JOURNAL LA EDUSCI

VOL. 06, ISSUE 02 (284-307), 2025
DOI: 10.37899/journallaedusci.v6i2.2244

Development of Teaching Materials and Harmonized Semester Learning Plan for the Aircraft Basic Workshop Theory Course through Learner-Centered Instructional Design in Indonesian Aviation Polytechnics

Mulyadi Nur[1], Fatmawati Sabur[1]

[1]*Makassar Aviation Polytechnic*

**Corresponding Author: Mulyadi Nur*
Email: mulyadi.nur@poltekbangmakassar.ac.id

Article Info

Article history:
Received 20 May 2025
Received in revised form 21 June 2025
Accepted 8 July 2025

Keywords:
Harmonization
Learning
Aircraft Basic
Workshop Theory

Abstract

This paper meets the on-going challenge of gaps in the training of Aircraft Basic Workshop Theory course as part of Indonesian aviation polytechnic that seeks to develop an organized competency-based teaching material and integrated RPS (Rencanna Pembelajaran Semester). By using both a Research and Development (R&D) structure borrowed on the 4D model-Define, Design, Develop, and Disseminate and a qualitative (1W) section, the research will combine the validation of stakeholders with the query of the learners to evidence that the pedagogy is relevant and the implementation is possible within the institution. Primary data were collected using the analysis of the curriculum, the consultation of experts, and instrumentation based on the cadets, such as structured questionnaire and semi-structured interviews of Surabaya and Makassar Aviation Polytechnics. Define and Design phase findings showed severe shortage between the formal curriculum requirements and course delivery that involved lack of sequencing of learners; Matching words to learning outcomes and provision of instructional support materials. The created teaching unit and updated RPS has been directly targeting these shortcomings by providing a weekly structure of goals, procedures, and evaluations based on national standards of competencies. At the Disseminate step, the institutional review verified that the instructional tools were usable, adaptable and had systemic worth in various campuses. Above all, acute learner disenfranchisement was identified by the 1W component: cadets claimed that there was a significant level of confusion, the absence of instructional structure, and procedure uncertainty in workshop learning settings.

Introduction

The fancy dynamic industrial and technological development in the world today needs agile, competent and very highly skilled human resources which has become the pillar block of national development. It is thus a burning need among the institutions of higher education (especially those in vocational and technical areas) that they match and fine-tune their teaching pedagogy and curriculum models to fit in the changing needs of the international workforce. (Duron, 2006; Hidayat, 2009). The curriculum as the core of this adaptation is considered not only a guide to instruction but also an instrument of implementing the institutional vision and attaining the expectations of society (Fujiawati, 2016; Julaeha, 2019; Pak et al., 2020). Strong curriculum goes beyond the enumeration of the course material, as Dahar (2011) points out, strong curriculum is associated with the philosophical, pedagogical and operational stake of an institution to create knowledgeable learners, the ones that are critical thinkers, virtuous practitioners and technically competent operators in their respective vocations.

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Such alignment is even more important in the Indonesian vocational aviation education. Other similar institutions specialized in aviation of the country such as the Makassar Aviation Polytechnic are placed in the centralized lead of Center of Human Resource Development in Air Transportation (PPSDMPU) who in turn acts under the Ministry of Transportation. This ranking pattern was created keeping in mind to enhance the standardization of curricula and guarantee the quality of different Technical Implementation Units (UPTs) within the country. But whereas the macro-curriculum is centrally provided, the micro-level interpretation thereof especially in the development of Semester Learning Plans (RPS) is sometimes left to the lecturer or program coordinators. Although certain flexibility is supported in such decentralization, it has resulted in a great deal of fragmentation and inconsistencies when it comes to course implementation among institutions (Endah & Hendrastomo, 2017; Huda et al., 2013).

An outstanding case of the problem could be identified in the Aircraft Basic Workshop Theory course, which is supposedly a foundational technical course in all Diploma III aviation programmes. Although it is based on the same syllabus, this course is implemented differently in different UPTs including the Makassar Aviation Polytechnic, Surabaya Aviation Polytechnic and Indonesian Aviation Polytechnic Curug (PPIC). Difference among Aircraft Basic Workshop Theory courses cannot be neglected as random; instead, they represent inherent pressure in terms of teaching control, resource distribution, and academic freedom (Lilawati, 2017). Lack of consistent teaching resources and reference modules has been seen producing varying interpretations of the course objectives, discontinuous learning delivery methods, and, as a logical result, unequal performance achievements among students--the trend which threatens to undermine the national vision of the same-level production of aviation graduates (Anwar, 2009; Anggraini et al., 2020).

Moreover, these challenges are enhanced by the fact that the curriculum uses subjective experience of lecturers, as well as the unsystematic application of the PowerPoint presentations instead of the standard textbooks, interactive media, or thorough assessment tools. Eryilmaz, Yildiz and Akin (2011) found a direct correlation between teaching resources, their quality and structure, and student engagement and learning outcome in technical subjects. Erroneously created or variable materials spawn mental overload, superficial knowledge, and inadequacies in movable abilities. Consistent with such results, Depdiknas (2008) claims that learning materials should be designed keeping clear purpose in mind, built-in formative assessment, directed activities and media (e.g. visual diagrams, audio-visual devices, simulations) to truly engage in active learning and student agency.

In turn, the work will solve an urgent pedagogical problem of creating standardized teaching materials in a specific environment, establishing its foundation on top of the national course of study and on the providing of programming instruction on the materials provided. Based on the 4D model of development: Define, Design, Develop, and Disseminate augmented with qualitative (1W) data on interviews, the study has made use of a systematic evidence-based and user-informed process of instructional design (Djamarah & Zain, 2002; Irawati & Saifuddin, 2018). Now in the modern context of post-secondary education in Indonesia a methodological paradigm has been instituted and developed which has enabled a formation of technically adept learning modules and in the process tackles the epistemic dissonance that usually arises when there is a centrally specified curriculum being employed at the time in contrast to locally enacted pedagogical constructs. By so doing, the framework conforms to national and international trends in competency-based technical education, shifts the focus away but not lost to the content coverage to measureable student outcomes, and transparently focuses workforce alignment. At the same time, this initiative is a direct reply to the directive

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

of the Indonesian Ministry of Education that orders higher education institutions to generate graduates who are prepared to work, learn and innovate. Through offering aviation cadets standardized and pedagogically inflexible teaching tools, the research increases their readiness to work in truly practical aircraft maintenance settings, as well as cross-college evaluations and accreditation requirements.

The framework also supports a wider garnering of equity in education whereby irrespective of the polytechnic institution through which a cadet will be awarded a degree, he/she will enjoy equal core knowledge, learning outcome and pathways to achieve skills. The proposed practice of the harmonized module is pictured as an exemplary model which can be replicated in other courses in the aviation polytechnics toward building of instruction excellence and consistency in systems. With this, this research supports the moral dimensions of educators, which is to offer inclusive and high-quality learning experiences to all learners, regardless of geographic or institutional diversity (Dewi, 2018; Hidayat, 2009).

Methods

The methodology of the project was a research and development (R&D) direction depending on the modified scheme of 4D instructional design presented by Rizki et al. (2016) and then changed to modern vocational and technical conditions. The current research study aimed at achieving the highest levels of contextual relevance as well as authenticity during the establishment of teaching resources in relation to the Aircraft Basic Workshop Theory subject in Makassar Aviation Polytechnic. To this extent, an element of qualitative data, namely, interview data collected among the faculty and other stakeholders, has been introduced into an expanded design framework, providing a 4D+1W (model) architecture. This multimethodological approach ensured that the compendium of learning resources that were produced were not only reflective of accepted principles of instructional design but also an accurate representation of what the experience and practical worldviews of participants within the Makassar Aviation Polytechnic community.

The define stage became the first phase of the project. In this case, a thorough needs analysis play was conducted to define a gap between the required curriculum established by the PPSDMPU (Center for Human Resource Development for Air Transportation) and the practice of instruction conducted at UPTs, especially, in the course of Aircraft Basic Workshop Theory. Appropriate artifacts were reviewed; national syllabus, institutional RPS (Semester Learning Plans), and available curriculum guidebooks of the three UPTs under study, i.e., Makassar Aviation Polytechnic, Surabaya Aviation Polytechnic, and Indonesian Aviation Polytechnic Curug (PPIC) were reviewed. Particular focus was given to determine the extent to which there was a congruence between current classroom delivery, assessment programs, and students experience, and the CPMK (learning outcomes) envisioned by BPSDMP. The analytical results showed that the lack of consistency in respect of resource standards had contributed to delineable differences across institutions in the sequencing of the content, use of media and pedagogical and assessment approach.

