

Data to Decisions in School Agriculture: The RECORD Pathway for Animal and Fish Production

Arjellyn Maddawat

Abstract

Keeping records is commonly presented in elementary agricultural education as the act of writing down dates, animal counts, feed use, growth, mortality, treatments, expenses, and sales. Although these entries are important, copying them into a form does not by itself constitute record literacy. Learners also need to understand why a field is recorded, how observations become comparable, how missing or inconsistent entries weaken interpretation, and how a record supports an accountable decision. This conceptual-pedagogical article analyzes Keeping Updated Records of Growth/Progress on Animal/Fish Raising as an instructional source and develops the Recognize-Establish-Capture-Organize-Review-Decide (RECORD) framework for Grade 6 Technology and Livelihood Education. The framework connects authentic animal and fish production contexts with data literacy, experiential learning, formative assessment, animal welfare, and basic enterprise reasoning. It distinguishes eight record domains: identification, growth and production, feeding, health and treatment, breeding, inventory and movement, mortality and loss, and finance. For each domain, the article specifies a decision purpose and a minimum set of fields. It further proposes a six-stage learning sequence in which pupils recognize the decision a record must inform, establish the animal or group being observed, capture dated and standardized observations, organize entries for retrieval, review patterns and exceptions, and decide on a justified next action. The framework treats paper records as legitimate learning technologies and reserves digital tools for situations in which they improve retrieval, calculation, or feedback. Assessment evidence therefore includes not only completeness but also identity consistency, measurement quality, traceable corrections, interpretation, and decision justification. The article contributes an instructional design method rather than empirical estimates of learner achievement. It offers teachers a disciplined way to transform a record-keeping module into inquiry that integrates agriculture, numeracy, literacy, ethics, and evidence-based decision-making without requiring a commercial farm or advanced software.

Keywords: agricultural education; animal and fish raising; record keeping; data literacy; experiential learning; Grade 6 TLE

Introduction

A farm record is a memory made inspectable. It preserves what was observed, when it occurred, which animal, flock, pond, or production unit was involved, and what action followed. This simple function has consequences for production planning, animal health, food safety, traceability, risk management, and financial control. Farmers who rely only on memory cannot reliably compare periods, reconstruct treatments, explain mortality, calculate feed use, or determine whether an intervention improved performance. The Food and Agriculture Organization describes records as

organized stores of data that can be recalled for analysis and planning, while Kahan (2008) treats farm records as a primary source of historical production and financial information for risk decisions.

The educational value is broader than farm management. When pupils weigh a growing animal, count fish mortalities, record feed issued, or compare expenses and sales, they encounter data as evidence produced by human choices. They must decide what the observation represents, which unit is appropriate, and whether two entries can be compared. Record keeping can therefore connect agricultural work with measurement, numeracy, writing, classification, ethical responsibility, and explanation. These connections are especially valuable in Technology and Livelihood Education because the learning task is practical yet intellectually demanding.

The source module, *Keeping Updated Records of Growth/Progress on Animal/Fish Raising*, introduces Grade 6 learners to identification, milk yield, growth, feeding, health and treatment, breeding, animal history, and financial records (Timbreza, 2022). It uses letters, matching exercises, self-assessment, an essay, and a small-scale chicken record form. The module is consistent with the Department of Education's emphasis on planning, implementing, monitoring, and recording animal and fish raising projects (Department of Education, 2022). Its practical orientation supplies a useful instructional base. A journal contribution, however, requires a focused analytical problem and a transferable method rather than a reproduction of module activities.

The problem addressed here is the gap between record completion and record literacy. A pupil may fill every cell but still be unable to explain why an identifier is needed, whether a weight is plausible, what a blank means, how mortality changes a flock count, or what decision the record supports. Conversely, a short record can be educationally powerful when its fields are coherent and the learner can use them to justify action. The central argument is that agricultural record instruction should be designed backward from decisions, not forward from blank forms.

