

Collaborators Needed: Predictors of Self-Assessed Teamwork Competence in Agricultural Faculty



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Abstract

Despite an abundance of research in the past 20 years on the importance of teamwork in higher education, little data exists on what factors predict faculty self-evaluations of teamwork competence. This is important for leadership educators because as research on team science has increased there has been a proliferation of different training programs for faculty in academia to improve collaboration, with little regard for what variables predict self-perceived teamwork skill. This study used a cross-sectional survey design to collect faculty self-evaluations of teamwork competence from a national sample of agricultural faculty. Regression analysis was used to determine what factors, identified as potentially important from prior research, predicted positive self-evaluations of teamwork competence. Results showed that discipline self-efficacy, feelings of impostorism, team participation, the presence of prior training, and gender were all significant predictors.

The implications of these findings and avenues for future research for teamwork in higher education are discussed.

Keywords: *teamwork, self-efficacy, impostor phenomenon, agriculture, faculty*

Since the turn of the century, social and behavioral scientists have increasingly called for faculty to engage in more collaborations across disciplinary, organizational, and geographic boundaries to meet scientific and societal challenges (Hall et al., 2018). Researchers have emphasized the importance of team science because of the continued increase in specialization of faculty in higher education and the improved access that research collaborations provide, in terms of expertise, limited resources, and strategic affiliations (Leahey, 2016). The teamwork literature contains an enormous amount of practical guidance for the skills necessary for individuals to be effective in team

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environments (McEwan et al., 2017). Emerging research has also provided several different approaches for improving the intrapersonal and interpersonal skills required for effective collaboration and teamwork (Vogel et al., 2012; Stokols et al., 2008). However, very little research exists regarding faculty self-perceptions of teamwork competence and what variables influence this self-assessment.

Almost no emphasis has been placed on leadership or teamwork training for doctoral students to prepare them for faculty positions at major research universities that in the future will require significant collaboration with other faculty (Tebes & Thai, 2018). This lack of training has caused problems in the preparation of doctoral students and has been made worse when faculty enter positions in administration where the ability to work in teams has become more positionally relevant (Macfarlane, 2011; Oleksiyenko & Ruan, 2018). Although some higher education institutions have wanted to support the professional development of teamwork competence, time available for training has proven to be a limiting factor that has prohibited the coaching necessary for skill development and mastery (Link, 2008; Ziker 2014).

The idea that teamwork should be important for faculty in higher education institutions also contradicts many traditional ways of viewing doctoral education and faculty training in the western world. The path to become a faculty member has traditionally gone through doctoral programs, which have generally been viewed as solitary, and require individual preparation and defense of original research (Bohen & Stiles, 1998; Sverdlik et al., 2018). The dissertation process has been described as isolating, and discipline, resilience, self-motivation, and self-sacrifice have become the norm and not the exception for those choosing to endure this educational journey (Roberts & Hyatt, 2019). After earning a doctorate, the tenure and promotion process has also been isolating, and generally required faculty to invest most of their time in independent scholarly activity with most of the emphasis placed on individual research (Bohen & Stiles, 1998; Sverdlik et al., 2018). The limitations of time, combined with a reward structure focused on the quantity of research produced or teaching evaluations in a specific and often strictly defined academic discipline has deemphasized the notable benefits of effective collaboration and teamwork (Bohen & Stiles, 1998; Oleksiyenko & Ruan, 2018; Sverdlik et al., 2018). It is unlikely that in all the years from doctoral training to attaining tenure that a faculty member would formally learn to manage social processes that improve the cognitive, affective, and motivational states that enable team scientists to blend competencies to solve complex problems (Tebes & Thai, 2018; Vogel et al., 2012).

For agriculture faculty, the focus of this study, there are further challenges that can influence self-assessed teamwork competence. Many colleges of agriculture include faculty from diverse backgrounds including lab, field, and social sciences. Adams et al. (2012) suggested that philosophical challenges emerge in cross disciplinary research teams due to differences in epistemological philosophies and foundations of knowledge. Researchers have identified several other barriers to interdisciplinary teams in agriculture, including a lack of relationships and

networks, time constraints, absence of trust, and a reticence to engage in actions that would build cooperation (Bruce & Ricketts, 2008; McKim et al., 2010; Stedman & Pope, 2019). Adams et al. (2012) indicated that to carry out the necessary social interactions associated with successful cross-disciplinary research that leadership, trust, quality interactions, and perceptions of effective teamwork and communication are crucial to team success. Unfortunately, land-grant institutions are extensively siloed and do not provide an environment that has encouraged interdisciplinary team development and leadership facilitation activities (Boone, 1990; O'Meara & Jaeger, 2006; Trust et al., 2017).

