Measuring the Perceived Usefulness of Social Media Professional Learning Networks to Elevate Agricultural Development

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Abstract

Elevating agricultural development requires attention to aspects beyond production such as education and professional development. Individual demands for professional development have influenced the augmentation of recreational social media platforms as vicarious and functioning professional networks as well. The study's purpose was to understand agricultural education teachers' perceived usefulness of professional social media use to better prepare themselves for positively impacting agricultural development. A random sample of secondary agriculture teachers responded to a self-administered survey instrument. New teachers perceived social media to be useful and also reported a greater number of minutes of use per week for professional purposes; this trend declined with increased years of teaching. Behaviors which teachers reported, in combination with their perceived usefulness and reported use, suggested professional social media use is supportive of andragogical assumptions. The elements of teachers' professional learning network activities instrument could serve as a valuable tool in explaining the variance in teachers' professional social media use. Data can be used to inform the development of online professional learning experiences and in preparation of new professionals. Future research should explore the extent to which learning networks prepare agricultural preservice teachers and offer professional learning for practicing teachers to improve online and social media communications for all learners.

Keywords

Secondary agriculture instructors, evaluating digital learning, online engagement, innovation adoption

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Introduction and Problem Statement

Improving educational access to individuals working in any aspect of the agricultural sector is an often-overlooked feature of agricultural development (Chaleta, et al., 2021). Of the United Nations' 17 sustainable development goals, goal 4 highlights the need for quality inclusive education with effective learning environments for all (Li et al., 2021). Improving the volume of individuals with access to quality education is a fundamental component of goal 4 (Chankseliani & McCowan, 2021; Huynh et al., 2019). 5G networks have proliferated professional learning networks' availability, which allows users to access the communal knowledge of instructors or researchers across the globe (Strong et al., 2022; Zhou et al., 2022).

Online resources and enhanced accessibility have motivated teachers to follow others, exchange solutions, and broaden individual professional development experiences through social media outlets (Prestridge, 2019). Hillman et al. (2021) suggested social media are communal locations that serve as a conduit for professionals and nonprofessionals to improve learning respective to areas of interest. Social media has emerged as low-cost broad dissemination platforms for individuals seeking knowledge to improve their professional needs (Ahn et al., 2022; Luo et al., 2020). Markham et al. (2018) indicated social media can provide professional development experiences, identify collaborators and social systems for shared professional goals, and allow participation in discussion boards focused on professional discrepancies.

Azorín et al. (2020) found digital professional learning networks can be a bridge from educational institutions to stakeholders yearning for professional development without resources or time to participate in face-to-face opportunities. Professional learning networks offer instructors digital peer relational support at the instructors' time, location, and convenience (Chiu et al., 2022). Doleck et al. (2021) suggested professional learning networks optimize digital learning experiences that enable teachers to instigate self-empowered communal learning.

Theoretical and Conceptual Framework

Knowles et al. (2015) suggested adult training programs are developed and implemented to meet learners' needs. The teachers' professional learning network (PLN) activities model was created by Krutka et al. (2016) to illustrate attributes of teachers' PLN participation. The five PLN elements are engaging, discovering, experimenting, reflecting, and sharing and include teachers' social media usage as a professional (Krutka et al., 2016).

The first attribute, engaging, highlights methods educators use to participate in their PLN and results from self-motives and self-identified training discrepancies (Krutka et al., 2016). Visser et al. (2014) reported impactful professional development as the primary motive of teachers' professional Twitter usage due to increased professional social networks and perceived

beneficial content. Davis (2015) suggested autonomy is a benefit Twitter provides teachers in evaluating if and how often they read posts, comment, like, and retweet.

Krutka et al. (2016) described discovery as serendipitous experiences with techniques, resources, and ideas due to PLN participation. Teachers experienced teaching methods, delivery strategies, and examples of lesson plans, even though they had not sought the information, due to their participation in web-based platforms (Dabbagh & Kitsantas, 2012; Krutka et al., 2016). Twitter #edchat users indicated the information channels the platform exposed teachers to including additional resources and new ideas from peer users was an asset (Davis, 2015).

