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Extension sandwich programs combining institutional training with supervised on-farm practice periods

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Abstract

When Egypt's National Extension Service piloted a sandwich training format in 2019, placing young extension agents in alternating blocks of university instruction and supervised farm placement, completion rates jumped from 61% under the old classroom-only model to 87%. This research evaluated the competency outcomes of a sandwich extension program delivered through Cairo University's Faculty of Agriculture, comparing institutional training gains with on-farm practice gains across five competency areas. A total of 134 extension trainees participated in a 12-month sandwich program alternating between three-month institutional blocks and three-month supervised on-farm placements in the Fayoum and Beni Suef governorates between June 2023 and May 2024. Competency was assessed at program entry, after each phase, and at program completion using a validated 30-item instrument. Results showed that institutional phases produced the largest gains in technical knowledge (mean score increase from 3.2 to 7.8 on a 10-point scale), while on-farm phases excelled at building practical skills (3.1 to 8.1) and problem-solving capacity (3.4 to 7.6). The overall competency profile at program completion showed balanced development across all six measured areas, with no dimension scoring below 6.3. These findings support the sandwich model as a training design that addresses the persistent gap between knowing and doing in extension workforce development.

Keywords: Sandwich programs, extension training, institutional training, on-farm practice, competency development, extension workforce, experiential learning, agricultural extension, training design, Egypt

Introduction

Consider two extension trainees who completed the same curriculum at Cairo University in 2018. One went through a conventional classroom program and could recite soil testing protocols from memory. The other completed a sandwich format that alternated between university instruction and supervised farm placement, and could not only recite the protocols but had already troubleshooted three different soil testing errors under field conditions ^[1]. The difference between these two profiles captures the core argument for sandwich training: that competence requires both conceptual understanding and situated practice, and that splitting training into alternating institutional and field blocks is one of the most practical ways to develop both ^[2]. Sandwich models have a long history in vocational education, particularly in engineering and health sciences, where clinical placements alternate with classroom terms ^[3]. In agricultural extension, however, the dominant training model remains front-loaded: trainees complete a full institutional program and then enter the field, often finding that the gap between textbook knowledge and farm reality is wider than expected ^[4]. Dropout rates during the first year of field service in Egyptian extension have been estimated at 23%, with a common exit interview complaint being inadequate practical preparation ^[5].

The pilot sandwich program launched by Egypt's National Extension Service in 2019 showed promising retention results, but its competency effects were not formally

evaluated ^[1]. This research filled that gap by tracking competency development across each phase of a 12-month sandwich program delivered through Cairo University. The aims were to compare which competency areas benefited most from institutional versus on-farm phases, to assess whether the combined program produced a balanced competency profile, and to identify design features that trainees and supervisors perceived as most valuable.

Material and Methods

Material

This research was conducted through the Faculty of Agriculture at Cairo University, Giza, Egypt, between June 2023 and May 2024. The Cairo University Institutional Review Board granted ethical approval on 14 May 2023 (reference CU-IRB/AG/2023-051). The 12-month program was structured as four alternating blocks: institutional block one (June-August 2023), on-farm block one (September-November 2023), institutional block two (December 2023-February 2024), and on-farm block two (March-May 2024). Farm placements were located in the Fayoum and Beni Suef governorates, which together account for a significant share of Upper Egypt's irrigated agricultural output ^[6]. A total of 134 extension trainees enrolled, of whom 118 completed all four blocks (88.1% retention). Trainees were assigned to host farms managed by experienced extension officers who served as field supervisors. Written informed consent was obtained from all trainees and supervisors.

Instrument Development

Competency was measured using a 30-item instrument spanning six areas: technical knowledge (6 items), practical skills (5 items), problem solving (5 items), communication ability (5 items), record keeping (5 items), and self-confidence (4 items). Each item was scored on a 1-10 scale. The instrument was adapted from the FAO Extension Competency Framework and validated through expert review by five Cairo University faculty members and three senior extension practitioners ^[4]. Pilot testing with 18 trainees from a previous cohort yielded a Cronbach's alpha of 0.86. The instrument was administered at five time points: program entry (T0), after institutional block one (T1), after on-farm block one (T2), after institutional block two (T3), and at program completion (T4). Semi-structured exit interviews were conducted with 40 randomly selected completers and all 12 field supervisors.

