

AN ASSESSMENT OF AGRICULTURAL MECHANICS COURSE REQUIREMENTS IN AGRICULTURE TEACHER EDUCATION PROGRAMS IN THE UNITED STATES

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Abstract

Agricultural mechanics classes remain a popular choice for agricultural education students. These courses often comprise up to one-third of classes taught by agriculture teachers and continue to include traditional curricula despite growing discussion for utilizing more physical science-based curricula. Research has shown those teachers new to or preparing for the agriculture teaching profession often express anxiety for and a lack of preparedness to teach agricultural mechanics subject matter. The purpose of this study was to evaluate the preservice agricultural mechanics components of agriculture teacher education programs in the United States. States.

Fifty-nine agriculture teacher education programs were identified to accomplish the objectives of this descriptive study. These programs accounted five or more newly certified agriculture teachers annually during the academic years 1992-1994. Forty-six (78%) of the 59 programs responded to a mail questionnaire seeking to identify courses offered to support agricultural mechanics teacher preparation.

Results and Conclusions: Approximately two (2) three semester-credit-hour courses were generally required in agricultural mechanics to meet teacher certification requirements. In addition, 1.3 semester-credit-hours in agricultural mechanics teaching methods were required. From course syllabi collected, content offered in required agricultural mechanics courses reflected traditional agricultural mechanics subject matter. Most agriculture teacher education programs utilized instructors who have substantial knowledge in the areas of both agricultural education and agricultural mechanics to teach required agricultural mechanics courses. The departments in which these instructors teach reflected the changes in the agricultural industry as evidenced by the integrated titles of these departments. This may indicate a willingness to expand the content of required agricultural mechanics preservice courses to reflect these changes in agriculture.

Introduction / Theoretical Framework

Do students preparing to teach secondary agricultural education in the next millennium need agricultural mechanics teaching competencies? According to Phipps (1983) agricultural mechanics is an important component of the total secondary agricultural education program. Buriak (1992) found, however, that there were critics who perceived agricultural mechanics to be a non-essential area with the transformation of secondary agriculture programs to a truer science based curricula. These courses continue to be offered in secondary agricultural education programs despite discussions considering content changes towards a more science focused curricula (Harper, 1990; Dillard, 1991; Slocombe, 1987; National Research Council, 1988; Buriak, 1992; Osborne, 1992; Laird and Kahler, 1995).

Though still using traditional technology, agricultural mechanics lab classes remain popular. In 1998, for example, agricultural mechanics was offered in some form in 925 Texas schools with total enrollment in agricultural mechanics classes reaching nearly 28,000 (B.F. Shaw, personal communication August 3, 1999). Hoerner and Bekkum (1990) reported that agriculture teachers from seven selected states taught an average of two agricultural mechanics classes per semester. Shinn (1987) similarly found the amount of time devoted to laboratory instruction may comprise one-third to two-thirds of the total instructional time in many agriculture programs. However, preservice education may not necessarily provide new teachers with the proper experience to manage a dynamic learning environment such as an agricultural mechanics laboratory. The large percentage of instructional time spent in laboratory settings suggests a need for sound preservice laboratory and shop management practices.

Student teachers reported high levels of anxiety associated with teaching agricultural mechanics prior to and during their student teaching (Foster, 1986). For agriculture teachers to do the best job possible teaching agricultural mechanics, they need to receive current and reliable preservice agricultural mechanics instruction. However, Borne and Moss (1988) indicated that "on-the-job/self study" made the greatest overall contribution to preparation as first year agriculture teachers. Observant of the complexities for teaching in a laboratory environment, Johnson, Schumacher, and Stewart (1990) also suggested pre-service training of new teachers in laboratory management. They suggested it include timely, relevant instruction in the area of agricultural mechanics laboratory management practices.

Numerous studies indicated that teacher knowledge of agricultural mechanics was in need of improvement both prior to and after accepting teaching positions (Birkenholz, 1986; Schlautman and Siletto, 1992). Foster (1986) recommended that agricultural education majors participate in an early experience program designed to address those factors of highest anxiety, one being teaching agricultural mechanics.

Agricultural mechanics instruction is an important component of secondary agricultural education programs in the U.S. Therefore, a need exists to assess how teachers are being prepared to teach agricultural mechanics. Based on these findings agriculture teacher education programs will have a knowledge base for initiating curricular change.