Experimentation is testing new information, regardless of purpose or intention, such as teaching strategies or curricula from PLN engagement (Krutka et al., 2016). Ranieri et al. (2012) found members who participated in Facebook groups where members did not have personal ties to other members in a face-to-face manner were more likely to pursue new projects as a result of their interaction within the Facebook group. Inversely, those in thematic groups did not experience as many new ideas as a result of their Facebook membership because new ideas were less likely to surface in a homogeneous group. The element of PLN experimenting (Krutka et al., 2016) encompasses teachers' learning process of implementing their learning in classrooms.

Reflection addresses the teacher's consideration of outputs and changed behavior based on their exposure and implementation to new ideas, curriculum, and instructional strategies (Krutka et al., 2016). Davis (2015) found examples of Twitter chat participants reflecting online and being challenged to examine their thinking by other chat participants. Twitter was used to inform Mexican farmers about loan applications (Strong et al., 2014). Educators reported using Twitter for taking notes and reflections in real time while in attendance at conferences, and those not in attendance reported following conferences through other's tweets (Visser et al., 2014).

Krutka et al. (2016) suggested sharing describes the knowledge contributed by a teacher. Teachers shared strategies, outside sources, websites, and other resources in discussions with other teachers (Davis, 2015). The five elements may be joined to other model attributes to better comprehend the multidimensional complexity of PLNs and their purposeful or unintentional opportunities for teacher advancement (Krutka et al., 2016).

Knowles et al. (2015) postulated andragogical assumptions are underscored by adults' readiness and motivation to pursue individual learning goals. Teacher autonomy to participate in professional learning to address problem-centered training needs is a downstream result of engaging in social media (Davis, 2015). Krutka et al. (2016) reported diverse benefits for teachers resulting from social media exchanges such as access to additional content, new social systems of like-minded professionals, avenues to additional resources, and vicarious opportunities to broaden their global network of educational professionals.

Purpose

The study's purpose was to identify California teachers' professional social media perceived usefulness and teachers' school-supported professional learning, juxtaposed to teachers self-reported professional social media participation. Specifically, research objectives were:

1. Describe self-reported participation of professional social media usage.
2. Assess the variance among perceived usefulness of school supported professional learning and perceived usefulness of professional social media engagement.
3. Examine teacher career phases effects on social media perceived usefulness compared to reported professional social media participation.

Methods

A Qualtrics survey was emailed to a random sample of agriculture teachers in a single administration. This study utilized a web-based 58-item survey instrument (see Appendix A) that measured several constructs in the sample of 464 California teachers (Fraenkel et al., 2019). Relevant literature in the area of qualitative (Davis, 2015), mixed methods (Visser et al., 2014), and quantitative studies (Greenhow & Lewin, 2016; Ranieri et al., 2012; Xing & Gao, 2018) were consulted to develop the instrument used in this study. Participants answered several demographic questions, but the only one reported in this manuscript relates to the number of years teaching. Participants were then categorized based on their self-reported number of completed years of teaching: new (1-3 years), early career (4-10 years), mid-career (11-16 years), late career (17 and over).

The web-based survey explored several constructs through its 58 items. The instrument was developed with consideration of existing literature (Dillman et al., 2014; Lindner et al., 2001). Demographic variables allowed for description of career phase, highest degree, age, location, teacher preparation path, course assignments, gender, and declaration of whether or not they were the only teacher on their site with specific courses in their teaching assignment.

For the purpose of this study, social media was defined with the examples of Snapchat, Google+, Pinterest, Twitter, and Facebook. Survey respondents reported their professional use in minutes per week for social media platforms. Using Davis' (1989) scale, with only minor edits, teachers' perceived usefulness of professional social media use was compared to their perceived usefulness of their school sponsored professional learning. The questionnaire was delivered via Qualtrics. Participants responded to six items on a seven-point Likert scale with anchors of 1 = e*xtremely likely*, 2 = *quite likely*, 3 = *slightly likely*, 4 = *neither likely nor unlikely*, 5 = *slightly unlikely*, 6 = *quite unlikely*, 7 = *extremely unlikely*. A post hoc analysis supported the instrument as reliable (Field, 2013), with a Cronbach's α = .96 for the construct of teachers' perceived usefulness of social media in their professional learning, and a Cronbach's α = .97 for the construct of school sponsored professional learning perceived usefulness.

