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School Nutrition Directors' Perceptions of Technology Use in School Nutrition Programs

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ABSTRACT

Purpose/Objectives
This study investigated the types of technology/software currently used by Southwest Region school nutrition directors (SNDs) and assessed their perceptions of barriers to purchasing new technology/software. In addition, the importance of future technology/software acquisitions in meeting school nutrition program (SNP) goals was examined.

Methods
A questionnaire was developed by the researchers, validated by an expert panel using the Delphi technique, converted to an online format, and pilot tested. A randomized group of School Nutrition Association SNDs and members of the Academy of Nutrition and Dietetics School Nutrition Services Dietetic Practice Group listserv participated. Participants (N = 111) identified technology/software currently used, their perceived computer skill level, and other demographics. Likert-type scales were used to rate agreement/disagreement with barriers to purchasing new technology/software and the importance of future technology/software acquisitions. Multivariate analyses were used to determine differences in SND ratings according to demographic variables.

Results
SNDs who completed the survey used a variety of technology/software. The majority of respondents worked in suburban or metropolitan communities and perceived themselves as having advanced/expert computer skills. Older SNDs, SNDs with less education, and SNDs serving fewer meals per day found inadequate funds, outdated computers, and lack of information technology and administrative support to be barriers to acquiring new technology/software. However, SNDs with higher perceived computer skills ($p = .003$) and higher education levels ($p = .073$) were more likely to disagree with these barriers. SNDs with higher perceived computer skills utilized the most technology/software ($p = .000$) and were more likely to see future technology/software acquisitions ($p = .551$) as important to meeting SNP goals.

Applications to Child Nutrition Professionals
Although technology is widely used by many SNDs, some SNDs have not implemented software applications that could help reduce costs and improve productivity. The school nutrition industry needs influential leaders who can develop local mentorship programs, initiate computer skill building classes, and encourage online training for this group of SNDs.

INTRODUCTION

Currently, the National School Lunch Program (NSLP) and the School Breakfast Program (SBP), individually and collectively, serve the nutritional needs of children across the United States. In 2011, the SBP operated in over 89,000 public and non-profit private schools and served 12.1 million children while the NSLP operated in over 100,000 public and non-profit private schools and fed approximately 31 million children (U.S. Department of Agriculture [USDA], Food and Nutrition Service [FNS], 2012a, 2012b). During fiscal year 2011, the U.S.

government spent 3 billion dollars to operate the SBP and 11.1 billion dollars to operate the SLP in order to ensure that eligible children were fed a nutritious lunch and/or breakfast meal every day. (USDA, FNS, 2012a, 2012b).

As many as fifteen years ago, researchers predicted the need for school nutrition programs to keep up with computer technology to survive in an increasingly competitive environment (White, Sneed, & Martin, 1992). Similarly, the need for technology and its advantages remain paramount today. Technology in schools continues to rapidly change as school nutrition programs (SNPs) constantly pursue better ways of improving and refining labor-intensive processes, increasing productivity, keeping up with new federal and state regulations, and meeting customer service demands (Lowe, 2005). The federal government and states are also following the technology trend by moving toward electronic recording systems for meal reimbursement claims, filing of free and reduced-price meal applications, and commodity allocation (Gryder, 2005).

Due to these requirements and trends, technology and computer software programs have also become increasingly important in terms of controlling program costs. Initially, SNPs used technology for basic accounting purposes, but they moved quickly into using menu management software to assist with the intensive task of meeting government nutrient requirements. According to the School Nutrition Association's (SNA) 2011 School Nutrition Operations Report, Point-of-Sale (POS) systems have now been cited as the most commonly used technology platform within a school nutrition program, especially within larger districts. POS systems have grown in popularity due to their ability to provide school nutrition directors (SNDs) with daily participation counts, school sales performance predictions, and student participation rates for strategic planning and budgeting (Sackin, 2007). Additionally, this type of technology improves accountability and productivity by facilitating better reporting and quicker decision making (Puckett, 2002). POS systems also protect students' eligibility status, improve participation by shortening cafeteria lines, and allow SNDs to accurately manage government reimbursement (Lowe, 2005).