Purpose / Objectives

The purpose of this study was to assess the agricultural mechanics course requirements necessary to achieve agriculture teacher certification at selected colleges and universities in the United States. Seven objectives were developed to guide this study.

1. Identify the number of newly certified agricultural teachers for the 1994-95 academic year within the study population.
2. Determine the total number of agricultural mechanics or related courses required for agriculture teacher certification.
3. Determine the number of semester credit-hours required in agricultural mechanics (or related) courses for agriculture teacher certification.
4. Ascertain the number of semester credit-hours in agricultural mechanics teaching methods required for agriculture teacher certification.
5. Determine minimum qualifications required/preferred of the instructors in agricultural mechanics courses required for agriculture teacher certification.
6. Develop an inventory of titles for those administrative units offering the agricultural mechanics required courses for agriculture teacher certification.
6. Identify the major topics of required agricultural mechanics or related courses for agriculture teacher certification.

Methods / Procedure

Population

The population for this study included university agricultural teacher certification programs that certified five or more agriculture teachers during the 1992-93 and 1993-94 school years, respectively, as reported in A National Study of the Supply and Demand For Teachers of Agricultural Education. The lower limit of five teachers certified was determined as the cutoff point due to budgetary restrictions of the researcher. A total of fifty-nine university agricultural education teacher certification programs were identified. For this two-year period, forty-eight of the fifty-nine identified programs certified five or more new agriculture teachers during both years. The remaining eleven universities certified five or more new agriculture teachers in only one of the two years. Consequently, a total of fifty-nine programs met the criterion for this study during this two-year period.

Instrumentation

This was a descriptive study that used a one-page, mail questionnaire. A panel of experts in agricultural mechanics curricula from several universities was used to insure content validity. To insure a high level of reliability, the instrument was administered to several groups of individuals at Oklahoma State University in the spring of 1996. These individuals included agricultural education teacher educators, former agricultural mechanics instructors and students of a research design course. The qualitative nature of the instrument did not lend itself to a formal test of reliability. Following review, the instrument was revised and distributed to the target population.

Data Collection

Data were collected over an eight-week period during the spring of 1996. Department heads of university programs were initially contacted via email to determine willingness to participate in this study. All universities agreeing to participate were mailed the instrument and a cover letter detailing the purpose of this study. A self-addressed, envelope was included for return of both the survey instrument and the requested syllabi of each respective university's required agricultural mechanics courses needed for teacher certification. Follow-up contacts of non-respondents were completed via electronic mail, conventional mail, or telephone. All non-respondents were contacted by telephone and/or email in an attempt to gather their completed survey and syllabi. The questionnaire was originally distributed to fifty-eight programs but it was determined through responses that one university issues two different types of credentials and the decision was made to count each as a separate program. Therefore, the total number of programs participating in the study was determined to be fifty-nine (N=59). A total of 46 of the 59 programs completed the survey resulting in a 78 percent response rate. Figure 1 provides a graphic representation of the responding institutions defined by AAEE region.

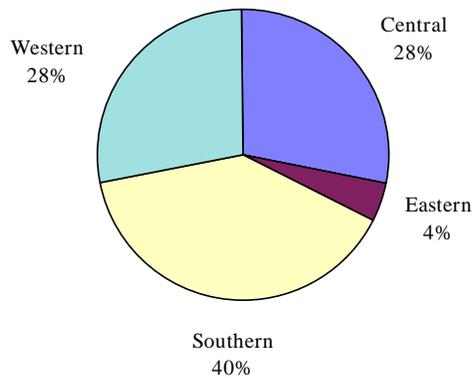


Figure 1. Percentage of responding teacher education programs by AAAE region.

Analysis of Data

Quantitative data were analyzed using descriptive statistics including means, frequency distributions, and percentages. All findings were reported in the aggregate with no individual institutions being singly identified.

Results / Findings

Objective 1: Identify the number of new agriculture teachers certified by responding programs in 1994-95. It was found that only six university agricultural education programs certified more than 16 new teachers during 1994-95. The remaining forty programs certified 87 percent of the new teachers. The mean number of new teachers certified per responding program was 9.5. Figure 2 was developed to summarize Objective 1.

