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Volleyball Underhand Passing ⁵ Learning Outcomes through the Student Teams Achievement Division (STAD) Cooperative Learning Model

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ABSTRACT

²his Classroom Action Research (CAR) investigated the effectiveness of the Student Teams Achievement Division (STAD) cooperative learning model in enhancing volleyball underhand passing skills among tenth-grade students at High Secondary School YP PGRI 1 Makassar, Indonesia. Addressing baseline performance gaps—where only 29.2% of students achieved the Minimum Mastery Criteria (*KKM* = 80), heavily hindered by low psychomotor scores (mean = 57.90)—the study employed a two-cycle spiral design (planning, action, observation, reflection) involving 24 students selected via total sampling during the 2025/2026 academic year. Data was gathered through observation instruments, cognitive assessments, and psychomotor evaluation rubrics across the cognitive, affective, and psychomotor domains. Following Cycle I interventions, classical mastery increased to 54.2% (mean = 81.02). Subsequent pedagogical refinements in Cycle II yielded a 100% classical mastery rate (mean = 92.39), with substantial gains across cognitive (95.67), affective (97.14), and psychomotor (84.38) domains. The results demonstrate that STAD's structured peer-tutoring and group-reward framework successfully remediates persistent motor execution errors while fostering affective engagement and conceptual understanding. These findings offer secondary physical education practitioners an evidence-based, replicable instructional strategy to bridge holistic learning domains in team-sport skill acquisition.

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1. INTRODUCTION

⁹Physical Education, Sport, and Health (*Pendidikan Jasmani, Olahraga, dan Kesehatan/PJOK*) constitutes a strategic, long-term investment in the development of human resources (Hasmyati et al., 2024; McCuaig & Quennerstedt, 2018). Beyond building physical fitness, structured physical activity cultivates resilience, sportsmanship, and emotional regulation, while stimulating motor development and healthy lifestyle behaviors that indirectly reinforce students' broader academic

achievement (Opstoel et al., 2020). Within the Indonesian senior secondary curriculum, volleyball occupies a central place among team-sport units, and effective participation requires mastery of several interrelated techniques—serving, passing, setting, smashing, and blocking (Astuti et al., 2025; Saputra, 2026). Among these, the underhand pass is foundational: it initiates ball control, sustains rally continuity, and underlies subsequent attacking sequences, making it indispensable to effective teamwork on court (Akhir et al., 2025; Hasmuddin et al., 2026).

Despite its curricular importance, classroom observation at High Secondary School YP PGRI 1 Makassar revealed a substantial gap between curricular expectations and students' actual performance. Baseline assessment of the target class ($n = 24$) indicated that fewer than a third of students (29.2%) met the school's Minimum Mastery Criteria of 80 for underhand passing, with the psychomotor domain—rather than conceptual knowledge or attitude—constituting the principal bottleneck (mean = 57.90, markedly below the cognitive and affective means). Recurring technical faults were observed, including an overly upright stance, unbalanced foot placement, excessive elbow flexion on ball contact, and inconsistent forearm (“palm-lock”) alignment. These faults are consistent with prior reports that the advanced execution phase of the underhand pass—requiring simultaneous coordination of body weight transfer, arm platform stability, and visual tracking—is the aspect most frequently left unmastered by novice players (Afrilia et al., 2026; Auliazain et al., 2026).

The persistence of this technical gap appears rooted not only in students' physical readiness but also in motivational and pedagogical factors. Conventional, teacher-centered instruction in many Indonesian PJOK classrooms tends to rely on repetitive drilling with limited individualized feedback, a pattern associated with declining student interest and intrinsic motivation to practice (Nazaruddin, 2025). Teachers working within this model are also less able to detect and respond to early signs of disengagement, underscoring the need for a learning approach that distributes responsibility for skill correction beyond the single instructor and actively sustains student engagement throughout practice (Van den Berghe et al., 2016).

