

Demand for and Factors Related to Potential Enrollment in an Online Master of Science Degree Program in Agricultural Education

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Abstract

The purpose of this study was to describe the need for an online Master of Science degree program in agricultural education and to determine factors that could be used to predict the likelihood of high school agriculture teachers applying for admission to such a program. The population consisted of 236 agriculture teachers in Iowa. The response rate for the online census survey was 73%. Ninety-nine high school agriculture teachers said they would consider pursuing an online master's degree program. In addition, 80 teachers whose highest level of education was a bachelor's degree indicated there was a high likelihood they would apply for admission to an online Master of Science degree program in agricultural education at Iowa State University. Logistic regression analysis yielded a three-factor model that could be used to correctly classify 81% of teachers as being likely or unlikely to apply for admission to the proposed degree program. Variables included in the model suggest that recruitment and program development efforts should target younger teachers who are highly skilled in using computers and need graduate courses in the next five years to maintain their professional license.

Introduction

"The Internet is the biggest technological change in education and learning since the advent of the printed book some 500 years ago. It is destroying the traditional classroom and replacing it with an even better way to learn and teach" (Draves, 2002, p. 5).

Draves and Coates (2007) predict that half of all learning in this century will take place online. Interest and participation in online learning is clearly growing. Allen and Seaman (2006) reported that 3.2 million students took at least one online course in fall 2005, up from 2.3 million in 2004. Allen and Seaman also reported that more than 90% of public institutions of higher education offered online courses or programs in fall 2005. Even so, Moloney (2006) concludes that demand for online learning has outpaced supply.

Demand for online learning has also been documented in agricultural education. In a study by Roberts and Dyer (2005), department chairs and program leaders in agricultural education at 67

institutions across the United States reported a moderately high demand for distance education courses. Two-thirds of these programs offered distance education classes. Most classes were offered at the graduate level, delivered online, and had a large number of agriculture teachers as enrollees. Wilson and Moore (2004) discovered a demand among high school agriculture teachers in North Carolina for an online master's degree program in agricultural education. Edwards, et al. (2004) found a similar level of demand among high school agricultural education teachers in Georgia.

Several agricultural education departments (e.g. Iowa State University, North Carolina State University, Oklahoma State University, Texas A&M University, Texas Tech University, University of Florida) offer online master's degrees. However, the overall trends in online learning and the demand documented in two states by Wilson and Moore (2004) and Edwards et al. (2004) suggest it is unlikely that the supply of courses and programs is adequate. Findings from a June 2006 survey by Eduventures revealed that a majority of persons considering totally online programs preferred that the program provider have a physical presence in their state (Garrett, 2007). Opportunities to serve specific statewide or regional agricultural education teacher populations most likely remain.

Theoretical Framework

This study was part of a needs assessment for a proposed online Master of Science degree program in agricultural education. According to Witkin and Altschuld (1995, p. 4), needs assessment is *"a systematic set of procedures undertaken for the purpose of setting priorities and making decisions about program or organizational improvement and allocation of resources."* Needs assessment consists of pre-assessment, assessment, and post-assessment phases. Data are collected in the assessment phase. From a career and technical education perspective, data should provide the basis for curriculum decisions (Finch and Crunkilton, 1993). From this perspective, demographics, projected degree program enrollments, and supply and demand factors in the labor market for program graduates are important considerations.

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Related literature was reviewed to determine what factors might be useful predictors of the likelihood that high school agriculture teachers whose highest level of education was a bachelor's degree would apply for admission to a specific online Master of Science degree program. Factors were organized into three categories: demographics, needs or incentives, and resources and proficiencies. Predictor variables that were considered in the analysis of data are included in Table 1.

In her U.S. Senate testimony, Cornelia Ashby (2002) reported that when compared to other postsecondary students, distance learners tend to be older, married, female, and employed full time. Distance learners also earned higher incomes, and a significant proportion of them were taking online courses offered by two-year public institutions. A more recent demographic profile of online learners was developed by Noel-Levitz Inc. (2006). Noel-Levitz Inc. collected data from 2003 to 2006 and obtained responses from more than 34,000 students from 78 institutions. Noel-Levitz Inc. reported that a majority of online learners were female, older than the traditional college-aged student, married, employed full time, and pursuing undergraduate studies. Noel-Levitz Inc. reminds us that these national demographics may not hold true for specific institutions. As an example, Miller and Miller (2005) reported that most of the students who earned degrees in agriculture at a distance from Iowa State University received a master's degree and were male.