The lack of teamwork training and preparation for faculty in higher education have been made worse due to feelings of impostorism (IP). IP occurs when an individual has persistent feelings of professional fraudulence, believing that through luck they have fooled their colleagues into thinking they are more competent than they are (Clance & Imes, 1978). IP is especially prevalent in higher education due to the stressful academic environment that includes competitiveness, a lack of interdisciplinary work during doctoral training, scholarly isolation, and an emphasis on output over process (Hutchins & Rainbolt, 2017; Jaremka et al., 2020). The outcomes of IP on faculty performance can be dramatic, leading to lower ratings of job performance, less interactive teaching, anxiety and burnout, and struggling faculty may decrease interactions with others to reduce the likelihood of the discovery of their perceived fraudulence (Shreffler et al., 2020). Jaremka et al. (2020) suggest that feeling unprepared may also increase feelings of intimidation, insecurity, shame, and unworthiness that would all be detrimental for building the trust necessary to practice effective teamwork. Given these past findings, the objectives of this study were to:

1. Determine the self-perceived teamwork competence of agricultural faculty,
2. Identify the relationship between self-assessed teamwork competence and critical teamwork covariates identified in the literature, and,
3. Use Multiple Linear Regression to determine the predictive value of these variables on agricultural faculty self-assessed teamwork competence.

Literature Review

There have been a number of definitions of a team, but the most relevant to this study came from the work of Alderfer (1977) and Hackman (1987), which stated that a team is at least two individuals who work interdependently on tasks, share responsibility in task outcomes, self-identify, are seen by others to be and act as a social entity rooted in a larger organization, and who have managed relationships across organizational boundaries (Cohen & Bailey, 1997; Hare, 2010). The process that ensures a team has achieved its common goals has been referred to as teamwork (Salas et al., 2005). Thirty years later, the definition of a team has remained relatively stable, and according to Varela and Mead (2018) a team “denotes a group of two or more people working interdependently in the pursuit of a common goal (p.173).” Vast amounts of literature present a great deal of

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consensus around this definition, but strangely the concept of teamwork has not received the same level of attention with one literature review of teamwork pedagogy from 1995 to 2015 suggesting that only 17% covered teamwork processes (Barley & Weickum, 2017; Reibe et al., 2016; Salas et al., 2005).

Teamwork refers to the interpersonal interactions among group members that are necessary for communication, sharing information, coordinating actions, and maintaining social order (Bowers et al., 1997). This definition arose from research based on McGrath's (1984) team process model that focused on group interaction processes. McGrath's (1984) conceptual model theorized that properties of individual group members, the standing group, the task or situation, and properties of the environment, are four interacting forces that predict group interaction processes. Most importantly from this work, McGrath (1984) suggested that the interaction of these four functions on a group leads to changes in those inputs, so in effect, the outcomes of group interaction processes become the inputs for the next cycle of group interaction processes. One important takeaway from the McGrath (1984) model was the concept that groups conducted multiple tasks at one time, and each task required complex temporal patterning and faced different levels of ambiguity, synchronization, and constraints on resources.

In this context, Marks et al. (2001) developed the recurring phase model of team processes that included episodic approaches over time differentiated by two activities related to goal accomplishment. These included action phases, where teams focused entirely on actions that directly impacted task completion, and transition phases, which included when teams focused on evaluation or planning activities (Marks et al., 2001). Marks et al. (2001) also added a third phase involving interpersonal processes, which they proposed could take place at any time during

the rhythm of team task accomplishment. From these phases, a taxonomy of team processes was developed that was broad enough to apply to different types of teams (McEwan et al., 2017). They settled on ten team processes selected from the teamwork literature and integrated those within their temporal model but kept them distinct enough conceptually for operationalization. From this research, Varela and Mead (2018) sought to create an instrument that measured teamwork with high specificity in academic settings. Through their research, the ten-factor model from Marks et al. (2001) was eventually reduced to eight items, as the validity of the instrument revealed that eight items were superior (Table 1) (Varela & Mead, 2018).

Much of this prior teamwork theory serves as the foundation for effective team practices in team science (Tebes & Thai, 2018). Many researchers suggest that coordination, cooperation, and communication are essential to team performance and integrative capacity (Salas et al., 2018; Salas et al., 2015; Salazar et al., 2012; Tebes & Thai, 2018). According to Salazar et al., (2012), integrative capacity is a team's capability "to build effective communication practices, a shared identity, and a shared conceptualization of a problem to create new knowledge. (p. 528)." Integrative capacity is only possible when a team can carry out effective social processes that lead to beneficial cognitive, affective, and motivational states. The most important of these emergent states for successful science teams are trust, psychological safety, openness, and the formation of a team identity (Salazar et al., 2012; Tebes & Thai, 2018). As science is essentially a social endeavor, interpersonal risk taking is essential to knowledge production, but individual faculty may be hesitant to engage in these behaviors if they have low discipline self-efficacy (DSE) and high levels of the impostor syndrome (IP) (Kuhn, 1962; Tebes, 2017).

