	269.00	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
241	13	269	7	200.00	•	•
242	13	379	7	•	•	180.00
243	13	392	7	134.80	•	•
244	15	212	7	•	•	276.40
245	15	418	7	169.00	•	•
246	15	469	7	389.99	•	•
247	3	442	8	7.00	•	•
248	5	125	8	24.95	•	•
249	5	361	8	15.60	•	•
250	10	190	8	10.37	•	•
251	12	363	8	17.00	•	•
252	13	379	8	6.40	•	•
253	13	392	8	12.97	•	•
254	15	418	8	7.95	•	•
255	2	190	9	18.05	•	•
256	3	214	9	15.85	•	•
257	3	266	9	15.75	•	•
258	3	442	9	13.95	•	•
259	5	125	9	14.76	•	•
260	5	176	9	12.17	•	•
261	5	266	9	20.00	•	•
262	5	361	9	17.10	•	•
263	6	214	9	•	•	15.75
264	6	304	9	18.50	•	•
265	7	408	9	18.50	•	•
266	7	536	9	15.62	•	•
267	7	548	9	16.98	•	•
268	10	190	9	19.25	•	•
269	11	234	9	17.48	•	•
270	11	337	9	•	•	12.98
271	11	415	9	•	•	13.25
272	11	474	9	•	•	12.98
273	11	498	9	•	•	12.98
274	11	513	9	13.07	•	•
275	12	363	9	•	•	15.08
276	13	269	9	16.00	•	•
277	13	359	9	•	•	13.07
278	13	379	9	13.40	•	•
279	13	392	9	14.64	•	•
280	14	311	9	16.90	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
281	15	418	9	16.06	•	•
282	15	469	9	17.14	•	•
283	1	460	10	9.95	•	•
284	2	190	10	•	•	4.77
285	2	257	10	•	•	4.22
286	3	214	10	5.00	•	•
287	3	260	10	•	•	5.60
288	3	266	10	12.99	•	•
289	3	291	10	9.20	•	•
290	3	442	10	10.65	•	•
291	5	125	10	9.69	•	•
292	5	176	10	10.00	•	•
293	5	240	10	11.42	•	•
294	5	266	10	8.70	•	•
295	5	336	10	10.00	•	•
296	5	361	10	8.80	•	•
297	6	214	10	•	•	4.80
298	6	304	10	•	•	4.14
299	6	408	10	•	•	4.14
300	6	473	10	•	•	4.68
301	6	536	10	•	•	4.68
302	6	548	10	•	•	4.68
303	10	190	10	3.00	•	•
304	10	484	10	4.80	•	•
305	10	506	10	•	•	5.05
306	11	234	10	4.59	•	•
307	11	415	10	•	•	3.87
308	11	474	10	•	•	3.87
309	11	498	10	4.59	•	•
310	11	513	10	•	•	3.87
311	11	546	10	•	•	3.87
312	12	363	10	•	•	3.32
313	13	269	10	7.44	•	•
314	13	293	10	9.00	•	•
315	13	359	10	5.29	•	•
316	13	379	10	5.60	•	•
317	13	392	10	7.38	•	•
318	15	469	10	7.69	•	•
319	1	551	11	5.54	•	•
320	1	568	11	5.18	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
321	1	677	11	5.45	•	•
322	2	726	11	•	•	1.97
323	4	576	11	•	•	1.90
324	4	911	11	•	•	1.90
325	5	581	11	3.50	•	•
326	5	584	11	5.34	•	•
327	5	769	11	5.54	•	•
328	6	703	11	•	•	1.96
329	7	653	11	•	•	1.96
330	7	753	11	4.00	•	•
331	11	608	11	1.76	•	•
332	11	638	11	•	•	1.55
333	11	652	11	•	•	1.55
334	11	684	11	•	•	1.55
335	11	702	11	5.54	•	•
336	11	809	11	•	•	1.55
337	11	930	11	•	•	1.55
338	12	598	11	5.97	•	•
339	14	584	11	•	•	1.75
340	14	739	11	2.95	•	•
341	15	747	11	9.14	•	•
342	16	604	11	4.95	•	•
343	1	551	12	.59	•	•
344	1	568	12	.96	•	•
345	1	677	12	.67	•	•
346	2	726	12	•	•	.48
347	4	576	12	.44	•	•
348	4	911	12	•	•	.49
349	5	581	12	.60	•	•
350	5	584	12	1.44	•	•
351	5	769	12	.96	•	•
352	6	703	12	•	•	.42
353	7	653	12	•	•	.71
354	7	753	12	.89	•	•
355	11	608	12	•	•	.43
356	11	638	12	•	•	.42
357	11	652	12	•	•	.42
358	11	684	12	•	•	.42
359	11	702	12	•	•	.42
360	11	809	12	•	•	.42

	REA	District	Item No.	Individual	Collaborative	Coop
361	11	883	12	•	•	.42
362	11	930	12	•	•	.42
363	12	598	12	.96	•	•
364	12	667	12	.75	•	•
365	13	604	12	.41	•	•
366	14	584	12	•	•	.47
367	14	634	12	•	•	.48
368	14	739	12	.85	•	•
369	15	700	12	.72	•	•
370	15	747	12	.67	•	•
371	16	604	12	1.54	•	•
372	1	551	13	.21	•	•
373	1	568	13	.19	•	•
374	1	677	13	.21	•	•
375	2	726	13	.26	•	•
376	4	911	13	•	•	.36
377	5	581	13	.46	•	•
378	5	584	13	.19	•	•
379	5	769	13	.59	•	•
380	6	703	13	•	•	.25
381	7	653	13	•	•	.24
382	7	753	13	.38	•	•
383	11	608	13	•	•	.35
384	11	638	13	•	•	.35
385	11	652	13	•	•	.36
386	11	684	13	•	•	.34
387	11	702	13	•	•	.34
388	11	809	13	•	•	.35
389	11	883	13	•	•	.35
390	12	598	13	.41	•	•
391	12	667	13	.28	•	•
392	14	584	13	•	•	.39
393	14	634	13	•	•	.40
394	15	747	13	.44	•	•
395	1	551	14	•	•	4.00
396	1	568	14	•	•	5.08
397	1	677	14	12.07	•	•
398	4	576	14	•	•	5.37
399	4	911	14	•	•	10.00
400	5	584	14	•	•	4.70

	REA	District	Item No.	Individual	Collaborative	Coop
401	5	769	14	•	•	4.70
402	6	703	14	•	•	5.76
403	7	653	14	•	•	9.20
404	7	753	14	•	•	5.76
405	11	608	14	•	•	5.15
406	11	638	14	•	•	5.15
407	11	652	14	•	•	5.15
408	11	684	14	•	•	5.15
409	11	702	14	11.65	•	•
410	11	809	14	•	•	5.15
411	11	930	14	•	•	5.15
412	12	598	14	14.32	•	•
413	12	667	14	•	•	6.27
414	13	604	14	•	•	6.00
415	14	584	14	•	•	5.60
416	14	739	14	8.00	•	•
417	15	700	14	•	•	5.53
418	15	747	14	•	•	4.94
419	16	604	14	7.75	•	•
420	1	551	15	•	•	17.46
421	1	568	15	•	•	17.62
422	1	677	15	•	•	17.46
423	4	576	15	•	•	12.10
424	4	911	15	•	•	15.20
425	5	584	15	•	•	17.48
426	5	769	15	•	•	17.48
427	6	703	15	•	•	19.07
428	7	653	15	17.50	•	•
429	7	753	15	•	•	18.65
430	9	1053	15	•	18.00	•
431	11	608	15	•	•	17.55
432	11	638	15	•	14.24	•
433	11	652	15	•	•	17.55
434	11	684	15	•	•	17.55
435	11	702	15	16.20	•	•
436	11	809	15	•	•	17.55
437	11	883	15	•	•	17.55
438	11	930	15	•	•	17.55
439	12	598	15	•	•	15.20
440	12	667	15	•	•	24.08

	REA	District	Item No.	Individual	Collaborative	Coop
441	14	584	15	•	•	17.55
442	15	747	15	•	•	16.08
443	16	604	15	•	•	15.42
444	1	551	16	12.25	•	•
445	1	568	16	25.60	•	•
446	1	677	16	11.25	•	•
447	2	726	16	•	•	10.23
448	4	576	16	•	•	10.08
449	5	584	16	•	•	9.48
450	5	769	16	•	•	9.48
451	6	703	16	•	•	12.69
452	7	753	16	46.65	•	•
453	11	638	16	•	•	8.54
454	11	684	16	•	•	8.54
455	11	702	16	•	•	8.54
456	11	809	16	•	•	8.54
457	11	930	16	•	•	8.54
458	12	598	16	40.83	•	•
459	14	584	16	•	•	9.65
460	14	634	16	7.00	•	•
461	16	604	16	14.40	•	•
462	1	551	17	•	•	273.76
463	1	677	17	269.00	•	•
464	2	726	17	295.00	•	•
465	4	576	17	265.00	•	•
466	4	911	17	•	•	277.23
467	5	769	17	•	•	276.00
468	6	703	17	299.00	•	•
469	7	653	17	253.34	•	•
470	7	753	17	•	•	437.50
471	11	638	17	310.00	•	•
472	11	652	17	•	•	275.00
473	11	702	17	215.00	•	•
474	11	883	17	•	•	280.00
475	12	667	17	•	•	277.73
476	14	584	17	•	•	276.71
477	14	634	17	•	•	276.40
478	15	747	17	•	•	249.00
479	16	604	17	299.95	•	•
480	1	551	18	4.96	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
481	1	568	18	17.30	•	•
482	5	769	18	9.15	•	•
483	6	703	18	10.65	•	•
484	7	753	18	15.65	•	•
485	11	638	18	•	•	4.72
486	11	652	18	•	•	4.72
487	11	684	18	•	•	4.72
488	11	702	18	•	•	4.72
489	11	809	18	•	•	4.72
490	14	584	18	•	•	3.14
491	14	634	18	4.75	•	•
492	1	551	19	15.34	•	•
493	1	677	19	16.25	•	•
494	2	726	19	15.39	•	•
495	4	576	19	15.13	•	•
496	4	911	19	14.30	•	•
497	5	769	19	16.99	•	•
498	6	703	19	14.99	•	•
499	7	753	19	15.65	•	•
500	11	608	19	•	•	13.25
501	11	638	19	•	•	12.98
502	11	652	19	•	•	13.25
503	11	684	19	•	•	13.25
504	11	702	19	•	•	13.75
505	11	809	19	•	•	13.25
506	11	883	19	11.95	•	•
507	11	930	19	•	•	12.98
508	12	667	19	18.50	•	•
509	14	584	19	•	12.03	•
510	14	739	19	15.80	•	•
511	15	747	19	15.50	•	•
512	16	604	19	15.54	•	•
513	1	551	20	5.47	•	•
514	1	568	20	9.20	•	•
515	4	576	20	5.53	•	•
516	4	911	20	10.18	•	•
517	5	7698	20	8.45	•	•
518	6	703	20	•	•	4.80
519	7	653	20	8.94	•	•
520	7	753	20	3.98	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
521	11	608	20	•	•	3.87
522	11	638	20	•	•	3.87
523	11	652	20	•	•	3.59
524	11	684	20	•	•	3.87
525	11	702	20	•	•	3.87
526	11	883	20	•	•	3.87
527	11	930	20	•	•	3.87
528	12	667	20	4.30	•	•
529	13	604	20	7.50	•	•
530	14	584	20	•	•	4.37
531	14	634	20	•	•	5.19
532	14	739	20	5.60	•	•
533	15	700	20	•	•	4.63
534	15	747	20	•	•	4.71
535	16	604	20	5.49	•	•
536	1	1169	21	9.20	•	•
537	2	4775	21	1.73	•	•
538	4	1161	21	3.10	•	•
539	5	1839	21	9.20	•	•
540	6	1264	21	•	•	2.10
541	6	4761	21	2.21	•	•
542	7	5074	21	1.88	•	•
543	9	2926	21	2.95	•	•
544	9	5117	21	1.79	•	•
545	11	1333	21	•	•	1.55
546	11	1521	21	•	•	1.55
547	11	1602	21	•	•	1.55
548	11	1783	21	•	•	1.55
549	11	2336	21	2.30	•	•
550	11	3244	21	•	•	1.55
551	11	3570	21	3.70	•	•
552	13	1112	21	2.75	•	•
553	14	1448	21	2.44	•	•
554	15	2671	21	2.50	•	•
555	15	2191	21	2.11	•	•
556	1	1169	22	2.29	•	•
557	2	4775	22	.44	•	•
558	4	1161	22	•	•	.49
559	5	1839	22	.96	•	•
560	6	1264	22	•	•	.41