Geographic location may be a defining characteristic of distance learners. Thompson (1998) indicated that students have historically been attracted to distance learning because of their significant geographical distance from campus-based programs. Geography was a factor for graduates of an off-campus agriculture degree program in Idaho (Mink and Moore, 2005). However, these place-bound adults are being joined more frequently in distance learning programs by students who live very near an appropriate on-campus program (Thompson). Distance learners have distinguishing demographic characteristics, but are these characteristics useful predictors of their likelihood of pursuing online education?

In their synthesis of agricultural distance education research, Roberts, et al. (2005) concluded that students are motivated to take distance education

courses for professional development purposes and the desire to earn degrees. They also identified requirements to maintain employment and administrative support as factors that may be useful in predicting enrollment. Mink and Moore (2005) concluded that a majority of students were motivated to enroll in an off-campus agriculture degree program at the University of Idaho because of future employment goals, related pay raises, and personal enrichment. Rezabek (1999) reported that adult distance learners at an Iowa community college were motivated by convenience, pursuit of a degree, and career advancement. They also indicated that support from family, friends, and the workplace served as enablers. According to Noel-Levitz Inc. (2006), the top five factors in distance education enrollment are convenience, work schedule, program flexibility, program requirements, and institutional reputation.

Prior experience with computers and online learning has been indirectly related to intention to take future online courses. Lim (2001) found positive relationships between satisfaction with a web-based course and years of computer use. In turn, satisfaction was related to intent to take additional web-based courses. Similarly, Lim found statistically significant positive relationships between computer self-efficacy and years of computer use, frequency of computer use, and number of Internet courses taken. Computer self-efficacy was a significant predictor of intention to take web-based courses in the future.

High speed Internet access is not yet universal. As an example, New York has one of the highest rates (54%) of homes with high speed connections (Gallagher, 2007). Iowa, the location of the proposed online Master of Science degree program that is the focus of this study, ranks near the bottom of all states

Table 1. Variables considered and retained for predicting the likelihood that high school agriculture teachers would apply for admission to an online Master of Science Degree program in agricultural education at Iowa State University

Variables Considered	Variables selected by stepwise logistic regression	Variables retained for the final model
Demographics		
1. Gender		
2. Age	Age	Age
3. Distance from university that offers a graduate program in agricultural education		
Needs/Incentive		
4. Need graduate courses in the next five years	Need graduate courses in the next five years	Need graduate courses in the next five years
5. Master's degree can/did increase salary		
6. Employer encourages formal education		
7. Employer provides tuition assistance		
8. Employer provides release time to take courses		
Resources/Proficiencies		
9. Computer skill	Computer skill	Computer skill
10. Previously taken an online course		
11. Previously taken any distance education course	Previously taken any distance education course	
12. Have high speed Internet access		

in Internet connection speed (Breen, 2007). However, high speed Internet access is an important resource for students pursuing online education. Murphy and Lindner (2001) concluded that an online course management system (WebCT) positively influenced student success in an upper-level undergraduate course, but success was negatively impacted when students did not have ready access to reliable computers with high speed Internet connections.

Purpose and Objectives

The purpose of this study was to describe the need for an online Master of Science degree program in agricultural education and to determine factors that could be used to predict the likelihood of high school agriculture teachers applying for admission to such a program. The objectives of the study were to:

1. Describe demographic characteristics of high school agriculture teachers who participated in the study.
2. Describe high school agriculture teachers' needs and incentives related to graduate education.
3. Describe high school agriculture teachers' resources and proficiencies related to pursuing an online Master of Science degree program in agricultural education.
4. Predict the likelihood that high school agriculture teachers whose highest level of education was a bachelor's degree would apply for admission to an online Master of Science degree program in agricultural education offered by Iowa State University.

Methods

The population for this census survey consisted of 236 high school agriculture teachers who were listed in the Iowa Agricultural Education Directory.