Having identified the problem, Design stage worked on the development of the initial framework of the offered instructional materials. The decisions made at this step related to the arrangement of contents, proper choice of media types (e.g., text, illustrations, diagrams), and insertion of the formative assessments correlated to the syllabus. The instructional design was to be competency-based in that each unit or module had clearly stated course learning outcome reference. The basics of the best practices in prior studies on the development of instructional material (Depdiknas, 2008; Huda et al., 2013) were examined and some were incorporated in

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

selective manner to enable pedagogical rigor. At the same time a written reference procedural sequencer (RPS) was worked on as a logical guide to semester-long instruction.

The first design was also developed into a full prototype in Develop stage. The lesson plan of the course Aircraft Basic Workshop Theory provided the detailed sections of the content, demonstrative illustrations, working flow models, training exercises, and a built-in system of formative assessment. Iterative validation of the relevance and effectiveness of the prototype was done by consulting subject-matter experts (SMEs) in the aviation-maintenance industry, senior course teachers and curriculum developers based at the Makassar and Surabaya polytechnics. The opinions were used to refine the content, correct temporal sequencing and clarify pictorial and procedure physicality. Practice exercises were likewise test-run on cadet groups on controlled situations; reactionary remarks from the practice participants were sourced out and incorporated in later updates.

These were followed by further propagation efforts which focused on the further spreading of the end product and its instructional mechanisms. The learning content and RPS would be presented to the interested parties in the three UPTs in an organized academic session that allowed free discussion and collaborative evaluation. In as much as these dissemination activities helped pilot the use of the resources, they helped in the cross-UPT discussion that contributed in the harmonization of the curriculums. While full-scale implementation remains beyond the scope of this initial development study, the dissemination phase served as a strategic entry point for institutional buy-in and future adoption.

Complementing the 4D model, the 1W component (interview) played a pivotal role in contextualizing the development process. Semi-structured interviews were conducted with lecturers responsible for teaching the *Aircraft Basic Workshop Theory* course, curriculum coordinators, and select cadets who had completed the course. These interviews captured nuanced perspectives regarding instructional challenges, material constraints, and pedagogical preferences. The qualitative data collected were thematically analyzed to identify recurring issues and inform the instructional content design. This bottom-up approach ensured that the final product addressed the real needs of end-users, thereby enhancing its relevance, usability, and sustainability.

Results and Discussion

Define Phase

The given research started with a critical review of the existing program framework, actually still implemented by the Center of Human Resource Development in Air Transportation (PPSDMPU) and determining the teaching policy and academic orientation related to all Diploma III courses in the specialisation Aircraft Maintenance Technology (TPPU). This preliminary stage was quite necessary in identifying the differences between the instructional design and implementations between the three aviation polytechnics: Curug, Surabaya, and Makassar. The resultant effect of this has been the understanding that, though the macro-level curriculum may be prescribed in a standard manner, the operational translation of the same into the classroom differs very broadly, not just by magnitude, or orientation, but often by the choice of pedagogical mechanisms.

Specifically, the TPPU program is crafted in such a way that it incorporates theoretic learning and practical experience in a balanced manner. This is declared by the fact that in the national curriculum guidebook, every course is marked with the size of credits and the number of contact hours allocated to theory instruction in the classroom and lab practice. In this context the Aircraft Basic Workshop Theory course comes in the early stages in the academic journey

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

of the cadets and serves as the stepping point to other technical skills. It does not just limit its intentions to the introduction of certain tools, safety procedures but also aims at shaping a judgmental and procedural approach to operations that has to be transferred to higher courses. This positioning is represented in the curriculum map.

However, upon further review of the framework, a large gap was realized, in that, whilst the Aircraft Basic Workshop Theory course has been clearly defined, with a respective credit weight and hours associated with it, it still lacks an RPS (Semester Learning Plan) being attached to such module. This has forced many instructors to come up with their own interpretation as to the pedagogical content of the course hence leading to different approaches as to instruction hence leading to a lack of alignment in the curriculum.This is in stark contrast to other courses, such as *Technical Drawing*, which are accompanied by full RPS templates. The absence of an RPS for *Aircraft Basic Workshop Theory* is not a minor administrative gap—it constitutes a deep structural flaw. In the context of competency-based education, the RPS is not simply a bureaucratic formality; it serves as the primary instructional roadmap that connects curricular goals to daily learning activities, assessment tasks, and instructional materials. Without it, the interpretation and delivery of the course become heavily dependent on individual instructors' backgrounds, preferences, and resource availability.

To further understand how this macro-curricular ambiguity affects implementation at the ground level, the researcher examined the official distribution of course loads in the fourth semester, where *Aircraft Basic Workshop Theory* is taught.

Table 1. Semester IV Course Distribution – TPPU Diploma III

No.	Course Name	Credit Hours (SKS)	Theory (Hours)	Practice (Hours)
1	Aircraft Basic Workshop Theory	3	2	2
2	Aircraft Electrical and Instrumentation	3	2	2
3	Aircraft Structures	3	2	2
4	Aerodynamics and Aircraft Performance	2	2	0
5	Aircraft Maintenance Documentation	2	2	0
6	Aviation English IV	2	2	0
7	Hangar Practice	3	0	4

The table reaffirms the significant placement of *Aircraft Basic Workshop Theory*, which carries three credits—equivalent to or exceeding many other technical subjects—and includes a balance of two hours of theory and two hours of practice per week. On paper, this affirms the course's importance. However, the absence of structured pedagogical tools reveals a disconnect between the course's formal presence in the curriculum and its actual instructional planning. Without a standardized RPS or materials, the credit hour allocation lacks instructional integrity. The time is assigned, but what is taught, how it is taught, and how student learning is measured are all left to fragmented interpretation.

Recognizing this institutional vulnerability, the study then turned to how different UPTs were operationalizing the same course under these ambiguous conditions. Three RPS documents were collected—from the Indonesian Aviation Polytechnic Curug (PPIC), the Surabaya Aviation Polytechnic, and the Makassar Aviation Polytechnic. These were reconstructed for consistency and analysis. The first document, from PPIC, presents a relatively structured and process-focused approach.

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Table 2. RPS – Indonesian Aviation Polytechnic Curug (PPIC)

Topic	Learning Activities	Method	Assessment Method
Safety Regulations	Lecture and Q&A	Multimedia Lecture	Written Quiz
Tool Identification	Practical Demonstration	Lab-Based Practice	Observation Checklist
Maintenance Documentation	Guided Exercise	Workshop Simulation	Structured Report

In this table, PPIC outlines three main components: safety regulations, tool identification, and maintenance documentation. These are taught through a combination of lectures, practical demonstrations, and guided exercises, with assessments using quizzes, observation sheets, and structured workshop reports. At first glance, this suggests a well-rounded RPS with a clear procedural foundation. However, deeper examination reveals that it lacks curriculum-theory integration and reference standards. The RPS does not specify any student learning materials, textbooks, or rubrics. It assumes that instructors know what to teach and how to assess it, even though no framework is provided. Thus, while the document looks organized, it remains pedagogically shallow and susceptible to uneven implementation. It promotes procedural clarity without ensuring epistemic depth or instructional transparency.

The second RPS, from Surabaya Aviation Polytechnic, introduces a markedly different instructional philosophy. Surabaya adopts a more student-centered approach that emphasizes active participation, group learning, and scenario-based engagement.

Table 3. RPS – Surabaya Aviation Polytechnic

Topic	Learning Activities	Method	Assessment Method
Aircraft Jacking Procedures	Instructor Demo + Practice	Simulation-Based Lab	Practical Score Sheet
Tool Tagging and Labelling	Group Activity + Role Play	Cooperative Learning	Peer Assessment
Maintenance Log Completion	Interactive Workshop	Case-Based Learning	Portfolio Submission

The emphasis here is on experiential learning—students are expected to practice aircraft jacking techniques, simulate safety procedures, and work collaboratively on maintenance documentation.

The strength of this model lies in its interactivity; it fosters critical thinking, communication skills, and practical readiness. However, the critical weakness is its lack of formal structure. The instructional content is not scaffolded through standardized materials. There is no clear alignment with national curriculum outcomes, and the use of peer assessments, while potentially enriching, raises concerns about evaluation validity and fairness. In the absence of rubrics and standardized references, assessment results could be more reflective of student relationships than actual performance. Thus, although Surabaya's RPS appears innovative, it is at risk of being pedagogically inconsistent and difficult to scale or replicate across campuses.