Purpose of the Article

This article has three objectives: (a) to distinguish mechanical record completion from record literacy; (b) to develop the RECORD framework for age-appropriate animal and fish production records; and (c) to propose assessment evidence that connects accurate entries with interpretation and justified action. The guiding question is: How can a Grade 6 agricultural record-keeping lesson help learners produce, organize, examine, and use evidence while remaining feasible in low-resource school and home settings?

Conceptual-Pedagogical Approach

Instructional Source and Unit of Analysis

The article uses conceptual synthesis and instructional design analysis. Timbreza's module provides the local curriculum context, examples of record types, and a learner-facing production form. Agricultural guidance from FAO and the World Organisation for Animal Health clarifies the management purposes of identification, production, feeding, health, movement, mortality, and financial records. Literature on experiential learning, statistical literacy, representation, feedback, and classroom assessment is used to translate those purposes into teachable actions. No learner sample, intervention dataset, or achievement effect is reported.

The unit of analysis is a record-use episode: a sequence linking a practical question, an identified production unit, a dated observation, an organized entry, an interpretation, and a decision. This unit prevents the record sheet from becoming the endpoint. It also makes the framework applicable to a single household chicken, a small flock, a goat, a fish pond, or a classroom simulation. The scale may change, but the evidence chain remains visible.

From Record Keeping to Record Literacy

Record keeping concerns the creation and preservation of entries. Record literacy adds the ability to judge and use them. It includes understanding that data are not detached facts: an entry has a producer, purpose, unit, time, and context. Statistical literacy similarly requires learners to move beyond reading numbers toward interpreting, evaluating, and communicating claims grounded in data (Gal, 2002; Rumsey, 2002). The GAISE II framework organizes school statistics around asking questions, collecting or considering data, analyzing data, and interpreting results (Bargagliotti et al., 2020). Agricultural records provide a concrete setting for that investigative cycle.

Experiential learning provides a complementary rationale. Agricultural activities become educational when experience is deliberately connected to reflection, concepts, and further action. Knobloch (2003) emphasizes real-life contexts, projects, problem solving, and active explanation; Baker, Robinson, and Kolb (2012) argue that experience requires purposeful teacher guidance, reflection, abstraction, and assessment. Merely feeding an animal or copying a count is activity. Comparing the record with an expectation, explaining a discrepancy, and choosing a next step converts activity into learning.

The Evidence Architecture of a Useful Record

Decision Before Data

A useful record begins with a decision question. 'How much feed was given?' may support inventory control; 'Has the animal gained weight?' may support growth monitoring; 'Which animals received treatment?' may support follow-up and food-safety precautions; 'Did sales exceed recorded costs?' may support enterprise evaluation. The question determines the fields. Asking learners to write everything creates burden without clarity. Asking them to capture the minimum evidence needed for a named decision creates purpose and makes omissions diagnosable.

The principle is consistent with professional guidance. FAO materials link fish-farm monitoring to feeding, fertilization, stocking, transfer, harvesting, and financial decisions. FAO and OIE (2009) connect livestock records with disease investigation, movements, feeding and health changes, treatments, mortality, and traceability. At classroom scale, these purposes should be simplified without being distorted. A Grade 6 record need not imitate a commercial database, but its fields should still form a coherent evidence chain.

Minimum Evidence Fields

Six fields constitute a minimum viable educational record: date or period; animal, group, pond, or project identifier; observation or transaction; unit or category; action or input; and recorder or verifier. Context-specific fields may be added, such as age in weeks, beginning count, feed quantity, body weight, mortality, treatment, expense,

sale, or note. A blank should have an agreed meaning. If nothing occurred, the learner may enter zero or 'none'; if the observation was not made, the learner may enter 'not observed.' This distinction prevents absence of evidence from being mistaken for evidence of absence.

Standardization is equally important. Dates must follow one format; weights must use one unit; group names must remain stable; and corrections must preserve traceability. A learner who changes 2.5 kg to 3.5 kg should not erase the history invisibly. A single line, corrected value, initials, and date model accountability. These routines are modest, but they establish habits needed for later scientific, financial, and administrative records.