Cooperative learning models, and the Student Teams Achievement Division (STAD) format in particular, have been proposed as a response to this pedagogical gap. Originally developed by Slavin, STAD organizes students into small, heterogeneous teams that study material together, take individual quizzes, and earn team recognition based on each member's individual improvement over their own prior performance (Boke et al., 2025; Bjørke & Mordal Moen, 2020; Casey & Fernandez-Rio, 2019; Rahawarin et al., 2026). In the Indonesian PJOK literature, STAD has been associated with improved peer tutoring and deeper cognitive processing (Suryadi et al., 2024), a more positive affective climate through team-based reward structures (Setiawan et al., 2026), and, over sufficient practice repetitions, gains in motor skill consistency (Upa et al., 2025). However, comparatively little cyclical, classroom-embedded evidence exists on whether—and how—STAD's group-reward and peer-correction mechanisms can specifically remediate persistent psychomotor errors of the kind observed in underhand passing, as opposed to producing only cognitive or motivational gains.

This study addresses that gap. Its contribution lies in documenting, across two structured intervention cycles, how a STAD implementation tailored around peer-based technical correction – in which more proficient teammates are explicitly tasked with helping peers diagnose body-mechanics errors in pursuit of shared team improvement points – affects learning outcomes simultaneously across the cognitive, affective, and psychomotor domains. By reframing skill correction as a shared, low-stakes team responsibility rather than an individualised, teacher-driven correction, this approach is hypothesised to reduce the performance anxiety often associated with public skill failure while sustaining the repetition needed for motor learning to consolidate. Accordingly, this classroom action research was designed to answer the following question: to what extent, and through what cyclical pattern, does implementation of the STAD cooperative learning model improve tenth-grade students' underhand passing learning outcomes across the cognitive, affective, psychomotor domains at High Secondary School YP PGRI 1 Makassar? The findings are intended to provide PJOK practitioners with an empirically grounded, replicable cyclical protocol for teaching team-sport motor skills using cooperative learning.

2. METHOD

This study employed Classroom Action Research (CAR), a design intended to identify, analyse, and iteratively improve the quality of classroom instruction through teachers' systematic self-reflection on real instructional problems encountered in the field. The research followed the spiral CAR model of Arikunto (2011), comprising two cycles, with each cycle iterating through four stages: planning, action, observation, and reflection. The outcome of the reflection stage in Cycle I directly informed the revised action plan implemented in Cycle II, consistent with the iterative logic of CAR.

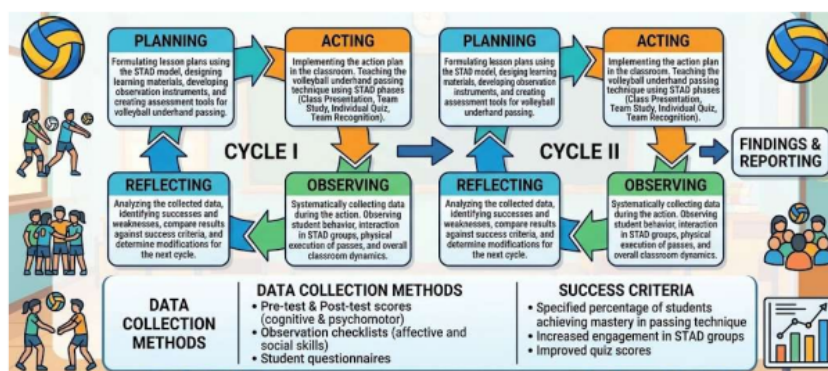


Figure 1. Classroom Action Research Design

The study was conducted at High Secondary School YP PGRI 1 Makassar, Indonesia, during the odd semester of the 2025/2026 academic year. Participants comprised all 24 students of one tenth-grade class (17 male, 7 female), selected through total sampling based on documented low baseline achievement in large-ball game units, including volleyball underhand passing. As an intact-class action research design, no

separate control group was used; all 24 students received the STAD intervention across both cycles.

Data was collected through observation, performance testing, and documentation across three learning domains. Cognitive achievement was measured using a written test (objective and short-essay items) assessing students' theoretical understanding of underhand passing mechanics and game application. Affective outcomes – discipline, active participation, engagement with STAD team procedures, and motivation – were assessed using a structured 16-indicator observation sheet completed during practice sessions. Psychomotor skill was assessed using the underhand-passing motor-skill assessment rubric, which rates the preparation, execution, and follow-through phases of the technique. All three instruments were administered identically at the end of the pre-cycle baseline, Cycle I, and Cycle II to allow direct within-subject comparison across phases.