The readings of three writings of Makassar UPTs through the RPS is highly traditionalist, that is, the teacher presents in exposition and the final form of the evaluation of knowledge. Such orientation establishes an orderly classroom environment where the instructor has the control

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

concerning instruction. Such an arrangement provides very little opportunities to develop higher order thinking and procedural independence although the same arrangement is beneficial in disseminating information. The use of multiple-choice testing in a workshop-based subject is an indication of a misalignment between the test form of such learning outcome and the ability to recall facts and concepts rather than apply or diagnostic-reason.

Table 4. RPS – Makassar Aviation Polytechnic

Topic	Learning Activities	Method	Assessment Method
Workshop Safety Protocols	Lecture and Notes	Direct Teaching	Multiple Choice Exam
Introduction to Workshop Tools	Instructor Explanation	Board-Based Delivery	Short Essay
Basic Disassembly Skills	Demonstration	Supervised Practice	Instructor Evaluation

The second RPS under consideration is based on Makassar Aviation Polytechnic. This scheme represents more traditional instructor-centered orientation. Teaching is accomplished by the use of whiteboard talks, board elucidations and one-on-one administration. The evaluation tools include multiple-choice assessments, short-answer papers and scores by instructors. Though the plan provides consistency, stability, and predictability by following a specific timetable and being subjected to instructor control, it also proves the limitations of a transmissive pedagogy of a skill-based field. Active learning, critical thought and adaptive skill learning are given scarce specialty. In addition, like the other two RPS documents, there is no mentioned teaching material or student reference guide and thus, delivery of the content is vulnerable to personal judgment.

The comparative reflection between the three documents makes it clear to both diversity in instruction and curricular drift. Where the three UPTs fall under the same policy authority, and also under the same course, their interpretation differs radically, both structurally and pedagogically. Such mismatch discredits one of the main aims of the curriculum harmonization process the assurance that diverse students master comparable skills and that all of them achieve standards and requirements in the field of national professionalism. The line of inquiry goes past the achievements of the learning to the integrity of the learning process itself.

The lack of common teaching resources, RPS templates, and common assessment systems signify the fact that the educational system is poorly organized, and the macro policy does not take effect in practice. It exerts unreasonable demands on lecturers, many of which are required to create their own resources, set their own goals and develop their own evaluation strategies, none of which are coordinated, trained or managed. This creates inequalities in learning to the students. A cadet in Surabaya can walk out with a completely different set of skills and knowledge organization and procedural culture to the cadet of Makassar or Curug- although both of them have been on the same course under the same national curriculum. It presents both an instructional problem and a policy failure, which has ramifications in preparation of the workforce, in the standardization of licensing, and in quality assurance.

These results of the Define stage obviously explain why this study is required. They show the necessity of developing an harmonized RPS and teaching component which will ensure the instructional structure as well as the pedagogical coherence. This project aims at filling the disjunction between the interventions in policy-making and their implementation in the educational process in Indonesian aviation polytechnics by creating materials based on the

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

official syllabus yet flexible enough to be used in the classroom to transfer the essence of the curriculum content to the actual experience that cadets in Indonesian aviation polytechnics would have during the educational process.

Design Phase

After identifying major gaps in implementation of the aircraft basic workshop theory course curriculum, in different aviation polytechnics in Indonesia at the Define phase, the next most important stage of the research was Design phase. At this step, it was supposed to transform the diagnostic experience into a pedagogically sound instructional design by creating a synergized Semester Learning Plan (RPS) and the supporting system of teaching materials. The idea was not only to make content delivery uniform, but to establish a learning tool to fill the gap between the syllabus intention and what happens in the classroom (and still be within the concept of competency-based education).

The design process began with a careful interpretive alignment of the official syllabus issued by PPSDMPU. This document, although unified across UPTs, had suffered from fragmented operationalization due to its open-ended delivery mechanisms and the lack of centralized instructional instruments. As a result, instructors were left to interpret the syllabus in ways that reflected personal teaching philosophies rather than institutional consensus. Recognizing this, the study took the syllabus not as a fixed template but as a conceptual anchor, ensuring that the proposed RPS would honor its core objectives while operationalizing them into coherent, week-by-week instructional sequences, activities, and assessments.

Key elements were integrated into the proposed RPS design. These included clear topic sequencing, learning objectives aligned with Course Learning Outcomes (CPMK), pedagogical methods selected for suitability to practical-technical learning, and multi-dimensional assessments. The emphasis was placed on functional learning—making sure that each learning objective was not only understood theoretically but also practiced, evaluated, and reinforced in a way that reflected real-world aircraft maintenance operations. The structure also considered scaffolding: foundational concepts were introduced early in the semester, and more complex procedural skills followed in a logical learning arc.

Table 5. Author's Proposed RPS – Aircraft Basic Workshop Theory

Week	Topic	Learning Objectives	Learning Activities	Methods	Assessment Method
1	Introduction to Workshop Safety	Understand safety symbols, PPE use, and emergency procedures	Interactive lecture, video demo	Multimedia + Discussion	Quiz, oral Q&A
2	Identification of Workshop Tools	Identify names, functions, and specifications of basic maintenance tools	Hands-on tool identification	Lab practice	Practical performance
3	Tool Usage and Calibration	Use torque wrenches, calipers, and	Guided practice	Demonstration	Observation checklist

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

		multimeters accurately			
4	Aircraft Jacking and Support	Explain jacking points and execute lifting procedures	Simulation and supervised task	Group simulation	Instructor evaluation
5	Safety Tagging and Lock-out Steps	Apply aircraft component tagging protocols	Practice with actual aircraft parts	Role play	Peer assessment, rubric
6	Maintenance Documentation Basics	Fill out inspection forms and maintenance logs	Workshop log entry and review	Guided writing	Portfolio-based evaluation
7	Disassembly Procedures	Safely disassemble simple aircraft components	Workshop session	Instructor-led practice	Practical test, observation
8	Mid-Semester Formative Assessment	Evaluate comprehensive procedural knowledge and tool skills	Review, remediation, assessment	Diagnostic testing	Written test + practice score

The proposed RPS has a number of innovations, which will address the issues of the current system at the very core. First, it fills the situation with broken teaching delivery through standardisation of the weekly content and synchronisation with the syllabus and CPMK. Unlike the previous RPS samples which were both idiosyncratic and inconsistent this RPS produces a coherent pattern of instructional pacing that can be followed by lecturers without compromising pedagogic richness. It also clearly states learning objectives that are precise, observable and competency driven-which has been neither adequately stated nor clear in the earlier RPS documents.

Second, the format of the learning activities is learner-centered and multimodal incorporating the aspects of the lecture, simulation, and hands-on practices. The proposed RPS incorporates the integration of video demonstration, role plays, and point-of-care guided practice through the use of literal tools understanding that technical mastery cannot be acquired through descriptive talk only. It is based on the findings of constructivist approach to learning and finds that the students have a better time internalizing procedural competence into their heads when they are put into situated learning experiences that are more responsive to complexity of the actual world. The strategy does not have the flaws of chalk and talk models (as exhibited in the Makassar RPS) and also avoids the unstructured openness of peer-intensive designs (such is the case of the Surabaya model).

Third, the assessment system in the proposed RPS focuses on both the formative and summative aspect. Radically different assessments are used other than assessments in form of quizzes or instructor scoring, assessments are in form of checklists, performance rubrics or portfolios and peer assessment. The tools are not arbitrarily allocated and are allocated on the basis of the kind of the learning outcome they are intended to measure. As an example, practical work with the tools is evaluated with the help of observation checklists, whereas desk tasks are evaluated using portfolios. This provides validity of assessment, that is, the approach is appropriate to the learning objective and promotes accuracy and disclosure in evaluation.

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Fourth, the weekly paradigm incorporates feedbacks and continuance of progression. Weekly goals are also connected with the results of the previous session, creating a lesson path leading to the development of cognitive and psychomotor skills. As an illustration, the identification of tools in Week 2 will easily flow into the calibration of the tools in Week 3. Week 4 develops a muscle memory that is necessitated by the safety tagging of Week 5. Such vertical integration is missing in the existing RPS documents because the topics could be switched and it could seem that the topic sequencing was random or fragmented.

Fifth, scarcity of materials has always been a vexing issue that the proposed RPS will take care of. Whereas the previous examples of RPS did not contain references to any instructional media or student resources, the new model should be introduced together with a teaching module that is yet to be created in the following step. This module would entail visual aids, charts and practice cases in line with the weekly topic. The end result in such efforts is to ensure not only consistency in the instructional design but to be able to reproduce and scale the same to all UPTs and hence, making it viable in terms of national harmonization.