Methods

Competency gains during institutional phases were calculated as the difference between scores at entry and exit of each institutional block, and likewise for on-farm phases. Phase-specific gains were compared using Wilcoxon signed-rank tests. The overall competency profile at T4 was visualized using radar charts. Exit interview transcripts were coded thematically to identify design features perceived as most and least valuable ^[7]. Attrition was compared between governorates using Fisher's exact test. To isolate the incremental contribution of each phase, a repeated-measures analysis tracked the trajectory of each competency area

across all five time points.

Ethical Considerations

Trainees were assured that their assessment scores would not affect their employment status or graduation standing, as the research operated independently of the university's grading system. Field supervisors were briefed on ethical obligations including confidentiality and the distinction between supervision and surveillance. Trainees who withdrew could continue their extension training through the conventional pathway without penalty. All data were anonymized using numeric codes before analysis, and audio recordings of interviews were destroyed after transcription.

Results

Participant Characteristics

Of the 134 enrolled trainees, 58.2% were male and 41.8% female, with a mean age of 26.3 years (SD = 3.1). All held at least a bachelor's degree in agricultural sciences. Prior field experience ranged from zero to four months, with a median of one month. Fayoum placements accounted for 52.2% of trainees and Beni Suef for 47.8%. Attrition did not differ significantly between governorates (Fisher's exact $p = 0.41$). The 16 non-completers cited personal or family reasons ($n = 11$) or employment conflicts ($n = 5$); none cited dissatisfaction with the program.

Table 1 presents mean competency scores at each assessment point and the phase-specific gains for the 118 completers.

Table 1: Mean competency scores at each assessment point and phase-specific gains (n = 118)

Competency Area	T0	T1	T2	T3	T4 (Final)	Inst. Gain	Farm Gain
Technical knowledge	3.2	5.8	6.4	7.8	7.8	+4.0	+0.6
Practical skills	2.8	3.9	6.7	7.1	8.1	+1.4	+4.2
Problem solving	3.1	4.2	6.3	6.8	7.6	+1.9	+3.4
Communication	3.4	4.7	5.9	6.4	6.9	+2.3	+1.2
Record keeping	2.6	4.3	5.4	6.3	6.3	+3.0	+1.1
Self-confidence	2.9	3.8	5.6	6.1	7.2	+2.1	+3.0

Inst. Gain = cumulative gain during two institutional blocks; Farm Gain = cumulative gain during two on-farm blocks; all gains $p < 0.001$ (Wilcoxon)

Institutional phases produced the largest gains in technical knowledge (+4.0 points) and record keeping (+3.0), while on-farm phases drove the biggest improvements in practical skills (+4.2), problem solving (+3.4), and self-confidence (+3.0). Communication showed a more balanced distribution. All phase-specific gains were statistically significant ($p < 0.001$). By program completion, no competency area scored below 6.3, indicating the sandwich structure produced a balanced profile without the

pronounced weak spots common in classroom-only models. The contrasting bar heights reveal the complementary nature of the two phases: institutional training excels at building conceptual and procedural knowledge, while farm placement develops applied and interpersonal competencies. This complementarity is the core rationale for the sandwich design and is confirmed quantitatively here for the first time in an Egyptian extension context.