Table 1.

Varela and Mead Classification of Team Processes

Category	Lower-level dimension	Definition
Transition processes	Mission Analysis	Definition of the team main task and appraisal of resources to accomplishing mission.
	Strategy Formulation	Establishing courses of action for mission accomplishment
Action processes	Situation Monitoring	Ensuring the task advances according to preestablished goals and procedures.
	Backup Behaviors	Assisting other members in performing their tasks.
	Coordination	Orchestrating teammates' actions toward goal accomplishment
Interpersonal processes	Conflict Management	Preventing harmful conflict or finding healthy resolution for existing conflicts
	Motivating and Confidence Building	Supporting the spirit of the team. Reinforcing team cohesiveness.
	Affect Management	Regulating emotions that may interrupt advancement of collective tasks.

Note. Adapted from Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of management review*, 26(3), 356-376.

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Review of Compositional Variables Influencing Faculty Teamwork Self-Competence

Discipline Self-efficacy and Impostor Syndrome.

Bandura (1991) suggested that no mechanism of human agency was more integral to behavior choices than people's beliefs about their ability to control their level of success over events in their lives. Most important to group work, Bandura and Schunk (1981) suggested that people will persist in activities in which they feel self-efficacious because completion of these behaviors will foster high levels of satisfaction. In professional environments, employees with feelings of self-efficacy are more prepared to take on responsibility and challenge in their jobs (Bandura, 1997; Kittel et al., 2021; van Mierlo et al., 2006). Individuals with high self-efficacy are more likely to appreciate a challenge and persist in the face of short-term failures. Compared to less efficacious individuals, persons with high self-efficacy are more likely to pursue responsibilities that allow them to exercise personal judgement, appreciate a challenge, and assess and improve their work if their performance falls short (Bandura, 1997; Kittel et al., 2021; van Mierlo et al., 2006). Most importantly, individuals with high self-efficacy do not react anxiously to threatening tasks or environments (Bandura, 1986; Kittel et al., 2021; van Mierlo et al., 2006). Results have shown that self-perceptions of coping in risky situations are positively correlated with risk-taking behavior (Dachner et al., 2017). Bandura (1989) further indicated that people have influence over their lives by choosing the environments in which they live and work. Choi et al., (2003) further suggested that a positive group climate of open communication and trust between members is related to positive changes in member self-efficacy because they are free to experiment without fear and while receiving frequent feedback.

However, low perceived self-efficacy in social situations can cause great stress and depression and prevent individuals from forming interpersonal relationships that could access these benefits (Bandura, 1989; Fortuin et al., 2021; Holahan & Holahan, 1987). It is for this reason the impostor phenomenon (IP, also known as the impostor syndrome) can be such a powerful detriment to teamwork for faculty. According to Harvey and Katz (1985) the core feelings of IP include the constant fear of exposure as a fraud and the inability to accept that one's success is due to ability or hard work. Faculty suffering from IP strive to appear capable, competent, and successful to gain respect from others (Jaremka et al., 2020). Impostors will often conceal their imperfection by not participating in situations where their perceived limitations will become visible to others (Shreffler et al., 2020). Consequently, impostors are highly self-conscious and will seek to conceal their mistakes to appear perfect which can have an extreme negative impact on the social processes necessary for effective teamwork as defined by interactive capacity (Frost et al., 1995; Salazar et al., 2012; Sakulku & Alexander, 2011). In addition, those most afflicted with IP will have higher levels of stress, anxiety, emotional exhaustion, and lower levels of job satisfaction (Hutchins et al., 2018; Hutchins & Rainbolt, 2017). Much of this anxiety is due to perceptions

of self-inefficacy which can prevent high quality analytical thinking, disrupt the desire to participate or take risks, and lead to avoidant behavior that hurts team learning (Wood & Bandura, 1989; Roussin et al., 2018; Zanchetta et al., 2020). These findings from IP and self-efficacy research are supported by teamwork literature which has shown that integration of faculty in science teams has been difficult to achieve (Cronin & Weingart, 2007; Eigenbrode et al., 2007; Fiore, 2008; Balakrishnan et al., 2011).

Gender.

Previous research has shown that women typically self-assess teamwork competence greater than men (Al-Alawneh et al., 2011; De Paola & Scoppa, 2018; Rosch et al., 2014; Stedman & Pope, 2019; Strom & Strom, 2011). However, previous research has also shown that women may self-assess their competence more harshly than their male peers. Torres-Guijarro and Bengoechea (2016) in a review of self-assessment literature found eight studies that showed that men were typically overconfident in self-assessment and women underconfident. Further, Rees (2003) found that 72.7% of females underrated their performance while 73.3% of men overrated their own.