Data was analysed using descriptive quantitative statistics to characterise the progression of student learning outcomes from the pre-cycle baseline through Cycle II. Each student's raw score in each domain was converted to a standardised final score using the following formula:

$$\text{Nilai Akhir} = \frac{\text{Skor yang Diperoleh}}{\text{Skor Maksimum}} \times 100$$

An individual student was classified as having achieved mastery if their composite final score (the mean of the three domain scores) reached the school's Minimum Mastery Criteria (*KKM*) of 80. At the class level, the intervention was considered successful once the classical completion percentage exceeded 80%, calculated as:

$$P = \frac{F}{N} \times 100\%$$

Where P is the classical completion percentage, F is the number of students meeting or exceeding the *KKM*, and N is the total number of participating students.

In the planning stage of each cycle, the researcher, in collaboration with the class teacher, prepared lesson plans, STAD team assignments (four to five heterogeneous members balanced by baseline skill level and sex), quiz instruments, and the observation and assessment rubrics. During the action stage, instruction followed the standard STAD sequence: whole-class presentation of underhand-passing technique, structured team practice in which higher-skill members were assigned responsibility for coaching lower-skill teammates toward a shared team improvement target, individual formative quizzes, and public recognition of teams achieving the greatest average individual improvement. The observation stage ran concurrently with the action stage, with the researcher and a collaborating teacher recording cognitive, affective, and psychomotor data using the instruments described above. In the reflection stage, cycle-level results were analysed against the *KKM* and classical completion criteria to identify specific persisting weaknesses – for example, in Cycle I, follow-through mechanics and insufficient peer attention to movement evaluation – which were then used to redesign the action plan.

3. RESULTS AND DISCUSSION

Results

Pre-Cycle Baseline

Prior to the intervention, students' underhand passing learning outcomes were low overall. As shown in Table 1, only 7 of 24 students (29.2%) achieved *KKM* of 80, while 17 students (70.8%) did not. The class mean final score was 75.00, comprising a cognitive mean of 83.00, an affective mean of 84.11, and a markedly lower psychomotor mean of 57.90. Table 2 further shows that no students reached the "Very Good" category (93–100), while the majority (70.8%) fell into the "Poor" category (<80). These results confirm that, while students' conceptual understanding and classroom attitude were comparatively adequate, their motor execution of the underhand pass was the primary constraint on overall mastery, providing the empirical basis for implementing the STAD intervention.

Table 1. Descriptive Statistics of Baseline Student Learning Outcomes Across Domains (N=24)

Assessment Domain	Class Mean (M)	<i>KKM</i> Threshold	Mastery Status
Cognitive	83.00	80.00	Mastered
Affective	84.11	80.00	Mastered
Psychomotor	57.90	80.00	Unmastered
Composite Final Score	75.00	80.00	Unmastered

Table 2. Pre-Cycle Completion Category Distribution

Score Range	Category	f	%
93 - 100	Very Good	0	0.0
86 - 92	Good	2	8.3
80 - 85	Sufficient	5	20.9
< 80	Poor	17	70.8
Total		24	100.0

Cycle I

Following implementation of the STAD model in Cycle I, all three domains improved (Table 3). The cognitive mean rose from 83.00 to 87.33, with 22 of 24 students (91.7%) reaching the *KKM*; the highest score was 100 (HS and IN) and the lowest was 76 (SA and ZA). Persistent weaknesses were observed on items addressing variable ball-approach situations and match-application of the technique, flagging a specific target for Cycle II. The affective mean rose from 84.11 to 87.24 (20.8% below 88, i.e. most students in the 75–100 range), with the least-met indicators concerning attentiveness to movement evaluation, learning motivation, and enjoyment of the learning process. The psychomotor mean improved from 57.90 to 68.49, the largest relative gain of the three domains, yet remained the weakest, with only 5 students reaching *KKM*-level psychomotor performance and the majority still located in the follow-through phase, where arm-platform tracking of the ball, smooth weight transfer, and post-contact ball-direction control were the most commonly unmastered elements. Overall classical completion rose from 29.2% to 54.2% (13 of 24 students; class mean = 81.02), leaving

11 students below the *KKM* threshold and confirming the need for a second, refined cycle (Table 4).