In addition to POS systems, technology, and software are being offered in many other areas of school nutrition. There are now software programs that can provide monitoring and record-keeping functions in HACCP programs, help meet wellness program requirements by offering students interactive nutrition education programs, improve training methods, and assist with personnel management. Also, new technologies may help increase student participation rates through social media, digital displays, TV monitors, and other web-based applications.

While many school districts have explored various options for technology/software use within their operations, some districts may still use antiquated systems and have limited access to technology and software. Likewise, a number of districts may be limited in implementing technology due to the lack of adequate information technology (IT) staff to support their computer technology requirements (National Center for Education Statistics [NCES], 2005). In light of these possible barriers, it is surprising that the use of technology in school nutrition programs has not been widely researched. Furthermore, there is a lack of research exploring the impact of technology and software on school districts in terms of costs control, participation rates, effectiveness in meeting government standards, and requirements for the future.

Therefore, the purpose of this research was to investigate the prevalence of technology/software use and SNDs attitudes toward the use of technology in school nutrition programs. Additionally, this research examined whether number of meal equivalents served per day, SND education level, and SND perceived computer knowledge level made a significant difference in the 1) amount/type of technology used, 2) SNDs perceptions of challenges or barriers to purchasing and attaining technology/software, and 3) SNDs perceptions of what technology/software will be important and useful in the future of their SNPs.

METHODS

All methods for this study were first approved by the Texas Woman's University Institutional Review Board.

Instrument

The questionnaire developed by the researchers included questions on demographics and asked participants to identify what types of software applications were currently being used in their SNP. Software categories included financial management, menu and food management, safety and security, regulatory requirements, labor management, communications, and miscellaneous needs. Lastly, participants were asked to rate the importance of various types of technology/software for future purchase and indicate their level of agreement regarding barriers to purchasing new technology/software. All rating questions used Likert-type scales.

After the questionnaire was developed, the Delphi technique (Linstone & Turoff, 1975) was used with a panel of child nutrition experts to assess its validity. After feedback was received two times, the expert panel's suggestions and comments were summarized, and the questionnaire was revised accordingly. The questionnaire was then formatted and converted into an on-line version through PsychData.

Twenty-one SNDs in the North Texas regional area who were not part of the study sample were invited to participate in a pilot study to evaluate the internal reliability of the questionnaire. Twelve SNDs completed the pilot study, and their data was evaluated for internal reliability. Cronbach's alpha analyses showed that all categories of Likert-scale questions had inter-item reliability > 0.70.

Participants

The target population was SND's in the Southwest Region of the United States which includes the states of Arkansas, Louisiana, New Mexico, Oklahoma, Kansas, Colorado, and Texas. The sample was taken from the School Nutrition Association's (SNA's) member database of SND's in the Southwest Region. Major city districts were over-sampled due to the small number of these types of districts. This was done by including all SND's (n = 23) in the Southwest Region sample who were categorized as Major City Districts in the SNA member database. Due to limited responses, the Academy of Nutrition and Dietetics School Nutrition Services Dietetic Practice Group (AND SNS-DPG) members were later contacted for participation, using the group's listserv.

Data Collection and Analyses

The questionnaire was initially sent as a paper copy with a cover letter to 500 SNDs. In addition to the paper copy, a web-based version was available for convenient data entry through PsychData in 2010. The cover letter included a link to the PyschData website for participants who preferred to answer the survey in an on-line format. A postcard was mailed to all 500 SND's two weeks after the initial mailing reminding the recipients to return the survey. Two weeks after the postcard was sent, a follow-up e-mail was sent to each respondent who had an e-mail address and who had not participated in the study (n = 243). At this time, an e-mail was also posted to the AND SNS-DPG listserv inviting members who were school nutrition administrators to participate in the study. An additional time of two weeks was given for respondents to answer the questionnaire.

SPSS was used to summarize and analyze data. Descriptive statistics such as frequencies, mean scores, and standard deviations were calculated to summarize data. All Likert-type questions were evaluated by central tendency (mean) of the responses. Multivariate analyses was used to compare differences between number of meal equivalents served, SND education level, and perceived computer knowledge/skill level with amount of technology currently used, barriers to purchasing technology/software, and the importance of future technology/software purchases. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Response Rate

From the 500 questionnaires sent through the mail to SNA SNDs and distributed to the responding AND SNS-DPG listserv member, 118 were returned (23.6%) and 111 questionnaires (22.2%) were usable for data analyses. Of the 111 questionnaires used, 74 (67%) were completed online through PsychData, indicating that a majority of respondents possessed basic computer literacy. Fifty three respondents started the questionnaire online but did not finish it by the specified deadline.