The elements of the online teacher engagement instrument explores the conceptual model of Trust et al. (2016). The items in the instrument were drafted to explore the teachers' online

behavior based on the definitions of each component of the Trust et al. (2016) model. Teachers responded using a seven-point Likert scale: 1 = *strongly agree*, 2 = *agree*, 3 = *somewhat agree*, 4 = *neither agree nor disagree*, 5 = *somewhat disagree*, 6 = *disagree*, and 7 = *strongly disagree*. All constructs were considered reliable in post hoc analysis, as they were above Field's (2013) threshold of Cronbach's α = .80. Individual construct reliability coefficients were: sharing Cronbach's α = .94, active engagement Cronbach's α = .92, passive engagement Cronbach's α = .88, experimenting Cronbach's α = .98, reflecting Cronbach's α = .85, and discovery Cronbach's α = .94. The exploratory factor analysis of the instrument identified six factor loadings with acceptable eigenvalues (over 7). Of the factors that loaded, five were named to match the Krutka et al. (2016) model; however, the element of engagement was subdivided into active and passive by the researchers in this study based on the ability of researchers to observe these behaviors. Active engagement represents behaviors that could be observable by researchers, for example, making a post asking for a resource. Passive engagement represents behaviors that are not likely observable by researchers, for example, searching a folder for a resource or reading a post but not responding.

Findings

The elements of online teacher engagement scale has six constructs, sharing (*M* = 4.07, *SD* = 1.05), active engagement (*M* = 3.34, *SD* = 1.70), passive engagement (*M* = 3.18, *SD* = 1.54), discovery (*M* = 2.65, *SD* = 1.23), experimenting (*M* = 2.64, *SD* = 1.09), and reflecting (*M* = 2.73, *SD* = 1.15). The attribute of sharing had the least agreement grand mean of the six constructs (*M* = 4.07, SD = 1.50). The lowest perceived usefulness of social media item was "I connect other teachers to resources. For example, tagging them or mentioning them in posts or retweets or sending them direct messages" (*M* = 3.62, *SD* = 1.83). "I share my feelings online" (*M* = 4.76, *SD* = 1.65) had the lowest level of agreement (see Table 1).

Table 1

Descriptive Statistics for Sharing (N = 164)

Items	M	SD
I share my feelings online.	4.76	1.65
I post, tweet, share about my personal experiences relating to teaching.	4.33	1.87
I share my opinion online.	4.33	1.72
I share ideas online.	3.98	1.78
I share resources online.	3.77	1.76
I respond to others posts with text and/or links to discuss my past experiences.	3.70	1.87
I connect other teachers to resources. For example, tagging them or mentioning them in posts or retweets or sending them direct messages.	3.62	1.83

Note. M = 4.07, SD = 1.50. 1 = *strongly agree*, 2 = *agree*, 3 = *somewhat agree*, 4 = *neither agree nor disagree*, 5 = *somewhat disagree*, 6 = *disagree*, and 7 = *strongly disagree.*

Active engagement was measured with two items (see in Table 2). "I ask for resources" was the item earning the highest agreement (*M* = 3.14, *SD* = 1.75), and "I ask questions and/or for advice" earned the lowest level of agreement (*M* = 3.55, *SD* = 1.80).

Table 2

Descriptive Statistics for Active Engagement (N = 164)

Items	*M*	*SD*
I ask questions and/or for advice.	3.55	1.80
I ask for resources.	3.14	1.75

Note. M = 3.34, *SD* = 1.70. 1 = *strongly agree*, 2 = *agree*, 3 = *somewhat agree*, 4 = *neither agree nor disagree*, 5 = *somewhat disagree*, 6 = *disagree*, and 7 = *strongly disagree.*

The passive engagement construct was measured with four items and earned (*M* = 3.18, *SD* = 1.54). "I search for resources I need by looking in group shared folders and drives" yielded the highest level of agreement (*M* = 2.62, *SD* = 1.59). In Table 3, the least agreement was item "I search for resources I need by searching hashtags or key term searches within the social media platform," (*M* = 3.48, *SD* = 1.87).