Table 3. Comparative Summary of Student Learning Outcomes Across Domains (Baseline vs. Cycle I

Learning Domain	Baseline Mean (M1)	Cycle I Mean (M2)	Absolute Mean Gain (ΔM)	Cycle I Mastery Rate (n, %)	Primary Identified Weaknesses / Diagnostic Focus
Cognitive	83.00	87.33	+4.33	22 (91.7%)	Variable ball-approach tactics; match-context application
Affective	84.11	87.24	+3.13	High (>79.2%≥88)	Movement evaluation focus; intrinsic motivation; task enjoyment
Psychomotor	57.90	68.49	+10.59	5 (20.8%)	Follow-through mechanics: arm-platform tracking, weight transfer, direction control
Overall Context	75.00	81.02	+6.02	—	Psychomotor execution remains primary constraint

Table 4. Cycle I Completion Category Distribution

Score Range	Category	f	%
93 - 100	Very Good	0	0.0
86 - 92	Good	6	25.0
80 - 85	Sufficient	7	29.2
< 80	Poor	11	45.8
Total		24	100.0

Table 5. Granular Breakdown of Domain-Specific Performance Indicators in Cycle I

Domain	Key Performance Metrics	Cycle I Value / Status	Targeted Instructional Focus for Cycle II
Cognitive	Mean Score (M) <i>KKM</i> Mastery Rate (n, %) Score Range	87.3322 / 24 (91.7%)76.00 – 100.00	Integrate variable trajectory drills and situational decision-making scenarios.
Affective	Mean Score (M)Distribution <88.00Dominant Score Band	87.2420.8% (n=5)75.00 – 100.00	Enhance peer-feedback protocol, peer coaching roles, and Gamified STAD rewards.
Psychomotor	Mean Score (M) <i>KKM</i> Mastery Rate (n, %) Primary Deficit Phase	68.495 / 24 (20.8%) Follow-Through	Implement targeted kinesthetic cues for arm-platform stability and weight transfer.

Cycle II

Reflection on Cycle I informed targeted refinements for Cycle II, including additional guided repetition of the follow-through phase, more explicit peer-feedback prompts within STAD teams, and individualised coaching for the lowest-performing students. These refinements produced marked improvement across all three domains (Table 6). The cognitive mean rose to 95.67, with all 24 students scoring between 88 and 100 (100% completion); most students gained 4–20 points relative to Cycle I, although the same five items concerning situational and match-based application remained comparatively difficult. The affective mean rose to 97.14, with 16 of 24 students achieving a perfect score of 100 and only one student (Indah, 81) below 88; residual weaknesses concentrated on punctuality, enjoyment of learning, attentiveness to evaluation, and post-lesson motivation. The psychomotor mean rose to 84.38, with 22 of 24 students (91.7%) reaching the *KKM*; the two students who remained marginally below threshold (AH and BU; both 79) nonetheless improved substantially relative to Cycle I (respectively +50 and +27 points), and the highest psychomotor scores (92) were achieved by TA, AI, and FI. In aggregate, all 24 students (100%) achieved the *KKM* in Cycle II, with a class mean final score of 92.39 – an increase of 17.39 points over Cycle I and 17.39 points over the pre-cycle baseline combined across both cycles (Table 7).

Table 6. Descriptive Summary of Domain-Specific Student Outcomes Following Cycle II Refinements

Domain	Cycle II Mean (M)	Score Range (Min–Max)	Mastery Rate (n, %)	Identified Micro-Deficits / Residual Constraints
Cognitive	95.67	88.00 – 100.00	24 (100.0%)	Complex situational adaptation & match-based decision-making
Affective	97.14	81.00 – 100.00	24 (100.0%)	Post-lesson motivation, evaluation focus, punctuality, enjoyment
Psychomotor	84.38	79.00 – 92.00	22 (91.7%)	Fine motor precision in follow-through (marginal for n=2)
Composite Score	92.39	82.67 – 97.33	24 (100.0%)	Full classroom mastery achieved against <i>KKM</i> benchmark (80.00)

Table 7. Longitudinal Progression of Student Learning Outcomes Across Experimental Cycles