Crucially this design is not supposed to be a hard and fast prescription. Instead, it is a scaffolded instructional prototype, one that individual instructors can modify but still remain at the center with national standards. The model has flexibility introduced in it, by not prescribing a set of steps, but by recommending methods which can be used, and by providing a range of assessment options to be used in assessing each outcome, without making these choices disrupt the coherence. This compatibility of standardization and customization enshrined in the design period preconditions the future successful adoption of the concept across aviation polytechnics with their varied instructional cultures and available resources.

As an enhancement to the instructional design, it was not sufficient to just build an activity-based RPS in sequential fashion. To ensure curricular alignment and institutional coherence, the RPS was further mapped to the expected graduate profiles and learning achievement descriptors defined by the BPSDMPU and internal quality assurance frameworks. This step served to verify that the newly proposed learning design would contribute meaningfully to the broader educational mission of the aviation polytechnic system, particularly in shaping graduates who are not only technically competent but also procedurally disciplined and safety-oriented in real-world contexts.

Table 6. Graduate Profile and Learning Achievement Mapping for TPPU Diploma III

Graduate Profile	Learning Outcome Category	Indicators of Achievement
Aviation Maintenance Technician	Cognitive (Knowledge)	Understands aircraft maintenance procedures, safety standards, and tool usage theory
Operational Safety Adherent	Psychomotor (Skills)	Demonstrates correct use of tools and equipment; performs maintenance procedures with precision and safety
Document and Compliance Executor	Affective (Attitude)	Shows commitment to procedural discipline, accurate documentation, and regulatory compliance
Team-Based Problem Solver	Collaborative Competence	Participates effectively in group tasks, role-based simulations, and maintenance coordination

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Life-Long Learner in Aviation Technologies	Reflective Learning	Demonstrates self-assessment ability, improvement tracking, and openness to continuous learning

Such a table is very central in making sure that the instructional product created in the context of this study does not only operate in the operational level (i.e., weekly lesson planning), but is also in line with the strategic educational goals of the aviation polytechnic system. The mapping indicates the distinct interpolation among teaching strategies, mode of assessment and institutional aspirations.

Cognitively, the design also aims at ingraining important knowledge areas, including safety procedures, equipment calibration, and technical documentation into cadets by tapping into lectures, simulations, and directed writing. The RPS focuses on sequential presentation of the content following the pattern of understanding to application as opposed to the disintegrated delivery as it occurred in the previous RPSs in Curug, Surabaya, and Makassar regions. Under psychomotor domain, the suggested RPS incorporates the repetitive, systematic training in laboratory settings, where students work on actual instruments with guidance. This practice would mean development of manual competency in a systematic form as opposed to the presupposed or a chance exposure. This can be achieved through assessment checklists and instructor assessment tools and this helps in giving a defense way of determining competency.

The affective dimension, one frequently ignored because of lack of development in the technical curricula, is used intentionally because of the shape of the task. The maintenance documentation, paperwork, and simulations to role-based functions are applied not only to entrench the knowledge but to inspire the discipline of procedure and adherence to responsibility. Incorporation of these values into the assessment customs, e.g., portfolio reviews and group performance assessment, the RPS helps students to conceptualize compliance as a painstaking part of professional identity, rather than as any administrative burden.

In addition the RPS also teaches collaborative competency invoking cooperative learning techniques and the collective responsibility of the task. On exercises based on the simulation of aircraft maintenance teams, the cadets are taught to work within hierarchical structures, to communicate rapidly under pressure and organize flows of tasks, which is important in aviation settings, where miscommunication may be fatal. Lastly, reflective learning activities also prompt cadets to keep track of their progress, single out weak areas, and explain how they would improve the situation. The above aspects play a fundamental role in the aviation polytechnic graduate vision of a life-long learner; i.e., an individual who can cope with the fast-changing technological setups and the regulatory regime.

Having all these graduate attributes incorporated into the instructional design, the proposed RPS and its supporting module will make sure that teaching Aircraft Basic Workshop Theory is no more an isolated course but the process that will fit into a greater developmental arc in the process of forming aviation maintenance professionals. This table, as such, does not merely provide a mapping of learning but also renders the proposed RPS within an institutional paradigm of a professional formation, which provides the design not only with an educational legitimacy but also with the institutional legitimacy. The Design Phase is therefore concluded by a two-fold success, namely, the designing of a harmonized, pedagogically acceptable RPS and its strategic integration into the institutional results of the aviation polytechnic system. The actual production of the instructional materials on the basis of this framework to actualize the next step in the development is discussed in the next section and a subsequent test of the work

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

by experts validation and feedback of cadets is necessary to assure that the work needs to be fit in the context and effective as the work in instruction.

The third stage of 4D instructional design model, Develop can be described as a stage in which the theoretical plan of the Design Phase is changed in the form of an instructional product, a full teaching module of the course, the Aircraft Basic Workshop Theory. Relating to the order suggested by Suartama et al. (2022), this stage is no longer concerned solely with production, but also involves reiterated validation, and feedback integration, and material revision to guarantee pedagogic integrity and reality of feasibility. A harmonized RPS-based structured and media-enhanced instructional module, fulfilled by two parallel activities involving both development of a structured, media-enhanced instruction module according to harmonized RPS and empirical validation was done using expert judgments and cadet feedback as suggested by Dahar (2011) and Depdiknas (2008) in development-based educational research.

The module that was developed during this step consisted of eight completed learning units all of which were aligned to the weekly instructional plan within the RPS. Each of the units contained particular learning objectives, safety notes, procedural illustrations, checklists, tools schematics, practice tasks, reflection prompts, and formative quizzes. The module was made on a constructivist perspective (Duron et al., 2006) according to which knowledge is not conveyed but rather constructed with the help of structured communication with activities resembling real process of aviation maintenance. In particular, the procedural sections focused on combining not only the cognitive and psychomotor domains but also relied on the validated practices in technical education module design (Habibati & Septiani, 2019; Huda et al., 2013; Ferris & Aziz, 2005; Uduafemhe, 2019; Oropesa García, 2012).

The module and the harmonized RPS were also sent to be validated by the experts so that the quality of the materials developed had been proven to be of national standards and viable in several UPT situations. The five subject-matter specialists included two senior instructors (Surabaya and Curug), one aviation curriculum reviewer (Makassar), one expert of pedagogical design (the curriculum board of the Ministry of Transportation) and one individual representing the aviation quality assurance unit. This team of experts considered it on a modified rubric (based on Hidayat, 2009; Irawati & Saifuddin, 2018) covering five categories: relevance of content, clarity of instructions, alignment of terms, flexibility of implementation, and assessment design.

Table 7. Summary of Expert Validation Feedback

Criteria	Validator Comments	Action Taken
Content Relevance	"Accurate and comprehensive; fits the syllabus and real maintenance workflow well."	Retained core content structure
Instructional Clarity	"The module flow is intuitive and easy to follow—especially for less experienced instructors."	Minor refinements to instructions and layout
Terminology Accuracy	"Replace informal mechanical terms with DGCA-aligned vocabulary."	Revised all terminology using standardized lexicon
Delivery Flexibility	"Some campuses won't be able to follow the weekly plan exactly due to workshop availability."	Added alternative pacing schedules and modular paths
Assessment Structure	"Good variety of quizzes and practicals, but suggest clearer rubric descriptors."	Expanded assessment rubrics with performance levels

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Enhanced evidence supplied by the validation study demonstrated that the module not only benefited the objectives of the curriculum in a consistent manner across several polytechnic context but also met the practical needs of the classroom application. The fact that the reviewers demanded the flexibility in terms of focusing more on the availability of workshops, and the variability of the scheduling requirements, had a substantial effect on further design. The split of standard module progression into optional sequencing options has now made it possible to consolidate, extend or to reorder in-depth units without jeopardizing the underlying learning sequence thus fitting the advice given by Roschelle et al. (2009) to advance modular flexibility of technical curricula even in cases where infrastructure does not support the modular design.

Reviewers also raised the heterogeneous terminology as a potential cause of ambiguity or confusion lessons specifically in formalized forms of the terminology as in licensing examinations. Correspondingly, all technical designations, safety words and description of steps were linguistically edited and content is still loyal to the DGCA-approved vocabulary and to the language norm and standards, used in the aviation maintenance related documentation. Improving semantic clarity in addition to strengthening regulatory compliance is the core feature of regulatory compliance, which is a primary goal of aviation maintenance graduates seeking licensed jobs.

At the same time relevancy of the module was appraised in relation to perceptions of the learners. The selection of airplane students (both Surabaya and Makassar Polytechnics) attending aircraft basic workshop theory course was invited to participate in the review of chosen units (week 2 and 4: tool calibration and aircraft jacking) and feedback questionnaires, reflections notes. Their remarks provided effective observations on engagement, teaching comprehensibility, and convenience, thus increasing the validation process through triangulation of experts opinion and students experience.

