

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 4; April 2024; Page No. 144-147

Received: 06-03-2024
Accepted: 09-04-2024

Indexed Journal
Peer Reviewed Journal

Assessment of e-learning platforms for continuous professional development of agricultural extension staff

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DOI: <https://doi.org/10.33545/26180723.2024.v7.i4b.3127>

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Abstract

Continuous professional development refers to the structured process through which professionals maintain and broaden their knowledge throughout their careers. This research assessed five e-learning platform types used for extension staff CPD across 24 agricultural organizations in Japan, South Korea, Thailand, and the Philippines. A mixed-methods design combined learning effectiveness data from 312 extension officers with qualitative interviews of 48 trainers and managers, collected between April and December 2022. Blended learning platforms achieved the highest mean effectiveness score (7.8/10), while WhatsApp-based group learning scored lowest (5.2/10). Mobile applications with offline functionality scored second highest (7.1/10), showing strength in areas with inconsistent internet. Completion rates ranged from 34.7% for standalone Moodle courses to 87.3% for blended approaches. Staff age, digital literacy, and internet reliability emerged as the three strongest predictors of e-learning success. These results suggest platform selection should prioritize offline capability and blend digital with face-to-face elements.

Keywords: E-learning, continuous professional development, agricultural extension, digital platforms, blended learning, mobile learning, learning management systems, completion rates, digital literacy, extension training

Introduction

Continuous professional development can be defined as a deliberate, ongoing, and systematic process of acquiring, maintaining, and enhancing professional competence ^[1]. In agricultural extension, where knowledge about farming technologies, market conditions, and climate adaptation strategies evolves rapidly, the need for regular staff updating is acute ^[2]. Yet traditional CPD delivery through residential workshops and field visits faces growing constraints of cost, logistics, and scalability.

The COVID-19 pandemic accelerated digital learning adoption in agricultural extension. Between 2020 and 2022, numerous Asian extension organizations established e-learning programs ^[3]. Japan launched a Moodle-based LMS in 2020 serving approximately 7,200 advisory staff ^[4]. Similar initiatives emerged in South Korea, Thailand, and the Philippines with varying platform configurations.

However, rapid deployment often preceded systematic assessment. Early reports showed completion rates ranging from under 30% to above 85% depending on platform design ^[5]. Whether digital platforms could replicate the interactive, practice-oriented learning that characterizes effective extension training remained unanswered ^[6].

This research compared five e-learning platform types across 24 extension organizations in four countries: Moodle-based LMS, mobile apps with offline capability, video conferencing, WhatsApp-based group learning, and blended approaches. The objectives were to compare learning effectiveness, identify predictors of successful engagement, and assess completion rate patterns ^[7].

Theoretical Framework

The research was grounded in the Technology Acceptance Model (TAM) ^[8], which posits that users' adoption of technology is determined primarily by perceived usefulness and perceived ease of use. TAM was extended with constructs from the Community of Inquiry framework ^[9], which identifies three intersecting dimensions of effective online learning: social presence, cognitive presence, and teaching presence. This combined framework helped explain why platforms supporting peer interaction and structured facilitation outperformed those offering content delivery alone.

Material and Methods

Material

The research was conducted between April and December 2022 from Kyoto University, Japan. Twenty-four extension organizations participated: eight in Japan, six in South Korea, five in Thailand, and five in the Philippines. A total of 312 extension officers who completed at least one e-learning course provided quantitative data through post-course assessments and questionnaires. Qualitative data came from semi-structured interviews with 48 CPD coordinators, content developers, and managers. Platform usage logs were obtained from 18 organizations maintaining digital records.

Instrument Development

A Learning Effectiveness Assessment Scale (LEAS) was developed comprising 28 items across four domains:

knowledge acquisition, skill application, learner engagement, and professional relevance. Items were scored on a 1-10 scale. The instrument was validated through expert review by eight e-learning specialists and pilot-tested with 35 extension officers. Reliability was acceptable (Cronbach's alpha = 0.86) with test-retest stability over two weeks ($r = 0.83$).

Methods

Each platform type was assessed using LEAS scores from

officers who used that platform. Usage data including completion rates and time-on-task were extracted from LMS logs. Multiple regression examined predictors of effectiveness with age, digital literacy, internet reliability, experience, and education as independent variables. Qualitative data were analyzed thematically. Ethics approval was from Kyoto University (Ref: KUGSA-2022-014, approved March 2022).