Table 1

Record domains, decision purposes, and minimum classroom evidence

Record domain	Decision purpose	Minimum fields	Learner evidence
Identification	Know which animal, group, or pond an entry concerns	ID/name; species or group; location; sex/age when relevant	Uses the same identifier across entries
Growth and production	Judge change over time and readiness for a next stage	Date; age/period; weight, count, yield, or harvest measure; unit	Compares at least two dated measures
Feeding	Plan supply and relate inputs to condition or output	Date; feed type; quantity; unit; group/pond; person	Computes or explains use for a period
Health and treatment	Follow illness, care, response, and referral	ID/group; date; sign observed; action; product/advice; outcome	Separates observation from diagnosis
Breeding	Document mating, birth/hatch, and reproductive outcome	Parents or group; date; event; outcome; offspring count	Links outcome to the correct animals/group
Inventory and movement	Reconcile animals or fish entering, leaving, transferred, or sold	Date; beginning count; additions; removals; ending count; reason	Checks that counts balance
Mortality and loss	Detect unusual loss and trigger investigation or assistance	Date; ID/group; number; observed circumstances; action	Flags a change without inventing a cause
Finance	Compare recorded costs, sales, and basic result	Date; item; quantity; unit price; amount; receipt/source	Shows calculation and distinguishes cash from estimate

The RECORD Framework

RECORD is a six-stage instructional framework: Recognize the purpose; Establish the unit; Capture observations; Organize for retrieval; Review patterns and exceptions; and Decide, document, and improve. The stages are sequential for beginners but recursive in practice. Reviewing a record may reveal that an identifier is ambiguous or a field is missing, sending the learner back to establishment or capture. The framework therefore treats error detection as part of competence rather than as failure.

Recognize the Purpose

The learner states the practical question before receiving a form. A teacher may ask, 'Do we have enough feed for the next seven days?' or 'Is the flock count consistent after additions, sales, and mortality?' The learner then identifies what evidence is necessary. This step guards against decorative data collection and establishes criteria for relevance.

Establish the Unit

The learner defines what is being observed: one named animal, a flock, a cage, a pond, a batch, or a household project. Identification may be physical, such as a tag, or instructional, such as 'Pond A.' What matters is consistent linkage. Professional

traceability systems depend on the ability to connect animals, groups, locations, movements, and events; the same logic can be modeled with simple classroom labels (World Organisation for Animal Health, 2018).

Capture Observations

The learner records an observation or transaction at the appropriate time and with an explicit unit. Capture should distinguish what was seen from what was inferred. 'Fish were swimming slowly near the surface at 8:00 a.m.' is an observation; 'the fish lack oxygen' is a possible explanation that may require adult or technical verification. This distinction supports scientific reasoning and protects animal welfare by discouraging confident but unsupported diagnosis.

Organize for Retrieval

The learner places entries in a stable structure: chronological log, individual card, flock sheet, pond sheet, or transaction record. Multiple representations may support different functions, but they should not require copying without purpose. Ainsworth's (2006) framework reminds educators that representations can complement, constrain, or deepen understanding. A daily log may preserve sequence, while a weekly summary reveals a pattern. The instructional task is to show why each view exists.

Review Patterns and Exceptions

The learner checks completeness, plausibility, change, and inconsistency. Review questions include: Are dates missing? Do units match? Does the ending count reconcile? Is the change gradual or sudden? Which entry requires verification? The goal at Grade 6 is not advanced statistics. It is disciplined comparison, accurate arithmetic, sensible graphical or tabular reading, and recognition that variability and measurement error matter.

Decide, Document, and Improve

The learner proposes a proportionate next action and cites the record. The action may be to continue monitoring, correct an entry, replenish feed, consult an adult, isolate a concern for professional attention, revise a schedule, or calculate a basic result. Decision quality depends on the strength of the evidence and the learner's authority. Pupils should never be asked to prescribe veterinary treatment. They can document signs, report promptly, and explain why responsible assistance is needed.