Table 8. Themes from Limited Cadet Feedback

Theme	Cadet Feedback Excerpt
Conceptual Clarity	“Now I finally understand the difference between torque tools and standard wrenches.”
Procedural Confidence	“I could practice jacking procedures in my mind before we did it in the lab.”
Autonomy and Engagement	“The checklists made me feel more in control of the process—not just waiting for orders.”
Documentation Understanding	“The examples of maintenance forms helped me avoid common mistakes in the logbook.”

This study confirms the theoretical hypothesis according to which cognitive internalization and acquisition of skills can be achieved more effectively with the help of structured and multimodal modules than with verbal one (Anggraini et al., 2020; Djamarah & Zain, 2002). The cadets presented the module as a kind of a bridge between learning and practice a rather fitting characterisation of the learned intentions. Procedural checklists and interactive visual content especially stood out among the learners who had been, before, utilized only instructor explanations or unstructured presentations.

The reflections have also shown that, the module was not just a mental or cognitive resource, but a motivational and a metacognition tool. They could also evaluate themselves, analyse their preparation, visualise actions pre-practical sessions, all of which have been found to positively affect transfer of learning and its retention in applied technical settings (Dewi, 2018; Sen & Selvaratnam, 2022). This is a great argument in favor of the selection of the type of formative

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

assessment, which should be the integration of formative quizzes, self-check instruments, and reflection prompts in every unit.

Collectively, the two forms or verifications, that is, the expert and the cadet, present significant empirical data that the created instructional module is instructionally coherent, pedagogically robust, and contextually adaptive. It addresses the fundamental inadequacies in the Define Phase, that is, lack of standardized content, non-structured instruction, and inconsistent assessment procedures besides coming up with a scalable, teacher-friendly, and professionally graded instruction model.

Disseminate Phase

During the Disseminate Phase, dissemination is not realised at the end of a (perfunctory) project, but at the beginning of the institutional transformation. Ideas are brought into confrontation with actual limits, policies enter into practice and pedagogy collides with politics. Dissemination, therefore, occurred in an informal and semi-formal consultation in three big UPTs: Makassar, Surabaya, and Curug, because each UPT has its own leadership culture, infrastructural capacities, and instructional mindsets. Dissemination was not seen as a one-way delivery but has been treated as a strategic academic dialogue and therefore the harmonized RPS and instructional products were introduced as open templates rather than complete artifacts. This inward profusion practice echoes with what Huda & Qosyim (2013) refer to as the participatory curricular implementation, in which teachers are asked to participate in instruction innovation as co-owners and not as adopters.

The main topic of discussions was the harmonized RPS - a document that tried to solve the fragmentation identified at previous stages. In all the UPTs, the reaction to the RPS was not only positive, but also reflective. In Surabaya RPS was regarded not just as a facelift or shift in formatting or layout but also, as a rational pattern codified and long overdue needed by instructors that would translate the abstract requirements of the national curriculum into practical series of lessons and evaluation. The force of this feedback was that it was located in the reality of lived instructional frustration: teachers admitted that they had long been able to build weekly planning on the fly, binders in hand, creating new copies of more or less similar slides each time, without any critical consideration of pedagogy. The RPS formed an interruption to that cycle, providing a weekly scaffold that made intent, pace, and logic of assessment clear-- and made that previously ad hoc teaching purposeful instructional design. It coincides with the claim made by Gruppen et al. (2016) that pedagogical structure does not add any value in the case of competency-based instruction; it has become a condition to learning fidelity.

It is also important that the RPS was not a top-down prescription. Its modular flexibility was valued by stakeholders, particularly in Makassar where access to workshops is rather irregular, and classes are frequently over-subscribed. On that site, the faculty members took comfort in the fact that they could reorganize units, expand some modules or even merge weeks without jeopardizing concurrence of outcomes. This versatility in a standard is an embodiment of the nature of adaptive design as posited by Wahid & Widoyoko (2015), who cited the hazards of strict standardization in vocational arenasThe harmonised RPS, during dissemination, became a variable organisational framework: it maintains a sense of coherence, even as it makes space, in any situation, hybrid (differing with the frameworks of competencies), increasing fidelity, and responsiveness to classroom conditions. The learning achievement mapping and the graduate profile created a parallel response. Curug and Surabaya faculty members and curriculum coordinators noticed that the first time in the career of a student, one course, such as Aircraft Basic Workshop Theory, could be placed in the context of a broader system of

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

professional aviation competence. Analysis of the mapping as strategic accreditation artefact revealed that such educators believed that they could use the instrument to defend pedagogical decisions when scrutinized during BAN-PT audits or inspections by Ministry. The granularity of it was also effective in showing similarities between the outcomes in the term relative to the outcomes in the cognitive, psychomotor, and affective domains, hence validating the arguments put forth by Lilawati (2017), who added that the facilitation of accreditation success in technical education depends entirely on the fact that the curricular content was made to align conspicuously with any professional attribute of graduates.

The training dialogue was later developed to be integrative. Some of the instructors were asking to have editable versions of the RPS to adapt it to the location; some had ideas to come along with the modules and create instructor guides, sample lesson plans and rubrics. Though such requests indicate unanswered questions, this is also an indication of willingness to adapt: the institutions that request a product to adapt on their end do not see it as an external experiment, but rather as a locally internalized solution. This willingness to integrate the harmonised RPS echoes the request of Duron et al. (2006) on the need to create coherence between outcomes, instructional design, and evaluation, a set of three impacting until now little operationalised in Indonesian aviation polytechnic programmes.

The dissemination part of this project showed not only the willingness to roll out emergent instructional products, but also an overall moving towards harmonization. Stakeholders went further to talk about the topics of a cross-institutional workshop, cross-institutional pilot efforts and aligned instructional benchmarking projects. No multi-organizational partnership can be carried out on the basis of top-down instructions; the partnership thrives when the instructional product appears credible and flexible enough to support the local pedagogical identities. The project had three key artifacts, which were RPS, mapping tables, and the structured module, and they acted bounding objects (Star & Griesemer, 1989), on the one hand, preserving conceptual integrity, on the other hand, adjusting to the situational demands with relative ease.

The dispersal phase also shed light at a rewritten account of harmonization, and it was no longer casted as an undertaking in itself, but a pledge to instructive equity. In the past, stakeholders would presume that divergent campuses required dissimilar RPS documents. The dissemination stage revealed though, that the success of harmonization does not depend on format consistency but on consistency in fidelity to the objectives of learning and the transparency of procedures. The RPS and the mapping, it turned out, promoted pedagogical coherence as opposed to mechanical compliance, a significant and seldom occurring change. This conclusion agrees with Anwar (2009), whose assumptions are that the curricular reform in the vocational education is only successful when operating with two opposed poles; institutional structures and the agency of the practitioners.

1W Component: Interview and Questionnaire Analysis

Design development process was faced with the harshest criticism in the one of the components of the 1W potential interview in Indonesian, or wawancara the direct criticism of the students. Even though most research on instruction design relies on established validation by experts and theoretical compliance, this phase would place emphasis on real-life reality of learning by cadets based on well-organized surveys and narrative interviews. It became immediately clear that the insights offered here were not mere reactions, but diagnoses of deeper systemic dysfunctions in how technical education is being delivered, interpreted, and internalized.