	REA	District	Item No.	Individual	Collaborative	Coop
561	6	4761	22	.97	•	•
562	7	1712	22	.44	•	•
563	7	5074	22	1.48	•	•
564	9	2926	22	.45	•	•
565	9	5117	22	.42	•	•
566	10	1621	22	.40	•	•
567	11	1212	22	•	•	.42
568	11	1333	22	•	•	.42
569	11	1521	22	•	•	.44
570	11	1602	22	•	•	.42
571	11	1783	22	•	•	.42
572	11	2028	22	.89	•	•
573	11	2336	22	•	•	.49
574	11	3244	22	•	•	.42
575	11	3570	22	•	•	.42
576	13	1112	22	1.30	•	•
577	14	1448	22	.51	•	•
578	15	1809	22	.42	•	•
579	15	2671	22	.22	•	•
580	16	2191	22	.48	•	•
581	1	1169	23	.59	•	•
582	2	4775	23	.23	•	•
583	5	1839	23	.43	•	•
584	6	1264	23	•	•	.24
585	6	4761	23	.29	•	•
586	7	1712	23	.32	•	•
587	7	5074	23	.32	•	•
588	9	1689	23	.24	•	•
589	9	2926	23	.27	•	•
590	9	5117	23	.29	•	•
591	11	1333	23	•	•	.35
592	11	1521	23	•	•	.36
593	11	1783	23	•	•	.36
594	11	2028	23	.41	•	•
595	11	2336	23	.29	•	•
596	11	3244	23	•	•	.35
597	11	3570	23	.28	•	•
598	13	1112	23	.91	•	•
599	14	1448	23	.32	•	•
600	15	2671	23	.48	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
601	16	2191	23	.40	•	•
602	1	1169	24	•	•	4.93
603	2	4775	24	•	•	5.54
604	5	1839	24	•	•	4.70
605	6	1264	24	•	•	5.75
606	6	4761	24	5.22	•	•
607	7	1712	24	•	•	5.33
608	7	5074	24	5.77	•	•
609	9	1689	24	•	•	5.56
610	9	5117	24	5.88	•	•
611	10	1621	24	5.85	•	•
612	11	1333	24	•	•	5.15
613	11	1521	24	•	•	5.15
614	11	1602	24	•	•	6.81
615	11	1783	24	•	•	6.08
616	11	2020	24	7.40	•	•
617	11	2336	24	10.00	•	•
618	11	3244	24	•	•	5.15
619	11	3570	24	5.98	•	•
620	13	1112	24	7.50	•	•
621	14	1448	24	7.78	•	•
622	15	1809	24	•	•	6.41
623	16	2191	24	7.71	•	•
624	1	1169	25	•	•	17.62
625	2	4775	25	17.80	•	•
626	4	1161	25	•	•	15.20
627	5	1839	25	•	18.50	•
628	6	1264	25	•	•	18.65
629	6	4761	25	•	•	18.65
630	7	1712	25	•	•	18.65
631	7	5074	25	18.90	•	•
632	9	1689	25	•	•	16.60
633	9	2926	25	•	16.55	•
634	9	5117	25	16.00	•	•
635	10	1621	25	•	•	17.32
636	11	1333	25	•	•	17.55
637	11	1521	25	•	18.00	•
638	11	1602	25	•	16.95	•
639	11	2028	25	22.95	•	•
640	11	2336	25	19.00	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
641	11	3244	25	•	•	17.55
642	11	3570	25	18.30	•	•
643	13	1112	25	19.60	•	•
644	14	1448	25	18.00	•	•
645	15	1809	25	•	•	16.08
646	15	2671	25	•	•	16.08
647	16	2191	25	20.20	•	•
648	1	1169	26	27.30	•	•
649	2	4775	26	10.22	•	•
650	5	1839	26	•	9.48	•
651	6	1264	26	•	•	11.80
652	6	4761	26	9.75	•	•
653	7	1712	26	12.13	•	•
654	7	5074	26	10.40	•	•
655	9	1689	26	9.75	•	•
656	9	2926	26	•	16.10	•
657	11	1333	26	•	•	8.54
658	11	1521	26	•	•	8.54
659	11	1783	26	•	•	8.54
660	11	2028	26	24.00	•	•
661	11	2336	26	•	•	8.54
662	11	3570	26	•	•	8.54
663	13	1112	26	25.00	•	•
664	14	1448	26	39.13	•	•
665	15	1809	26	12.30	•	•
666	15	2671	26	14.46	•	•
667	16	2191	26	10.30	•	•
668	6	1264	27	270.00	•	•
669	7	1712	27	•	•	268.47
670	7	5074	27	260.00	•	•
671	9	1689	27	179.00	•	•
672	9	2926	27	•	•	272.44
673	9	5117	27	•	•	272.00
674	10	1621	27	299.00	•	•
675	11	1521	27	199.00	•	•
676	11	2028	27	325.00	•	•
677	11	2336	27	385.00	•	•
678	11	3244	27	•	•	264.44
679	11	3570	27	•	•	264.44
680	13	1112	27	250.00	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
681	14	1448	27	249.00	•	•
682	15	1809	27	225.00	•	•
683	15	2671	27	276.00	•	•
684	16	2191	27	•	•	277.13
685	1	1169	28	4.20	•	•
686	7	5074	28	2.84	•	•
687	9	5117	28	3.98	•	•
688	11	2028	28	6.50	•	•
689	11	2336	28	•	•	4.72
690	11	3244	28	•	•	4.72
691	11	3570	28	•	•	4.72
692	15	2671	28	8.50	•	•
693	1	1169	29	16.26	•	•
694	6	4761	29	12.69	•	•
695	7	1712	29	13.68	•	•
696	7	5074	29	14.06	•	•
697	9	1689	29	13.98	•	•
698	9	2926	29	•	14.45	•
699	9	5117	29	•	14.45	•
700	10	1621	29	14.86	•	•
701	11	1333	29	•	•	12.98
702	11	1521	29	•	•	13.25
703	11	1783	29	•	•	12.98
704	11	2028	29	13.85	•	•
705	11	3244	29	•	•	13.25
706	11	3570	29	•	•	13.75
707	13	1112	29	14.00	•	•
708	14	1448	29	14.50	•	•
709	15	2671	29	16.00	•	•
710	16	2191	29	13.07	•	•
711	1	1169	30	•	•	6.50
712	2	4775	30	•	•	4.77
713	4	1161	30	5.08	•	•
714	5	1839	30	4.45	•	•
715	6	1264	30	•	•	4.68
716	6	4761	30	5.20	•	•
717	7	1712	30	5.29	•	•
718	7	5074	30	6.18	•	•
719	9	1689	30	•	•	9.00
720	9	2926	30	5.15	•	•

	REA	District	Item No.	Individual	Collaborative	Coop
721	9	5117	30	4.61	•	•
722	11	1212	30	•	•	3.87
723	11	1333	30	•	•	3.87
724	11	1521	30	•	•	3.87
725	11	1602	30	•	•	3.87
726	11	1783	30	•	•	3.95
727	11	2028	30	3.70	•	•
728	11	2336	30	5.29	•	•
729	11	3244	30	•	•	3.94
730	11	3570	30	•	•	3.87
731	13	1112	30	3.85	•	•
732	14	1448	30	7.69	•	•
733	15	1809	30	•	•	4.63
734	15	2671	30	6.29	•	•
735	16	2191	30	10.00	•	•
736	1	9754	31	1.79	•	•
737	10	17406	31	1.72	•	•
738	11	30998	31	2.71	•	•
739	12	14477	31	1.40	•	•
740	13	10090	31	5.85	•	•
741	1	9754	32	.99	•	•
742	9	18246	32	.60	•	•
743	10	17406	32	.48	•	•
744	11	30998	32	.42	•	•
745	12	14477	32	.47	•	•
746	13	10090	32	.47	•	•
747	1	9754	33	.35	•	•
748	9	18246	33	.28	•	•
749	10	17406	33	.36	•	•
750	11	30998	33	.21	•	•
751	12	14477	33	.31	•	•
752	13	10090	33	.41	•	•
753	1	9754	34	•	•	5.60
754	9	18246	34	4.86	•	•
755	10	17406	34	6.74	•	•
756	11	30998	34	5.25	•	•
757	12	14477	34	5.54	•	•
758	13	10090	34	6.30	•	•
759	1	9754	35	•	•	20.35
760	9	18246	35	•	•	16.80

	REA	District	Item No.	Individual	Collaborative	Coop
761	10	17406	35	18.65	•	•
762	11	30998	35	18.20	•	•
763	12	14477	35	16.90	•	•
764	13	10090	35	17.50	•	•
765	1	9754	36	11.05	•	•
766	10	17406	36	8.45	•	•
767	1	9754	37	269.00	•	•
768	9	18246	37	•	•	267.00
769	10	17406	37	320.00	•	•
770	11	30998	37	269.00	•	•
771	12	14477	37	•	•	278.03
772	13	10090	37	•	•	285.00
773	1	9754	38	4.24	•	•
774	9	18246	38	3.81	•	•
775	10	17406	38	4.00	•	•
776	11	30998	38	3.20	•	•
777	12	14477	38	2.66	•	•
778	13	10090	38	2.88	•	•
779	1	9754	39	12.85	•	•
780	10	17406	39	16.11	•	•
781	11	30998	39	12.57	•	•
782	1	9754	40	4.79	•	•
783	9	18246	40	4.97	•	•
784	10	17406	40	5.41	•	•
785	11	30998	40	4.65	•	•
786	12	14477	40	4.32	•	•
787	13	10090	40	2.38	•	•

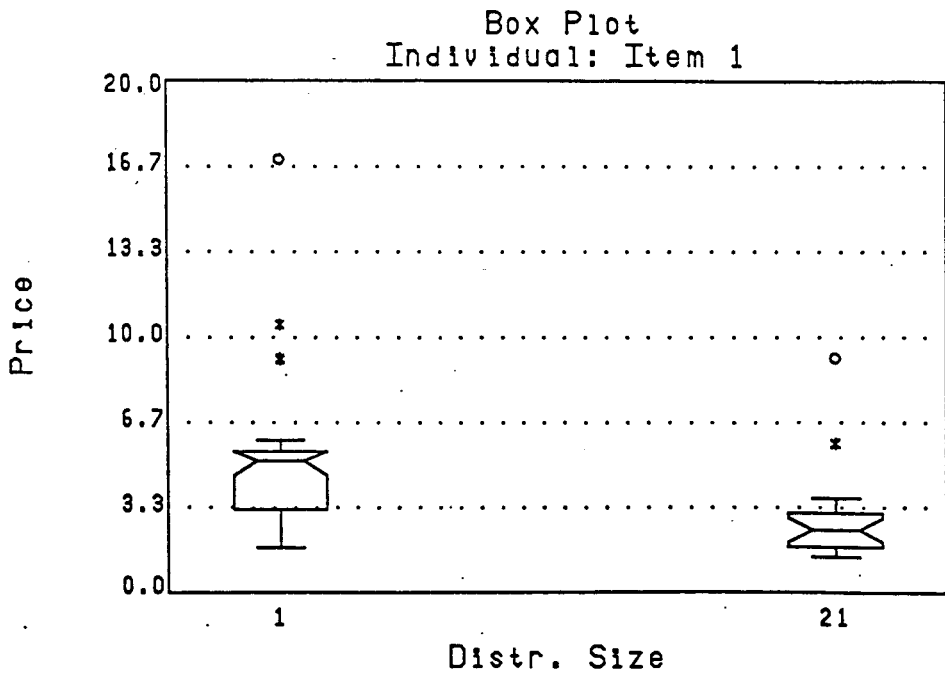
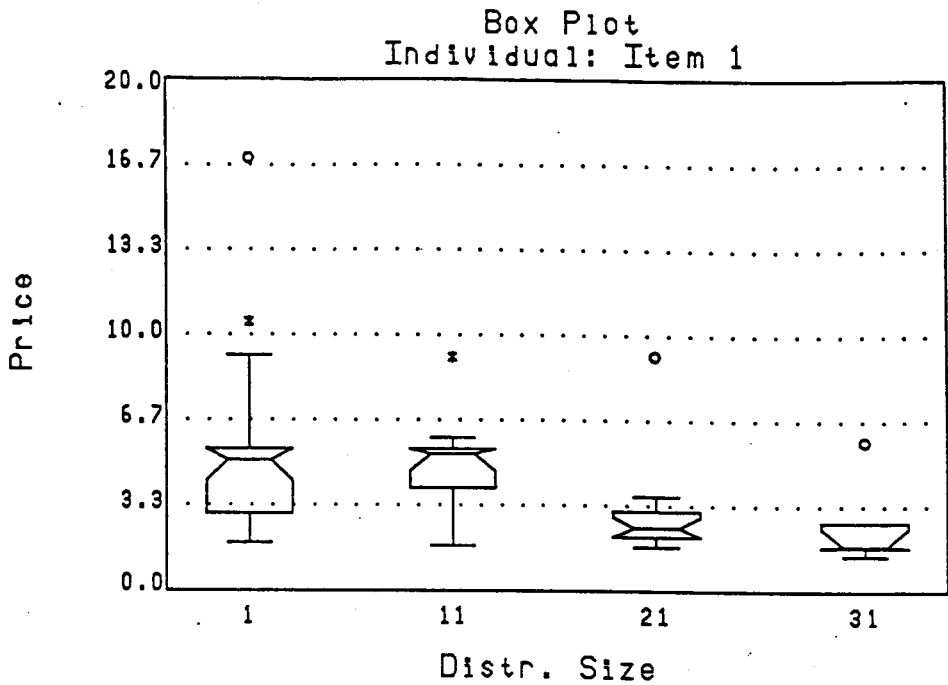
APPENDIX D

