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Google Classroom-Supported Fisheries Vocational Learning During COVID-19: A Two-Cycle Classroom Action Study

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ABSTRACT

Emergency remote teaching posed particular challenges for vocational fisheries education, where learners require clear guidance, feedback, and opportunities to engage with technical content. This classroom action study examined changes in learning outcomes after Google Classroom was introduced for the topic of treating disease-affected aquatic organisms in Grade X APAT-1 at SMK Negeri 1 Tulungagung, Indonesia. The study involved 25 students in the second semester of 2021/2022 and used two iterative cycles of planning, action, observation, and reflection. Learning materials, worksheets, group discussion, assignment submission, and teacher feedback were organized through Google Classroom; multiple-choice tests were administered through Google Forms. The detailed results tables report mastery for 6 of 25 students (24%) at the first-cycle pretest, 14 (56%) at the end of Cycle I, and 24 (96%) at the end of Cycle II. Mean posttest scores increased from 74 in Cycle I to 85 in Cycle II. Classroom observations identified initial platform-adaptation and internet-connectivity problems that were addressed through instructional refinement. These findings document improvement within one classroom, but the absence of a comparison group and discrepancies between the source abstract and results tables preclude a definitive causal attribution. Google Classroom was a feasible asynchronous organizational tool for this cohort when accompanied by structured tasks and responsive feedback.

Keywords: Google Classroom; vocational fisheries education; classroom action research; emergency remote teaching; learning mastery

INTRODUCTION

The COVID-19 pandemic disrupted the ordinary delivery of secondary and vocational education, especially learning that depends on practical demonstration, iterative feedback, and access to specialized resources. Research on emergency remote teaching documents uneven readiness, constrained connectivity, and difficulties translating established classroom routines into digital environments (Al Mazrooei et al., 2022; Kaden, 2020; König et al., 2020; Trust & Whalen, 2020). Learning disruption was also associated with widening gaps in achievement and unequal access to educational support (Donnelly & Patrinos, 2022; Engzell et al., 2021). These findings provide an international context for interpreting local instructional responses without assuming that all schools faced identical conditions.

For fisheries vocational education, instructional continuity involves more than transferring readings to the internet. Students need to interpret aquatic animal health problems, select appropriate responses, and demonstrate understanding of treatment procedures. In the present setting, synchronous platforms were judged impractical because of connectivity and economic constraints. The school initially distributed materials and collected assignments using Google Drive; however, the teacher reported limited interaction and low student interest. The subsequent intervention adopted Google Classroom to consolidate materials, worksheets, assignment submission, feedback, and communication. Evidence from vocational education suggests that the instructional design surrounding a learning management system, rather than the application alone, is critical to its educational value (Antonietti et al., 2022; Larasati & Haryono, 2022; Suswanto et al., 2022).

Google Classroom provides an asynchronous structure that may help teachers organize learning and make feedback more visible, but access alone does not guarantee comprehension or participation. Reviews of online teaching emphasize teacher presence, interaction, learner readiness, and purposeful activity (Martin et al., 2020; Rapanta et al., 2020; Rasheed et al., 2020). Students also differ in their capacity to manage learning time and persist with remote tasks (Aguilera-Hermida, 2020; Adedoyin & Soykan, 2023). Accordingly, a classroom action approach was selected to diagnose practical obstacles, implement adjustments, and document successive changes in student learning.

The research question was: How did students' documented mastery and mean test scores change across two cycles of Google Classroom-supported instruction in aquatic organism disease treatment? The study also describes instructional adjustments and observed access barriers. Its contribution is a context-specific account of asynchronous learning in a fisheries vocational class, rather than a controlled estimate of Google Classroom's causal effectiveness.

LITERATURE REVIEW

Emergency remote learning and digital access

Emergency remote teaching differs from planned online learning because schools and teachers must reorganize instruction under time and resource pressure. Studies across countries describe challenges involving infrastructure, device availability, digital competence, communication, and student support (Almaiah et al., 2020; Bao, 2020; Ferri et al., 2020; Carrillo & Flores, 2020). These constraints are especially relevant when synchronous participation is not dependable. Asynchronous environments can permit flexible access, but they shift greater responsibility to task clarity and timely teacher guidance (Dhawan, 2020; Rapanta et al., 2020; Martin et al., 2020).

Research on technology adoption indicates that teacher competence, institutional support, and pedagogical readiness shape how digital platforms are used (Akram et al., 2022; AlAjmi, 2022; Howard et

al., 2021; Lucas et al., 2021). Systematic evidence on secondary-school digital tools also cautions against treating a platform as a self-contained intervention (Hillmayr et al., 2020; Tondeur et al., 2021). The present study therefore evaluates a package of activities implemented through Google Classroom, including task design and feedback, rather than isolating a software effect.