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

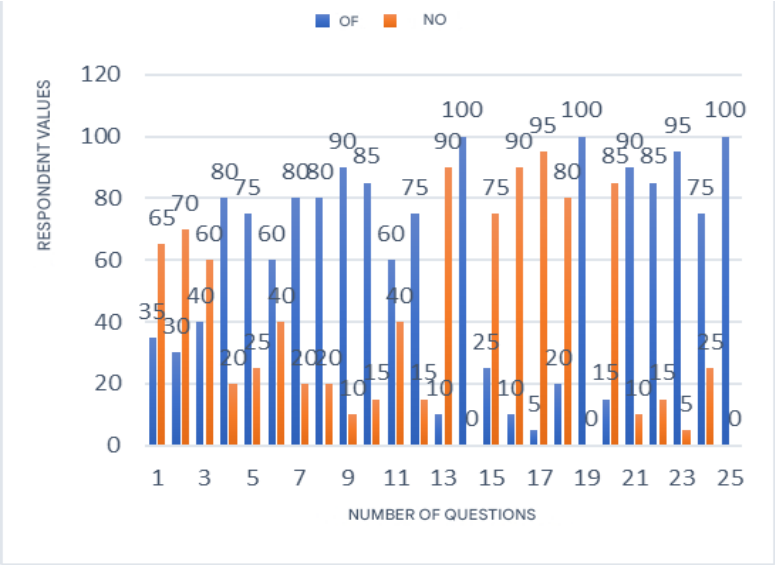

Figure 1. Questionnaire Results for Surabaya Polytechnic Cadets

The questionnaire instrument, distributed to 24 cadets each in Surabaya and Makassar Aviation Polytechnics, was intentionally simple in structure—25 binary items—but far-reaching in implication. Designed to evaluate not just course satisfaction, but the conditions under which learning occurred, the responses painted a sobering picture. In Surabaya, for instance, more than 70% of cadets affirmed that no formal teaching module had ever been distributed during the *Aircraft Basic Workshop Theory* course. Instruction, by their account, consisted mostly of slide-based lectures, verbal explanations, and impromptu workshop demonstrations. This is not simply a pedagogical style issue—it is an epistemological failure. When technical instruction relies entirely on oral and instructor-driven input, students are denied the opportunity to engage with knowledge autonomously, critically, and systematically. As Eryilmaz et al. (2011) have shown, the absence of multimodal instructional materials in engineering and vocational education correlates directly with lower cognitive retention, weaker procedural confidence, and increased learning anxiety.

When the survey on the assessment of the aviation undergraduate pilot training (UPT) was conducted in Indonesia, the responses obtained in Makassar were particularly salient. About 80 % of cadets confirmed that they had never received any structural learning document about the course at all, be it before training, during or after it. In addition, a high percentage of cadets indicated that laboratory-based assignments are presented with little or no prior theoretical preparation, which means that the student is forced to learn through trial and error as opposed to being taught rehearsal. One of the respondents remarked that he had gotten exposed to maintenance checklist on a first-grading practical session. This result cuts across the whole issue of sequencing; it shows a serious mismatch between what curricula aim to cover and what is delivered in ways that students can actually receive. When proceeding to learning processes in the technical fields without finely layered scaffolds, in which abstract principles neatly linked to real world implementation is performed, attentive learners often fall to conflating the satisfaction of the task with their skill; this creates an illusionary overconfidence, or gross conceptual ignorance (Dahar, 2011).

The purposeful sample of cadets (five cadets in each UTP) was interviewed using semi-structured interviews to elaborate on the aggregate data, but not based on GPA but instead, based on the active interest in the initial questionnaire who had provided written comments or/and inquiry regarding the questionnaire. These interviews were given further insight into the

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

lived experience of an aviation education with the modern constraints. There was a theme that kept reappearing between the lines with one or two variations: pedagogical improvisation as an idea of instructional design. One of the students in Surabaya explained this phenomenon in the following manner: We did not know what to bring with us-- when the instructor used slides we did the same. Otherwise we would not listen." These ad-hoc modes of teaching cannot be sustained; they make teaching a matter of performance, and the only performance that is dependent upon personal charisma not on serious planning. This dilemma, as it were, resonates worryingly well with the argument made by Julaeha (2019), who describes a problematic notion of conflation between the delivery of a content in technical education in Indonesia, and the experience of learning that activity, leaving out the specific strategies, timing and materials that are essential in each.

Instructional practices in the context of Makassar left a systematic learning sequence. Where in the words of one cadet, they were taught, but not in the sense of it being taught. The instructions were given upon entering into the laboratory, and did not imply any particular reason: "This is the tool; this is what you do." This kind of fragmentation undermined the cognitive involvement, and rote execution was far better than conceptual elaboration. Having no explicit materials to work with, modular frameworks, procedural diagrams, reflective prompts, students became exposed to the process of becoming competent by guesswork, which proved counterproductive to the process of becoming competent and forming a subsequent professional identity. According to Lilawati (2017), the associated technological superficiality will result in graduates who will be able to operate equipment without any rational justification, diagnosis or ability to innovate on-demand.

The significance of this pedagogical stage was not only identification of gaps, but also explicit self-identification of the solution the students came up with. When Cadets saw singularly and consecutively spaced out modules by virtue of gradually elaborated modules parts & pieces, such as harmonized Rapid Process Sheets, multimedia visual aids, and clearly sequenced learning activities, they reacted not only with affirmation but literally with relief. One of the Surabaya cadets stated, it is what we needed which referred to the weekly routine. It reveals, what is ahead, what should be prepared, and how it is related to the workshop. The information indicates that students did not wish only tangible resources but consistency, organizational logic, and individual control. The given observation concurs with Duron et al. (2006), who document that in case the flow of instruction is expected and logically explained, the involvement of learners becomes high and self-regulatory skills increase.

Next, interviews noted that there is a negative impact, which is emotional, related to the fragmentation of instruction. Many cadets described experiencing a sense of invisibility at the educational environment as they are only meant to perform and not discuss or think. One of them said, researchers and instructors know all these, and we do not. And when we fail to get our answers through questioning them, they respond at times to the effect that we ought to have heard more carefully the first time. This imbalance is hazardous. It maintains an instructor-centered culture in which questions are considered a form of insubordination and confusion on the part of the students is considered a form of laziness. Pedagogically this is untenable. Human development wise it is not acceptable. The 1W phase, therefore, did not traverse the information collection, but it helped to reveal a subtle undermining of the dignity of instruction which should not only be met by superior materials but also by a renewed sense of professional integrity about learner-centered teaching. The role of the developed instructional module becomes evident taking into consideration the findings. It is not a product, but a rectifying machine. Its to the point planning, step by step directions, and precise correlation to the specified competency outcomes will serve as direct responses to the mentioned expressed

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

needs of the cadets. The module does not only give information but rather orientation; not only content, but coherence. It confirms what Endah and Hendrastomo (2017) stress that successful instructional development cannot be other than the result of the conversation between the professional design and reality of learners. And such a dialogue was not hypothetical in this research, but a spoken, embodied one, at that, often emotional.

Placing Learner Testimony Back at the Centre of Instruction Revision

In the recent discussion of the field concerning instructional development (especially in technical and vocational education and training (TVET)) it is becoming more difficult to justify the marginalizing of student voice in design rationale. The 1W component of this study questions that historical marginalization by initiating cadet perception as the main epistemological evidence. Nothing that the Surabaya and Makassar students disclosed in the answers to the questionnaire and in interviews was only the dissatisfaction, it was deeply rooted manifestation of the Educational dislocation- the learning environment which lost its continuity, structure, and predictability. This displacement fulfills the warning delivered by Wei (2021) more than 60 years ago that without the ability to see the structure of a subject, students are unable to internalize the logic of a subject, nor are they able to remember the meaning. That more than 70 per cent of the respondents in Surabaya and about 80 per cent in Makassar do not recall ever having an opportunity to access structured learning documentation is not merely a random occurrence of the statisticians. It is a pedagogical crisis of visibility, and in the high-stakes fields such as aviation, invisibility is rather a hazard, which results in the process of mimicry instead of mastering concepts (Eryilmaz, 2011; Shay, 2023; Winch, 2013).

To blame such issue on lack of resources and casualness of the instructors is to overlook an institutional malaise: an epistemological confusion of teaching and telling, of having a syllabus and creating a learning situation. These cadet accounts highlight what Perkins (1992) referred to as thin- Gast knowledge, superficial recollection of surface content and inability to internalize or to apply this knowledge to the world. That is the inevitable result of an instruction that is given in bits, improvised week to week, completely subject to the personality and taste of the lecturer. Another student described the experience of being handed a maintenance checklist in the first time of graded evaluation which demonstrates the greater pedagogical trend of late introduction, when students are to be assessed without prior conceptual knowledge. This is the opposite of that which was criticized by Shulman (1987) as a consequence of a failure of pedagogical content knowledge, the separation of subject matter and instruction delivery as parallel strands that never meet in designing a classroom. Students have to blindly decode procedures without scaffolded guidance and that in many instances and situations acquire patterns of action devoid of know-how as to the reasoning behind the same (Holton & Clarke, 2006; Black & Wiliam, 1998).

Such an issue is peculiar not to the aviation polytechnic system of Indonesia. It is indicative of what scholars like Wheelahan (2007), adequately Majumdar (2011) have discovered to be the case across the world in the low-to-middle income TVET systems, an imminent over dependence on instructor core modalities, rationalized by using rhetoric of the on-the-job realism. The irony is pretty hard to miss. Although aviation is one of the highly regulated industries in the world, technical training infrastructure of an aviation is commonly supported by informal learning, oral teaching, and improvised training-on-the-fly workshop training. This inconsistency is revealed by the witnesses (the cadets) in very clear language. This is not a realistic belief that learners will necessarily work out an understanding on their own through a practical experience when they lack the conceptual apparatus to do so; this is laisprudence disguised as commonsense. And this negligence has even been demonstrated to cause not only

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

disengagement of the students, but risky sparing gaps in the procedural safety, and diagnostic thought process (Mishra & Koehler, 2006).

