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Improving Student Responses and Food-Ingredient Knowledge Outcomes through Snowball Throwing: Classroom Action Research at an Indonesian Vocational School

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ABSTRACT

This classroom action research examined student responses and learning outcomes following the implementation of the snowball throwing cooperative learning model in Food Ingredient Knowledge at SMK Negeri 1 Kubu, Bali. Participants were 36 Grade X TB1 students in the first semester of the 2019/2020 academic year. The study was conducted from July to November 2019 across two cycles, each comprising planning, action, observation and evaluation, and reflection. Student responses were measured with a 15-item five-point questionnaire, while learning outcomes were assessed using achievement tests. Descriptive quantitative analysis showed that the mean student-response score increased from 49.72 in Cycle I to 60.42 in Cycle II, an increase of 10.70 points. The mean achievement score rose from 6.28 to 8.25, a gain of 1.97 points. Very positive responses increased from 1 of 36 students (2.78%) to 22 of 36 students (61.11%). These within-class improvements coincided with refinements in group facilitation, questioning, and classroom management. Because the design did not include a comparison group, the findings support the practical feasibility of the intervention but do not establish a causal effect. The study suggests that structured peer questioning can support participatory learning in vocational food-knowledge education.

Keywords: snowball throwing; cooperative learning; student response; learning outcomes; vocational education

INTRODUCTION

Food Ingredient Knowledge is a foundational subject in culinary vocational education. Students are expected to identify food categories, including cereals and additives, and connect theoretical knowledge with practical kitchen decisions. In the observed Grade X TB1 class at SMK Negeri 1 Kubu, preliminary observations and interviews indicated boredom, low motivation, prolonged note-taking, and limited peer interaction. These classroom conditions motivated a shift toward structured, student-centered cooperative learning.

Research syntheses suggest that active learning and cooperative interaction can improve academic achievement, while the quality of group organization, discussion, and teacher guidance influences implementation (Freeman et al., 2014; Kyndt et al., 2013; Gillies, 2016; Roseth et al., 2008). In vocational settings, a meta-analysis also supports the relevance of cooperative approaches to student learning outcomes

(Ridwan et al., 2022). However, outcomes vary by subject, classroom conditions, and the extent to which learners participate meaningfully (Gillies, 2014; Crouch & Mazur, 2001).

The snowball throwing model organizes learners into groups, distributes questions written on paper, and invites students to answer questions received from peers. Studies in Indonesian schools have reported favorable learning outcomes in science, social studies, mathematics, and vocational technical subjects (Hanum et al., 2015; Nurhaedah & Amran, 2017; Setyawan & Zamtinah, 2018; Rofisian & Ferryka, 2023; Sipayung et al., 2021). The present study addresses two questions: (1) How did student responses to snowball throwing change across two action-research cycles? (2) How did Food Ingredient Knowledge achievement change across those cycles?

LITERATURE REVIEW

Cooperative learning involves coordinated peer interaction in pursuit of shared academic goals. Its theoretical mechanisms include explanation, elaboration, accountability, and constructive discussion. Gillies (2016) emphasizes teacher support and productive group talk, whereas Kyndt et al. (2013) synthesize evidence on achievement and student attitudes. Roseth et al. (2008) further associate cooperative goal structures with achievement and positive peer relations. These perspectives provide a basis for interpreting both achievement and student-response measures in the present action research.

Snowball throwing operationalizes cooperative learning through question generation, physical exchange of paper questions, peer responses, and teacher feedback. In comparable classroom contexts, Setyawan and Zamtinah (2018) documented increased learning activity and achievement in vocational electrical education; Hanum et al. (2015) examined its application to biology; and Nurhaedah and Amran (2017) studied social studies in Makassar. Subsequent studies have continued to examine the approach across school subjects (Rofisian & Ferryka, 2023; Yani et al., 2025; Gultom et al., 2025; Karnita et al., 2026). These studies are contextual comparators, not substitutes for a controlled evaluation of the current intervention.

METHOD

The study was conducted at SMK Negeri 1 Kubu between July and November 2019. Participants were all 36 students in Grade X TB1 during the first semester of the 2019/2020 school year. A classroom action research design was implemented in two cycles, each comprising planning, action, observation and evaluation, and reflection. Cycle I consisted of three meetings; Cycle II also consisted of three meetings. Six groups of six students were formed, with a designated group leader for each group.

