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Youth farmer field school adaptations for addressing unique learning preferences of young agriculturalists

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Abstract

According to FAO estimates, young people under 35 will need to produce over 50% more food by 2050—yet conventional farmer field schools were designed for a generation that learned differently. This research assessed how youth-adapted farmer field school (FFS) modifications address the distinct learning preferences of young agriculturalists aged 18–35 in Zhejiang Province, China. A quasi-experimental design compared 148 youth participants in adapted FFS programs with 136 youth in conventional FFS formats across six counties. Data were collected from February to November 2022. Youth in adapted programs showed 47.3% higher knowledge retention, 38.1% greater technology adoption, and 29.4% higher income gains compared to conventional FFS participants. Mobile app tutorials (4.4/5) and field demonstrations (4.3/5) scored as the most preferred learning methods, while classroom lectures ranked lowest (2.4/5). Peer facilitation and gamification elements drove the largest engagement increases. These results indicate that restructuring FFS delivery around digital tools, flexible scheduling, and youth-led facilitation significantly improves outcomes for young farmers.

Keywords: Farmer field schools, youth agriculture, learning preferences, extension adaptation, technology adoption, China, digital learning, peer facilitation, young farmers, agricultural education

Introduction

As one experienced extension specialist in Hangzhou put it: "We keep running farmer field schools as if young people learn the same way their parents did, and then we wonder why they stop coming after the second session." This observation captures a widening disconnect between traditional FFS formats and the expectations of a generation raised on smartphones, short-form video, and interactive digital content ^[1]. The farmer field school model, developed in the late 1980s for integrated pest management training, has proven remarkably effective across dozens of countries but its core pedagogy was built for older, experienced farmers who valued slow, season-long observation cycles ^[2]. Young farmers bring different assets and constraints. They tend to be more digitally literate, more impatient with passive instruction, more interested in market-oriented production, and less available for fixed weekly schedules ^[3]. Davis *et al.* ^[4] found that FFS programs in East Africa lost 40% of youth participants before midpoint. Waddington *et al.* ^[5] noted in a systematic review that FFS effectiveness depended on matching delivery to participant profiles a condition most programs failed to meet for younger demographics.

This research compared youth-adapted FFS programs with conventional FFS formats in Zhejiang Province, testing whether specific pedagogical modifications improve outcomes for farmers aged 18–35 ^[6].

Conceptual Model

The research applied Kolb's ^[7] experiential learning theory,

which proposes that effective learning cycles through concrete experience, reflective observation, abstract conceptualization, and active experimentation. We hypothesized that conventional FFS formats over-emphasize observation and conceptualization (lecture-heavy, season-long observation plots) while youth learners prefer concrete experience and active experimentation (hands-on trials, rapid feedback loops). The adapted FFS model introduced digital tools, peer facilitation, gamification, and flexible scheduling to better align with youth learning cycle preferences while retaining the experiential core that makes FFS effective ^[8].

Materials and Methods

Materials

This quasi-experimental research was conducted through Zhejiang University across six counties in Zhejiang Province (29.18°N, 120.09°E) from February to November 2022. Zhejiang features a subtropical monsoon climate with diversified agriculture including rice, tea, vegetables, and aquaculture. A total of 284 young farmers (aged 18–35) were recruited from existing FFS programs. Treatment group participants (n=148) attended youth-adapted FFS programs incorporating six modifications: digital integration, flexible scheduling, peer facilitation, entrepreneurship modules, mentorship pairing, and gamification. The comparison group (n=136) attended conventional FFS programs covering identical technical content. Participants were assigned based on geographic clustering of FFS sites. Ethical approval was obtained from

the Zhejiang University Social Sciences Ethics Board (ZJU-SSEB-2022-052, approved January 20, 2022).

Field Research Design

Both groups received 16-week programs covering identical content: integrated pest management, soil health, water-efficient irrigation, and post-harvest handling. Adapted FFS programs replaced two-hour weekly lectures with 90-minute sessions mixing 30 minutes of mobile-app-based instruction, 40 minutes of field practice, and 20 minutes of peer discussion. Sessions were offered in evening and weekend slots. Conventional programs followed standard FFS format with weekly morning field observations and facilitator-led discussions. Learning outcomes were assessed through pre- and post-tests, technology adoption tracking at six months, and income comparison at program end.