Another trend that the interviews and the surveys also divulge is the trend in the instructional exclusion, the cadets being considered not as knowledge builders but as the handicapped, hapless recipients of the wavering mood of instruction. Expressions such as, we were not taught, we were told - do not only refer to a manner - we are talking about an ideology. It is a pedagogy of authority not of inquiry. Freire (1970), and Noddings (2005) have strongly criticized such pedagogical cultures in some way or the other, because, according to them, the dialogical engagement, emotional understanding and appreciation of the intellectual agency of the learner is the only way to achieve any kind of real learning. This agency loss is particularly inappropriate in the case of aviation training the consequences of which misunderstanding will be operationally catastrophic. The information shows that cadets are internalizing procedures, and often not with the critical use of their minds to assess what is suitable, to improvise based on the situational circumstances, or to hear what is strange. What it results in, as Lilawati (2017) has called it, is a brittle kind of competence, or a procedural superficiality, which works when things go by the book, but fails when put into stress.

However, the comments of the cadets do not just accuse but they also provide direction. Their responses toward the harmonized RPS and excerpts containing developed module were not dollar signs. They were also phrases of relief, acknowledgment and in other instances disbelief over how such tools were not availed the sooner. Comments, such as, I think that is what we needed are more than an emotional response to a pleasurable experience; that formal teaching design means that our books just plain feel right to the intuitive student mind. The fact that they crave clarity, sequencing and pre-tasks orientation can be explained in line with well-established cognitive science principles. An example is the expression of Mayer (2005) that learning is enhanced when the material of instruction is structured in the form of coherent pathways that are multimodally reinforced. The same approach focused on complexity management was made by Lee & Reigeluth (2009) who stressed that better learning can occur by dividing complex knowledge into time-bound chunks of learning and has been effective in the transfer of learners and retention of knowledge over long time. This is easy to understand; cadets do not want to learn- someone is yet to teach them systematically.

This is not a request, be it vocal or not, so much because of innovation, as it is for instructional justice. Affective burden of the feeling of the invisibility or is not just the garbage left by the emotional experience but it is the symptom of pedagogical violence. When students come to feel inferior in possessing qualities that the system refuses to make clear and when they are told that they are to blame them failing because they were not properly listening, the effect (Noddings, 2005) is relational harm. It is not a cuddly issue. It has an impact on the confidence in learning, risk behavior, and final professional identity formation. It affirms the argument by Black & Wiliam (1998) that there should be the interplay of assessment and instruction in a learning ecosystem of feedback and not a penal system of misunderstanding. Lack of the same makes the student just a performer of an unplanned or unstructured play of another person (as was the case in the two campuses in which the study was conducted).

The implication of such findings have to be placed now into the context of larger critique of educational reform in Indonesia. The gap between the written curriculum and its practical implementation have been routinely reported by the scholars, including Hidayat (2009), Sumarsono et al. (2016). But the one inimitable contribution that this study can bring to the table is a learner-centered empirical approach to that gap. The cadet data does not take the forms of validating a prior design option, it is rather a component on which one can build

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

his/her instructional design thereon. According to Endah & Hendrastomo (2017), any vocational curriculum not covering the epistemic realities of learners such as what they know, how they feel and where they face difficulties is not a valid curriculum. This is in that the harmonized RPS is not just another deliverable. It is an agreed reaction to the matters of cadet confusion, cadet exclusion and cadet aspiration.

Moreover, such findings overlap with world-leading experience of competency-based education. OECD (2018) has expressed the importance of integrating curriculum development with the genuine inputs of learners and sustained feedback in the classroom as well. UNESCO-UNEVOC (2017) too have voiced the concern. Another artifact of such alignment is the developed instructional module in this study. The clarity with which it paces students, the cognitive scaffolding, assessment transparency and all of these were in response to what students indicated they wanted, not what policymakers inferred. In such a way instructional intervention can be made sustainably not only in the piloted project, but in systemic implementation too because of such compliance to authentic learning design (Anwar, 2009; Rees Lewis et al., 2019; Duron, 2006; O'Donnell, 2008).

In those words, the epistemological role of the cadet voices is transformed. They are not events upon which triangulation can be carried out. The instructional system is co-authored, and their perspectives constitute the main diagnostic prism, according to which the curriculum, delivery, and assessment have to be assessed. Their statement changes the rules as evidence in instructional development- no longer is it adherence to curriculum requirements, but correspondence with learner experience. and when such resonance is attained = as it is effectively hinted by the response to the elaborated module = what happens is not mere learning, but transformation. The learners start to believe in the system which educates them. And in flights where no amount of clear competence is optional, such a change is nothing less than the price of professional preparedness.

Conclusion

The approach undertaken in this research involved not only the creation of a pedagogical module or the harmonisation of an RPS document, but rather of an intervention in a pedagogical ecosystem where the forces of fragmentation, improvisation and instructional opacity compromise the associated pedagogical landscape. The study implied not only produced instructional products, but through well-staged Research and Development (R&D) process, based on the Define, Design, Develop, Disseminate, and 1W (Wawancara) elements, also seeded new insights as to how to conceive teaching and learning in Indonesian aviation poly-technics. The result is not just some materials, they have redesigned the logic of instruction, built through interaction with all the institutional stakeholders as well as the cadets themselves.

What could be seen to come out of both stages of the study is a coherent unassailable pattern; that the present delivery of Aircraft Basic Workshop Theory is teeming in technical motive but perilously stretched in pedagogical scaffolding. The Define and Design stages demonstrated a stark contrast between institutional syllabi and delivery of instruction, uncovered the lack of week-by-week logical grouping, evaluation alignment, and competency alignment. These deficits in turn, were addressed at Develop phase through the development of systematized instructional contents based on both national education frameworks of curriculum and best instructional design practices. But most importantly, the Disseminate phase confirmed the operational and institutional relevance of these materials, showing their flexibility to various resources settings, and being a means to streamline formerly distinctive instruction practice at various campuses.

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

However, the 1W element, which proves the power and significance of this piece, is the voices of cadets. Their testimonies do not form an anecdotal addition to the main body of what is being studied; they are at the core of what will be contributed to the study. The outlook of the cadets indicated that the curriculum was technically sound enough but instructionally chaotic as well as the instructional culture in support of learners to simply act without question, imitate without knowing and produce without assistance. In this sense, the devised module and RPS can be seen as neither the mere means of academic accommodation, nor pure instruments of academic justice: they can also be viewed as the instruments of instructional justice, encompassing visibility, agency and illumination of students who had long been asked to learn in darkness. Through this study what many working in the field of technical education always knew and was so seldom able to validate was proved: instructional development cannot be on behalf of the learners; it must be with the learners. This was the process, incorporated integration of cadet responses, responsiveness to needs identified by cadets and validation of cadet lived realities, that made this study both credible and provided the moral authority to do so. The module, the graduate achievement map, the RPS--all those things are powerful not through their form, but because of their experience on the one hand of the learner, and on the other hand of the institutional feasibility.

In the future, this study opens the possibility of further studies and implementation. Similar R&D cycles can be useful to other technical courses in and out of aviation polytechnic situation- particularly where they are based on the voice of the learner and institutional flexibility. Moreover, future research should explore long-term impacts of such instructional designs on cadet learning outcomes, certification performance, and professional readiness. But even before such extensions are realized, this study already offers a blueprint for reform: one that replaces improvisation with structure, opacity with transparency, and top-down mandates with shared instructional ownership.

References

Anggraini, V., Syahrul, Darnis, A., & Maistika, R. (2020). Pengembangan bahan ajar membaca sastra berbasis graphic organizer Venn diagram di sekolah dasar. *Jurnal Basicedu, 4*(4), 1219–1227. https://doi.org/10.31004/basicedu.v4i4.513

Anwar. (2009). Penilaian sikap ilmiah dalam pembelajaran sains. *Jurnal Pelangi Ilmu, 2*(5), 103–114.

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

Dahar, R. W. (2011). *Teori-teori belajar*. Erlangga.

Depdiknas. (2008). *Panduan pengembangan bahan ajar*. Departemen Pendidikan Nasional.