Faculty Appointment.

Past research has shown that appointment type may significantly influence faculty productivity at work (Bland et al., 2006). Faculty work-life balance models have also indicated that professional priorities may influence faculty performance, especially in tasks that they perceive are not directly related to them successfully completing their work (Sheets et al., 2018). In addition, time, reward structure, and administrative barriers can influence the likelihood of faculty to engage in team behaviors (Stofer & Wolfe, 2018; Tebes & Thai, 2018).

Research and Administrative Team Experience.

Hall et al. (2018) provide a summary of past research that demonstrates that faculty with previous collaborative experiences tend to be more collaborative in the future. McGinn and Niemczyk (2020) showed that faculty with more experience on research teams also provided informal learning experiences for less experienced faculty to learn how to collaborate in team science. Love et al. (2021) found that more experience in team science increased participant interpersonal skills which were important in effective teamwork. Faculty participation on administrative teams, sometimes referred to as institutional service, is viewed much differently than team science because until recently it was not as important to tenure and promotion (Lawrence et al., 2012). Research has found that faculty citizenship is connected to employee engagement and increased productivity (Hammer et al., 2019). Culver et al. (2020) showed that participation in shared governance increased perceptions of organizational support, professionalized faculty, and increased collegiality and collaboration.

Prior Teamwork Training.

Prior teamwork training has been shown to improve faculty self-assessed teamwork competence in both

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research and teaching contexts across academic disciplines (Gast et al., 2017; Karimi et al., 2011; Vogel et al., 2012). However, there is no consensus in the scientific community regarding best practices for teamwork training, with very little empirical evidence to support any one method (Hall et al., 2018).

Graduate School Preparation.

Faculty have indicated that team-based experiences in graduate school provided significant insight that allowed them to contribute to higher quality science as professionals (DeHart, 2017). However, Gehlert et al. (2017) suggested that team science was not intuitive, and it required skills not often developed in traditional graduate curriculum. Previous research has also shown a positive relationship between perceived situation knowledge and task confidence as it relates to team performance (Hamilton et al., 2017).

Faculty Rank.

Previous research has shown that faculty with higher academic rank collaborate more often which can lead to more positive team outcomes (Hall et al., 2018). In addition, teams with a mix of academic ranks have even more positive outcomes and are more likely to produce breakthrough publications (Hall et al., 2018). The literature has also shown that academic rank and tenure eligibility were associated with varying levels of value placed on team science (McHale et al., 2019).

Methods

This study on faculty self-perceived teamwork competence was part of a larger study investigating the overlap between mentoring and teamwork as overarching interpersonal constructs using a cross-sectional survey design. The current study utilized responses from the teamwork section of the larger study's online survey instrument to investigate only the relationship between demographic variables and self-assessed teamwork competency. The target population in this study was United States agriculture faculty. The sample was taken from the 2020 North American Colleges and Teachers of Agriculture (NACTA) membership list. NACTA is a professional society that has three missions, to provide a forum for agriculture educators to discuss the advancement of agriculture, to improve teaching, and to support research in teaching agriculture (NACTA, 2020). The NACTA journal includes research articles on teaching, research, and extension in agriculture and suggests a diverse membership of agriculture faculty. Given the breadth of articles and the stated mission of the organization, the NACTA membership was believed to be an acceptable sample for the greater agriculture faculty population. Further supporting this case was the fact that NACTA membership is geographically diverse, with survey respondents indicating their connection to 86 institutions over 49 states. In addition, the member list was reviewed thoroughly and cleaned to remove duplicates and graduate students to guarantee that everyone surveyed was a part of the population of interest.

The instrument measuring teamwork competence was

designed by Varela and Mead (2018) and will be referred to as the teamwork competency assessment (TCA). This instrument was selected due to the rigorous analysis by the original authors that determined the instrument to have adequate internal-factor structure and adequate psychometric properties across raters in academic settings (Varela & Mead, 2018). The TCA includes 24 questions measuring eight lower-level teamwork dimensions hierarchically arranged into three superordinate categories: transition processes, action processes, and interpersonal processes that measure overall teamwork competence (LePine et al., 2008; Marks et al., 2001; Varela & Mead, 2018). Instructions for this study asked respondents to assess their level of perceived skill in teamwork from behavioral descriptions on a 7-point Likert-type scale with responses from 1 (extremely unskilled) to 7 (extremely skilled).