The questionnaire was developed by the researchers and was based upon questionnaires used for similar studies in North Carolina (Wilson and Moore, 2004) and Georgia (Edwards et al., 2004). The questionnaire contained 17 closed-ended items that produced nominal data, five closed-ended items that generated ordinal data, and three open-ended items that yielded ratio data. A panel of six experts at Iowa State University evaluated the questionnaire for wording, design, and validity. The panel consisted of the director of distance education for the College of Agriculture, the chair of the department of Agricultural Education and Studies, an associate professor in the department of Agricultural Education and Studies, an assistant professor in the department of Agricultural Education and Studies, and two graduate students majoring in Agricultural Education – one pursuing an MS degree and one pursuing a PhD degree. The questionnaire was edited to reflect the input of the panel and was judged by them to possess content and face validity.

Forty-four active graduate students majoring in agricultural education at Iowa State University were

invited to participate in a pilot test of the questionnaire. Their e-mail addresses were obtained from departmental records. The first contact included an information letter and a link to the web-based questionnaire. Twenty-two students responded to the initial contact. Fourteen days after the initial mailing, the 22 respondents were contacted for the second and final time to obtain retest data. The second contact included an information letter and a link to the web-based questionnaire. E-mails and first names were automatically collected by SurveyMonkey.com and were used to link first and second responses. Sixteen graduate students provided complete test and retest data. Appropriate measures of association between first and second responses were calculated for all items on the questionnaire. The coefficients for individual items were averaged across the questionnaire and resulted in a test-retest reliability coefficient of .87.

Recommendations by Dillman (2000) were closely followed in implementing the survey. Members of the population were contacted up to five times. The first contact was an e-mail pre-notice sent from the first author's university e-mail account. Other e-mail contacts were generated by SurveyMonkey.com. Four days after the pre-notice, a detailed information letter and a link to the questionnaire were sent by e-mail. One week later, a reminder including the link to the questionnaire was e-mailed to non-respondents. Seven days after the first reminder, a second reminder including the link to the questionnaire was e-mailed to non-respondents. Three weeks after the second reminder was e-mailed, a final reminder was sent by U.S. mail. This final letter was on university letterhead and individually signed by the researchers. The letter included directions on how to respond online. A total of 172 Iowa high school agriculture teachers provided useable data, resulting in a response rate of 73%.

Non-response error was addressed by using Lindner, et al.'s (2001) method number one. This involved comparing early ($n = 125$) and late ($n = 45$) responses to the questionnaire. Late respondents were defined as those who responded after the fourth and fifth contacts. The number of late respondents exceeded the minimum number ($n = 30$) recommended by Lindner et al. All 22 variables in this article were included in the analysis of early and late responses. There was no statistically significant difference between early and late respondents on 19 of 22 comparisons. Significant ($p < .05$) differences were found for years of professional work experience, number of miles the respondent lived from a university that offers a graduate program in agricultural education, and whether they would connect to their online courses at home. Late respondents had 17.5 years ($SD = 11.0$) of professional experience while early respondents had 13.6 years ($SD = 9.9$) of professional experience. Late respondents lived 114.3 miles ($SD = 52$) from a university offering a graduate

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program in agricultural education while early respondents lived 96.2 ($SD = 50.0$) miles from a university offering a graduate program in agricultural education. Early respondents (69%) would be more likely to connect to their online courses at home than late respondents (51%). The reader is cautioned not to generalize results for these three variables to the target population of Iowa high school agriculture teachers.

Data were analyzed with SPSS version 15 for Windows. Frequencies, percentages, means, and standard deviations were used to describe the demographic characteristics of the high school agriculture teachers, their needs and incentives related to graduate study, and resources and proficiencies related to pursuing an online Master of Science degree program in agricultural education. Logistic regression analysis was used to predict the likelihood that high school agriculture teachers whose highest level of education was a bachelor's degree would apply for admission to a specific online Master of Science degree program in agricultural education.

Results and Discussion

Objective 1. Describe demographic characteristics of high school agriculture teachers who participated in the study.

Most (80%) of the high school agriculture teachers who participated in the study were male. The teachers ranged in age from 22 to 62 years. The mean age was 38.3 years with a standard deviation of 11.2. Years of professional work experience ranged from less than one to 40 with a mean of 14.9 and a standard deviation of 10.5. The distance that teachers lived from a university offering a graduate program in agricultural education, ranged from 2 to 225 miles. The average distance was 100.8 miles with a standard deviation of 50.7.