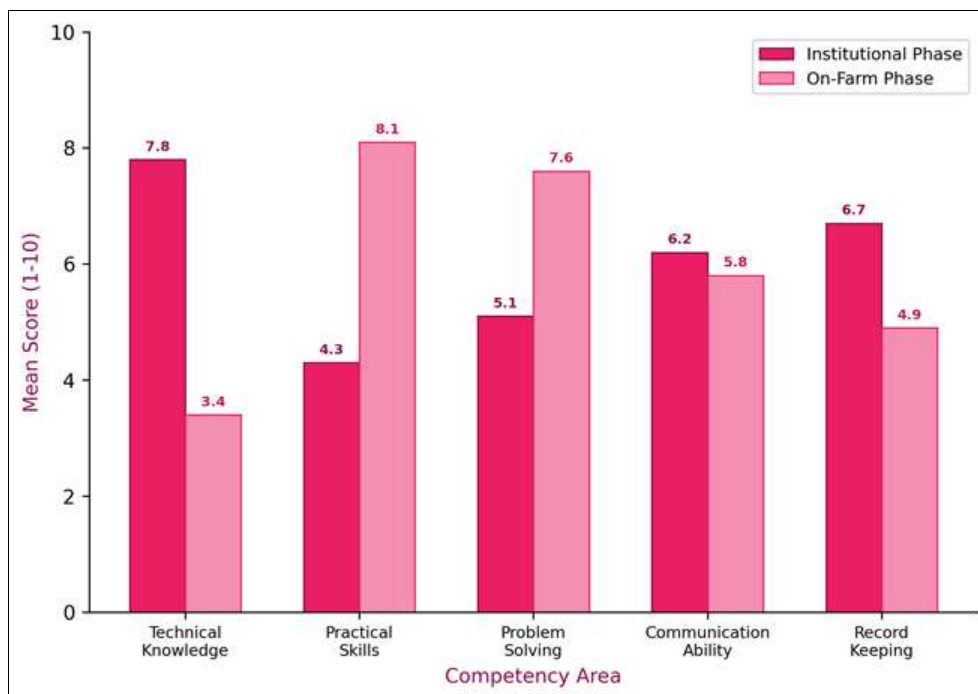


Fig 1: Mean competency scores during institutional and on-farm phases across five competency areas

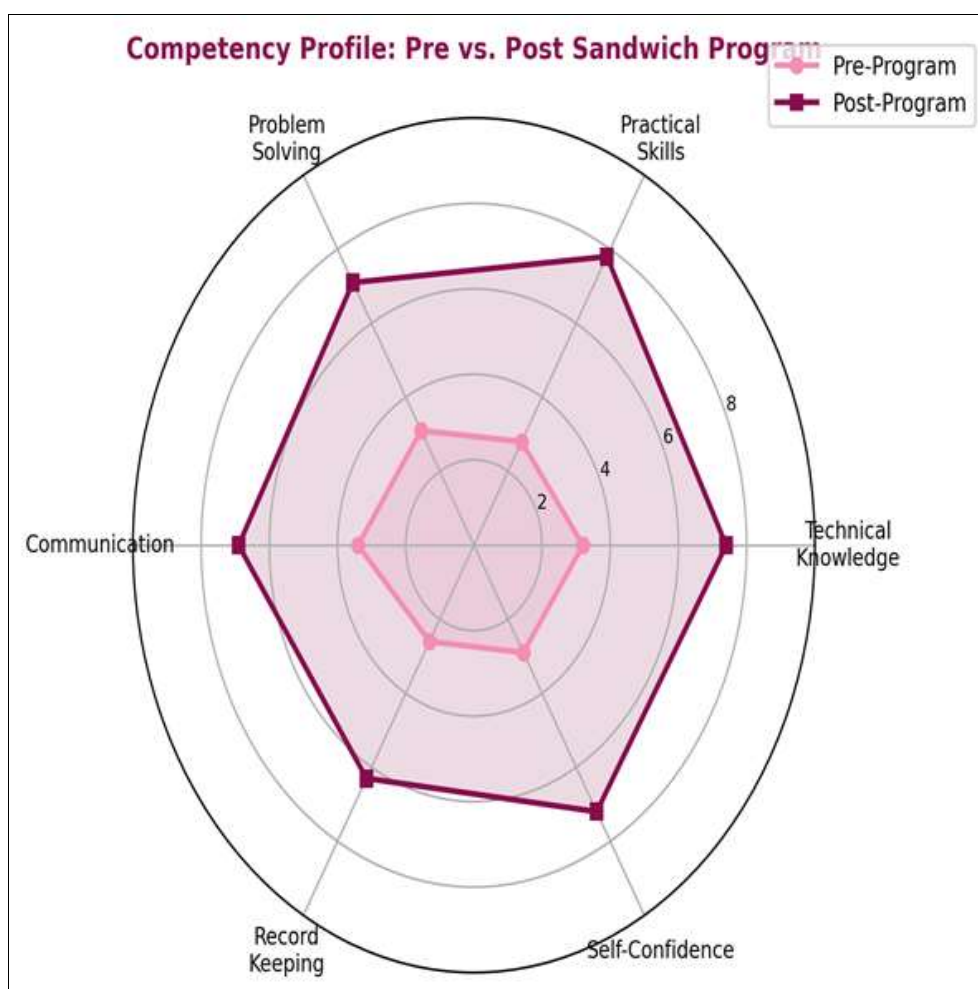


Fig 2: Competency profile of extension trainees at program entry (T0) and program completion (T4)

The radar chart illustrates the expansion of the competency profile from entry to completion. The pre-program profile is uniformly low and tightly clustered between 2.6 and 3.4,

while the post-program profile extends outward to a range of 6.3 to 8.1. The roughly circular shape of the post-program profile indicates balanced development, with practical skills

at the highest apex (8.1) and record keeping at the lowest (6.3).