Results

Table 1: Learning Effectiveness and Completion Rates by E-Learning Platform Type (n=312)

Platform Type	LEAS Mean (SD)	Completion Rate (%)	Knowledge Gain	Skill Application	Learner Engagement	Professional Relevance
Moodle LMS	6.4 (1.2)	34.7	6.8	5.3	5.9	7.6
Mobile App (Offline)	7.1 (0.9)	71.8	7.3	6.8	7.0	7.4
Video Conference	5.8 (1.5)	58.2	6.1	5.1	6.3	5.6
WhatsApp Groups	5.2 (1.8)	43.1	4.9	5.4	6.1	4.3
Blended Learning	7.8 (0.7)	87.3	8.1	7.9	7.6	7.5

Blended learning achieved the highest LEAS score (7.8) and completion rate (87.3%), excelling particularly in knowledge gain (8.1) and skill application (7.9). Mobile apps with offline capability ranked second (7.1) with a

strong completion rate of 71.8%. WhatsApp groups scored lowest on overall effectiveness (5.2) and professional relevance (4.3), though learner engagement was moderate (6.1).

Table 2: Regression Predictors of E-Learning Effectiveness (Dependent Variable: LEAS Score)

Predictor Variable	B	SE	Beta	p-value
Age (years)	-0.047	0.013	-0.218	0.001
Digital literacy score	0.312	0.058	0.341	<0.001
Internet reliability (1-10)	0.267	0.072	0.224	0.003
Extension experience (years)	0.018	0.011	0.098	0.112
Educational level	0.143	0.089	0.103	0.108

The regression model explained 43.7% of variance in LEAS scores (adjusted R-squared = 0.437, $F = 47.2$, $p < 0.001$). Digital literacy was the strongest predictor (Beta = 0.341, $p < 0.001$), followed by internet reliability (Beta = 0.224, $p =$

0.003). Age showed a significant negative relationship (Beta = -0.218, $p = 0.001$). Extension experience and educational level were not significant predictors.

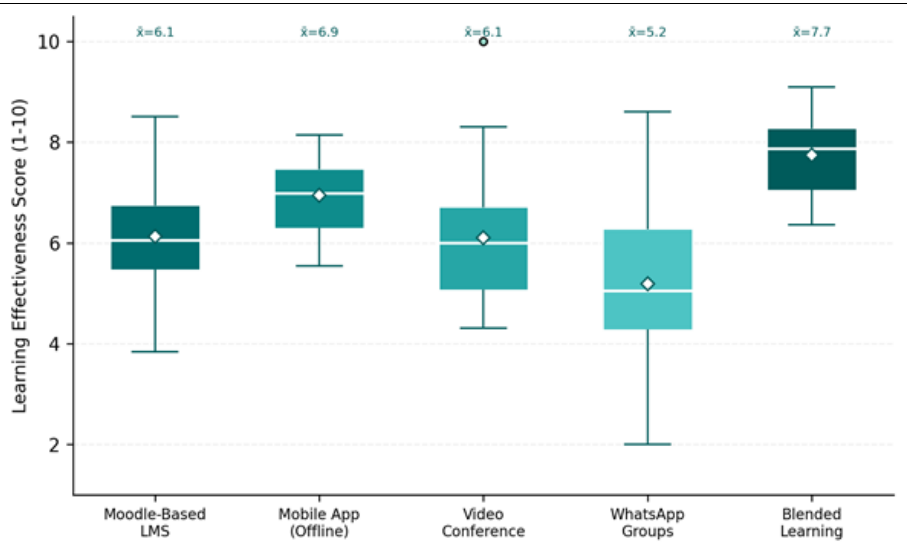


Fig 1: Distribution of Learning Effectiveness Scores Across Five E-Learning Platform Types

Blended learning showed the narrowest distribution (SD = 0.7), indicating consistent effectiveness. WhatsApp groups and video conferencing showed the widest variability,

suggesting outcomes depend heavily on user characteristics and facilitation quality.