Several variables in this study included survey items averaged into individual independent variables. Four questions were asked regarding respondent self-confidence in teaching and research ability and averaged to measure discipline self-efficacy (DSE). The items were all measured on a 5-point Likert-scale from 1 (not at all confident) to 5 (extremely confident). The combined index variable had a Cronbach's alpha of 0.77. Reliability values of .70 or higher are generally considered satisfactory (Cohen, 2013). Two items taken from the Clance Imposter Phenomenon Scale were averaged to measure faculty perceptions of the impostor syndrome (Clance, 1985). These questions regarding fear of being found out as fraudulent were measured on a 7-point Likert-scale with 1 (strongly disagree) to 7 (strongly agree). The Cronbach's alpha of these two items was 0.92. Finally, five items determining amount of time spent working in different types of teams were averaged into two variables. Amount of time spent in research teams included three different items that were averaged including multi-institutional research teams, within institution research teams, and department research teams scored from 0 (never) to 5 (2 or more times per week). Amount of time spent in administrative teams included two questions, amount of time in within institution administrative teams and time spent in professional association administrative teams with the same Likert-type scale.

The questionnaire was designed using Qualtrics®, a web-based, free survey platform that allowed for easy collection and transmission of results to analytic software. Each participant was provided a unique survey link through the online survey software in order to eliminate the likelihood of coverage error. Respondents were sent an invitation email during Fall 2020 describing the study and the nature of the questionnaire, and weekly reminder emails to increase response rate. The survey was sent to the entire member email listserv which included 1,085 individual contacts. The response rate was 37.51% (407) of which 338 were complete and usable. Non-response error was addressed by comparison of early to late respondents. Lindner, Murphy, and Briers (2001) suggest that this method is acceptable for addressing non-response error. Analysis of Variance comparing TCA scores across the five waves of respondents showed no significant differences $F(4, 347) = 0.516, p = 0.72$.

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Data Analysis and Results

Quantitative data were analyzed using SPSS version 27. Outliers were analyzed using Cook's distance and one data point was removed given its large deviation from other Cook's distance values in the data set (Stevens, 1984). Missing data were minimal and missing at random, with the entire dataset having only 0.55% missing values. Tabachnick and Fidell (2013) suggest that 5% or less missing values is acceptable, and that data can be considered missing at random when it is likely the missing responses would be similar in distribution to the observed responses. Missing values were handled with listwise deletion. To address multiple regression assumptions, multicollinearity among independent variables was analyzed using variance inflation factor (VIF) and tolerance statistics (Hair et al, 2014). Normality, linearity, and homoscedasticity were assessed via residual scatterplots (Tabachnick & Fidell, 2013). Evaluation of the assumptions associated with multiple regression indicated that all assumptions were met.

Respondents were mostly full professors (35.60%), associate professors (24.60%), and assistant professors (16.90%). Several respondents selected other (13.40%), and a review of text responses indicated that these participants were primarily department chairs and academic deans. Of the remaining faculty ranks in the study, only 5.90% were lecturers and 2.40% were distinguished/eminent professors. Respondents were highly experienced on average (M = 17.72 years, SD = 11.21). Surprisingly, only 35.20% of respondents self-reported ever having participated in any form of teamwork training. Participants self-reported engaging in research teams a little bit less than monthly (M = 1.78, SD = 1.25, see table 1-2 for coding information) and participating in administrative teams more

than once per month (M = 2.15, SD = 1.05). Slightly more men completed the survey (54.60%) than women. Respondents were predominantly teaching faculty (79.40%) with only a few self-selecting research (13.80%) or extension (6.80%) as their primary appointment type.

The first objective in this study was to determine the self-perceived teamwork competence of NACTA faculty using the average of all 24 items on the TCA (M = 5.78, SD = 0.73). The full descriptive statistics for the key demographic variables can be reviewed in Table 2 across all TCA higher-order teamwork constructs of transition, action, and interpersonal processes. Men (M = 5.75, SD = 0.78) and women (M = 5.83, SD = 0.67) scored similarly. In addition, men and women did not score significantly differently on action, transition, and interpersonal phases of teamwork, although women did score slightly higher in every category. Average self-assessments on the TCA were similar across faculty rank and appointment type.

The second research objective was to identify the relationships between self-assessed teamwork competence and important variables identified in the literature including prior teamwork training and experience, teaching and research self-efficacy, feelings of the impostor syndrome, faculty appointment, and gender. Mean, standard deviations, and intercorrelations were measured for these variables in Table 3.

Faculty perceptions of teamwork competence on the TCA were significantly and positively correlated with DSE ($r = 0.42, p < .01$), research ($r = 0.20, p < .01$) and administrative ($r = 0.19, p < .01$) team participation rates, higher ranking faculty titles ($r = 0.13, p < .05$), prior teamwork training ($r = 0.20, p < .01$), and more positive perceptions of graduate school preparation ($r = 0.20, p < .01$). The impostor

Table 2.