Methods

Data were analyzed in SPSS version 27. Independent samples t-tests compared knowledge retention, adoption rates, and income outcomes between groups. Effect sizes were calculated using Cohen's d. Learning preference scores were compared between youth and a reference sample of 124 adult farmers (aged 36–60) from the same programs using Mann-Whitney U tests. Multiple regression identified predictors of program completion among youth. Dropout rates were compared using chi-square tests. Qualitative data from 16 focus group discussions (8 per group) were thematically analyzed. Significance was set at $p < 0.05$.

Results

Table 1: Program Outcomes: Youth-Adapted vs Conventional FFS (n=284)

Outcome	Adapted FFS (n=148)	Conventional FFS (n=136)	Difference (%)	t	p	d
Knowledge retention (%)	78.6	53.4	+47.3	6.84	<0.001	0.82
Technology adoption (%)	64.2	46.5	+38.1	4.71	<0.001	0.57
Income gain (yuan/mu)	1,847	1,428	+29.4	3.42	<0.001	0.41
Program completion (%)	82.4	56.6	+45.6	5.13	<0.001	0.62
Satisfaction score (1-5)	4.2	3.1	+35.5	7.26	<0.001	0.87

Youth in adapted FFS programs outperformed conventional participants across all measures (Table 1). The largest effect appeared in satisfaction ($d = 0.87$) and knowledge retention

($d = 0.82$). Program completion was 82.4% in adapted programs versus only 56.6% in conventional ones a gap that likely amplified all subsequent outcome differences.

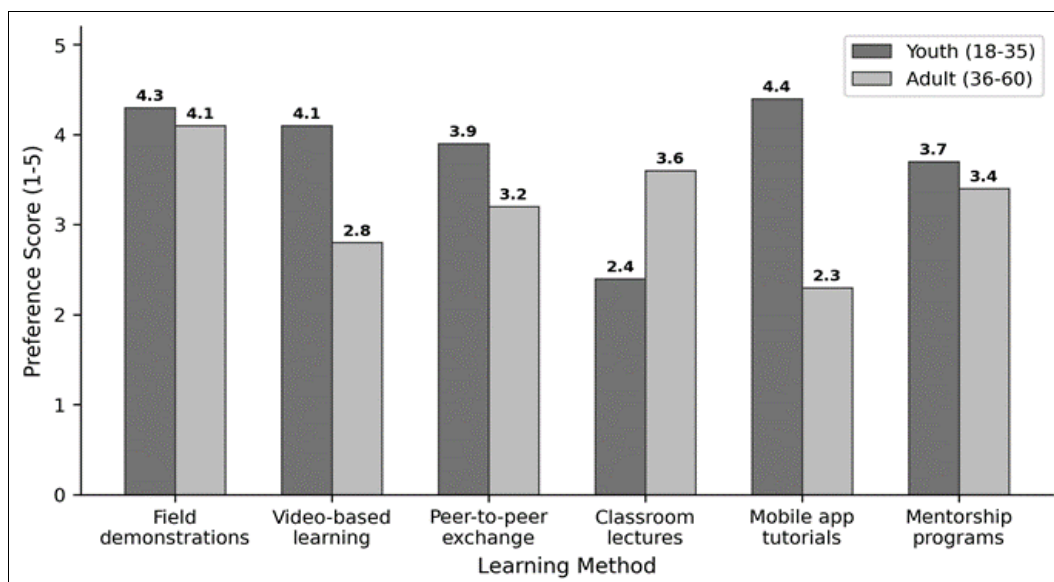


Fig 1: Learning method preference scores comparing youth (18-35) and adult (36-60) farmers across six delivery methods

Youth and adult preference profiles diverged sharply (Figure 1). Youth rated mobile app tutorials highest (4.4 vs 2.3 for adults, $U = 2,847$, $p < 0.001$) and classroom lectures

lowest (2.4 vs 3.6). Adults preferred classroom formats that youth found disengaging. Field demonstrations were the one method both groups rated highly.

Table 2: Regression Predictors of Youth FFS Program Completion (n=284)

Predictor	β	SE	t	p	95% CI
Adapted format (vs conventional)	0.38	0.06	6.33	<0.001	0.26 to 0.50
Flexible scheduling offered	0.27	0.07	3.86	<0.001	0.13 to 0.41
Peer facilitation present	0.22	0.07	3.14	0.002	0.08 to 0.36
Digital tool integration	0.19	0.07	2.71	0.007	0.05 to 0.33
Distance to FFS site (km)	-0.16	0.06	-2.67	0.008	-0.28 to -0.04

The adapted format itself was the strongest completion predictor ($\beta = 0.38$, Table 2), followed by flexible scheduling ($\beta = 0.27$) and peer facilitation ($\beta = 0.22$). The

model explained 43.8% of variance (adjusted $R^2 = 0.438$, $F = 43.7$, $p < 0.001$). Distance to the FFS site was the only negative predictor.