Teachers were asked to indicate their highest level of education. A bachelor's degree was the highest level of education for 72% of the teachers, while 27% of teachers had a master's degree and 1% held a doctoral degree. Only 14 (8%) teachers were currently enrolled in a master's degree program, but 99 (59%) said they would consider pursuing an online master's degree program in agricultural education.

Objective 2. Describe high school agriculture teachers' needs and incentives related to graduate education.

Table 2 summarizes the data related to agricul-

ture teachers' needs and incentives related to graduate study. A majority (70%) of the teachers indicated a need for graduate courses in the next five years to maintain employment or to renew their teaching license. In addition, most (89%) indicated a master's degree could or did increase their salary. A majority (63%) of teachers also indicated there was a financial incentive to take courses after earning a master's degree. Teachers were encouraged by their employers to continue their formal education (50%) and to participate in workshops and conferences (75%). However, few employers provide tuition assistance (2%) or release time (5%).

Objective 3. Describe high school agriculture teachers' resources and proficiencies related to pursuing an online Master of Science degree program in agricultural education.

Table 3 summarizes the data related to agriculture teachers' computer resources and proficiencies. Most (84%) of the high school agriculture teachers had high speed Internet access. Most (90%) of them would do online coursework at work and a majority (64%) would do online coursework at home. Most teachers rated their computer skill as moderate (54%) or high (40%). Less than half (42%) of the teachers had previously taken an online course, but a majority (63%) had taken at least one distance education course.

Table 2. Percent of respondents indicating specific needs and incentives

Need/Incentive	%
Need graduate courses to maintain employment or renew a professional license	71
Master's degree can/did increase salary	89
Financial incentive for taking courses beyond the master's degree	63
Employer encourages formal education	50
Employer encourages nonformal education	75
Employer provides tuition assistance	2
Employer provides release time to take courses	5

Table 3. Percent of respondents with specific computer resources and levels of proficiency

Resource/Proficiency	%
Would do online coursework at home	64
Would do online coursework at work	90
Would do online coursework at a public library	5
Have high speed Internet access	84
Computer skill: High	40
Computer skill: Moderate	54
Computer skill: Novice	6
Previously taken an online course	42
Previously taken any distance education course	63

Objective 4. Predict the likelihood that high school agriculture teachers whose highest level of education was a bachelor's degree would apply for admission to an online Master of Science degree program in agricultural education offered by Iowa State University.

A majority (72%) of the high school agriculture teachers did not have master's degrees. Data from this group of 124 teachers was used to predict the likelihood of enrolling in an online Master of Science degree program in agricultural education offered by Iowa State University. Predictor variables that were

considered, selected through a stepwise logistic regression analysis, and eventually retained are listed in Table 1. The dependent variable had two levels – high and low. High likelihood was defined by a response of either “I will definitely apply” or “I am likely to apply” to the question “If a Master's Degree in agricultural education were offered online through Iowa State University, how likely are you to apply for admission?” Low likelihood was defined as a response of either “I am not likely to apply” or “I will definitely not apply” to the same question.

Table 4 compares the high and low likelihood groups on each of the predictor variables that were considered in this study. Forward stepwise logistic regression analysis was used to reduce the list of 12 predictor variables to four. The probability for variable entry was set at .05. The likelihood-ratio change was used for variable removal and the probability level was set at .10. The researchers decided to eliminate whether the respondent had previously taken any distance education course from the model because the Hosmer and Lemeshow goodness-of-fit test was statistically significant at the

identified as outliers and were determined to have a disproportionate influence on the results. The four outliers were removed from the analysis and the final model was developed using data from 117 cases. The correlation matrix for age, computer skill (represented by two dummy variables), and need for courses (represented by two dummy variables) indicated that multicollinearity was not a problem.

The final model explained 61% of variance in teachers' likelihood to enroll in an online Master of Science degree program in agricultural education at Iowa State University (Table 5). Results show that for every year of additional age, the odds of a teacher indicating a high likelihood of applying for admission to the Master of Science degree program in agricultural education at Iowa State University decreased by a factor of .82. For teachers who indicated a moderate level of computer skill when compared to teachers who indicated a high level of computer skill, the odds of applying for admission decreased by a factor of .10. For teachers who did not need courses in the next five years when compared to teachers who needed courses, the odds of applying for admission decreased by a factor of .08.