Table 2

RECORD stages as observable classroom practice

Stage	Learner task	Teacher prompt	Observable evidence	Common error
Recognize	State the decision question	What will this record help someone decide?	Names a specific use	Collecting fields with no purpose
Establish	Define the animal, group, pond, and period	Exactly what does this row represent?	Uses a stable ID and scope	Mixing units or groups
Capture	Enter dated observations with units	What did you observe, measure, or receive?	Separates observation and inference	Undated or unit-free numbers
Organize	Store entries for retrieval and comparison	How will another person find the earlier entry?	Maintains sequence and legibility	Repeated copying or inaccessible sheets
Review	Check, compare, calculate, and flag exceptions	What changed, and what needs verification?	Cites entries and shows arithmetic	Treating every change as a cause
Decide	Choose and document a justified next step	What action follows, and who has authority?	Links evidence, action, and responsibility	Unsupported diagnosis or action

Designing an Age-Appropriate Learning Sequence

Begin With a Bounded Production Problem

A manageable problem is more effective than an encyclopedic form. For a one-week chicken simulation, learners might track beginning birds, additions, mortality, ending birds, and feed issued. For fish, they might track feeding dates, quantity, observed behavior, and a weekly sample measure supplied by the teacher. Home-based projects can use real observations with adult consent; classes without animals can use a consistent fictional dataset. Authenticity comes from the decision structure, not from exposing pupils or animals to unnecessary risk.

Move From Concrete Entry to Representation and Explanation

Instruction can follow a concrete-representational-abstract progression. Learners first observe or handle safe, teacher-provided materials; next they enter a table or plot a simple line; then they explain what the representation suggests. Explicit vocabulary and guided statistical investigation are particularly important for learners who find mathematics difficult (Doabler et al., 2022). The record should therefore use plain labels, model one completed row, and provide verbal prompts for comparison.

The sequence should also include deliberate reflection. Learners can answer three questions: What happened? What evidence supports that statement? What should be done or checked next? These prompts connect experience to abstraction and action. They also prevent the common classroom pattern in which pupils complete a table but never return to use it.

Use Feedback That Improves the Record

Feedback should identify where the evidence chain breaks. 'Incomplete' is less useful than 'The weight has no unit,' 'Pond A and Pond 1 appear to be the same unit but use different names,' or 'The ending count does not equal beginning plus additions minus removals.' Black and Wiliam (1998) place formative assessment in the use of evidence to modify teaching and learning, while Hattie and Timperley (2007) distinguish feedback about goals, current performance, and next steps. A record correction is therefore part of learning when the reason for the correction is visible.

Assess the Evidence Chain

A concise analytic rubric can assess six dimensions: purpose, identity, capture, organization, review, and decision. At an emerging level, a learner fills isolated cells with unclear units or scope. At a developing level, entries are mostly consistent but interpretation depends on prompts. At a proficient level, the learner maintains identifiers and units, checks plausibility, cites entries, and proposes an appropriate next step. At an extending level, the learner explains uncertainty, suggests a useful additional field, or compares two representations. This approach aligns assessment with the framework instead of rewarding handwriting or completion alone.

The teacher may collect evidence from the record sheet, oral explanation, calculation, short reflection, and peer verification. Multiple forms are justified when they reveal different aspects of competence. Shepard (2000) argues for assessment embedded in a learning culture rather than separated from instruction. In RECORD, the same artifact supports practice, feedback, revision, and evaluation.

Ethics, Welfare, and Data Responsibility

Agricultural records concern living animals, household property, health events, and money. Instruction should therefore include responsibility. Learners must not fabricate observations to complete a page, alter figures to make performance appear better, disclose household financial details publicly, or undertake unsafe handling. Teachers should obtain appropriate adult participation for home projects and offer equivalent simulated data when a pupil has no animal-raising context.