Demographic Characteristics

Demographic characteristics of the community size where respondents worked are listed in Table 1. Most respondents stated that they worked in suburban (2,500–50,000 people, 36%), rural (<10,000 people, 22.5%), or small metropolitan communities (50,100–500,000 people, 19.8%). Furthermore, all respondents reported participation in the NSLP, with 62% of respondents serving approximately 5,000 or more reimbursable lunch meals per day.

Table 1. *Demographic Characteristics of School Nutrition Programs and School Nutrition Directors (N = 111)*

Characteristics	No. of Respondents	Percent
Size of community		
Rural (<2,500)	10	9.0
Rural (<10,000)	25	22.5
Suburban (2,500–50,000)	40	36.0
Small Metropolitan (50,001–500,000)	22	19.8
Medium Metropolitan (501,000–1 million)	7	6.3
Large Metropolitan (<1 million)	7	6.3
No. of meal equivalents for lunch		
= 1,500	28	25.5
1,501–4,999	34	30.9
5,000–9,999	20	18.1
10,000–14,999	6	5.4
=15,000	22	20.0
SND level of education		
High school graduate/diploma	24	21.6
Associate's degree	2	1.8

Bachelor's degree	33	29.7
Some graduate school towards Master's	17	15.3
Master's degree	30	27.0
Some graduate school towards Doctorate	4	3.6
Doctoral degree	1	.9
SND age		
25–39 years	13	11.7
40–49	27	24.3
50–59	58	52.2
≥60	13	11.7
SND perceived computer knowledge and skill level		
Basic user	8	7.2
Average user	25	22.5
Advanced user	73	65.8
Expert user	5	4.5

Note. SND = School Nutrition Director

The educational background of the 111 respondents was also varied. Twenty-six (21.6%) indicated they had earned a high school diploma or an Associate's degree. Fifty (45%) had a Bachelor's degree or had taken some graduate school courses, and 34 (30.6%) held a Master's degree or higher (see Table 1). In addition, 25%t of respondents had additional certifications ranging from state food management certifications to various food industry certifications, such as ServSafe. The majority of respondents (63.9%) were over 50 years of age.

Nearly three-quarters of SND respondents (70.3%) perceived themselves as having advanced computer knowledge and skills. As defined in the questionnaire, an advanced user was someone who could: easily use all Windows applications; operate multiple software programs, such as Point of Sale, menu analysis, and inventory programs; and use web-based applications such as online payment systems, purchasing, and web-training. In contrast to respondents who identified themselves as advanced users, 30.7% of respondents felt they were basic to average users who were only comfortable with keyboard/mouse usage, basic word processing and accounting programs, surfing the Internet, accessing e-mail, and using school district databases.

School Nutrition Director's Current Use of Technology and Software Programs

Participants indicated that they used office applications most often, with a category average of 82.7% (See Table 2). Word processing and e-mail were used by 98.2 % of respondents. The second most frequently utilized type of

applications were menu/food related, with POS and menu planning systems used by 91.0% and 78.4% of districts, respectively.

Table 2. *Current Technology and Software Utilization in School Nutrition Programs (N = 111)*

Technology/Software Programs	**No. of Respondents**	**Percent**
Office Applications		
Word Processing	109	98.2
E-mail	109	98.2
Spreadsheet/Financial Management	104	93.7
Presentation	90	81.1
Database Management	47	42.3
Menu and Food Related Applications		
Point-of-Sale	101	91.0
Menu Planning	87	78.4
On-line Purchasing	75	67.6
Inventory Manager	48	43.2
Other (In-house program, Master Cook, Power Lunch)	6	5.4
Reimbursable Meal Vending Machines	5	4.5
State Reporting and Meal Application		
On-line Meal Application Reporting	58	52.2
Meal Application Scanning	27	24.3
Free/Reduced Meal Application	13	11.7
On-line Reimbursement Claim Reporting	13	11.7
Training and Education Applications		
On-line Training (Webinars/Web-based training modules)	68	61.3
Web-based Department Intranet	44	39.6