INDIVIDUAL PURCHASING STRATEGY

- Box Plots -

- Two Sample t-test Results -

- ANOVA Multiple Comparison Results -

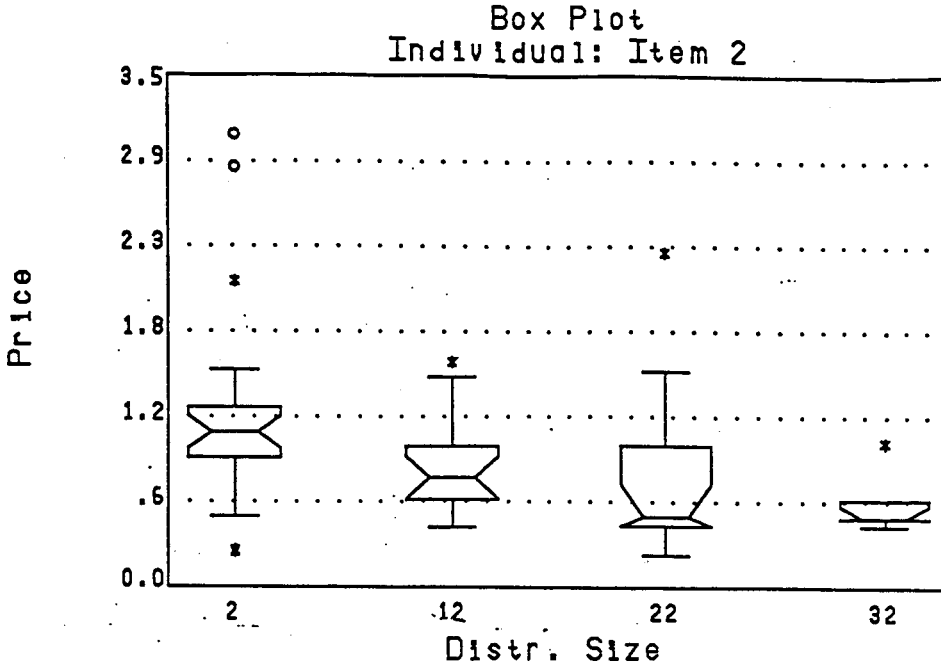


Two Sample T-Test Results

Response: "Individual"

Group:	Item No. 1		Item No. 21	
Count - Mean	38	5.0502	19	3.2279
95% C.L. of Mean	4.1366	5.9639	2.1084	4.3474
Std.Dev - Std. Error	2.7799	0.4510	2.3229	0.5329

Unequal Variance t: t-value 2.6104, P-value 0.0122



Means & Effects

Item No.	Count	Mean	Standard Error
2	24	1.1742	0.1377
12	15	0.8300	0.0828
22	15	0.7780	0.1438

Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A B C
A(22)	0.7780	. . S
B(12)	0.8300	. . S
C(2)	1.1742	S S .

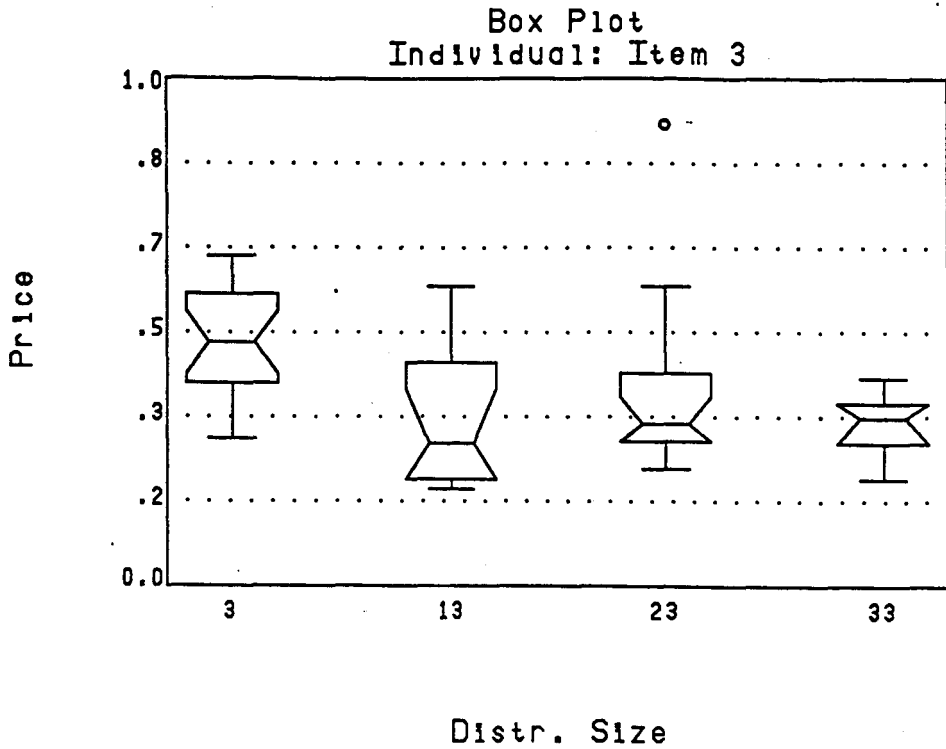
Two Sample T-Test Results

Response: "Individual"

Group:	Item No. 2		Item No. 32	
Count - Mean	24	1.1742	6	0.5717
95% C.L. of Mean	0.8893	1.459	0.3482	0.7952
Std.Dev - Std. Error	0.6746	0.1377	0.2135	0.0872

Unequal Variance t: t-value 3.6969, P-value 0.0009

ITEM 3 - CHALK

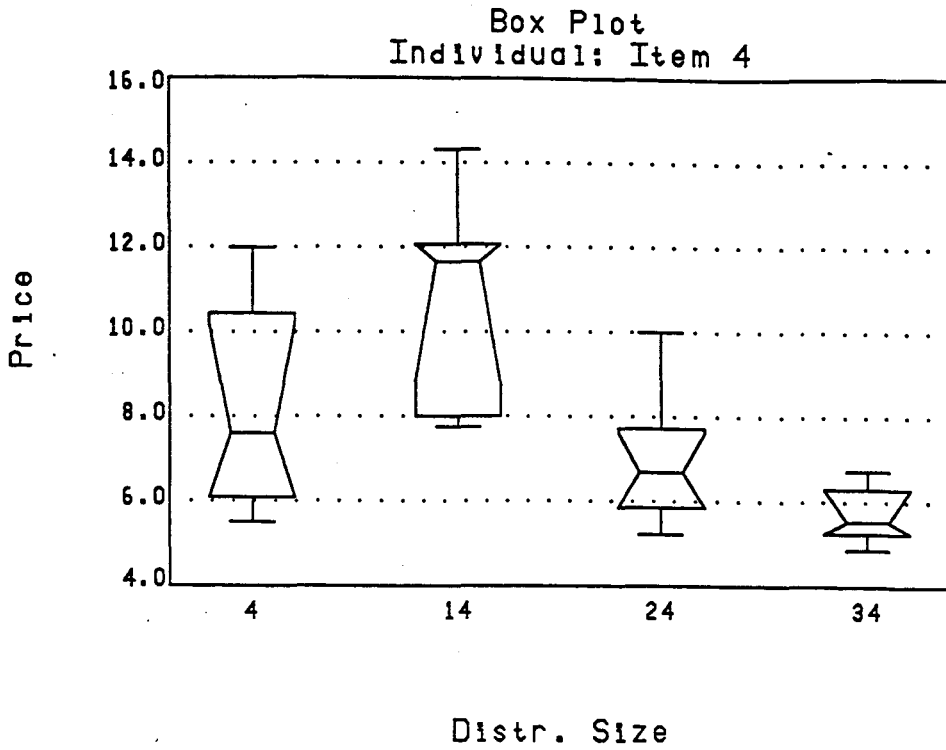


Means & Effects

Item No.	Count	Mean	Standard Error
3	20	0.4825	0.0293
13	11	0.3291	0.0395
23	16	0.3794	0.0328
33	6	0.3200	0.0535

Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A	B	C	D
A(33)	0.3200	.	.	.	S
B(13)	0.3291	.	.	.	S
C(23)	0.3794	.	.	.	S
D(3)	0.4825	S	S	S	.



Means & Effects

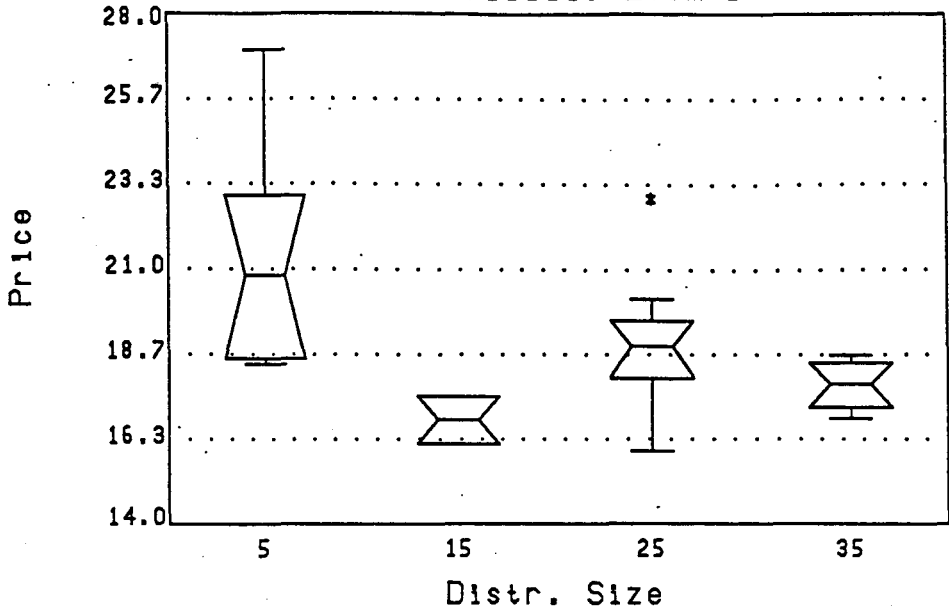
Item No.	Count	Mean	Standard Error
4	7	8.44	0.7449
14	5	10.76	0.8814
24	10	6.91	0.6232
34	5	5.74	0.8814

Unweighted Means ANOVA (Multiple Comparisons)

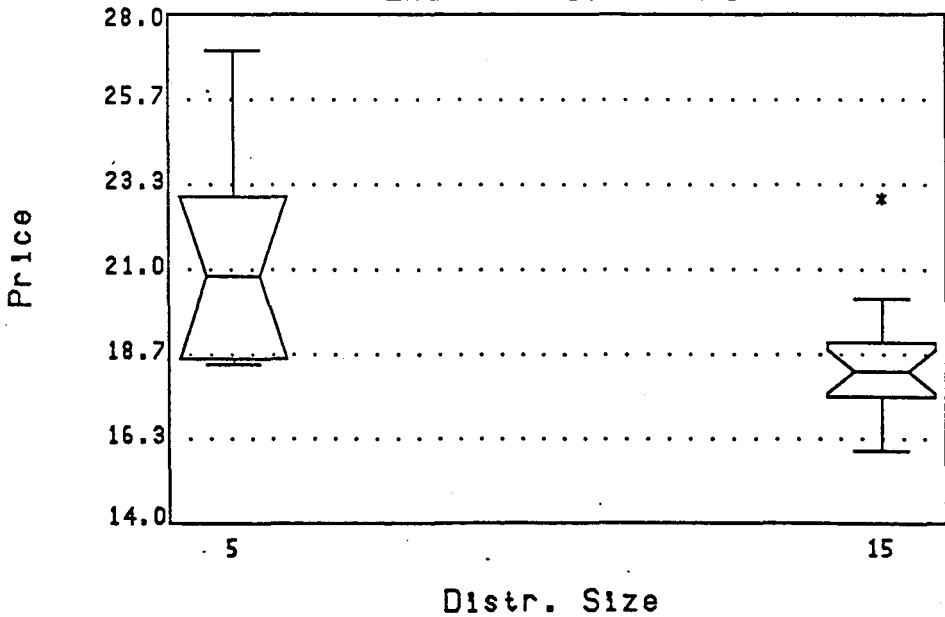
Code (Level)	Mean	A B C D
A(34)	5.74	. . S S
B(24)	6.91	. . . S
C(4)	8.44	S . . .
D(14)	10.76	S S . .