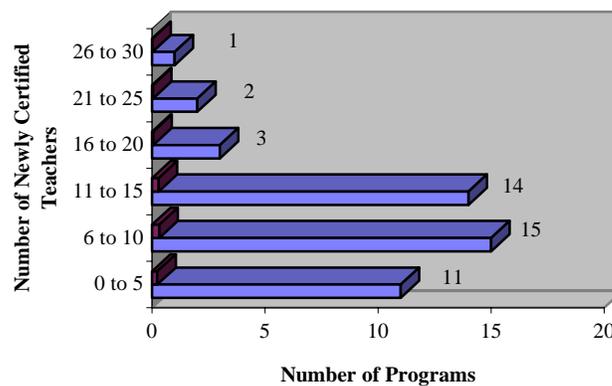


Figure 2. Number of Newly Certified Teachers by Programs.

Objective 2: Determine the number of courses required in agricultural mechanics for agriculture teacher certification. It was found that the number of required courses ranged from zero in three teacher education programs to as many as six or more courses in six programs. Almost two-thirds of the programs surveyed (65.2%) required two to four agricultural mechanics courses. The mean number of courses required per program was 2.8. These results are expressed in Figure 3.

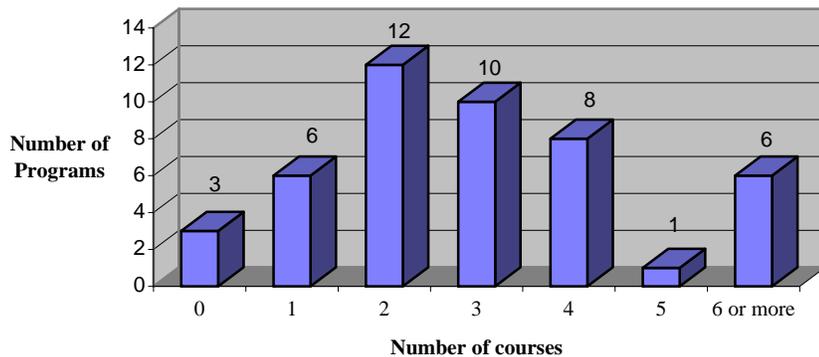


Figure 3. Number of courses required in agricultural mechanics by number of teacher education programs.

Objective 3: Determine the number of semester credit-hours required in agricultural mechanics (or related) courses required for agriculture teacher certification. Required semester credit-hours ranged from zero to 17.5 credit-hours. Almost 35 percent (34.7) of the programs responding required 2.6 to 5.5 credit-hours, while nearly half (47.8%) required 5.6 to 11.5 semester credit-hours in agricultural mechanics. The mean number of required semester credit-hours per program was 6.7. Figure 4 presents data for the number of semester credit-hours required in agricultural mechanics for agriculture teacher certification.

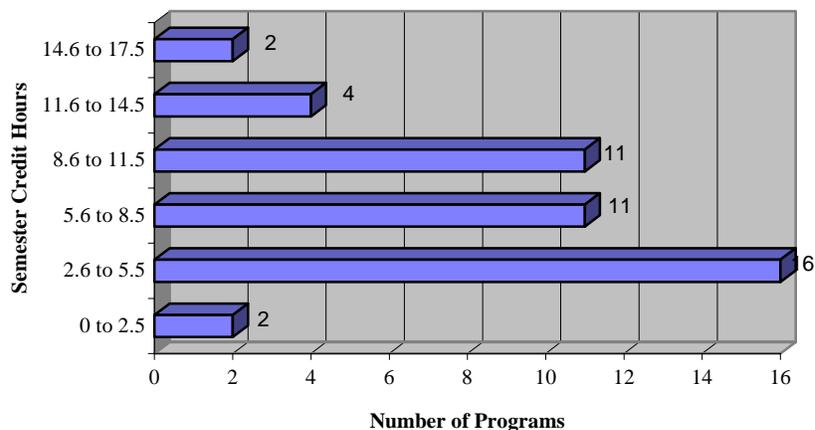


Figure 4. Number of semester credit-hours required in agricultural mechanics for agriculture teacher certification.