Performance Metric	Baseline	Cycle I	Cycle II	Total Progress (Δ)
Cognitive Mean (M)	83.00	87.33	95.67	+12.67
Affective Mean (M)	84.11	87.24	97.14	+13.03
Psychomotor Mean (M)	57.90	68.49	84.38	+26.48
Composite Final Class Mean (M)	75.00	81.02	92.39	+17.39
Overall <i>KKM</i> Mastery Rate (n, %)	7 (29.2%)	15 (62.5%)	24 (100.0%)	+70.8%

Progression Across Cycles

Table 8 and Figure 2 summarise the progression of learning outcomes from the pre-cycle baseline through Cycle II. Classical completion increased monotonically from 29.2% to 54.2% and then to 100.0%, while the class mean final score rose from 75.00 to 81.02 and then to 92.39. Notably, the psychomotor domain – the principal barrier identified at baseline – showed the largest proportional gain (57.90 → 68.49 → 84.38), indicating that the STAD intervention was particularly effective in remediating the motor-skill deficits that had constrained overall mastery.

Table 8. Comparative Summary of Learning Outcomes Across Research Phases

Phase	Cognitive Mean	Affective Mean	Psychomotor Mean	Final Score Mean	Students Achieving <i>KKM</i>	Classical Completion (%)
Pre-cycle	83.00	84.11	57.90	75.00	7 / 24	29.2
Cycle I	87.33	87.24	68.49	81.02	13 / 24	54.2
Cycle II	95.67	97.14	84.38	92.39	24 / 24	100.0

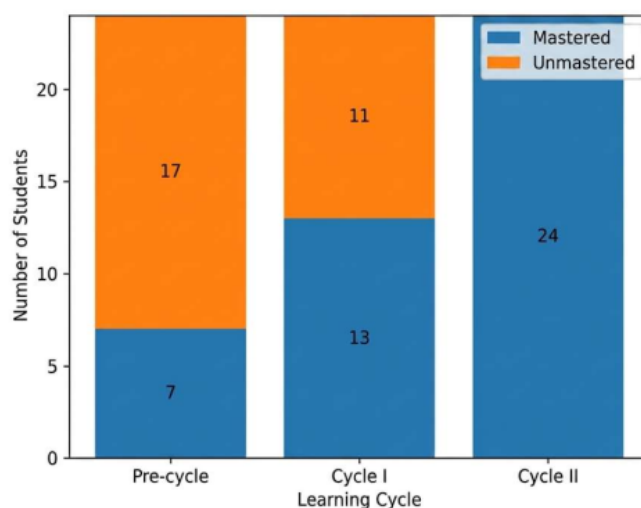


Figure 2. Comparison of Classical Completion (Across the Pre-Cycle, Cycle I, and Cycle II Phases)

Discussion

This study sets out to examine the extent to which, and the pattern through which, the STAD cooperative learning model improved tenth-grade students' understanding of learning outcomes across the cognitive, affective, and psychomotor domains. The findings demonstrate a consistent, cumulative improvement across two intervention cycles, with the psychomotor domain – initially the weakest and most resistant to change – ultimately showing the largest relative gain by Cycle II.

Cognitive Gains

The steady rise in cognitive scores, from a baseline mean of 83.00 to 87.33 in Cycle I and 95.67 in Cycle II, is consistent with the proposition that STAD's structured peer-tutoring format deepens conceptual understanding by requiring students to explain and justify movement concepts to teammates rather than passively receive instruction (Casandra & Doyan, 2025; Feng et al., 2024). The persistence of difficulty on items addressing variable ball-situations and in-game application across both cycles, however, suggests that declarative knowledge of technique consolidates faster under STAD than does the capacity to transfer that knowledge to dynamic, match-like conditions – an important boundary condition for practitioners to anticipate when designing STAD-based technical units.

Affective Gains

Affective outcomes improved from 84.11 at baseline to 87.24 in Cycle I and 97.14 in Cycle II. This pattern is congruent with evidence that STAD's team-reward structure fosters a more positive learning climate and sustains student engagement and motivation (Rahman, 2025; Weeldenburg et al., 2021). The comparatively slower gains on indicators related to punctuality, enjoyment, and post-lesson motivation—which remained the weakest affective indicators even in Cycle II—suggest that dispositional and motivational habits may require sustained exposure to cooperative structures beyond two cycles to fully consolidate.