The model correctly classified 81% of the teachers (Table 6). The overall correct classification rate was a 13% improvement over selecting the model category and a 31% improvement if the dependent variable distribution were held constant. It more accurately predicted membership in the high likelihood group. The model's specificity was very high. Eighty-eight percent of teachers who were observed to have a high likelihood of applying for admission were also predicted to have a high likelihood of applying. The false positive rate was 32%, as 12 cases that were observed to be in the low

group were predicted to be in the high group. The false negative rate was low. Only 13% of teachers who were observed to have a high likelihood of applying for admission were predicted to have a low likelihood of applying.

Ninety-nine high school agriculture teachers in Iowa said they would consider pursuing an online master's degree program. In addition, 80 teachers whose highest level of education was a bachelor's degree indicated that there was a high likelihood that they would apply for admission to an online Master of Science degree program in agricultural education at

Table 4. Comparison of the high and low likelihood groups on each of the predictor variables (n=117)

Variables	High ^w %	Low ^x %	High ^w M(SD)	Low ^x M(SD)
Demographics				
Male	72	88		
Female	28	12		
Age	34(10)	45(10)		
Distance in miles from a university that offers a graduate program in agricultural education	97(49)	99(44)		
Needs/Incentive				
Need graduate courses in the next five years	81	65		
Master's degree can/did increase salary	91	82		
Employer encourages formal education	50	43		
Employer provides tuition assistance	2	0		
Employer provides release time to take courses	4	3		
Resources/Proficiencies				
Computer skill - high	49	15		
Computer skill - moderate	45	78		
Computer skill - novice	6	7		
Previously taken an online course	43	30		
Previously taken any distance education course	54	68		
Have high speed Internet access	81	87		
^w Respondents who indicated a high likelihood of applying for admission to an online Master of Science degree program in agricultural education offered by Iowa State University (n=80).				
^x Respondents who indicated a low likelihood of applying for admission to an online Master of Science degree program in agricultural education offered by Iowa State University (n=37).				
^y Percent of respondents within the high likelihood group.				
^z Percent of respondents within the low likelihood group.				

fourth step. This indicated that the model may not have been a good fit. Logistic regression analysis with simultaneous entry of the three remaining predictor variables was conducted. This analysis resulted in a non-significant Hosmer and Lemeshow test, a slight decrease in the proportion of variance explained, but a slight increase in the correct classification of cases. In addition, the three-factor model was within the guideline that the number of cases should be at least thirty times the number of independent variables (SPSS, 1999).

Standardized residuals were examined for the three-factor model to locate outliers. Four cases were

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Table 5. Logistic regression of selected variables on teachers' likelihood to apply for admission to an online Master of Science degree program in agricultural education at Iowa State University (n = 117)

Variables	Odds Ratio	95% CI	p
Age	.82	.76-.89	.00
Computer skill			
Computer skill: moderate ^w	.10	.02-.45	.00
Computer skill: novice ^x	.99	.12-8.06	.99
Need courses			
Need courses: no ^y	.08	.01-.48	.01
Need courses: don't know ^z	.23	.01-7.75	.41

Note: Chi-square = 66.12; df = 5; $p < .001$. Nagelkerke R-square = .61

^w coded: highly skilled = 0; moderately skilled = 1; novice = 0.

^x coded: highly skilled = 0; moderately skilled = 0; novice = 1.

^y coded: yes = 0; no = 1; don't know = 0.

^z coded: yes = 0; no = 0; don't know = 1.

Table 6. Classification of teachers by likelihood to apply for admission to an online Master of Science degree program in agricultural education at Iowa State University (n = 117)

Observed	Predicted		Percent Correct
	Low	High	
Low	n = 25	n = 12	68
High	n = 10	n = 70	88
Overall Percentage			81 ^z

^z A 13% improvement over selecting the modal category and a 31% improvement if the dependent variable is held constant.

Iowa State University. These data indicate a significant demand for an online master's degree program in agricultural education. This level of demand is comparable to that reported in North Carolina (Wilson and Moore, 2004) and Georgia (Edwards et al., 2004).