ITEM 5 - BOND PAPER

Box Plot
Individual: Item 5



Box Plot
Individual: Item 5

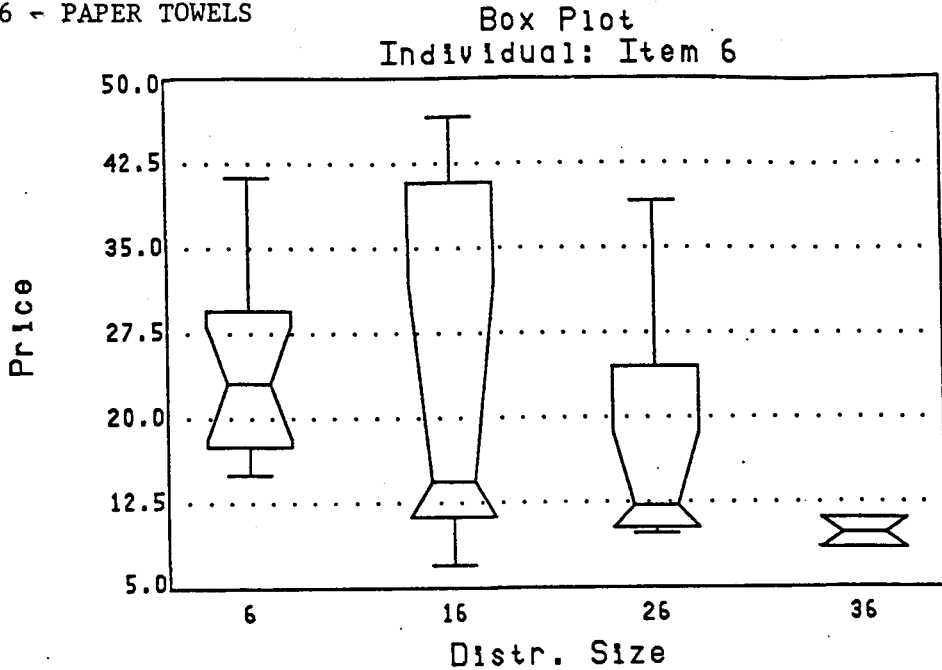


Two Sample T-Test Results

Response: "Individual"

Group:	Item No. 5	Item No. 15		
Count - Mean	8	21.2688	15	18.3800
95% C.L. of Mean	18.6012	23.9363	17.4315	19.3285
Std.Dev - Std. Error	3.2008	1.1316	1.7132	0.4423

Unequal Variance t: t-value 2.3775, P-value 0.0388



Two Sample T-Test Results

Response: "Individual"

Group:	Item No. 6		Item No. 16	
Count - Mean	14	24.9336	7	22.5686
95% C.L. of Mean	20.0619	29.8053	8.1215	37.0157
Std.Dev - Std. Error	8.442	2.2563	15.6326	5.9086

Unequal Variance t: t-value 0.3739, P-value 0.7182

Two Sample T-Test Results

Response: "Individual"

Group:	Item No. 6		Item No. 26	
Count - Mean	14	24.9336	12	17.0617
95% C.L. of Mean	20.0619	29.8053	11.0071	23.1163
Std.Dev - Std. Error	8.442	2.2562	9.5374	2.7532

Unequal Variance t: t-value 2.2115, P-value 0.0368

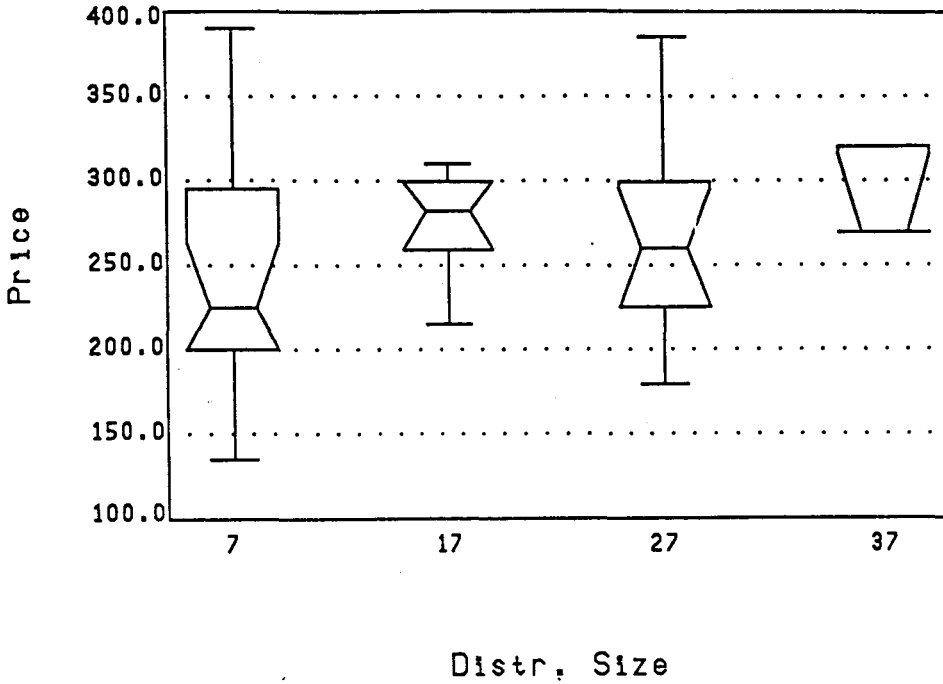
Two Sample T-Test Results

Response: "Individual"

Group:	Item No. 6		Item No. 36	
Count - Mean	14	24.9336	2	9.75
95% C.L. of Mean	20.0619	29.8053	-6.7806	26.2681
Std.Dev - Std. Error	8.442	2.2562	1.838478	1.3

Unequal Variance t: t-value 5.8310, P-value 0.0000

Box Plot
Individual: Item 7



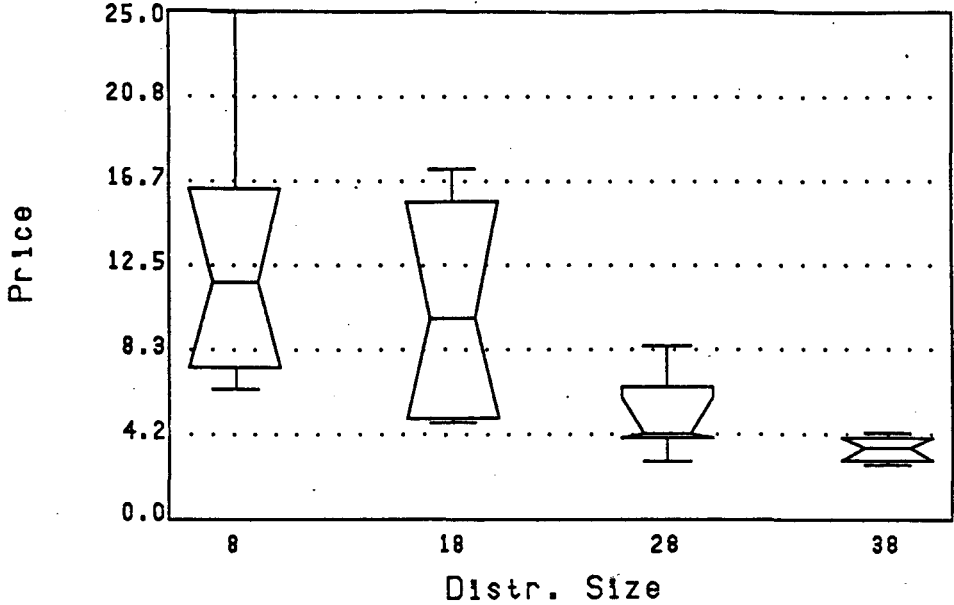
Means & Effects

Item No.	Count	Mean	Standard Error
7	15	251.39	15.1478
17	8	275.79	20.7420
27	11	265.18	17.6888
37	3	286.00	33.8715

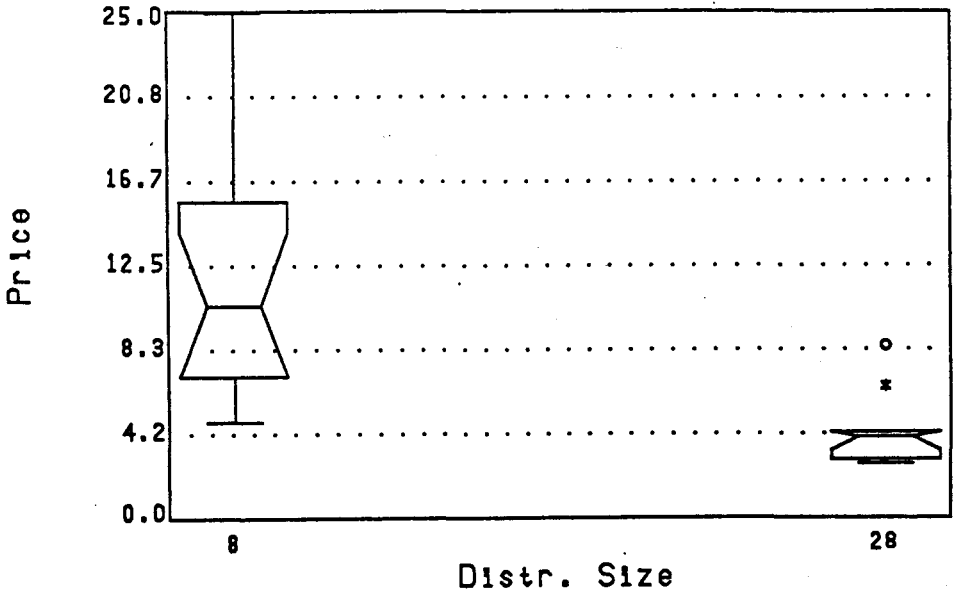
Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A	B	C	D
A(7)	251.39	.	.	.	.
B(27)	265.18	.	.	.	.
C(17)	275.79	.	.	.	.
D(37)	286.00	.	.	.	.