Objective 4: Determine the number of semester credit-hours required in agricultural mechanics teaching methods. Figure 5 graphically demonstrates the results of this objective. Data indicated that one-half (50%) of the programs responding had no course requirements for agricultural mechanics teaching methods. Almost 20 percent (19.4) of the programs required from 2 to 2.9 credit-hours. Three programs (7%) each required from 1 to 1.9 and 4 to 4.9, respectively while six programs (13%) required 3 to 3.9. The remaining 2 programs (4%) required greater than six credits. The mean number of methods credit-hours per program was 1.3.

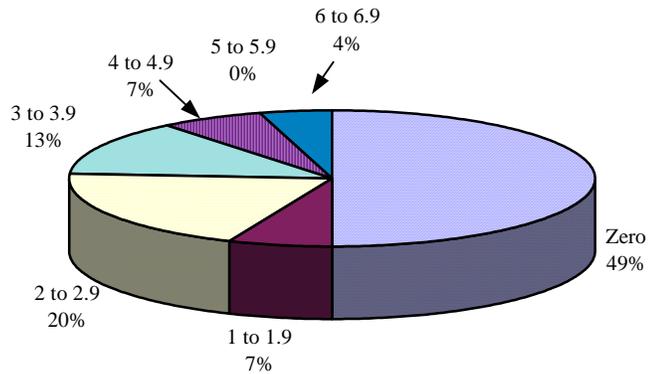


Figure 5. Semester credit-hours in agricultural mechanics teaching methods required for teacher certification.

Objective 5: Determine minimum qualifications required/preferred of the instructors in agricultural mechanics courses required for agriculture teacher certification. A total of 75 responses were received for this response item. This indicated more than one response from some programs as there was varying qualifications for teaching agricultural mechanics.

It was found that almost one-quarter of the agriculture teacher education programs required or preferred a professor to have a terminal degree in Agricultural Education to adequately teach required agricultural mechanics courses. One-fifth of the programs required or preferred course instructors to be agricultural engineers. Just over 10 percent indicated a master’s degree in Agricultural Education as a satisfactory qualification, while almost 15 percent preferred a doctorate in Agricultural Mechanics. Other qualifications deemed acceptable included a master’s degree in agricultural mechanics, a professional engineer certificate, doctorates in similar technological fields, and lastly, graduate student status with agricultural mechanics experience. Figure 6 provides a summarization of responses for these qualifications.

Degree preference

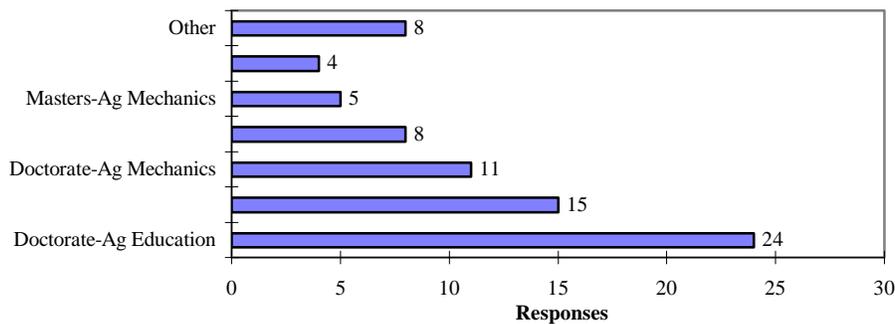


Figure 6. Required/Preferred Instructor Qualification to Teach Required Agricultural Mechanics Courses

Objective 6: Develop an inventory of titles for those administrative units offering the agricultural mechanics required courses for agriculture teacher certification. Figure 7 provides a summary of the results for this objective. Almost one-third (31.6%) of the administrative units responsible for teaching preservice agricultural mechanics courses contained “education” in the title. Additionally, nearly 37 percent (36.8) of the titles contained “agricultural engineering” either wholly or in part.