Mean and Standard Deviation of Faculty Self-Assessed Teamwork Competency Assessment (TCA) Scores Across Key Demographic Variables

TCA Competencies Mean and (SD)	N	Transition	Action	Interpersonal	TCA Scores
Full Sample	332	5.82 (.83)	5.74 (.78)	5.80 (.79)	5.78 (.73)
Men	184	5.78 (.86)	5.69 (.82)	5.78 (.83)	5.75 (.78)
Women	146	5.88 (.79)	5.80 (.73)	5.82 (.73)	5.83 (.67)
Dist. Prof.	7	6.21 (.67)	6.27 (.61)	6.38 (.62)	6.30 (.60)
Professor	118	5.88 (.86)	5.80 (.77)	5.74 (.78)	5.80 (.73)
Assoc. Prof	83	5.76 (.80)	5.62 (.83)	5.83 (.76)	5.73 (.73)
Ast. Prof	56	5.72 (.93)	5.69 (.81)	5.64 (.95)	5.68 (.82)
Lecturer	20	5.50 (.64)	5.54 (.80)	5.57 (.63)	5.55 (.63)
Other/Admin	46	5.99 (.77)	5.84 (.66)	6.10 (.59)	5.99 (.61)
Teaching	256	5.76 (.86)	5.69 (.80)	5.76 (.78)	5.73 (.74)
Research	45	6.01 (.72)	5.86 (.71)	5.88 (.80)	5.91 (.69)
Extension	21	5.94 (.78)	5.88 (.75)	5.86 (.71)	5.89 (.68)

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Table 3.

Mean, Standard Deviation, and Intercorrelations for TCA Scores and Independent Variables

Measures	M	SD	1	2	3	4	5	6	7	8	9
1. TCA score	5.77	0.76	x								
2. Discipline self-efficacy (DSE)	3.92	0.72	.42**	x							
3. Feelings of Impostorism (IP)	3.73	1.64	-.33**	-.40**	x						
4. Research Team Participation	1.77	1.25	.20**	.37**	-.09	x					
5. Admin Team Participation	2.15	1.05	.19**	.11	.00	.28**	x				
6. Prior Teamwork training	0.35	0.45	.20**	.06	-.09	.20**	.21**	x			
7. Faculty Title	3.53	1.35	.13*	.00	-.19**	-.10	.20**	.18**	x		
8. Primary Appointment	2.73	0.58	-.09	.04	.06	-.23**	-.03	-.06	-.09	x	
9. Gender	1.45	0.45	.07	-.18**	.25**	-.10	-.02	.05	-.13*	.10	x
10. Graduate Preparation	3.75	0.96	.20**	.33**	-.23**	.11	.11	.06	-.01	.14**	-.18**

Note. ** Correlation is significant at the 0.01 level (2-tailed);

* Correlation is significant at the 0.05 level (2-tailed).

Prior Teamwork Training: 0=no, 1=yes

Faculty title: 1=lecturer, 2=assistant professor, 3=associate professor, 4=professor, 5=distinguished professor, 6=other

Primary appointment: 1=extension, 2=research, 3=teaching

Gender: 1=male, 2=female

Average team participation: 0=never, 1=less than once per month, 2=monthly, 3=two or three times per month, 4=weekly 5=2+ times per week

Graduate preparation: 1=not at all prepared, 2=slightly prepared, 3=somewhat prepared, 4=moderately prepared, 5=extremely prepared

syndrome (IP) was significantly negatively correlated with faculty scores on the TCA ($r = -0.33, p < .01$). Gender was not significantly correlated to TCA scores but was significantly positively correlated to IP ($r = 0.25, p < .01$), and significantly negatively correlated to DSE ($r = -0.18, p < .01$), faculty title ($r = 0.13, p < .05$), and perceptions of graduate preparation ($r = -0.18, p < .01$). Follow up t-tests exploring this relationship between gender, DSE, IP, faculty title and graduate preparation showed that men universally self-evaluated significantly higher than women, yet still had statistically similar TCA scores (see Table 4).

The third objective was to determine which variables were key predictors of faculty teamwork self-competence. Standard multiple regression was run to determine the key predictors of faculty teamwork scores with the TCA as the dependent variable and discipline self-efficacy (DSE), feelings of impostorism (IP), research and administrative team participation, prior teamwork training, faculty title, primary appointment, gender, and graduate preparation as independent variables (Table 5).