Box Plot
Individual: Item 8



Box Plot
Individual: Item 8



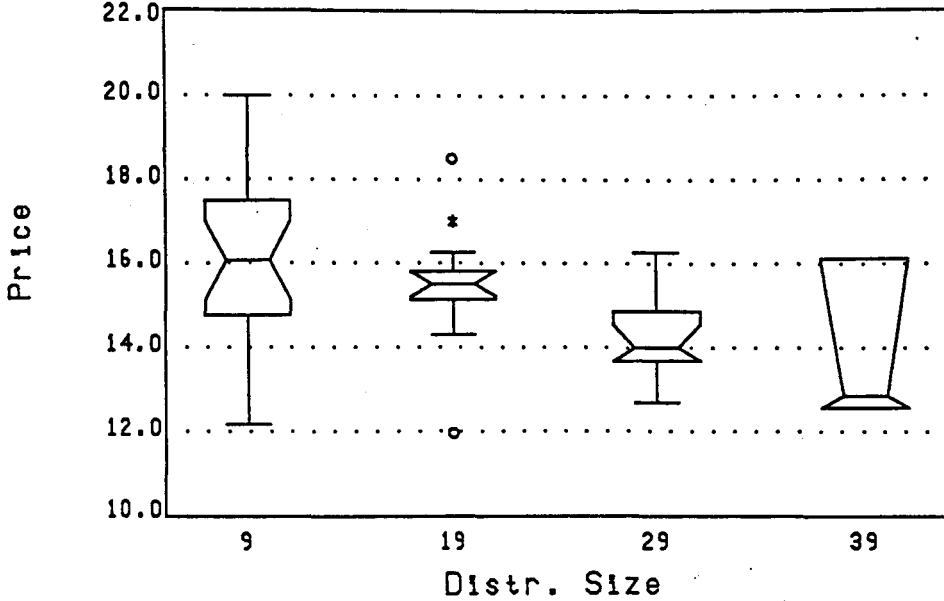
Two Sample T-Test Results

Response: "Individual"

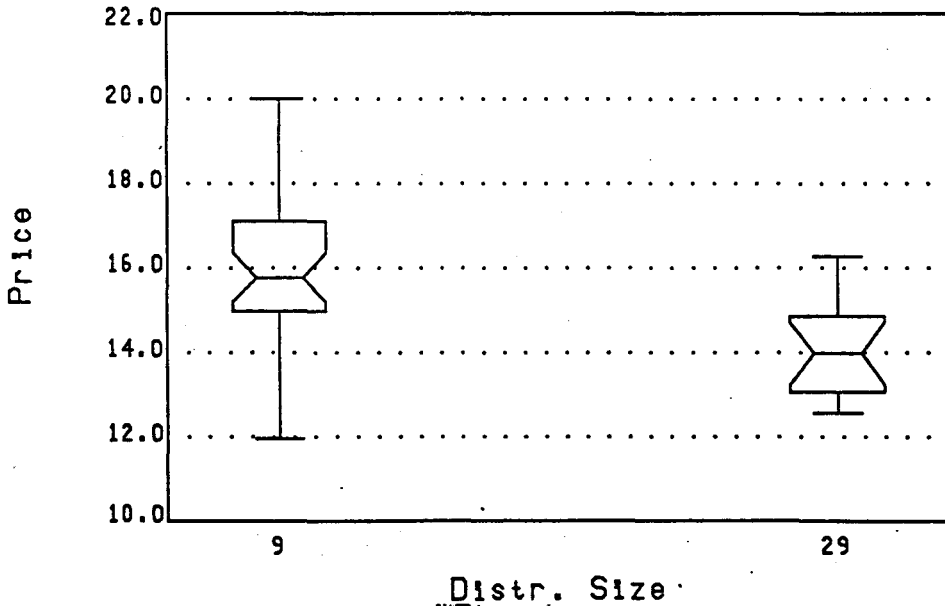
Group:	Item No. 8	Item No. 28		
Count - Mean	14	11.7643	11	4.2555
95% C.L. of Mean	8.4272	15.1014	3.0740	5.4369
Std.Dev - Std. Error	5.7828	1.5455	1.7593	0.5305

Unequal Variance t: t-value 4.5953, P-value 0.0003

Box Plot
Individual: Item 9



Box Plot
Individual: Item 9



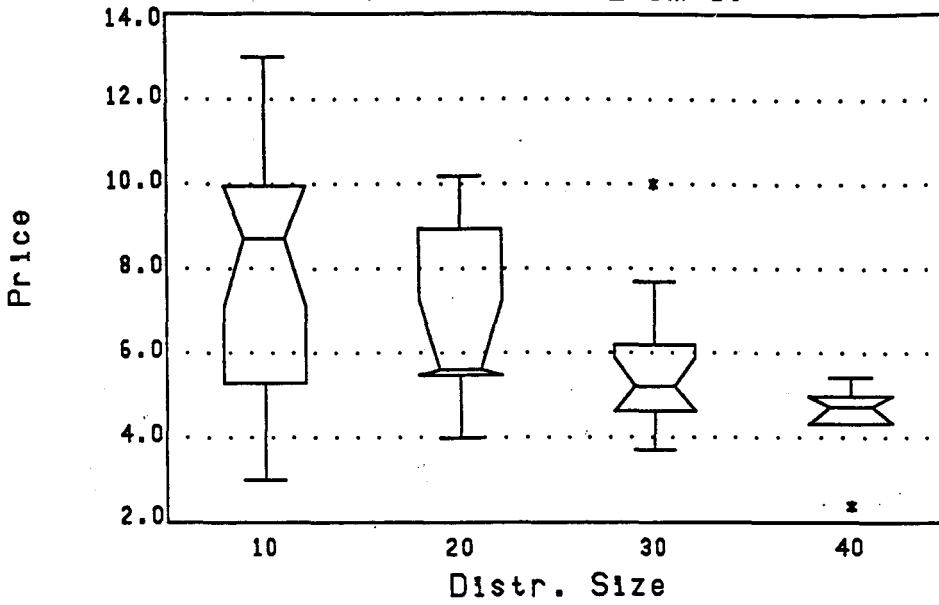
Two Sample T-Test Results

Response: "Individual"

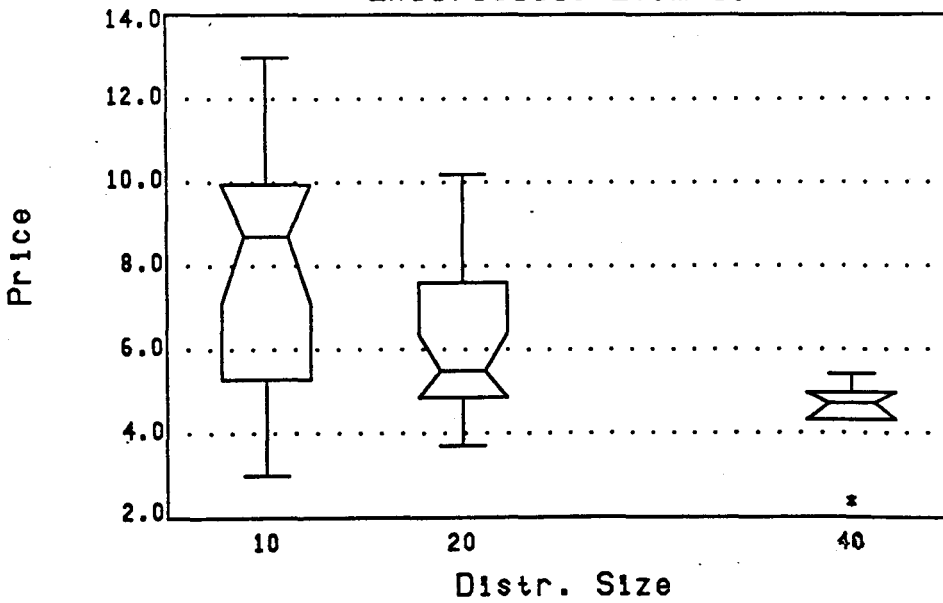
Group:	Item No. 9	Item No. 29
Count - Mean	34 15.9559	14 14.1771
95% C.L. of Mean	15.2981 16.6137	13.4580 14.8963
Std.Dev - Std. Error	1.8853 0.3233	1.2461 0.3330

Unequal Variance t: t-value 3.8320, P-value 0.0005

Box Plot
Individual: Item 10



Box Plot
Individual: Item 10



Means & Effects

Item No.	Count	Mean	Standard Error
10	21	7.8943	0.4814
20	11	6.7855	0.6651
30	13	5.5985	0.6118
40	6	4.4200	0.9006

Unweighted Means ANOVA (Multiple Comparisons)

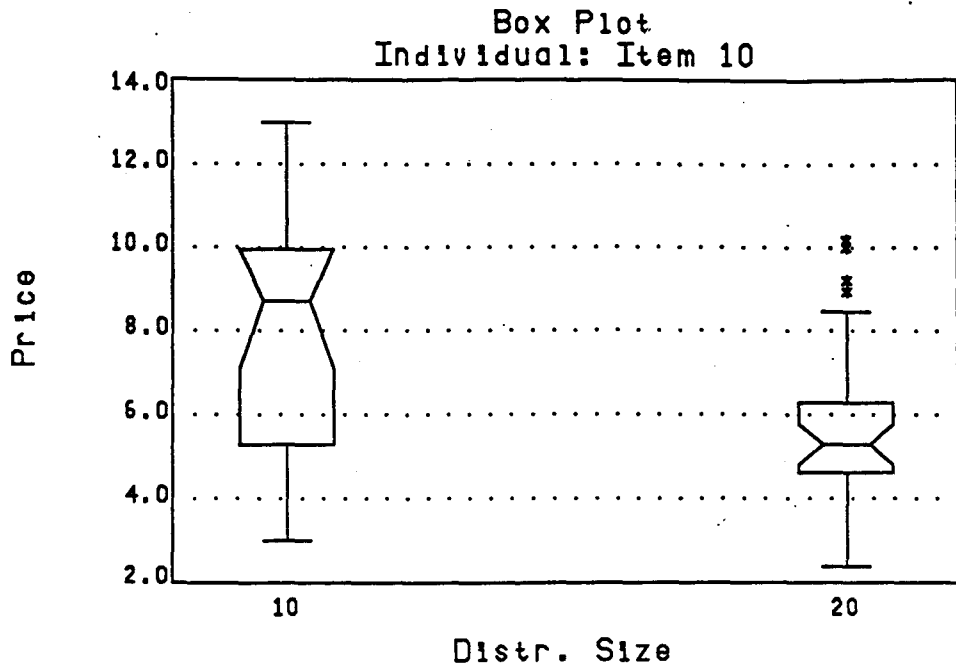
Code (Level)	Mean	A	B	C	D
A(40)	4.4200	.	.	S	S
B(30)	5.5985	.	.	.	S
C(20)	6.7855	S	.	.	.
D(10)	7.8943	S	S	.	.

Means & Effects

Item No.	Count	Mean	Standard Error
10	21	7.8943	0.4850
20	24	6.1425	0.4537
40	6	4.4200	0.9073

Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A	B	C
A(40)	4.4200	.	.	S
C(20)	6.1425	.	.	S
D(10)	7.8943	S	S	.



Two Sample T-Test Results

Response: "Individual"

Group:	Item No. 10	Item No. 20
Count - Mean	21 7.8943	30 5.7980
95% C.L. of Mean	6.6772 9.1114	5.0763 6.5197
Std.Dev - Std. Error	2.6740 0.5835	1.9328 0.3529