At the start of a lesson, the teacher explained the learning objectives and content to group leaders. Leaders relayed the material to their groups. Students then wrote questions on paper, crumpled the paper

into balls, exchanged the questions, and answered them in turn. The teacher observed interactions, facilitated clarification, and provided feedback. Reflection after Cycle I informed additional scaffolding, classroom-management procedures, and encouragement to answer questions in Cycle II.

Student response was assessed at the end of each cycle using a 15-statement questionnaire with five response options. Positively worded items were scored 5 to 1, and negatively worded items were reverse-coded. Learning outcomes were assessed through end-of-cycle tests. The original study reported descriptive mean scores and category distributions; individual-level data, reliability statistics, and item-level test information were not available for reanalysis.

Editorial clarification: The original method section also contains a six-step description labeled "Project Based Learning," although the intervention is repeatedly identified as snowball throwing. This inconsistent passage requires confirmation by the author and has not been treated as evidence that a separate project-based intervention occurred.

RESULTS

Student responses became more favorable between cycles. The number of students in the very positive category rose from 1 (2.78%) to 22 (61.11%), while the fairly positive category decreased from 23 (63.89%) to 3 (8.33%). All 36 students were included in each distribution.

Table 1. Student-response distribution by action-research cycle

Response category	Cycle I n (%)	Cycle II n (%)
Very positive	1 (2.78)	22 (61.11)
Positive	12 (33.33)	11 (30.56)
Fairly positive	23 (63.89)	3 (8.33)
Less positive	0 (0.00)	0 (0.00)
Very less positive	0 (0.00)	0 (0.00)
Total	36 (100.00)	36 (100.00)

Mean response scores increased from 49.72 to 60.42, a difference of 10.70 points. Mean learning achievement increased from 6.28 to 8.25, a difference of 1.97 points. The latter values are reported on the original manuscript's scale, which appears to be a ten-point scale; the source does not specify a validated scale transformation.

Table 2. Changes in reported cycle means

Indicator	Cycle I	Cycle II	Difference
Student response mean	49.72	60.42	+10.70
Achievement mean	6.28	8.25	+1.97

The source manuscript reports minimum and maximum test scores as 0 and 4 for Cycle I and 1 and 4 for Cycle II, which is inconsistent with achievement means of 6.28 and 8.25. These extreme-score values cannot be reconciled from the available aggregate data and therefore require verification against the original assessment sheets.

DISCUSSION

The observed improvement in response scores is consistent with an increasingly structured learning environment. During Cycle I, students were unfamiliar with the cooperative routine, some focused on throwing paper rather than answering questions, and several hesitated to speak. The teacher responded by providing clearer instructions, closer group supervision, opportunities for peer assistance, and reinforcement for meaningful answers. During Cycle II, the classroom was reported to be more orderly and students appeared more willing to respond to peer questions.

These observations accord with research emphasizing purposeful interaction rather than activity alone (Gillies, 2016; Gillies, 2014). The question-exchange component also resembles the emphasis on peer explanation in peer instruction, where discussing and defending answers can support conceptual understanding (Crouch & Mazur, 2001). The increase in mean achievement is consistent with broader evidence on active and cooperative learning (Freeman et al., 2014; Kyndt et al., 2013), as well as Indonesian classroom studies using snowball throwing (Setyawan & Zamtinah, 2018; Hanum et al., 2015; Rofisian & Ferryka, 2023).

The findings have practical implications for vocational classrooms: questions should be tied to authentic ingredient-identification tasks, group leaders should be trained to explain concepts accurately, and assessment should distinguish participation from content mastery. Since the same class participated in both cycles, maturation, increased familiarity with the material, teacher adjustments, and repeated testing may all have contributed to the observed gains. No causal inference or statistical significance claim is warranted from the reported aggregate data.

LIMITATIONS

This study was confined to one class of 36 students and two action-research cycles. It lacked a control group, individual-level scores, reliability estimates for the questionnaire, and sufficient assessment details to verify the reported score range. The original manuscript also contains a method-label inconsistency. Future studies should retain anonymized individual-level data, report instrument validation and scoring rules, and compare the model with a relevant alternative teaching approach.

CONCLUSION

Across two classroom action-research cycles, the implementation of snowball throwing in Food Ingredient Knowledge at SMK Negeri 1 Kubu coincided with improved student responses and achievement. Mean response scores rose from 49.72 to 60.42 and mean achievement scores rose from 6.28 to 8.25. The number of very positive student responses increased from 1 to 22. These findings indicate promising classroom-level improvement while remaining subject to the limitations of an uncontrolled action-research design.

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