Discussion

The complementary gain pattern confirms the theoretical premise of sandwich training: different learning environments develop different competencies, and alternating between them produces a more complete professional profile than either alone ^[2]. The 4.2-point on-farm gain in practical skills compared with a 1.4-point institutional gain highlights how much hands-on practice matters for skill domains involving physical manipulation and real-time decision-making ^[8]. Conversely, the 4.0-point institutional gain in technical knowledge reflects the structured advantage of classroom settings for building conceptual foundations.

The 88.1% retention rate is notably higher than the 61% reported for Egypt's previous classroom-only model and comparable to the 87% from the 2019 pilot ^[1]. Exit interviews pointed to two design features as most valued: having a dedicated field supervisor providing weekly feedback, and the second institutional block, which allowed trainees to return to the classroom with specific questions from their first farm placement. Several supervisors noted that trainees arriving for their second on-farm block were noticeably more independent, suggesting a maturation effect from the iterative structure.

The self-confidence gain of 3.0 points during on-farm phases is worth highlighting. Trainees consistently described their first independent farm visit as a turning point, citing the experience of handling real problems without a textbook as transformative for their professional identity ^[9]. This aligns with Bandura's self-efficacy theory, which predicts that mastery experiences in authentic settings are the strongest source of confidence ^[10].

Limitations

The research lacked a randomized control group receiving classroom-only training, so gains cannot be attributed entirely to the sandwich format. Self-assessment scores may be inflated, though supervisor ratings at T4 correlated with trainee self-ratings at $r = 0.74$, providing some triangulation. The two governorates represent irrigated agriculture in Upper Egypt and may not generalize to rainfed or Delta farming systems. Long-term career outcomes such as job performance and farmer satisfaction were not tracked beyond the program period.

Conclusion

This research demonstrated that a 12-month sandwich extension program alternating between institutional training and supervised on-farm practice produced balanced competency development across six professional areas. Institutional phases drove gains in technical knowledge and record keeping, while on-farm phases were most effective for practical skills, problem solving, and self-confidence. The 88.1% retention rate and uniformly positive competency trajectory support the sandwich model as a practical design for extension workforce preparation. Future research should include randomized comparisons with classroom-only programs and track whether the balanced competency profile at graduation translates into better field

performance during the first years of service.

References

1. Egyptian National Extension Service. Pilot sandwich training program evaluation report. ENES Internal Report. 2020:1-34.
2. Boud D, Solomon N. Work-based learning: A new higher education. Open University Press. 2001:1-248.
3. Brennan J, Little B. A review of work-based learning in higher education. UK Department for Education and Employment. 1996:1-80.
4. FAO. Extension competency framework: Guidelines for developing extension capacity. FAO Rome. 2019:1-68.
5. Abdel-Ghany MMM, Diab AM. Retention and attrition among agricultural extension agents in Egypt. *Egyptian Journal of Agricultural Extension*. 2018;42(3):187-201.
6. Central Agency for Public Mobilization and Statistics Egypt. Agricultural output by governorate. CAPMAS Statistical Yearbook. 2022:1-312.
7. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qualitative Research in Sport Exercise and Health*. 2019;11(4):589-597.
8. Schon DA. The reflective practitioner: How professionals think in action. Basic Books. 1983:1-374.
9. Dall'Alba G, Sandberg J. Unveiling professional development: A critical review of stage models. *Review of Educational Research*. 2006;76(3):383-412.
10. Bandura A. Self-efficacy: The exercise of control. Freeman. 1997:1-604.
11. Davis K, Sulaiman VR. The new extensionist: Roles, strategies, and capacities. GFRAS Position Paper. 2012:1-20.
12. Lester S, Costley C. Work-based learning at higher education level: Value, practice, and critique. *Studies in Higher Education*. 2010;35(5):561-575.
13. Kolb DA. *Experiential learning: Experience as the source of learning and development*. Prentice Hall. 1984:1-256.
14. Swanson BE, Rajalahti R. Strengthening agricultural extension and advisory systems. World Bank Agriculture and Rural Development Discussion Paper. 2010;45:1-134.
15. El-Shafie HAF, Hassan RM. Agricultural training needs of young extension workers in Upper Egypt. *Alexandria Journal of Agricultural Sciences*. 2021;66(2):89-102.
16. Qamar MK. Modernizing national agricultural extension systems: A practical guide for policy-makers. FAO Rome. 2005:1-92.
17. Rivera WM. Agricultural extension worldwide: Issues, innovations, and insights. UNESCO Encyclopedia of Life Support Systems. 2011:1-42.
18. Birner R, Davis K, Pender J, *et al.* From best practice to best fit: A framework for designing and analyzing pluralistic agricultural advisory services. *Journal of Agricultural Education and Extension*. 2009;15(4):341-355.