Unequal Variance t: 3.0741, P-value 0.0041

APPENDIX E

COOPERATIVE PURCHASING STRATEGY

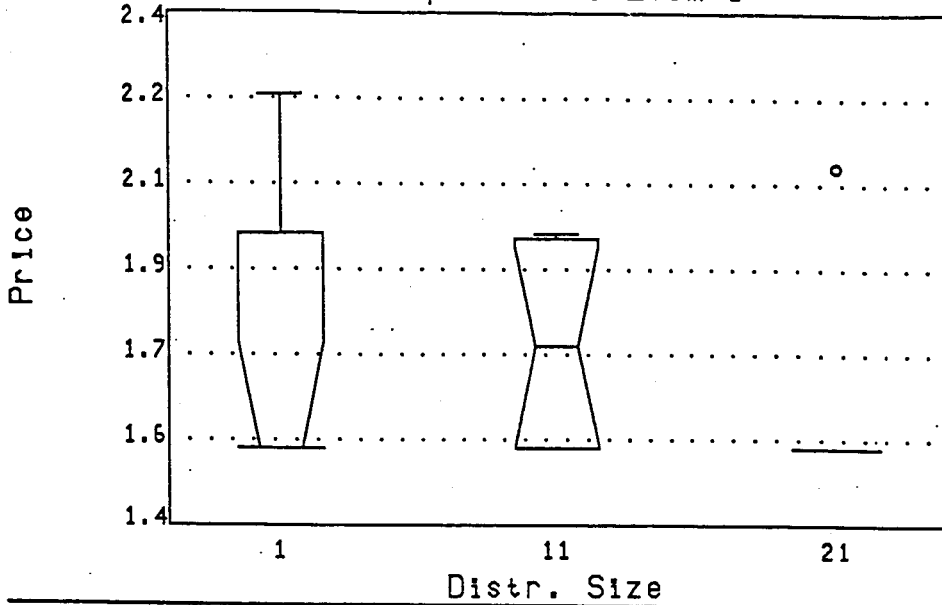
- Box Plots -

- Two Sample t-test Results -

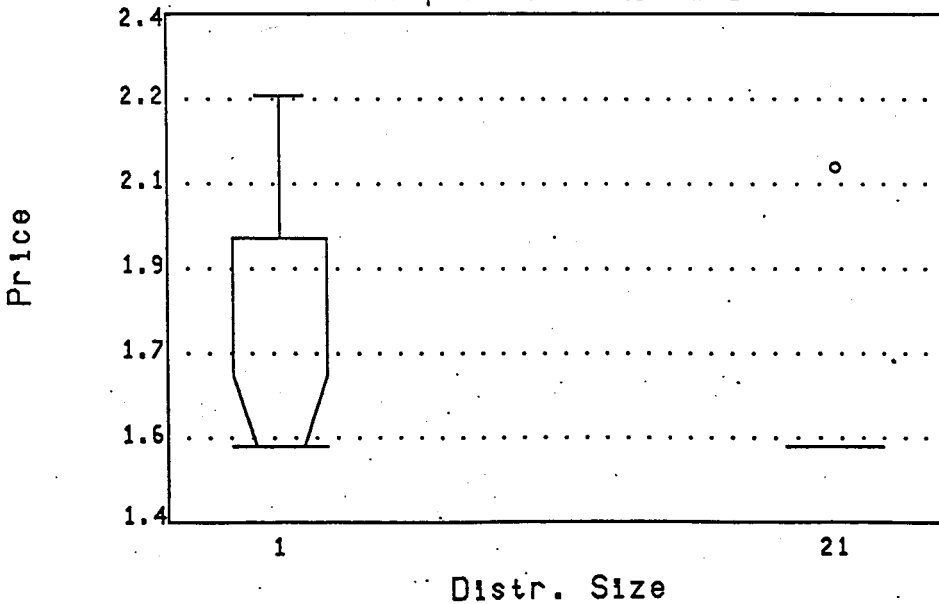
- ANOVA Multiple Comparison Results -

ITEM 1 ← BALL

Box Plot
Cooperative: Item 1



Box Plot
Cooperative: Item 1



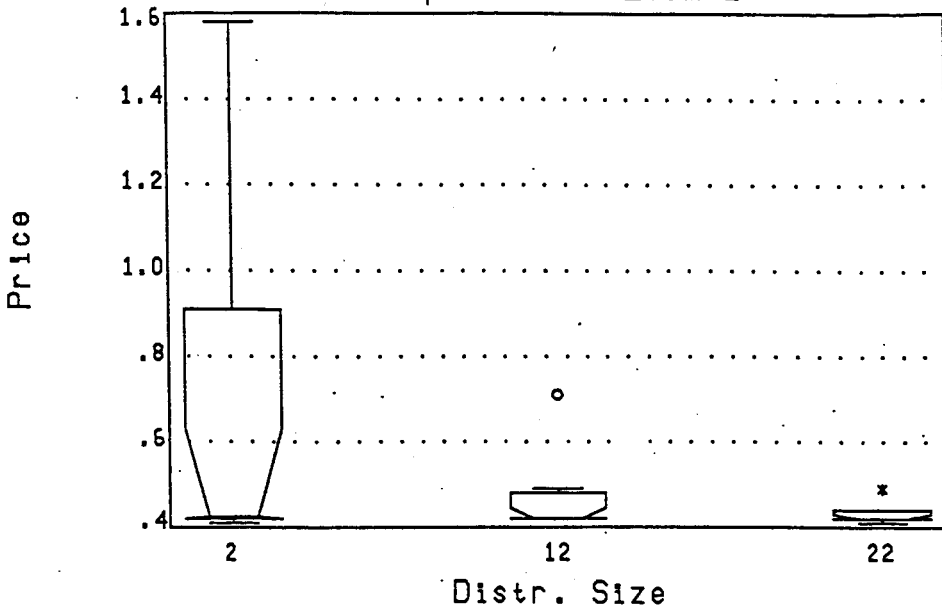
Two Sample T-Test Results

Response: "COOP"

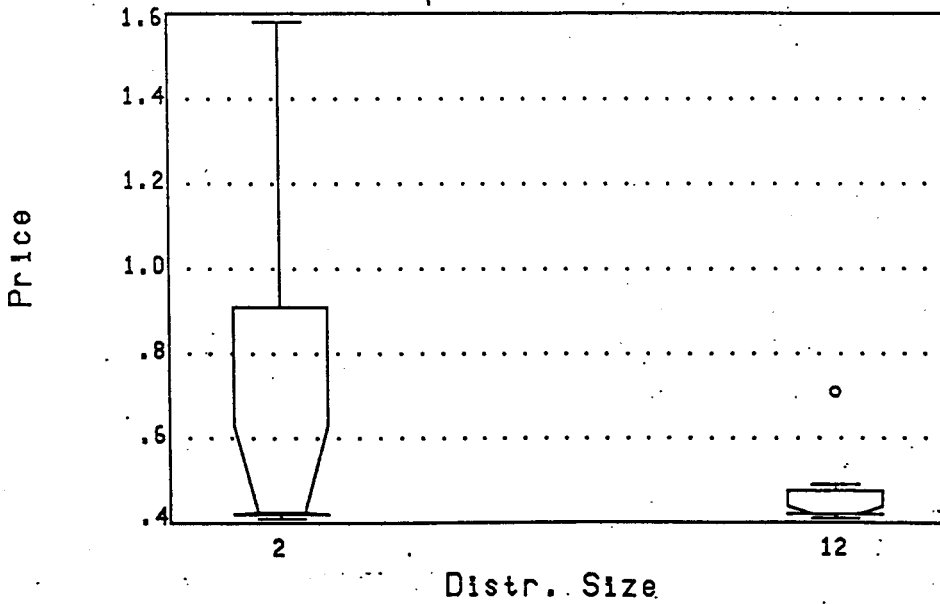
Group:	Item No. 1	Item No. 21		
Count - Mean	21	1.7552	6	1.6417
95% C.L. of Mean	1.6460	1.8645	1.4066	1.8767
Std.Dev - Std. Error	0.2400	0.0524	0.2245	0.0917

Unequal Variance t: t-value 1.0758, P-value 0.3073

Box Plot
Cooperative: Item 2



Box Plot
Cooperative: Item 2



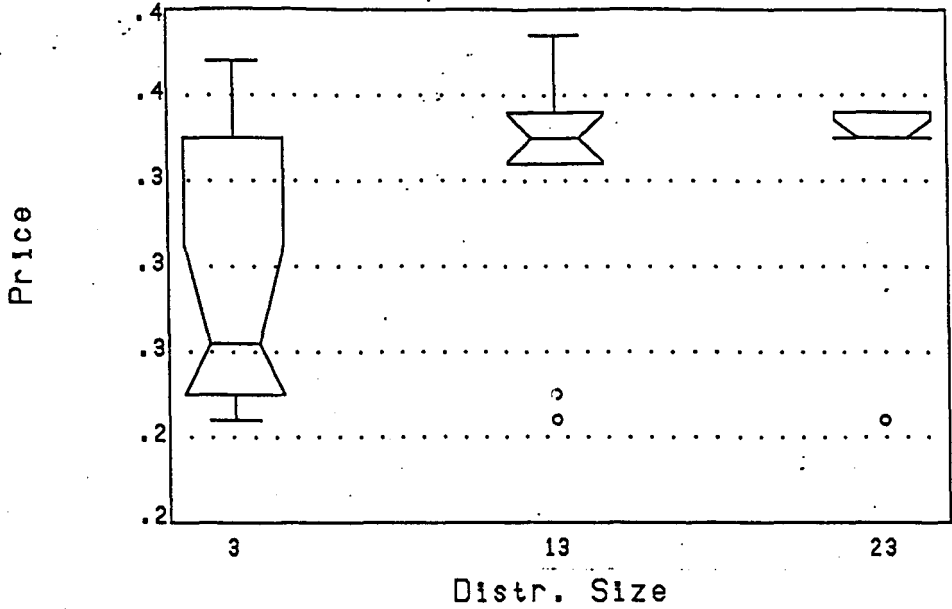
Two Sample T-Test Results

Response: "COOP"

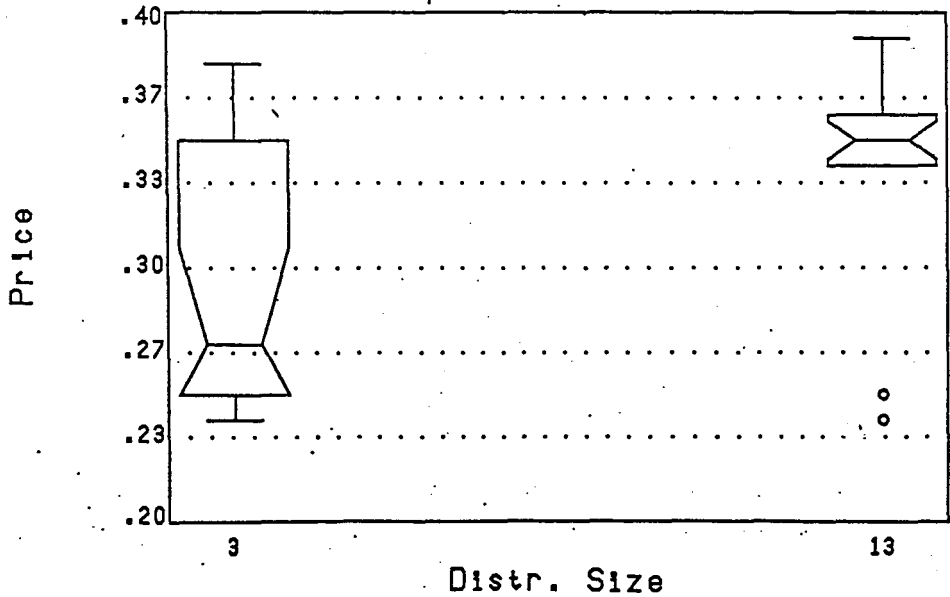
Group:	Item No. 2		Item No. 12	
Count - Mean	14	0.6486	24	0.4488
95% C.L. of Mean	0.4455	0.8516	0.4224	0.4751
Std.Dev - Std. Error	0.3519	0.0940	0.0623	0.0127

Unequal Variance: t-value 2.1057, P-value 00538

Box Plot
Cooperative: Item 3



Box Plot
Cooperative: Item 3



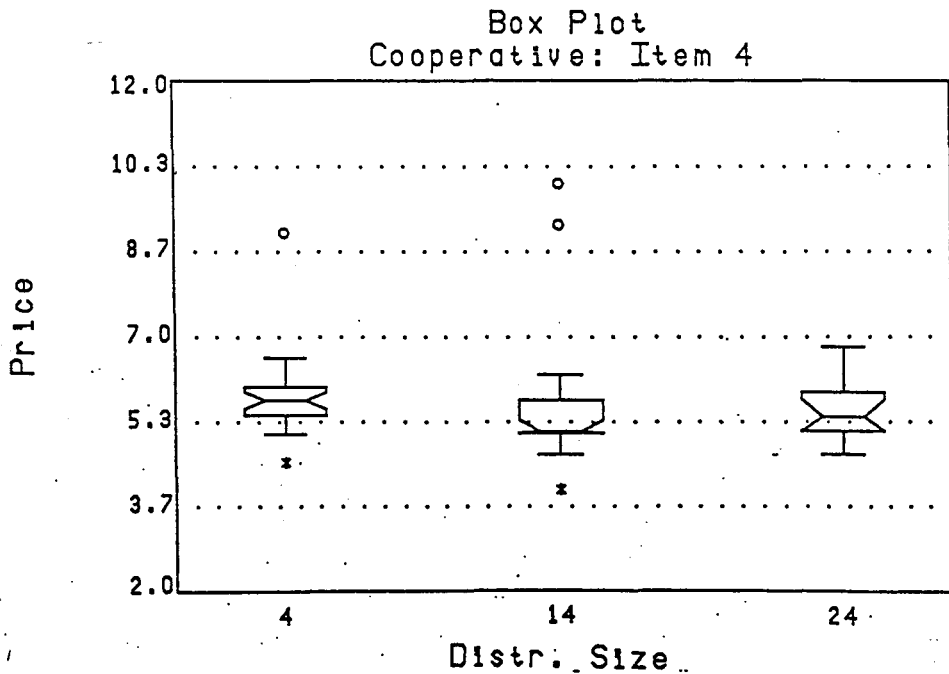
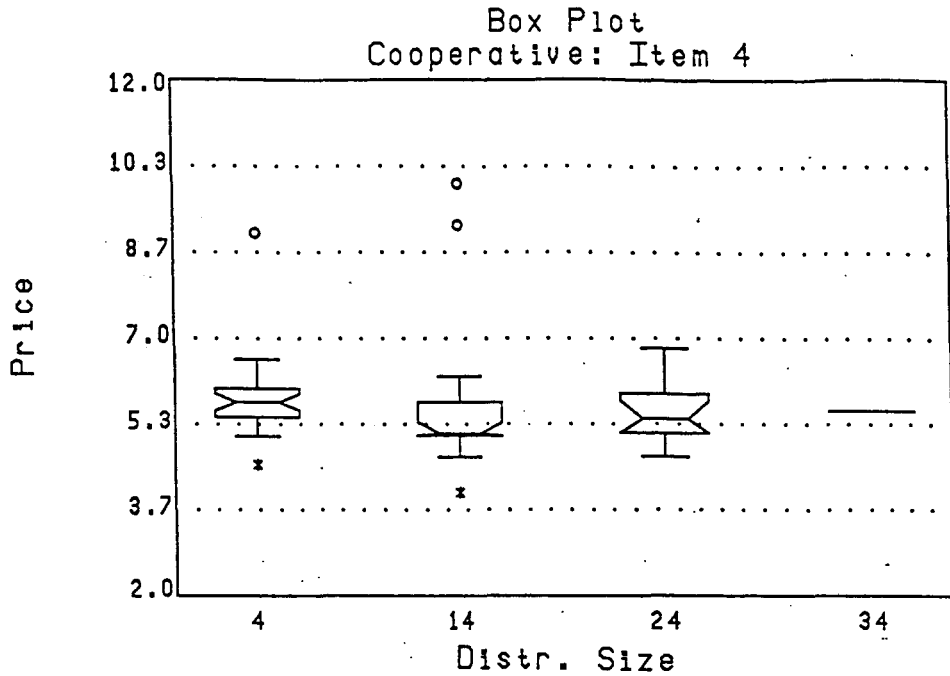
Two Sample T-Test Results