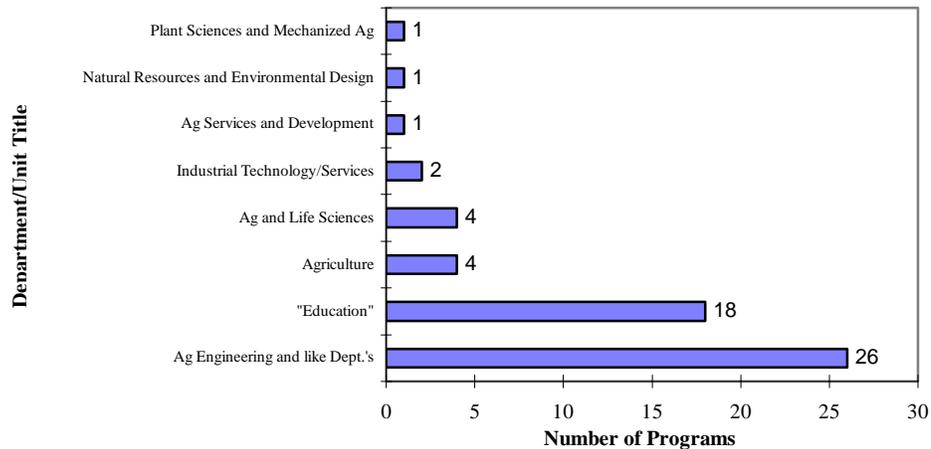


Figure 7. Administrative units offering courses in agricultural mechanics required for teacher certification.

Objective 7: Identify the major topics of required agricultural mechanics or related courses for agriculture teacher certification. The researcher reviewed 107 syllabi of required agricultural mechanics courses that were returned by respondents. Almost one-fifth of the central topics were in the aggregate field of “general agricultural mechanics skills.” There was no singular topic covered in these courses, but rather a broad overview of general agricultural mechanics skills. Other topics that were most frequently listed in syllabi included: teaching methods (17 percent), metals and welding (13.9 percent), agricultural building and construction (13 percent), agricultural power and machinery (13.0 percent), small engines (6.5 percent), electricity (5.6 percent), shop safety (2.8 percent), and introduction to agricultural systems (2.8 percent).. The “other” category included the topics “computer applications,” “facilities for agricultural and greenhouse production” and “woodworking” to “fundamentals of agricultural mechanization,” “irrigation water management,” and “applications in urban agromechanization.” Figure 8 provides a summary of these central topics of required courses in agricultural mechanics courses as determined from collected syllabi.

Profile of Agricultural Mechanics Preparation in Teacher Education Programs

When the data from teacher education program were studied, an agricultural mechanics profile of a “typical” agriculture teacher education program emerged. The agricultural mechanics component of an agriculture teacher education program can be described as requiring three courses in agricultural mechanics, or seven semester hours. In addition, a one credit-hour teaching methods course is also required. The university professor has a doctorate in agricultural education or agricultural engineering, the curricula include general topics on metals and welding, building and construction, agricultural power and machinery, small engines, electricity, shop safety, and agricultural systems. Agricultural engineering departments most commonly offer these courses with input from university agricultural education programs.

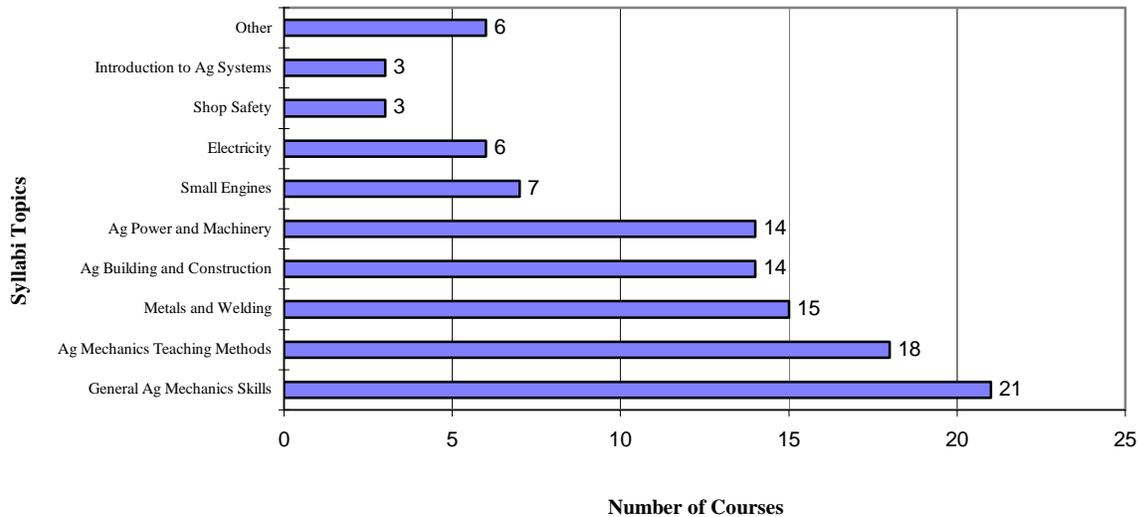


Figure 8. Central topics of required agricultural mechanics courses as determined from collected syllabi.