Table 3

Descriptive Statistics for Passive Engagement (N = 164)

Items	*M*	*SD*
I search for resources I need by searching hashtags or key term searches within the social media platform.	3.48	1.87
I search for people and/or groups I would like to connect with.	3.46	1.92
I interact with things others have posted by using features such as liking, pinning, sharing, retweeting.	3.15	1.82
I search for resources I need by looking in group shared folders and drives.	2.62	1.59

Note. M = 3.18, *SD* = 1.54. 1 = *strongly agree*, 2 = *agree*, 3 = *somewhat agree*, 4 = *neither agree nor disagree*, 5 = *somewhat disagree*, 6 = *disagree*, and 7 = *strongly disagree.*

The construct of discovery earned agreement (*M* = 2.65, *SD* = 1.23). The most agreeable item as depicted in Table 4 was "I discover new teaching resources I had not intentionally set out to find" (*M* = 2.33, *SD* = 1.26). The discovery item earning the least agreement was "I connect to individuals I might not have otherwise connected with" (*M* = 2.98, *SD* = 1.59).

Table 4

Descriptive Statistics for Discovery (N = 164)

Items	M	SD
I connect to individuals I might not have otherwise connected with.	2.98	1.59
I get connected to new teaching strategies I had not intentionally set out to find.	2.66	1.33
I become more aware of opinions and perspectives which are different than my own.	2.65	1.42
I learn about new technologies and digital tools even though I wasn't searching for them.	2.57	1.33
I get exposed to new ideas I didn't specifically go searching for.	2.38	1.23
I discover new teaching resources I had not intentionally set out to find.	2.33	1.26

Note. M = 2.65, SD = 1.23. 1 = *strongly agree*, 2 = *agree*, 3 = *somewhat agree*, 4 = *neither agree nor disagree*, 5 = *somewhat disagree*, 6 = *disagree*, and 7 = *strongly disagree.*

The experimenting construct earned a grand mean score of M = 2.64 and SD = 1.09. "I test ideas other teachers have suggested" (M = 2.51, SD = 1.09) earned the most agreement (see Table 5). The least agreement was produced by item "I make changes to how I teach my curriculum" (M = 2.86, SD = 1.27). All experimenting items earned some level of agreement.

Table 5

Descriptive Statistics for Experimenting (N = 164)

Items	M	SD
I make changes to how I teach my curriculum.	2.86	1.27
I experiment with new approaches to teach my students.	2.69	1.67
I experiment with new teaching strategies in my classroom.	2.63	1.16
I make changes to my teaching practices.	2.63	1.16
I experiment with new curriculum resources.	2.52	1.12
I test ideas other teachers have suggested.	2.51	1.09

Note. M = 2.64, SD = 1.09. 1 = *strongly agree*, 2 = *agree*, 3 = *somewhat agree*, 4 = *neither agree nor disagree*, 5 = *somewhat disagree*, 6 = *disagree*, and 7 = *strongly disagree.*

Reflecting was the least ranking construct (M = 2.73, SD = 1.15). Teachers indicated *somewhat agree* with the item series respective to personal reflection of online engagement. "I am reflecting on how I can become a more effective teacher" (M = 2.51, SD = 1.29) earned the most agreement (see Table 6).

Table 6

Descriptive Statistics for Reflecting (N = 164)

Items	M	SD
I reflect on my experiences relating to ideas I found on social media.	3.10	1.40
I spend time thinking about the teaching resources I am currently using.	2.59	1.24
I am reflecting on how I can become a more effective teacher.	2.51	1.29

Note. M = 2.73, SD = 1.15. 1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = neither agree nor disagree, 5 = somewhat disagree, 6 = disagree, and 7 = strongly disagree.

Perceived usefulness of social media and school sponsored professional learning are identified by item for each construct with descriptive statistics in Table 7. Of all the individual items, the statement "makes it easier to perform my duties as a teacher" had the most agreement for professional social media use (*M* = 2.71, *SD* = 1.39), and the least level of agreement for mandatory school-sponsored professional learning (*M* = 3.94, *SD* = 1.41). Teachers perceived their professional social media use (*M* = 2.85, *SD* = 1.24) to be more useful than their mandatory school sponsored professional learning (*M* = 3.83, *SD* = 1.29).