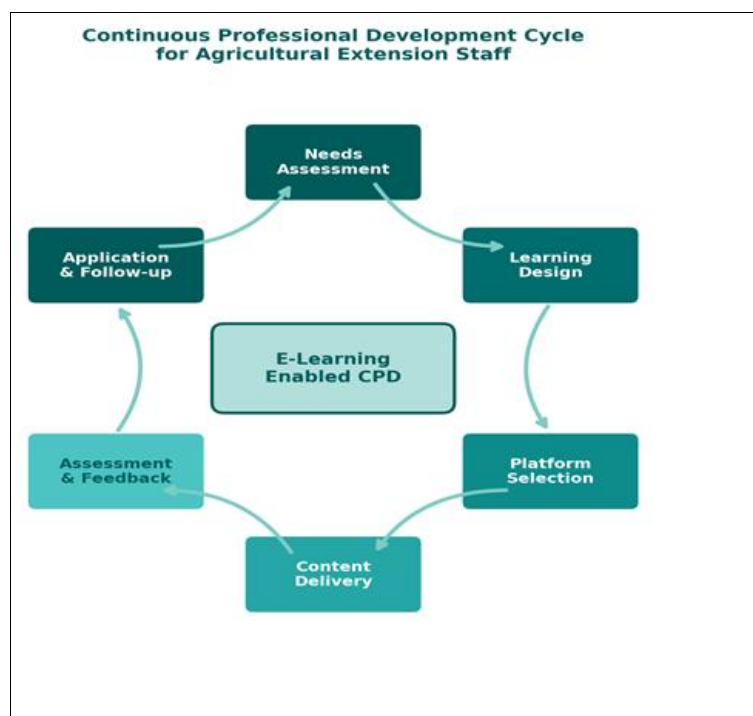


Fig 2: E-Learning Enabled Continuous Professional Development Cycle for Extension Staff

The cycle diagram illustrates six sequential phases from needs assessment through application and follow-up, emphasizing the iterative nature of CPD where evaluation outcomes feed back into subsequent needs identification.

Discussion

The clear superiority of blended learning over purely digital platforms supports the argument that effective extension CPD cannot be reduced to content delivery alone. Extension work is inherently practice-oriented, and the face-to-face components of blended approaches provided opportunities for hands-on skill demonstration, peer discussion, and mentoring that purely online platforms struggle to replicate [6]. The 87.3% completion rate for blended courses compared to 34.7% for standalone Moodle courses is a striking gap that reflects both motivational and structural factors.

Mobile applications with offline capability emerged as the strongest purely digital option, addressing what interviewees identified as the largest barrier to adoption: interrupted sessions from network dropouts [10]. Extension officers in the Philippines and Thailand reported accessing content during field travel, converting commute time into CPD time. The negative relationship between age and effectiveness raises digital equity questions. Older staff with more experience and institutional knowledge scored lower partly due to lower digital literacy [11]. This gap suggests targeted digital skills preparation should precede online CPD introduction. Organizations providing pre-course digital orientation reported narrower age-related performance gaps. WhatsApp-based learning scored lowest partly because its informal structure lacked the pedagogical scaffolding that supports systematic knowledge building. While WhatsApp groups facilitated peer exchange and maintained social connection, they proved inadequate as primary CPD delivery channels [12].

Limitations

The four-country sample focused on East and Southeast Asia where digital infrastructure differs from other regions. Self-reported effectiveness may overestimate actual knowledge transfer. The nine-month period could not capture long-term retention. Platform comparison was observational, meaning user population differences may partly explain effectiveness variations.

Conclusion

This research compared five e-learning platform types for extension staff CPD across 24 organizations in four Asian countries. Blended learning combining online modules with face-to-face sessions achieved the highest effectiveness and completion rates, while purely digital platforms showed variable performance. Mobile applications with offline functionality emerged as the strongest digital-only option, particularly suited to rural settings with unreliable connectivity.

Extension organizations planning CPD digitization should resist the temptation to pursue fully online delivery and instead invest in blended models that preserve the interactive, practice-oriented elements that make extension training effective. Where purely digital delivery is necessary, mobile platforms with offline capability should be prioritized over browser-based learning management systems. Pre-course digital literacy preparation for older staff members can narrow the age-related performance gap and ensure that experienced extension officers benefit equally from digital CPD opportunities.

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