Interaction, feedback, and achievement in asynchronous environments

An effective online environment requires students to do something cognitively meaningful with the provided resources. Teaching presence and engagement strategies are associated with students' perceptions and outcomes in online settings (Caskurlu et al., 2020; Martin & Bolliger, 2018; Bond et al., 2020). Feedback can orient learners toward errors and next steps, while retrieval practice and instructional videos may support understanding when matched to learning objectives (Agarwal et al., 2021; Mayer et al., 2020; Noetel et al., 2021). Research on multimedia design further indicates that unnecessary complexity can impede learning (Sweller, 2020; Sundararajan & Adesope, 2020; Wong & Adesope, 2021).

Online learning success also depends on learners' perceptions of readiness and the organization of learning activities. Studies of remote learning report variable acceptance, satisfaction, and persistence, and emphasize that instructional structure must be adjusted to local constraints (Wei & Chou, 2020; Rasheed et al., 2020; Adedoyin & Soykan, 2023). In vocational education, opportunities to apply theory to authentic technical decisions remain important even when practice cannot be fully replicated online (Antonietti et al., 2022; Skulmowski, 2024).

Google Classroom and vocational teaching

Empirical studies in Indonesian vocational schools provide relevant but nonidentical comparisons. Larasati and Haryono (2022) examined Google Classroom in a flipped-classroom approach for vocational English, while Suswanto et al. (2022) compared learning platforms in a discovery-learning context. Their results concern different subjects and designs and should not be transferred directly to fisheries disease-treatment instruction. More broadly, studies on online vocational practical learning highlight the difficulty of translating skill-oriented curricula into remote formats (Roslin et al., 2022; Siddiq et al., 2021). The present intervention is thus best interpreted as support for the cognitive component of vocational learning during an exceptional disruption.

METHOD

Design, setting, and participants

This was a teacher-led classroom action research study at SMK Negeri 1 Tulungagung, East Java, Indonesia. The participants were all 25 students in Grade X APAT-1 enrolled in the productive fisheries

subject during the second semester of the 2021/2022 school year. The manuscript reports implementation during February–April 2022, with Cycle I taking place on 10 February 2022. Two cycles followed planning, action, observation, and reflection. The research did not employ random assignment, a control class, or an independent intervention comparison.

Instructional intervention and data collection

In Cycle I, the teacher prepared a lesson plan, learning materials, a student worksheet (LKPD), observation sheets, and tests. Students accessed the topic of treatment of disease-affected aquatic organisms in Google Classroom, discussed worksheet questions, submitted responses, and received teacher feedback. A 10-item multiple-choice pretest and posttest were delivered through Google Forms; the source indicates that the same items were used before and after instruction. In Cycle II, planning and activities were revised following reflection, with additional prerequisite materials or exercises and continued attention to platform use and connectivity.

Observation sheets were used to record participation and problems encountered when accessing the platform. Although the source includes individual observation ratings, it does not provide a validated observation scale, inter-rater reliability, or an operational definition for each rating category. The analysis therefore uses the documented scores descriptively and does not infer psychometric precision from those ratings.

Outcome definitions and analytical approach

The school minimum competency threshold was 75 points. The prespecified classroom success criterion was that at least 75% of students should attain that score. The primary descriptive outcomes were the number and proportion meeting the threshold and the mean posttest score at the end of each cycle. Percentages were calculated as (number meeting the threshold / 25) × 100. No inferential statistical test was reported or added retrospectively. The source contains conflicting aggregate figures across the abstract, summary tables, and individual score records; these are disclosed rather than silently reconciled.

RESULTS AND DISCUSSION

Changes in reported mastery across the two cycles

The detailed summary tables show that 6 students met the mastery threshold at the first-cycle pretest (24%), 14 met it after Cycle I (56%), and 24 met it after Cycle II (96%). Thus, the reported post-cycle mastery proportion increased by 40 percentage points from Cycle I to Cycle II, exceeding the school's 75% class-level target by the second cycle. Mean posttest scores were reported as 74 and 85, respectively, an

increase of 11 points. These changes are within-cohort descriptive comparisons, not proof that the platform independently caused the improvement.

Table 1. Reported mastery and mean scores across assessments

Assessment point	Students meeting KKM	Mastery (%)	Mean score
Cycle I pretest	6 / 25	24	68
Cycle I posttest	14 / 25	56	74
Cycle II pretest	18 / 25	72	74
Cycle II posttest	24 / 25	96	85

Note. KKM = minimum competency criterion (75). Figures are taken from the detailed result summaries. The source abstract instead states 44% at baseline and 68% in Cycle I; these do not match the detailed summary tables.