Response: "COOP"

Group:	Item No. 3		Item No. 13	
Count - Mean	17	0.2994118	17	0.3376
95% C.L. of Mean	0.2721	0.3267	0.3132	0.3621
Std.Dev - Std. Error	0.0531	0.0129	0.0476	0.0116

Unequal Variance t: t-value -2.2102, P-value 0.0339

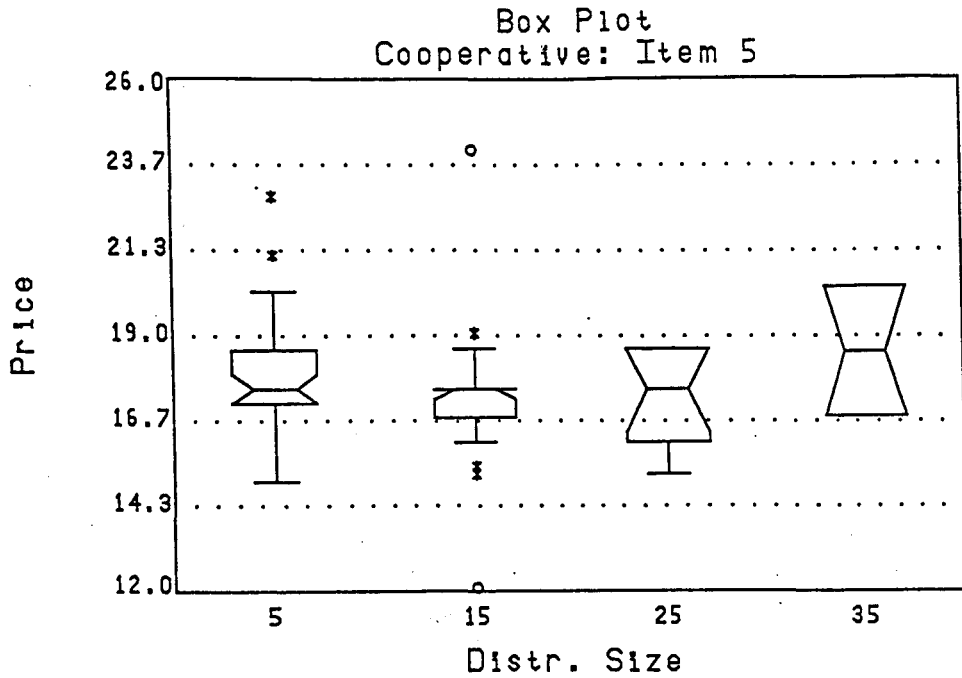
ITEM 4 - COMPUTER PAPER



Means & Effects

Item No.	Count	Mean	Standard Error
4	28	5.7975	0.1926
14	20	5.6905	0.2280
24	12	5.5467	0.2943

ITEM 5 - BOND PAPER



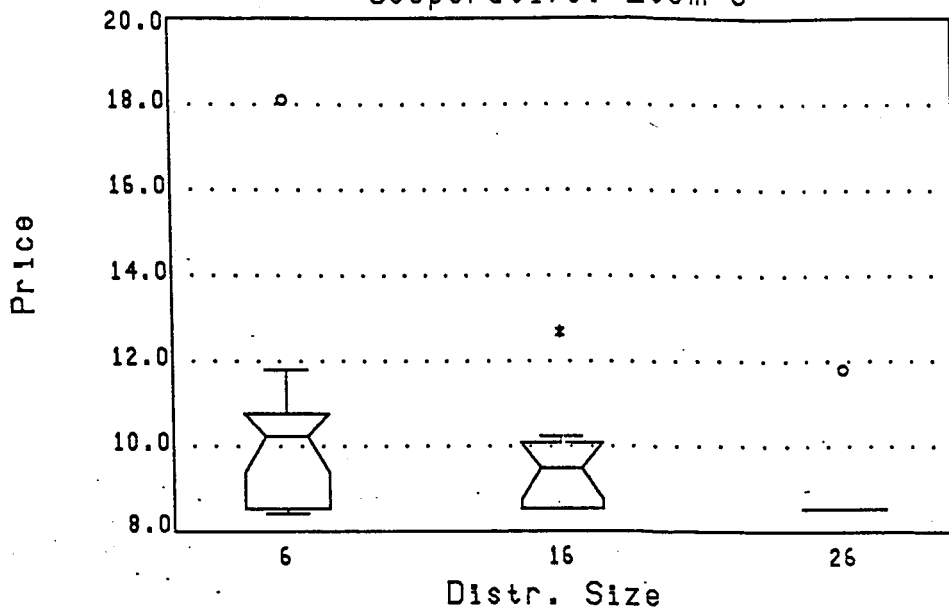
Means & Effects

Item No.	Count	Mean	Standard Error
5	32	17.8971	0.3129
15	20	17.3075	0.3958
25	11	17.2682	0.5337
35	2	18.5750	1.2515

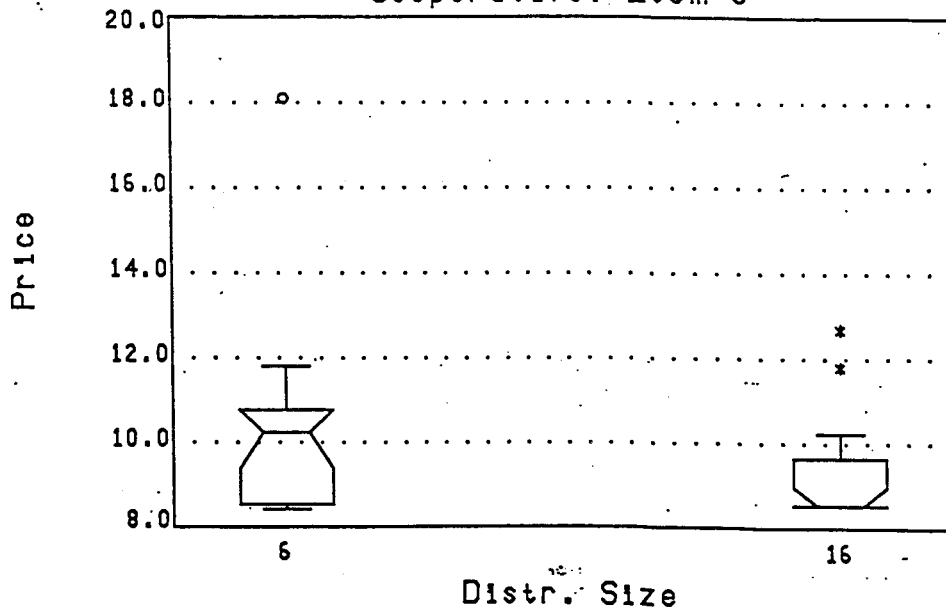
Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A B C D
A(5)	17.8971	. . . .
B(15)	17.3075	. . . .
C(25)	17.2682	. . . .
D(35)	18.5750	. . . .

Box Plot
Cooperative: Item 6



Box Plot
Cooperative: Item 6



Two Sample T-Test Results

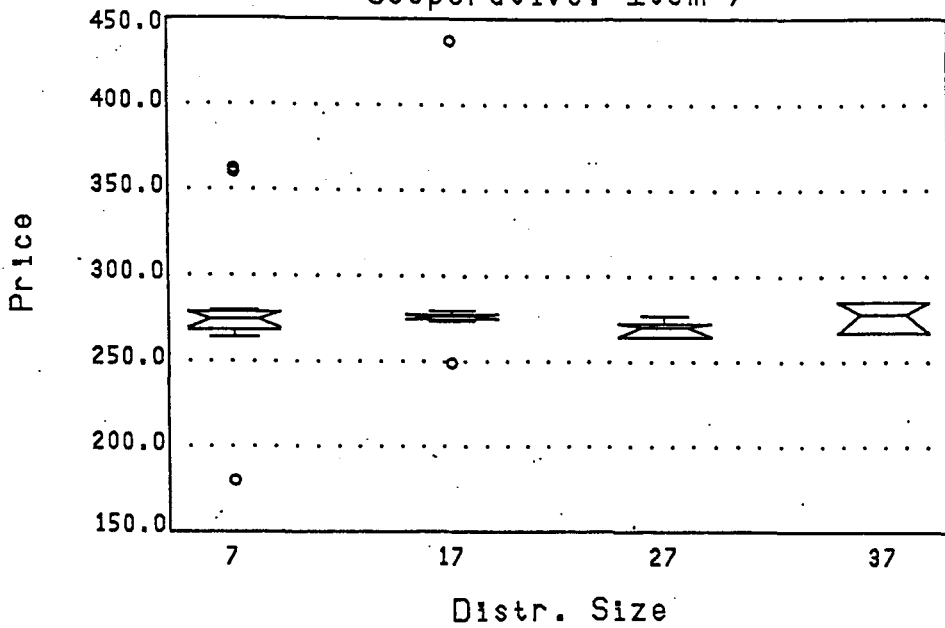
Response: "COOP"

Group:	Item No. 6		Item No. 16	
Count - Mean	17	10.2077	17	9.3418
95% C.L. of Mean	9.0136	11.4017	8.6972	9.9863
Std.Dev - Std. Error	2.3227	0.5633	1.2537	0.3041

Unequal Variance t: t-value 1.3526, P-value 0.1878

ITEM 7 - VCR's

Box Plot
Cooperative: Item 7



Means & Effects

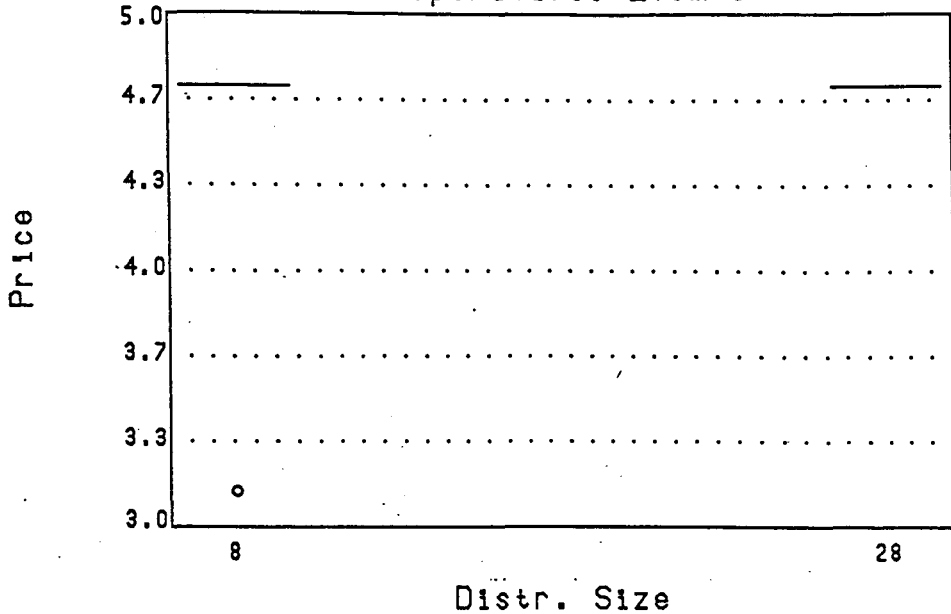
Item No.	Count	Mean	Standard Error
7	12	279.90	12.2934
17	10	289.93	13.4667
27	6	269.82	17.3855
37	3	276.68	24.5867

Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A B C D
A(27)	269.82	. . . .
B(37)	276.68	. . . .
C(7)	279.90	. . . .
D(17)	289.93	. . . .