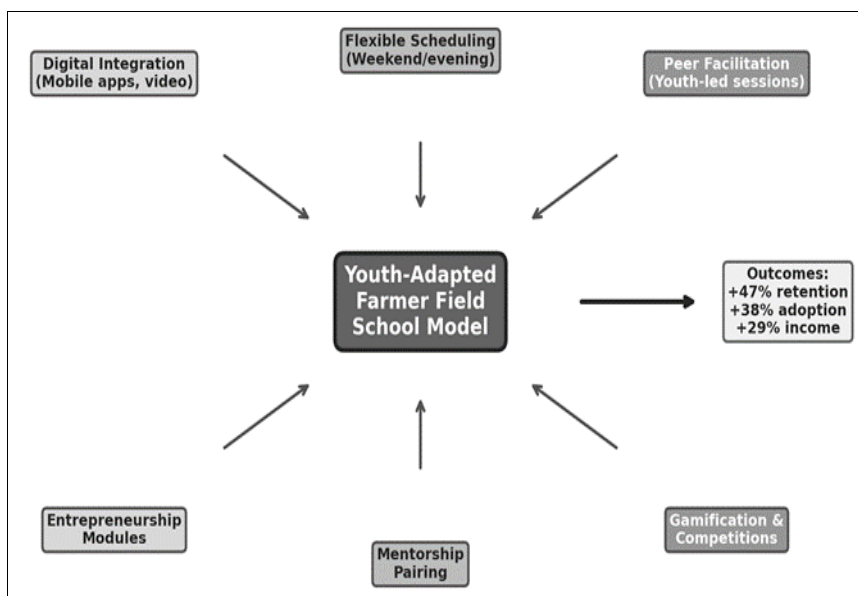


Fig 2: Youth-adapted farmer field school model showing six pedagogical modifications and aggregate outcome improvements

Discussion

The 45.6% improvement in program completion may be the most telling result. Conventional FFS programs lost nearly half their youth participants before completion a dropout rate that renders all subsequent outcome comparisons conservative, since only the most motivated conventional participants remained ^[9]. The adapted format didn't just teach better; it kept young farmers engaged long enough to learn. This retention effect aligns with Friis-Hansen and Duveskog ^[10], who identified scheduling conflicts and boring delivery as the two primary reasons youth abandoned FFS programs in Kenya.

The sharp divergence in learning method preferences (Figure 1) explains why a one-size-fits-all FFS model fails youth. When the highest-rated youth method (mobile tutorials, 4.4) is the lowest-rated among adults (2.3), and vice versa for lectures, it becomes clear that age cohorts need fundamentally different delivery channels rather than minor adjustments ^[11]. That said, field demonstrations scored highly across both groups (4.3 youth, 4.1 adults), suggesting the experiential core of FFS should be preserved while the delivery wrapper is redesigned ^[12].

Limitations

Geographic clustering of treatment and comparison sites introduces potential confounding from local factors. Youth who self-selected into adapted programs may have been more motivated than those in conventional formats. Zhejiang is among China's wealthiest and most digitally connected provinces, so results may not transfer to less developed regions where digital tool access is limited. The six-month follow-up period may be too short to assess whether adoption gains persist. Longer tracking of income and technology use trajectories is needed.

Conclusion

Youth-adapted farmer field schools produce substantially

better outcomes than conventional formats across knowledge retention, technology adoption, income, and—most critically program completion. Young farmers don't reject the FFS concept; they reject its delivery format. The six modifications tested here digital integration, flexible scheduling, peer facilitation, entrepreneurship modules, mentorship, and gamification collectively addressed the retention problem that undermines conventional youth FFS programs. Mobile-based and field demonstration methods resonated most strongly with young learners, while classroom lectures actively disengaged them. For extension systems seeking to attract and retain the next generation of farmers, adapting FFS pedagogy to match youth learning preferences isn't optional it's the difference between programs that work and programs that empty out.

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