The original paper also presents individual test records. Some mastery labels in the first-cycle student table are inconsistent with the stated 75-point threshold, and the reported Cycle I posttest mastery total differs from what some row-level scores would imply. The published aggregate counts are therefore retained as reported rather than reconstructed as if a verified cleaned dataset were available. This discrepancy limits the certainty of the precise improvement magnitude and should be resolved from original grade records before journal submission.

Instructional implementation and reflection

During Cycle I, the teacher posted material, used worksheets to structure discussion, and responded to submitted work. Reflection documented that both teacher and students required time to become familiar with Google Classroom and that unstable internet connectivity sometimes delayed learning. These barriers are consistent with wider findings on emergency remote education, particularly when infrastructure and prior experience are uneven (Almaiah et al., 2020; Ferri et al., 2020; Howard et al., 2021; Kaden, 2020). The teacher nevertheless observed advantages in task visibility, communication, and feedback, which provided a basis for refinement.

Cycle II retained the same general platform while addressing weaknesses identified in Cycle I. Additional prerequisite explanations or practice questions were planned, and the teacher again provided tasks and monitored responses. The source reports that most students participated more actively and that only one student remained below the mastery threshold. Because several elements changed simultaneously—including familiarity with the platform, repeated exposure to the topic, additional practice, and teacher guidance—the observed gains should be attributed to the iterative instructional process as a whole rather than to a single digital feature (Backfisch et al., 2020; Rapanta et al., 2020; Scherer et al., 2021).

Table 2. Classroom action sequence and reflection

Cycle	Instructional emphasis	Observed or reported issue	Reflective response
I	Materials, worksheet discussion, submissions and feedback	Adaptation to the new platform; unstable connectivity	Provide clearer instructions and identify access obstacles
II	Revised materials and prerequisite exercises; continued monitoring	Most reported barriers reduced; some connectivity problems persisted	Continue accessible asynchronous support and targeted follow-up

Note. This table synthesizes the intervention description in the original manuscript; it is not an additional dataset.

Interpretation for vocational education

The results suggest that a low-bandwidth asynchronous learning management system can help organize theory-oriented fisheries instruction when face-to-face practice is disrupted. However, digital content delivery is only one component of vocational competence. Disease recognition, treatment decisions, safety, and practical handling procedures ultimately require assessment through appropriate authentic or supervised tasks. Evidence from vocational learning and digital competence research supports pairing accessible technology with instructional guidance and competency-specific assessment (Antonietti et al., 2022; Roslin et al., 2022; Siddiq et al., 2021; Seufert et al., 2021).

The findings are also consistent with research suggesting that organized learning activities, meaningful teacher presence, and opportunities to respond may matter more than simply uploading materials (Bond et al., 2020; Caskurlu et al., 2020; Martin & Bolliger, 2018; Martin et al., 2020). The study does not isolate which element—feedback, discussion, additional practice, or improved access—was most influential. Future work could compare these components and examine whether knowledge gains translate into observed competence in actual aquatic animal health tasks.

Methodological limitations and data-integrity issues

This study was conducted in a single class of 25 students without a control group or random assignment. Repeated exposure to the same test questions, maturation, teacher attention, and progressive familiarity with the material are plausible alternative explanations for score changes. Test validity, reliability, item difficulty, and observation scoring procedures were not documented in sufficient detail to permit independent appraisal. The available manuscript does not establish whether ethical approval, student assent, or guardian consent was obtained; these details should be clarified in the final submission.

Two internal inconsistencies require explicit attention. First, the abstract reports 44% baseline mastery and 68% mastery in Cycle I, whereas the detailed results summaries give 24% for the Cycle I pretest and 56% for the Cycle I posttest. Second, the individual-level score and pass/fail labels are not fully

aligned with the stated threshold of 75. The final article reports the detailed summary-table values with a clear caveat and does not present an unsupported significance test. Data verification against the original student records is necessary before treating the exact mastery percentages as final.

CONCLUSION AND RECOMMENDATIONS

In this two-cycle classroom action study, Google Classroom-supported instruction in fisheries disease-treatment material was accompanied by an increase in the reported class mastery rate from 56% at the end of Cycle I to 96% at the end of Cycle II, while the reported mean posttest score increased from 74 to 85. The iterative process combined asynchronous materials, worksheet-based discussion, assignment submission, teacher feedback, and reflective adjustment to connectivity and platform-familiarity barriers. These observations support the practical feasibility of structured asynchronous instruction for this vocational class during COVID-19 restrictions, but they do not establish a causal effect of Google Classroom in isolation.

Teachers implementing similar approaches should provide concise task instructions, accessible materials, opportunities for dialogue, and timely feedback while maintaining alternative access arrangements for students with unstable connections. Future evaluations should verify original grade records, use transparent mastery rules and validated assessment tools, document ethical procedures, and include practical competency assessments or a suitable comparison design. The discrepancies identified in the original manuscript should be corrected before formal journal submission.

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