Website Manager (Virtual Café)	10	9.0
Student Nutrition Education Software	6	5.4
Safety and Security Applications		
Security (web-cam viewing)	29	26.1
On-line Food Training Monitoring	19	17.1
Biometrics (i.e. finger scanning)	17	15.3
Miscellaneous Applications		
On-line Payment Systems	57	51.4
Personnel Management (i.e. Kronos)	40	36.0
TV's, Digital Media for marketing	21	18.9

Internet usage by SNDs was high as well, with over half of all respondents employing online applications, including online training programs (61.3%), online meal application reporting (52.2%), and online payment systems (51.4%). Few respondents, however, were using technology in the areas of reimbursable meal vending machines (4.5%), student nutrition education software (5.4%), and virtual cafés (9.0%).

Multivariate analysis comparing SND computer skill level and amount of technology used found that SNDs with higher perceived computer skill levels used more types of technology/software applications than SNDs with lower perceived computer skill levels ($p = .000$). SNPs serving a larger number of meals per day used more technology in all application areas than SNPs serving a smaller number of meals per day ($p = .000$). These results indicate that SNPs who serve a larger number of students and staff employ more technology/software to handle the increase in volume of business. It may also indicate that larger districts have more technology support, and may have more funds to spend on technology due to a larger volume of revenues. Furthermore, SNDs with more education were found to use more office-related and menu/food- related applications than those SNDs with less education.

School Nutrition Directors' Perceived Importance of Technology/Software Programs for Future Purchase
SNDs rated the importance of future technology/software purchases using a Likert-type rating scale that ranged from 1 (not important at all) to 5 (very important). Menu planning and analysis (mean = 3.85, SD = 1.32), POS (mean = 3.80, SD = 1.48), and inventory management software (mean = 3.78, SD = 1.24) were rated by respondents as the three most important future software purchases (See Table 3). Because all of these software programs relate to the category of menu and food-related applications, this finding indicates that technology/software applications which help manage time and labor intensive responsibilities, such as menu writing, inventory tracking, and monitoring food sales, are top priorities to SNDs. These findings also reinforce the idea that well-designed menu programs can decrease costs by streamlining the work of combining menu items, refining purchasing procedures, and increasing inventory turnover (Riell, 2000).

Table 3. *School Nutrition Directors' Perceived Importance of Technology/Software Programs for Future Purchase (N = 111)*

Type of Technology/Software Program:	Importancea **Mean ± SD**
Menu Planning and Analysis	3.85 ± 1.32
Point-of-Sale	3.80 ± 1.48
Inventory Management	3.78 ± 1.24
Free/Reduced Application	3.60 ± 1.59
Online Payment	3.60 ± 1.49
Word Processing	3.46 ± 1.46
Online Purchasing	3.53 ± 1.33
Financial Management	3.43 ± 1.48
Online Training	3.24 ± 1.18
Online Food Temperature Monitoring (via Sensors)	3.13 ± 1.23
Personnel Management	3.09 ± 1.39
Meal Application Scanning	3.07 ± 1.51
Security (web-cam viewing)	3.06 ± 1.30
Web-based Department Intranet	2.99 ± 1.28
Student Nutrition Education	2.94 ± 1.13
TV's, Digital Media for marketing	2.81 ± 1.28
Biometrics (i.e. finger scanning)	2.77 ± 1.29
Website Manager (Virtual Café's)	2.66 ± 1.17
Reimbursable Meal Vending Machines	2.13 ± 1.20

a Importance was rated on a scale from 1 (*not important at all*) to 5 (*very important*).

Overall, 13 of 19 software programs had a mean importance rating greater than 3.0 indicating that respondents thought the majority of technology and software available to SNPs would be somewhat important to purchase in the future to assist in meeting department goals. Although a large number of respondents were already using many of these types of applications, as evidenced by previous data, they still rated them as important future purchases. This implies that SNDs recognize the need for technology/software and are aware of the need to

purchase more as regulations and trends change. In contrast, reimbursable meal vending machines, virtual cafés, biometrics, and digital media for marketing purposes were rated as the least important in regard to meeting future department goals. This result may be because these newer, more expensive types of technologies are used to enhance SNPs rather than meet the fundamental needs of the operation. It could also be true that some SNDs still need to purchase more practical and basic types of technology/software before allocating funds to purchase technology viewed as an added value, not a necessity. In the area of biometrics, however, this may change as the government has considered requiring finger scanning as a means of student identification (White, 2007).