Table 7

Perceived Usefulness of Professional Social Media Use and Mandatory School Sponsored Professional Learning (N = 164)

Item	Professional social media use[a]		Mandatory school sponsored[b]	
	M	SD	M	SD
Results in significant changes to my teaching	3.14	1.40	3.89	1.38
Results in improved learning outcomes for my students	2.88	1.32	3.75	1.35
Improves my effectiveness as a teacher	2.84	1.29	3.86	1.41
Enhances my effectiveness as a teacher	2.82	1.33	3.75	1.35
Improves my ability to prepare and deliver high quality instruction for my students	2.72	1.32	3.80	1.36
Makes it easier to perform my duties as a teacher.	2.71	1.39	3.94	1.41

Note. Professional social media use Total M = 2.85, SD = 1.24. Mandatory school sponsored PL total M = 3.83, SD = 1.29. Instrument adapted with permission from the Perceived Usefulness scale by Davis (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340. Six-point Likert-type scale, coded as 1 = extremely likely, 2 = quite likely, 3 = slightly likely, 4 = neither likely or unlikely, 5 = slightly unlikely, 6 = quite unlikely, 7 = extremely unlikely. PL = Professional learning. [a] In response to "Using social media professionally..." Reliability Cronbach's α = .96. [b] In response to "mandatory school sponsored professional learning…" Reliability =.97.

Overall, teachers perceived social media for professional purposes (*M* = 2.85, *SD* = 1.24) to be more useful than their school sponsored professional learning (*M* = 3.83, *SD* = 1.29). This

difference, .98, 95% confidence interval [.74, 1.21], was significant $t(163) = 8.15$, $p = < .01$, which represents a large effect size, $r = .54$ (Cohen, 1988; Lakens, 2013).

New teachers have the greatest difference between their perceived usefulness of social media and perceived usefulness of school sponsored professional learning scores. Early career teachers express the least perceived usefulness of school sponsored professional learning. In general, as years of teaching increases, the perceived usefulness of social media in professional learning decreases, with the exception of the mid-career teachers, who had the lowest perceived usefulness. While there was no significant difference for new and early career teachers in their perceived usefulness of social media, when mid and late ($n = 72$) teachers are compared as a group to new and early teachers ($n = 92$), there was a significant difference. The difference of -.60, 95% confidence interval [-.98, -.22] was significant, $t(162) = -3.17$, $p = <.01$ represents a small effect size, $r = .24$ (Cohen, 1988; Lakens, 2013).

Objective three described the effects of the teacher career phase on perceived usefulness of social media compared to teachers' professional social media use in minutes. Table 8 shows teachers perceived usefulness by career phase ($N = 164$) for the perceived usefulness of social media, where a low score indicates the highest level of perceived usefulness, and high score indicates a level of low perceived usefulness. New teachers had the highest perceived usefulness of social media, and mid-career had the lowest (see Table 8).

Table 8

Perceived Usefulness of Social Media and Weekly Minutes of Professional Social Media Use by Teacher Career Phase

Phase		Perceived usefulness of social media		Social media use in minutes per week	
	n	*M*	*SD*	*M*	*SD*
Mid	22	3.36	1.31	125.09	119.86
Late	50	3.11	1.29	107.29	119.85
Early	50	2.79	1.15	179.08	217.42
New	42	2.35	1.05	196.05	155.84

Note. Perceived usefulness of social media $M = 2.85$, $SD = 1.23$. Total Social Media Use $M = 154.29$ minutes per week, $SD = 167.71$. Career phases based on years completed, coded as New = 1-3 years, Early Career = 4-10, Mid-Career = 11-16, Late Career = 17 and over. 1 = *extremely likely*, 2 = *quite likely*, 3 = *slightly likely*, 4 = *neither likely or unlikely*, 5 = *slightly unlikely*, 6 = *quite unlikely*, 7 = *extremely unlikely*. [a] reported in minutes of use on a combination of all social media platforms per week.

Table 9 illustrates an analysis of variance depicting there was a significant difference between teacher career phase on perceived usefulness of social media, $F(3, 160) = 4.61$, $p = <.01$, $\omega^2 = 0.22$, representing a low effect size (Cohen, 1988; Lakens, 2013).