The results of the regression analysis were significant, ($F(9,306) = 14.58, p < .001$ with $R^2 = 0.30$). The adjusted R^2 value of 0.28 indicates 28% of the variability in faculty self-perceived teamwork competence is determined by the nine independent variables in the model. DSE ($\beta = 0.37, p < .01$), IP ($\beta = -0.20, p < .01$), administrative team participation ($\beta = 0.12, p = .02$), prior teamwork training ($\beta = -0.25, p = .02$), and gender ($\beta = -0.34, p < .01$) all emerged as significant predictors of faculty TCA scores, with DSE and gender being the strongest predictors based on beta coefficients.

Discussion

The purpose of this study was to explore what variables act as predictors for faculty self-assessed teamwork competence. OLS multiple regression revealed DSE, IP, administrative team participation, prior teamwork training, and gender were all significant predictors. The findings regarding DSE were not surprising given the amount of literature that suggests that self-efficacy impacts our choices in groups (Bandura, 1997; Bandura & Schunk, 1981; Kittel et al., 2021; ven Mierlo et al., 2006). Faculty with high DSE, which based on our survey questions was related to their teaching and research ability, were much more likely to feel confident in their teamwork skills and to participate in teams.

Interestingly, IP was not significantly correlated to working less frequently in teams as might be expected, but it was significantly negatively correlated with self-assessed TCA scores, DSE, graduate school preparation, and faculty title (or experience). This finding does align with previous research that people suffering from IP may have reduced career advancement, have lower self-esteem, lower research self-efficacy and feelings of reduced academic preparedness (Chakraverty, 2019; Craddock et al., 2011; Jostl et al., 2015).

One important finding in this study was that although faculty with prior teamwork training had significantly higher TCA scores, DSE and IP were not significantly influenced by prior training (Table 3). Instead, perception of graduate school preparation had a much stronger association with DSE and IP, while prior teamwork training was significantly correlated to more participation on both administrative

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Table 4.

Independent Samples t Test Comparing Discipline Self-Efficacy (DSE) Feelings of Impostorism (IP), Perceptions of Graduate Preparation, Faculty Title, and TCA Scores by Gender

Variable	Gender	N	M	SD	t	p	Cohen's D
Discipline self-efficacy (DSE)	Women	149	3.77	0.70	3.43	<.01	0.37
	Men	184	4.03	0.72			
Feelings of Impostorism (IP)	Women	149	4.18	1.54	-4.75	<.01	-0.52
	Men	184	3.37	1.62			
Graduate Preparation	Women	147	3.56	1.01	3.43	<.01	0.36
	Men	184	3.90	0.90			
Faculty Title	Women	148	3.33	1.54	2.27	0.02	0.27
	Men	183	3.69	1.17			
TCA Scores	Women	147	5.83	0.66	-1.00	0.32	-0.13
	Men	183	5.75	0.82			

and research teams. The assumption is that faculty do not receive significant training in how to work in teams during their graduate education, but do receive more preparation in teaching and research, which would explain the relationship in this study. If graduate school contained more explicit teamwork training, it may have a greater impact on faculty perceptions of teamwork competence (Coers & Williams, 2010).

Perhaps the most significant finding in this study was the importance of gender as a predictor for faculty self-perceived teamwork competency. To better understand this result, especially since gender was not significantly correlated with TCA scores, follow-up Independent T-tests were conducted which showed that although women had statistically similar TCA scores (M = 5.83) on average compared to men (M = 5.75), they had significantly lower DSE, perceptions of graduate preparation, and significantly higher IP (Table 1-4). The effect sizes of these findings were not trivial, with IP as large as 0.52 suggesting a moderate effect (Cohen, 1988). It is noteworthy that men self-reported significantly more favorable scores for each of these variables that were significant predictors, but then evaluated themselves similarly to women on the TCA. What this suggests is that being a man predicts lower self-assessed teamwork competence, despite higher scores in other key predictor variables. The research literature offers some explanation for this phenomenon, as there have been several examples of women self-assessing teamwork skills at a higher rate than men (Al-Alawneh et al., 2011; De Paola & Scoppa, 2018; Rosch et al., 2014; Stedman & Pope, 2019). Past research has shown that women lead in a more participative manner than men, are less likely to self-promote, and more likely

to serve as social facilitators (Eagley & Karau, 1991; van Engen & Willemssen, 2004). In addition, Huszczo and Endres (2017) suggest that women are more self-aware of their relational strengths in leadership positions and will self-evaluate as stronger in these domains than men. As it relates to IP, this study adds to the existing literature that women more often report statistically significantly higher rates than men (Bravata et al., 2019). While this study has done little to explain why the discrepancy exists, it does add to the research base by showing that women in academia still report similar teamwork skills as men despite significantly lower self-assessments of DSE, perceptions of less effective preparation in graduate school, and much greater IP.