Animal welfare sets a boundary on the activity. Observation must not delay care. A serious sign, injury, unusual mortality, or suspected disease should be reported to a responsible adult or qualified professional. The pupil's record can make the report more useful by preserving time, identity, signs, and prior actions, but it does not replace expertise. FAO and OIE (2009) emphasize records as part of tracing and addressing animal-production problems; educational simplification should preserve that accountability.

Paper, Digital Tools, and Low-Resource Feasibility

Paper is not a deficient technology when it is accessible, legible, protected, and regularly reviewed. It may be preferable where devices, power, connectivity, or digital accounts are unreliable. A clipboard, ruled notebook, and weekly summary can support the full RECORD cycle. Digital tools become valuable when they reduce duplicate entry, calculate totals, graph change, validate fields, back up data, or enable timely feedback. The choice should follow the learning purpose and local conditions.

A simple progression is appropriate: first establish sound paper routines; then transfer a clean dataset to a spreadsheet; finally compare the paper log, digital table, and graph. Learners can identify what each representation makes easier and what errors may occur during transfer. This comparison builds data literacy and discourages the assumption that a digital record is automatically accurate.

Discussion

The Record as a Boundary Object

A well-designed production record connects several domains without collapsing them. In agriculture it supports monitoring; in mathematics it gives quantities and change; in language it demands precise labels and explanations; in science it distinguishes observation from inference; in entrepreneurship it links inputs, outputs, and basic financial reasoning; and in ethics it makes responsibility traceable. The same sheet can therefore coordinate interdisciplinary learning while keeping a concrete purpose.

This coordination is strongest when every field earns its place. Large forms often simulate professionalism while overwhelming beginners. RECORD instead favors progressive complexity. Once pupils can maintain identity, date, measure, and decision purpose, additional fields can be introduced because a new question requires them. This design respects cognitive demand and reflects FAO guidance that record systems should be appropriate to the farm and used consistently rather than elaborate but neglected.

Implications for Teachers and Curriculum Developers

Teachers can use the framework to revise existing module activities without discarding them. A matching exercise can become a decision-mapping task; the self-rating checklist can be replaced or supplemented by evidence from an actual record; the chicken table can begin with a defined question and reconciliation formula; and the essay can require citation of specific entries. Curriculum developers can align competencies with observable record-use episodes rather than with generic statements about importance.

The framework also suggests a more defensible distinction between knowledge and performance. Naming eight record types shows conceptual recognition. Completing a coherent record demonstrates production. Explaining a pattern demonstrates interpretation. Selecting an appropriate next step demonstrates use. A journal or curriculum claim about mastery should specify which level was assessed.

Research Agenda

The RECORD framework can be examined through design-based classroom research, rubric validation, and comparative instructional studies. Researchers could investigate which stage is most difficult for Grade 6 learners, whether decision-first prompts improve completeness and interpretation, how home and simulated projects differ, and whether paper-to-spreadsheet transfer strengthens or fragments understanding. Studies should report the actual record tasks, scoring criteria, teacher support, and animal or simulation context so results can be interpreted and replicated.

Further work may examine language accessibility, Indigenous and local production knowledge, household privacy, teacher confidence, and the feasibility of record routines in multigrade or low-connectivity settings. The framework is intended as a testable design proposition. Its value will depend on transparent classroom evidence rather than on the attractiveness of the acronym.

Conclusion

Teaching pupils to keep animal and fish production records should not end when every cell is filled. A record becomes educationally and practically useful when its purpose is clear, its unit is identifiable, its observations are dated and standardized, its entries can be retrieved, its patterns are reviewed, and its evidence supports a responsible decision. The RECORD framework organizes these requirements into six teachable stages: Recognize, Establish, Capture, Organize, Review, and Decide.