Multivariate analyses revealed that SNDs with higher perceived computer skills were the respondents most likely to find the majority of technology/software programs to be important for future purchase. This is probably because these respondents were more comfortable with technology/software and saw its effectiveness; therefore, they wanted to purchase more of it. Or, this finding may suggest that SNDs with higher perceived computer skills already use a lot of technology/software, and they selected it as important on the questionnaire because they felt it was essential to own. In addition, SNDs with more education rated online-training programs as important future purchases, and SNDs in districts serving a large number of meal equivalents were interested in personnel programs, digital media, TV's, and online food temperature monitoring systems.

School Nutrition Directors' Perceived Agreement/Disagreement with Barriers to Purchasing New Technology and Software

SNDs were asked to rate their level of agreement with barriers to purchasing new technology/software using a Likert-type rating scale that ranged from 1 (*Strongly agree*) to 5 (*strongly disagree*). Table 4 shows that most respondents disagreed with the barriers of unsupportive administration (Mean = 3.96, SD = 1.02), kitchen wiring issues (Mean = 3.91, SD = 1.10), inadequate kitchen space (Mean = 3.90, SD = 1.15), and outdated computers (Mean = 3.90, SD = 0.99). Many SNDs, however, did slightly agree with the barrier of not having enough money to purchase new technology (Mean = 2.90, SD = 1.37). This supports previous findings that limited funding, along with cost of food, is a pressing and future concern for SNPs (SNA, 2011).

Table 4. *School Nutrition Directors' Perceived Agreement/Disagree with Barriers to Purchasing New Software or Technology (N = 111)*

Barriers to Purchasing New Software or Technology	Level of Agreement/Disagreement **Mean ± SD**
The administration for the district does not support technology in my department.	3.96 ± 1.02
The district does not have the wiring capabilities for new technology or computers.	3.91 ± 1.10
There is not enough space in the school kitchens to add computers.	3.90 ± 1.15
The district's computers are too old to run the newer technologies and programs	3.90 ± 0.99
The district does not have well trained or strong technology department.	3.74 ± 1.20
I do not know enough about new technology or software programs to purchase them.	3.71 ± 0.99

The district does not have a supportive technology department.	3.64 ± 1.19
It will cost too much money to update my old software programs to new programs.	3.35 ± 1.22
Training my staff on new technology or software is too time intensive.	3.23 ± 1.11
I do not have enough money to purchase new technology or software programs.	2.90 ± 1.37

aLevel of agreement/disagreement was rated using a scale of 1 = *Strongly Agree*, 2 = *Agree*, 3 = *Neutral*, 4 =*Disagree*, and 5 = *Strongly Disagree*.

An important study finding was that multivariate analyses comparing computer skill level and barriers to purchasing software/technology showed that SNDs with higher perceived computer skills disagreed more often with barriers to purchasing technology/software than SNDs with lower perceived computer skills ($p = .003$). In contrast, SNDs with less education and SNPs who were serving fewer meal equivalents per day agreed more with the barriers, especially in the areas of inadequate funds, outdated computers, and lack of IT support.

Several possible reasons may explain these findings. First, it is highly possible that SNPs serving fewer meal equivalents have less money overall; thus it is more of a challenge to purchase new technology/software and replace older computers (NCES, 2005). Second, respondents in districts working in suburban or small metropolitan communities (55%, $n = 62$), were more likely to hire SNDs with higher education, more computer skills, and more experience with IT. Third, SNDs with a longer tenure in their SNPs may have had sufficient time and support to gain more education and develop their IT skills.

CONCLUSIONS AND APPLICATION

In the face of tighter profit margins, labor force diversity, outside competition, and increasing regulation, it is critical that SNDs use every resource available to assist them in managing organized and productive child nutrition programs. New advances in software and technologies are occurring at a rapid pace. In addition, the Internet has a significant role in assisting SNPs with data collection and management, while offering an effective interface for communication with outside vendors, students, staff, and the community. It is essential, therefore, for SNPs to employ technology to maintain a competitive edge.