This research represents one of the first exploratory cross-sectional studies using the Varela and Mead (2018) teamwork competency assessment (TCA) to further our understanding of faculty self-perceived teamwork competence. Past research has made it clear that collaboration between faculty is a necessity, especially in interdisciplinary fields like agriculture, and models of integrative capacity have clearly demonstrated that social integration in teams is critical to effective team development (Adams et al., 2012; Leahey, 2016; Salazar et al., 2012; Tebes & Thai, 2018). This study has added to this literature by showing that feelings of self-efficacy and IP influence faculty self-perceived teamwork competence and are stronger predictors than teamwork training and experience in teams alone. In addition, participation in research teams was an extremely weak predictor of faculty TCA scores, suggesting that faculty experience on teams alone does not improve their teamwork ability.

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Table 5.

Coefficients of Independent Variables Predicting Overall TCA Scores

Independent	B	SE	t	β	p
Discipline self-efficacy	0.38	0.06	6.10	0.37	<.01
Feelings of Impostorism	-0.09	0.06	-3.47	-0.20	<.01
Research Team Participation	0.01	0.06	0.16	0.01	0.87
Admin Team Participation	0.09	0.05	2.30	0.12	0.02
Graduate Preparation	0.00	0.05	-0.01	0.00	0.99
Prior Teamwork Training					
No	-0.18	0.11	-2.27	-0.25	0.02
Yes					
Faculty Title					
Lecturer	-0.21	0.25	-1.13	-0.28	0.26
Assistant Professor	-0.23	0.19	-1.61	-0.31	0.11
Associate Professor	-0.22	0.18	-1.93	-0.30	0.10
Professor	-0.19	0.17	-1.51	-0.26	0.13
Distinguished Prof	0.03	0.37	0.12	0.04	0.91
Other (admin)					
Primary Appointment					
Extension	0.23	0.20	1.58	0.32	0.12
Research	0.08	0.16	0.64	0.10	0.52
Teaching					
Gender					
Male	-0.25	0.11	-3.22	-0.34	<.01
Female					

Note. Prior Teamwork Training: 0=no, 1=yes (reference)

Faculty title: 1=lecturer, 2=assistant professor, 3=associate professor, 4=professor,

5=distinguished professor, 6=other (reference)

Primary appointment: 1=extension, 2=research, 3=teaching (reference)

Gender: 1=male, 2=female (reference)

One final contribution of this study is the addition to research regarding women in agricultural higher education as it relates to their feelings of self-efficacy, IP, and graduate school preparation. Our results demonstrated that women felt much higher levels of IP than men, far lower discipline self-efficacy, and were much less prepared by graduate school education. Previous research by Cline et al. (2019) suggested that women faculty in agriculture suffered from several negative interpersonal interactions in their graduate education and in their professional workplaces. Our research contributes to these and other studies by demonstrating clear differences between men and women in the perception of academic preparation of agriculture faculty and how these differences impact self-perceived teamwork competence and emergent states (like self-efficacy) necessary for effective teamwork (Marks et al., 2001).

Limitations and Future Research Directions

Several limitations are relevant to the interpretation of these findings. First, this is a cross-sectional survey and therefore causation cannot be determined. Second, the population was skewed towards agricultural teaching faculty, so generalizations cannot be made for research and extension faculty. Third, the concept of faculty experience was measured using faculty title. Future researchers should consider combining years of experience and faculty title to provide a more accurate picture of faculty professional experiences which may be important in understanding perceptions of discipline self-efficacy and teamwork competence. Fourth, data were not collected for institution type (e.g., 2-year vs. 4-year). Fifth, future research should include the full Clance Impostor Scale and more mixed methods to better understand how feelings of IP influence self-perceived teamwork skills among faculty. Future researchers should also consider adding peer assessments to the study of teamwork competence in faculty. The TCA allows for peer assessment and the study

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of faculty perceptions of teamwork skill, especially across gender, could be advanced significantly by both self- and peer-assessment in future studies (Varela & Mead, 2018, Vaughan et al, 2019). Future research should also include experimental conditions that can compare specific teamwork interventions to understand which training is most effective at increasing faculty teamwork competence (Vogel et al., 2012). Finally, additional research is needed to understand why female faculty in agriculture perceive their graduate school experience to be less effective at preparing them for professional life than their male peers.

Summary

The overall purpose of this study was to explore the predictive relationships between discipline self-efficacy, teamwork experiences, professional faculty experience, teamwork training, feelings of impostorism, graduate school preparation, and gender on agricultural faculty self-perceived teamwork competence. Results of the current student support the predictive relationship between self-efficacy, feelings of impostorism, training, and gender on perceived teamwork skill. Additionally, the positive correlation between teamwork training, team participation, and teamwork competency supports previous research that more interpersonal and intrapersonal training programs are needed to improve faculty competence in collaborative science environments.

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