Table 9

One-way Analysis of Variance for Perceived Usefulness of Social Media by Teacher Career Phase

Career Phase	*n*	*M*	*SD*	*F*	*p*
Mid-Career	22	3.37	1.32	4.61	.00*
Late Career	50	3.11	1.30		
Early	50	2.79	1.15		
New	42	2.35	1.05		

Note. Career phases based on years completed, coded as New = 1-3 years, Early Career = 4-10, Mid-Career = 11-16, Late Career = 17 and over. 1 = *extremely likely*, 2 = *quite likely*, 3 = *slightly likely*, 4 = *neither likely or unlikely*, 5 = *slightly unlikely*, 6 = *quite unlikely*, 7 = *extremely unlikely*. * *p* < .05

In a comparison of early career teachers to all other groups, there was a significant difference $t(160) = -3.36$, $p = <.01$, with a small effect size ($r = .26$). No significant differences in perceived usefulness of social media was identified when comparing late career to mid-career teachers, or late to early career teachers. There was however a significant difference $t(160) = -3.03$, $p = <.01$ with a small effect ($r = .23$) when late and new career teachers were compared (Cohen, 1988; Lakens, 2013).

Conclusions, Discussion, and Recommendations

The elements of teachers' professional learning network activities instrument revealed factor loadings in constructs that were largely supportive of the conceptual model developed by Krutka et al. (2016). Only a slight suggested modification of differentiating between active and passive engagement is suggested by the researchers of this study. Each construct represents a type of behaviors teachers report using in their online professional learning, which are supportive of a body of literature suggesting that professionals are engaging online for their professional learning purposes (Chiu et al., 2022; Davis, 2015; Doleck et al., 2021; Hillman et al., 2021; Luo et al., 2020; Markham et al., 2018; Prestridge, 2019). The type of self-directed, time sensitive, and problem-based learning teachers reported is supported by Knowles' et al. (2015) assumptions.

There was a significant linear trend of teacher career phase on perceived usefulness of social media indicating that as the career phase increased, the perceived usefulness of social media decreased. While study participants believed their professional social media use was more beneficial than school supported learning experiences, there was still a positive relationship. For example, teachers that perceived their social media wasn't useful also didn't think their school sponsored professional learning was useful. Teachers reporting high perceived usefulness for professional learning with social media also reported increased social media use for professional purposes in minutes per week, which is supportive of literature surrounding teachers' social media use (Prestridge, 2019).

The attributes of teachers' professional learning network activities instrument and the resulting research could serve as a valuable tool in explaining the variance in teachers' professional social media use. This data can inform the creation of online professional development and learning experiences to prepare new professionals (Seitz et al., 2022). The second implication of this study relates to the teachers' career phase. New and early career teachers perceived social media to be beneficial for their professional growth, and also reported the highest use of social media in minutes per week. Therefore, career preparation programs for these young professionals should include development of robust individualized professional online networks that include social media applications (Ray, 2019).

According to Chaleta et al. (2021), ensuring access to professionals is not always a priority. Therefore, teacher educators must anticipate their credential candidates will not have adequate access to professional learning once they enter the field and therefore must consider how they can support their preservice teachers in developing robust online professional networks as preservice teachers, then continue to support them through especially their new and early career phases. As suggested by Azorín (2020), institutions should take an active role in developing online learning experiences because new and early career teachers reported the most usage and perceived usefulness of online learning experiences in this study.

Researchers should explore mid-career teachers' deviation from the trend of decreasing self-reported social media use and perceived usefulness. Researchers should utilize the use of teachers' professional learning network activities attributes survey instrument in other populations to explore the reliability and applicability in more contexts. Elevating agricultural development requires many aspects beyond production (Chaleta et al., 2021). Additional inquiries are needed to understand Extension professionals' use and perceived usefulness of social media professional learning networks (Mikwamba et al., 2021; Strong et al., 2022). Research is necessary to discern the extent learning networks prepare agricultural preservice teachers and offer professional learning for practicing teachers to improve online and social media communications for all digital and face to face learners.

Acknowledgements

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