Psychomotor Gains

The psychomotor domain exhibited the clearest cyclical improvement pattern, rising from 57.90 (baseline) to 68.49 (Cycle I) to 84.38 (Cycle II). That psychomotor gains lagged cognitive and affective gains in Cycle I is consistent with motor-learning research indicating that complex, multi-segment skills require substantially more repetition and feedback than knowledge-based or attitudinal outcomes before automation occurs (Wang et al., 2025). The subsequent acceleration of psychomotor gains in Cycle II—following targeted, repeated practice with intensified peer feedback on the follow-through phase—supports the interpretation that STAD's peer-correction mechanism becomes increasingly effective once students have accumulated sufficient shared vocabulary and observational skill to identify one another's technical errors, echoing similar second-cycle psychomotor gains reported by Sulistiadinata (2025).

Theoretical and Practical Implications

Taken together, these findings extend prior single-domain STAD studies (Khayyirah et al., 2024), on cognitive outcomes; (Atradinal & Ockta, 2024), on affective outcomes by demonstrating that a single, coherently designed STAD protocol can produce simultaneous, mutually reinforcing gains across all three learning domains within a compressed two-cycle timeframe. This is consistent with Slavin's original theoretical rationale that STAD's combination of individual accountability and positive group interdependence operates on cognitive, social, and behavioral mechanisms concurrently

rather than in isolation (Shafiee Rad et al., 2023). Practically, the results suggest that PJOK teachers facing similar profiles—adequate conceptual understanding but weak motor execution of a team-sport skill—may benefit from restructuring skill-correction responsibility around heterogeneous peer teams rather than relying solely on teacher-led correction, particularly where class sizes limit the individualized feedback a single teacher can provide.

Several limitations qualify these findings. First, as a single-class CAR design without a parallel comparison group, the observed gains cannot be unambiguously attributed to STAD alone; maturation, test familiarity, and Hawthorne-type effects from increased observational attention cannot be fully excluded. Second, the sample was limited to 24 students from a single school, constraining generalisability to other institutional or regional contexts. Third, effective and psychomotor data were collected through observer ratings, which, despite the use of structured rubrics, retain a degree of subjectivity; inter-rater reliability was not formally reported. Fourth, the two-cycle design captures short-term gains but does not establish whether psychomotor improvements are retained over time without continued cooperative practice. Future research should therefore consider quasi-experimental or randomized designs with comparison groups receiving conventional instruction, larger and multi-site samples, formal inter-rater reliability reporting, and follow-up retention testing to determine the durability of STAD-related psychomotor gains.

4. CONCLUSION

This classroom action research demonstrates that implementation of the Student Teams Achievement Division (STAD) cooperative learning model, delivered across two structured cycles, significantly and consistently improved tenth-grade students' volleyball underhand passing learning outcomes at High Secondary School YP PGRI 1 Makassar. Classical mastery rose from 29.2% at baseline to 54.2% after Cycle I and to 100% after Cycle II, with the class mean final score increasing from 75.00 to 92.39. Improvements were evident across all three assessed domains, with the psychomotor domain – the primary constraint identified at baseline – showing the most pronounced gain following the second, refined cycle. These results indicate that STAD's combination of heterogeneous peer teams, individual accountability, and group-reward recognition can effectively remediate persistent motor-skill errors while simultaneously strengthening conceptual understanding and learning engagement, supporting its use as a primary instructional alternative for teaching team-sport motor skills in secondary Physical Education. PJOK teachers are encouraged to adopt cyclical, peer-structured practice protocols of this kind when addressing similar cognitive-affective-psychomotor gaps, while future studies employing comparison-group designs and longer-term follow-up are recommended to further establish the generalisability and durability of these effects.

Based on these findings, it is recommended that this article expand its theoretical and methodological contributions by testing the generalizability of the Student Teams Achievement Division (STAD) model on a broader, more diverse sample and

employing a randomized controlled trial design to overcome the limitations inherent in classroom action research. Future research should incorporate long-term retention evaluations (longitudinal follow-up) to verify the durability of improvements across the psychomotor, cognitive, and affective domains in physical education. Furthermore, a more in-depth theoretical discussion regarding neuro-motor mechanisms and peer-assisted learning interactions during STAD implementation is highly encouraged, ensuring that the synthesis of research findings yields pedagogical policy implications that are richer and internationally relevant.

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