Conclusions

Based on the findings of this study, the following conclusions were made.

1. The number of newly certified agriculture teachers did not change substantially from 1992-1994 to 1994-1995. University teacher education programs preparing 15 or fewer graduates per year prepared the majority of the newly certified teachers in the U.S. from 1992 to 1995.
2. Approximately two (2) three semester credit-hour courses are generally required in agricultural mechanics to meet teacher certification requirements. In addition, 1.3 semester credit-hours of agricultural mechanics methods course work is required.
3. From course syllabi collected, content presented in required agricultural mechanics courses reflected traditional agricultural mechanics subject matter areas.
4. Most agriculture teacher education programs utilize instructors who have substantial knowledge in the areas of agricultural education and agricultural mechanics to teach required agricultural mechanics courses. The departments in which these instructors teach reflect the changes in the agricultural industry as evidenced by the integrated titles of these departments. This may indicate a willingness to expand the content of required agricultural mechanics preservice courses to reflect these changes in agriculture.

Recommendations

Based on the findings and conclusions of this study, the following recommendations were made.

1. Agricultural mechanics is an important component of secondary agricultural education programs in the U.S. It appears that most agriculture teachers have 6-8 semester credit-hours of preparation in agricultural mechanics. Further study is needed to ascertain what agricultural mechanics competencies agriculture teachers are expected to teach in secondary programs and to determine if the content of preservice education matches these competencies. A cursory review of agricultural education major degree requirements indicated that universities generally require more credit-hours in other agricultural subjects than agricultural mechanics.
2. Due to the major technological advances that have taken place in agriculture over the past two decades, agricultural educators, producers, government leaders, and industry experts must collaborate to develop a collective vision for agricultural mechanics/technology education. This vision is needed to guide the content of secondary and post-secondary agricultural education programs.
3. Teacher education programs that prepare 15 or fewer teachers annually certify the majority of agriculture teachers. Due to small university class sizes, innovative approaches need to be developed to deliver agricultural mechanics preparation and instruction to preservice teachers since small class sizes may limit courses that can be offered.

References

- Buriak, P. (1992, March). Filling the gap in Agriculture. *The Agricultural Education Magazine*, (64), 4, 23.
- Dillard, J. (1991, October). Agricultural mechanics. *The Agricultural Education Magazine*, (64), 6-7.
- Foster, R. (1986). Anxieties of agricultural education majors prior to and immediately following the student teaching experience. In *Seeking Solutions for Tomorrow's Challenges: Proceedings of the Thirteenth Annual National Agricultural Education Research Meeting*. Dallas, Texas. pp. 34-40.
- Harper, J. (1990, July). Agricultural mechanization; changing values in agricultural mechanics. *The Agricultural Education Magazine* (63), 20-21.
- Hoerner, T. and Bekkum, V. (1990). Factors related to safety instruction in secondary mechanics programs in seven selected states. Paper presented to the Agricultural Mechanics Special Interest Group during the 44th Annual Central States Seminar in Agricultural Education/Agribusiness. Chicago, IL.
- Johnson, D., Schumacher, L., and Stewart, B. (1990). An analysis of agricultural mechanics laboratory management inservice needs of Missouri agriculture teachers. *Journal of Agricultural Education* (31) 2, 35-39.
- National Research Council (1988). *Understanding Agriculture: New Directions for Education*, Washington DC: National Academy Press.
- Osborne, E. (1992, March). Reshaping ag mech. *The Agricultural Education Magazine*, (64), 3-4.
- Slocombe, J.W. (Fall, 1987). Agricultural mechanization curricula in 2000. *The Journal of Agricultural Mechanization*, 20-25.
- Schlautman, N.J. and Siletto, T.A. (1992, Winter). Analysis of laboratory management competencies in Nebraska agricultural education programs. *Journal of Agricultural Education*.
- Shinn, G. (1987). September—the time to improve your laboratory teaching. *The Agricultural Education Magazine*, (60) 3, 16-17.