ITEM 8 - BROOMS

Box Plot
Cooperative: Item 8



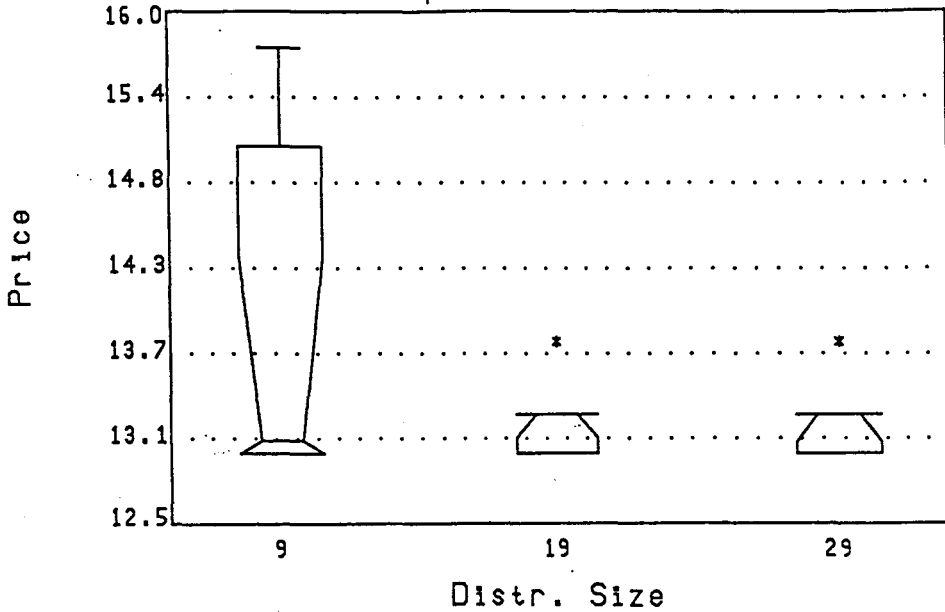
Two Sample T-Test Results

Response: "COOP"

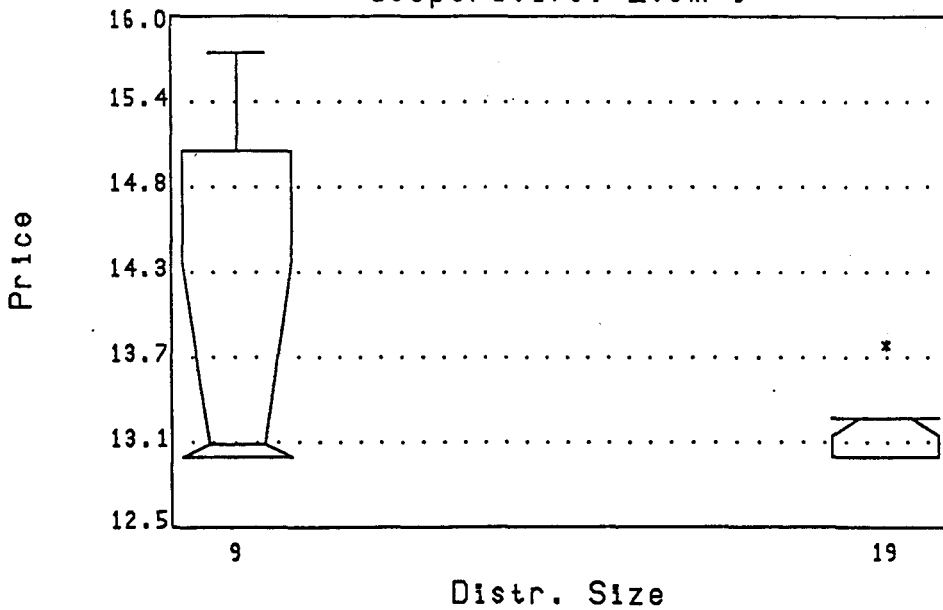
Group:	Item No. 8	Item No. 28		
Count - Mean	6	4.4567	3	4.7200
95% C.L. of Mean	3.7814	5.1314	0.0000	0.0000
Std.Dev - Std. Error	0.6450	0.2633	0.0000	0.0000

Unequal Variance t: t-value -1, P-value 0.3632

Box Plot
Cooperative: Item 9



Box Plot
Cooperative: Item 9



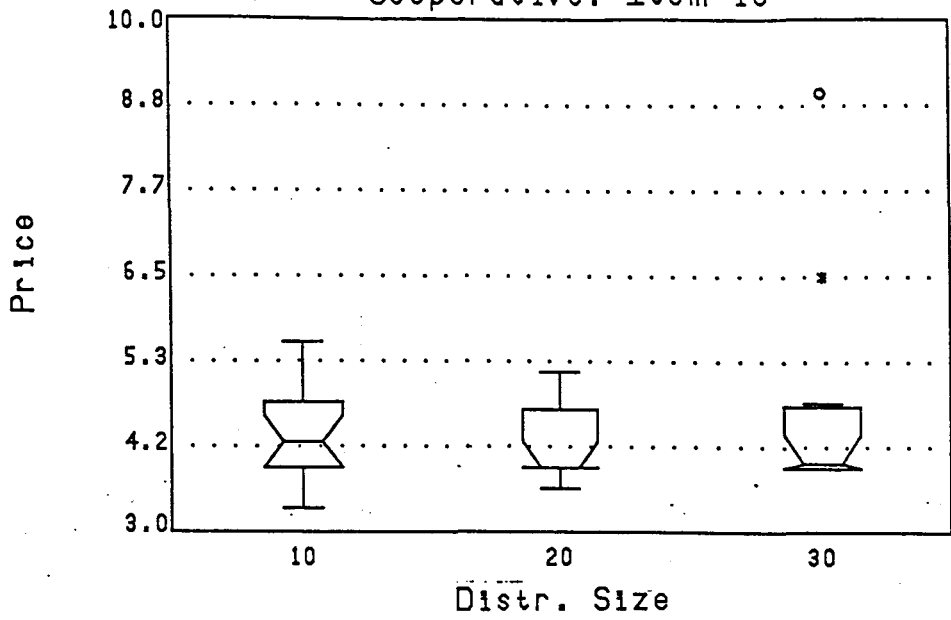
Two Sample T-Test Results

Response: "COOP"

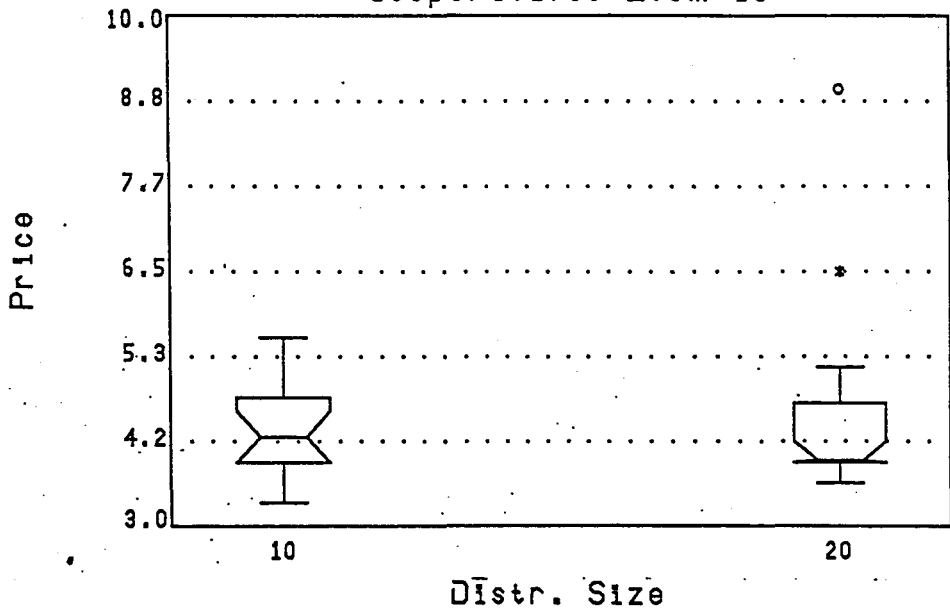
Group:	Item No. 9		Item No. 19	
Count - Mean	7	13.7271	12	13.2433
95% C.L. of Mean	12.6431	14.8112	13.0731	13.4136
Std.Dev - Std. Error	1.1731	0.4434	0.2682	0.0774

Unequal Variance t: t-value 1.0749, P-value 0.3237

Box Plot
Cooperative: Item 10



Box Plot
Cooperative: Item 10



Means & Effects

Item No.	Count	Mean	Standard Error
10	15	4.37	0.2509
20	12	4.21	0.2805
30	12	4.74	0.2805

Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A B C
A(20)	4.21	. . .
B(10)	4.37	. . .
C(30)	4.74	. . .

Two Sample T-Test Results

Response: "COOP"

Group:	Item No. 10	Item No. 20		
Count - Mean	15	4.3707	24	4.4721
95% C.L. of Mean	4.0452	4.6962	3.9834	4.9607
Std.Dev - Std. Error	0.5879	0.1518	1.1574	0.2362

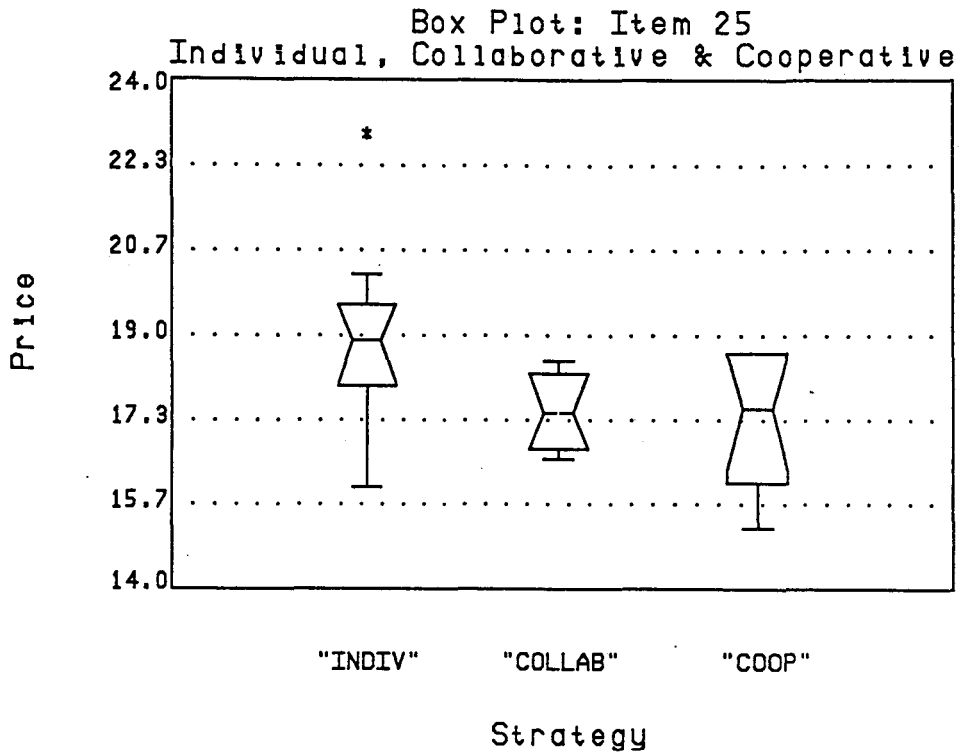
Unequal Variance t: t-value -0.3612, P-value 0.7200

APPENDIX F

COLLABORATIVE PURCHASING STRATEGY

- Box Plots -

- ANOVA Multiple Comparison Results -



Means & Effects

Item No.	Count	Mean	Standard Error
INDIV ^a	9	18.9722	0.4899
COLLAB ^b	4	17.5000	0.7348
COOP ^c	11	17.2682	0.4431

Unweighted Means ANOVA (Multiple Comparisons)

Code (Level)	Mean	A B C
A("COOP")	17.2682	. . S
B("COLLAB")	17.5000	. . .
C("INDIV")	18.9722	S . .

APPROVAL SHEET

The dissertation submitted by Paul L. Knudtson has been read and approved by the following committee:

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Assistant Professor, School of Education, Loyola

Dr. Philip M. Carlin
Associate Professor, School of Education, Loyola

Dr. Kathleen C. Westbrook
Assistant Professor, School of Education, Loyola

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the Committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Education.

12-1-93

Date

Edward T. Rancic

Director's Signature