Applied to Grade 6 Technology and Livelihood Education, the framework converts record keeping into record literacy. It preserves the source module's practical concern with growth, feeding, health, breeding, history, and finance while adding an explicit evidence chain, age-appropriate assessment, welfare safeguards, and low-resource implementation choices. The result is not merely a better form. It is a method for helping learners understand that trustworthy decisions begin with records whose meaning, quality, and responsibility can be explained.

References

- Ainsworth, S. (2006). DeFT: A conceptual framework for considering learning with multiple representations. *Learning and Instruction*, 16(3), 183-198. <https://doi.org/10.1016/j.learninstruc.2006.03.001>
- Baker, M. A., Robinson, J. S., & Kolb, D. A. (2012). Aligning Kolb's experiential learning theory with a comprehensive agricultural education model. *Journal of Agricultural Education*, 53(4), 1-16. <https://doi.org/10.5032/jae.2012.04001>
- Bargagliotti, A., Franklin, C., Arnold, P., Gould, R., Johnson, S., Perez, L., & Spangler, D. A. (2020). Pre-K-12 guidelines for assessment and instruction in statistics education II (GAISE II). American Statistical Association and National Council of Teachers of Mathematics.
- Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), 7-74. <https://doi.org/10.1080/0969595980050102>
- Department of Education. (2022). Self-learning module - Quarter 0 - TLE - Agri-Fisheries Arts: Grade 6, Modules 1-15. DepEd Learning Resource Portal. <https://lrmds.deped.gov.ph/detail/20984>
- Doabler, C. T., Clarke, B., Kosty, D., Sutherland, M., Turtura, J. E., Firestone, A. R., Brott, P., Brafford, T. L., Fien, N. J., Smolkowski, K., & Jungjohann, K. (2022). Promoting understanding of measurement and statistical investigation among second-grade students with mathematics difficulties. *Journal of Educational Psychology*, 114(3), 560-575. <https://doi.org/10.1037/edu0000711>
- Food and Agriculture Organization. (n.d.). Management for freshwater fish culture: Monitoring, record keeping, accounting and marketing. https://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6709e/x6709e16.htm
- Food and Agriculture Organization, & World Organisation for Animal Health. (2009). Guide to good farming practices for animal production food safety. https://www.woah.org/fileadmin/Home/eng/Food_Safety/docs/pdf/GGFP.pdf
- Gal, I. (2002). Adults' statistical literacy: Meanings, components, responsibilities. *International Statistical Review*, 70(1), 1-25. <https://doi.org/10.1111/j.1751-5823.2002.tb00336.x>
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112. <https://doi.org/10.3102/003465430298487>
- Kahan, D. (2008). Managing risk in farming. Food and Agriculture Organization of the United Nations. <https://www.fao.org/4/i0412e/i0412e.pdf>
- Knobloch, N. A. (2003). Is experiential learning authentic? *Journal of Agricultural Education*, 44(4), 22-34. <https://doi.org/10.5032/jae.2003.04022>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Roberts, T. G. (2006). A philosophical examination of experiential learning theory for agricultural educators. *Journal of Agricultural Education*, 47(1), 17-29. <https://doi.org/10.5032/jae.2006.01017>
- Rumsey, D. J. (2002). Statistical literacy as a goal for introductory statistics courses. *Journal of Statistics Education*, 10(3). <https://doi.org/10.1080/10691898.2002.11910678>
- Shepard, L. A. (2000). The role of assessment in a learning culture. *Educational Researcher*, 29(7), 4-14. <https://doi.org/10.3102/0013189X029007004>
- Sonaiya, E. B., & Swan, S. E. J. (2004). *Small-scale poultry production: Technical guide*. Food and Agriculture Organization of the United Nations.
- Timbreza, J. P. (2022). Keeping updated records of growth/progress on animal/fish raising [Grade 6 Technology and Livelihood Education module].
- World Organisation for Animal Health. (2018). Design and implementation of identification systems to achieve animal traceability. *Terrestrial Animal Health Code, Chapter 4.2*. https://www.woah.org/fileadmin/Home/eng/Health_standards/tahc/2018/en_chapitre_ident_design.htm