In light of this situation, the current study focused on exploring what technology/software SNDs were using and their perceptions about the challenges, barriers, and future needs of this ever-growing facet of our culture. Overall, this research revealed that SND respondents were using a wide variety of technology and software programs. Most respondents were 50 years or older, highly educated, working in suburban or metropolitan communities, and operating large SNPs.

This study also found significant differences in the amount of technology used based on the number of meal equivalents served, SND education level, and SND perceived computer knowledge level. SNDs serving more meal equivalents per day, with more education, and with higher perceived computer skills incorporated the most technology/software into their operations. The management of technology and software programs requires a fair amount of computer knowledge, and these findings reinforce the observation that individuals with more computer knowledge are more likely to implement technology/software to help meet department goals.

This research also verified that SNDs with higher perceived computer skills agreed that most types of technology/software were important as future purchases, and reported fewer barriers to obtaining more. Similarly,

SNDs who had more education and SNDs serving a larger number of meals per day used a greater amount of technology/software and disagreed more often with the barriers to acquiring new technology. Most respondents appeared to be familiar with technology/software, used a reasonable amount of it, and had probably witnessed the resulting benefits and effectiveness. Therefore, SNDs who perceive they are more proficient in using technology may be more likely to make future technology/software purchases and be more tenacious in finding ways to acquire it.

In contrast, SNDs with less education, and SNDs who were serving fewer meals per day, had a higher level of agreement with the barriers to purchasing technology/software. These findings suggest that not all school districts and SNDs are keeping up with the advances in technology. This may be due to a variety of reasons such as: lack of funds, nominal administrative support, limited experience with technology/software, and/or lack of perceived need. These findings also led the researchers to wonder if technology/software is being effectively marketed to SNDs in smaller communities. Sales commissions are often related to the size of the purchase; are technology/software companies as motivated to approach smaller districts in more rural communities to sell their products? This may be an important factor to consider when considering ways to encourage SNDs to purchase technology/software.

Since the majority of respondents answered the questionnaire online, the researchers felt that by using the SNA database and the listserv for recruiting participants, this research study possibly missed a certain cross-section of the SND population who have minimal computer skills, less education, and employment in smaller districts with less IT support. It is unknown if insufficient time, inadequate knowledge/information, or other factors were the reason for the number of questionnaires that were started but not completed.

In addition, data for this study was only collected from the Southwest Region of the United States, and the database used for participants was limited to the SNA and the AND SNS- DPG. Thus, results cannot be generalized to SNDs who are not members of these organizations. Future research is needed using databases in which information can be captured from those SNPs who are operating outside of membership in the SNA or AND SNS-DPG. In addition, data was only collected in school districts participating in the SBP or SNLP. Therefore, results cannot be generalized to other school districts operating SNPs that do not participate in the SBP or NSLP.

More research is needed to demonstrate the positive outcomes resulting from the use of technology, especially in the area of technology effectiveness in finite terms, such as decreased costs, increased participation, and improved productivity. For example, with the passage of the Healthy, Hunger-Free Kids Act of 2010 (2010), SNDs are being required to evaluate and re-examine menu and labor management, and food production systems, to assess how each new change will ultimately impact their SNP. Many of these changes take time and cost money. Technology, if available, may be of assistance.

SNDs who have more computer knowledge and experience have the opportunity to partner with those with less computer knowledge and those working in smaller, rural districts. The main intent of this partnership would be to collaborate in collecting data to show district decision-makers what can be achieved when technology is put to good use. Whatever the opportunity may be, research showing positive outcomes could likely encourage school administrators to support and allocate future funds. This is particularly true for SNDs who perceive barriers to acquiring technology or those considering purchase of new technology/software to improve productivity and efficiency in certain areas of their program.

In conclusion, this research confirmed that there is currently a group of SNDs who are confident in their computer skills and actively using many technology and software applications to meet their department goals. The study results demonstrating that a large group of SNDs have a solid technology foundation is a positive and encouraging sign for the child nutrition profession. This study, however, has revealed that there is a sub-section

of SNDs who still struggle in this area. Therefore, there is a definite need to bridge the gap between SNDs with less confidence in their computer skills and those very confident in their computer skills. The child nutrition industry needs positive and encouraging leaders who are willing to take time and put forth effort to support those in their field who are in need. The result of such leadership will be an investment of both mental and financial resources that ensures school nutrition programs will meet the future demands of the industry.

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