Gender was not a significant predictor of teachers' likelihood of applying for admission to an online Master of Science degree program in agricultural education at Iowa State University. Even so, a greater proportion of female teachers (82%) in this study were in the high likelihood group when compared to males (63%). This finding would be expected based on prior reports (Ashby, 2002; Noel-Levitz Inc., 2006) that women represent a greater proportion of distance learners.

Age was a significant predictor of teachers' likelihood of applying for admission to an online Master of Science degree program in agricultural education at Iowa State University. Younger teachers expressed a higher likelihood of applying. This finding is not a contradiction of earlier works (Ashby, 2002; Noel-Levitz Inc., 2006) that characterize distance learners as older than traditional postsecondary students. Most of the participants in this study were older than traditional college students. In fact, the mean age for the group was 38 years. Within this older group, increasing age decreases the odds of expressing a high likelihood of applying for admission to a specific online master's degree program.

Distance from a university that offers a graduate program in agricultural education was not a significant predictor of teachers' likelihood of applying for admission to an online Master of Science degree program in agricultural education at Iowa State University. Because of distance, a majority of the respondents did not have the option of pursuing on-campus study, but many who could were still interested in online learning. This is consistent with Thompson's (1998) observation that distance learning is not only about physical distance. For a variety of reasons, online learning is simply a more desirable option for some students.

Consistent with previous research (Roberts, et al., 2005), teachers who recognized a need to maintain or renew their teaching license

more frequently indicated a high likelihood of applying for admission to an online Master of Science degree program in agricultural education at Iowa State University. A potential increase in salary did not distinguish between those expressing a high versus low likelihood of applying. More than 80% of the teachers in each group recognized the potential of a master's degree to increase their salary. This finding is not necessarily inconsistent with Mink and Moore's (2005) finding that a potential pay increase could motivate someone to pursue distance learning opportunities.

Half of the teachers indicated that their employer encouraged formal education, but very few of them would receive tuition assistance or release time to take graduate courses. Administrative support was not a significant predictor of teachers' likelihood of applying for admission to an online Master of Science degree program in agricultural education at Iowa State University. Administrative support may not be a good predictor (Roberts, et al., 2005) of distance learning participation in this population, but could be an important enabler (Rezabek, 1999).

Computer skill was a significant predictor of teachers' likelihood of applying for admission to an online Master of Science degree program in agricultural education at Iowa State University. Persons who rated their computer skill as high were more likely to apply. This finding is consistent with the work of Lim (2001). Even though they live in a state

that ranks near the bottom in Internet connection speed (Breen, 2007), almost all (84%) of the teachers in this study had high speed Internet access. As a result, access to high speed Internet was not a useful predictor of likelihood to apply for admission.

Summary

High school agriculture teachers in Iowa expressed a significant need for graduate courses in agricultural education, indicated that incentives exist for them to continue their formal education, and indicated they have the computer resources and skills needed to pursue online education. These teachers must pursue formal education at their own expense and on their own time.

A model developed through logistic regression analysis suggests that younger teachers who need graduate courses in the next five years to maintain their current employment or to renew their teaching license and who are highly skilled computer users are the most likely to apply for admission to an online Master of Science degree program in agricultural education at Iowa State University. This model was developed with and for agriculture teachers in Iowa and may not be equally accurate with other populations. However, the procedure that was used can be followed in developing models for other target populations. It is important to conduct this type of analysis before expending the resources needed to develop an online degree program that may or may not be needed and/or may or may not attract enough participants to justify the expenditure of the resources.

Based on the findings and conclusions, the researchers recommended that the Department of Agricultural Education and Studies at Iowa State University move ahead with plans for an online Master of Science degree program. Faculty and administrators should endeavor to make the program as affordable as possible because the participants will be bearing almost all the costs. Because teachers balance full time employment, personal responsibilities and graduate education, the program should emphasize flexibility and the use of asynchronous delivery systems. Although a broad range of teachers can benefit from such a program, recruitment efforts may be more effective with younger teachers who are highly skilled in using computers and need graduate courses in the next five years to maintain their teaching license. It appears that teachers with these characteristics have the most interest in the program.

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