Dewi, E. R. (2018). Metode pembelajaran modern dan konvensional pada sekolah menengah atas. *Pembelajar: Jurnal Ilmu Pendidikan, Keguruan, dan Pembelajaran, 2*(1), 44. https://doi.org/10.26858/pembelajar.v2i1.5442

Djamarah, S. B., & Zain, A. (2002). Strategi Belajar Mengajar Rineka Cipta: Jakarta. *Dimyati dan Mudjion,(1999), Belaja dan Pembelajaran, Rineka Cipta, Jakarta*.

Duron, R. (2006). Critical thinking framework for any discipline. *International Journal of Teaching and Learning in Higher Education, 17*(2), 160–166.

Endah, N., & Hendrastomo, G. (2017). Implementasi pendidikan karakter melalui perkuliahan etika dan profesi keguruan. *Jurnal Pendidikan Karakter, 7*(2), 240–254.

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Erman, S. (2003). Strategi pembelajaran matematika kontemporer. *Bandung: Universitas Pendidikan Indonesia*.

Eryilmaz, A., Yildiz, M., & Akin, F. (2011). Investigating of relationships between attitudes towards physics laboratories, motivation and amotivation for the class engagement. *Eurasian Journal of Physics and Chemistry Education (Special Issue)*, 59–64. http://dx.doi.org/10.51724/ijpce.v3iSI.123

Ferris, T. L., & Aziz, S. (2005). *A psychomotor skills extension to Bloom's taxonomy of education objectives for engineering education* (Doctoral dissertation, National Cheng Kung University Tainan).

Freire, P. (1970). The adult literacy process as cultural action for freedom. *Harvard educational review*, *40*(2), 205-225. https://doi.org/10.17763/haer.40.2.q7n227021n148p26

Fujiawati, F. S. (2016). Pemahaman konsep kurikulum dan pembelajaran dengan peta konsep bagi mahasiswa pendidikan seni. *JPKS (Jurnal Pendidikan dan Kajian Seni), 1*(1), 16–28. https://doi.org/10.30870/jpks.v1i1.849

Gruppen, L. D., Burkhardt, J. C., Fitzgerald, J. T., Funnell, M., Haftel, H. M., Lypson, M. L., ... & Vasquez, J. A. (2016). Competency-based education: programme design and challenges to implementation. *Medical education*, *50*(5), 532-539. https://doi.org/10.1111/medu.12977

Habibati, M. N., & Septiani, P. D. (2019). Pengembangan handout berbasis literasi sains pada materi larutan elektrolit dan nonelektrolit. *Jurnal IPA dan Pembelajaran IPA (JIPI), 3*(1), 36–41. https://doi.org/10.24815/jipi.v3i1.13824

Hafid, A. (2011). Sumber dan media pembelajaran. *Sulesana: Jurnal Wawasan Keislaman, 6*(2), 69–78. https://doi.org/10.24252/.v6i2.1403

Hidayat, N. (2009). Pengembangan pembelajaran terpadu model connected untuk meningkatkan hasil belajar siswa dalam mata pelajaran IPA. *Jurnal Inovasi Kurikulum, 4*(1), 15–29.

Holton, D., & Clarke, D. (2006). Scaffolding and metacognition. *International journal of mathematical education in science and technology*, *37*(2), 127-143. https://doi.org/10.1080/00207390500285818

Huda, S., & Qosyim, M. (2013). Penerapan IPA terpadu tipe connected dengan model cooperative learning untuk meningkatkan hasil belajar siswa pada materi perubahan fisika dan kimia di SMP Muhammadiyah 6 Surabaya. *E-Journal Pendidikan Sains UNESA, 1*(2).

Irawati, H., & Saifuddin, M. F. (2018). Analisis kebutuhan pengembangan bahan ajar matakuliah pengantar profesi guru biologi di Pendidikan Biologi Universitas Ahmad Dahlan Yogyakarta. *Biopedagogi: Jurnal Pembelajaran Biologi, 7*(2), 96–99. https://doi.org/10.20961/biopedagogi.v7i2.27636

Julaeha, S. (2019). Problematika kurikulum dan pembelajaran pendidikan karakter. *Jurnal Penelitian Pendidikan Islam, 7*(2), 157–182. https://doi.org/10.36667/jppi.v7i2.367

Lee, J. Y., & Reigeluth, C. M. (2009). Heuristic task analysis on e-learning course development: a formative research study. *Asia Pacific Education Review*, *10*, 169-181. https://doi.org/10.1007/s12564-009-9016-1

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Lilawati, J. (2017). Analisis pemanfaatan sumber belajar dalam proses pembelajaran. Dalam *Seminar Nasional Tahunan Fakultas Ilmu Sosial Universitas Negeri Medan Tahun 2017*. Digital Repository Universitas Negeri Medan.

Majumdar, S. (2011). Teacher education in TVET: Developing a new paradigm. *International Journal of Training Research*, *9*(1-2), 49-59. http://dx.doi.org/10.5172/ijtr.9.1-2.49

Mayer, R. E. (2005). Cognitive theory of multimedia learning. *The Cambridge handbook of multimedia learning*, *41*(1), 31-48. https://psycnet.apa.org/doi/10.1017/CBO9780511816819.004

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record*, *108*(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Noddings, N. (2005). Identifying and responding to needs in education. *Cambridge Journal of education*, *35*(2), 147-159. https://psycnet.apa.org/doi/10.1080/03057640500146757

O'Donnell, C. L. (2008). Defining, conceptualizing, and measuring fidelity of implementation and its relationship to outcomes in K–12 curriculum intervention research. *Review of educational research*, *78*(1), 33-84. https://doi.org/10.3102/0034654307313793

Oropesa García, I. (2012). *Conceptual framework for the design, implementation and validation of psychomotor skills' assessment systems in minimally invasive surgery* (Doctoral dissertation, Telecomunicacion).

Pak, K., Polikoff, M. S., Desimone, L. M., & Saldívar García, E. (2020). The adaptive challenges of curriculum implementation: Insights for educational leaders driving standards-based reform. *Aera Open*, *6*(2), 2332858420932828. https://doi.org/10.1177/2332858420932828

Perkins, R. D. (1992). *Deixis, grammar, and culture*. John Benjamins Publishing Company. https://doi.org/10.1075/tsl.24

Rees Lewis, D. G., Gerber, E. M., Carlson, S. E., & Easterday, M. W. (2019). Opportunities for educational innovations in authentic project-based learning: understanding instructor perceived challenges to design for adoption. *Educational technology research and development*, *67*, 953-982. https://doi.org/10.1007/s11423-019-09673-4

Rizki, S., Linuhung, N., & Dacholfany, M. I. (2016). Design research and development 4D model for developing mathematics teaching materials. In *The First International Conference on Education ICONLEE* (Vol. 1, No. 1, pp. 288-291).

Roschelle, J., Knudsen, J., & Hegedus, S. (2009). From new technological infrastructures to curricular activity systems: Advanced designs for teaching and learning. In *Designs for learning environments of the future: International perspectives from the learning sciences* (pp. 233-262). Boston, MA: Springer US. https://doi.org/10.1007/978-0-387-88279-6_9

Sen, A., & Selvaratnam, L. (2022). Future-proofing healthcare skills education: Technology-enhanced collaborative learning and peer teaching strategies for large student cohorts in anatomy practicals. In *Collaborative active learning: Practical activity-based approaches to learning, assessment and feedback* (pp. 179-212). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-2078-5_11

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)

Shay, P. W. (2023). Precluding Critical Pedagogy: Ethical Democracy and the Tyranny of Functional Metrics, Visible Learning, and Data Surveillance. *Journal for Critical Education Policy Studies (JCEPS)*, *21*(3).

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard educational review*, *57*(1), 1-23.

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology,translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social studies of science*, *19*(3), 387-420. https://doi.org/10.1177/030631289019003001

Suartama, I. K., Triwahyuni, E., & Suranata, K. (2022). Context-aware ubiquitous learning based on case methods and team-based projects: Design and validation. *Education Sciences*, *12*(11), 802. https://doi.org/10.3390/educsci12110802

Sumarsono, R. B., Rochmawati, R., Zulkarnain, W., Prestiadi, D., Ubaidilah, E., Bhayangkara, A. N., & Indrawanto, D. W. (2024). Pelatihan Pengembangan Modul Ajar Berbasis Implementasi Kurikulum Merdeka bagi Guru Sekolah Dasar di Kecamatan Bantur Kabupaten Malang: Training on the Development of Teaching Modules Based on the Implementation of the" Merdeka" Curriculum for Elementary School Teachers in Bantur District, Malang Regency. *PengabdianMu: Jurnal Ilmiah Pengabdian kepada Masyarakat*, *9*(10), 1780-1788. https://doi.org/10.33084/pengabdianmu.v9i10.7507

Uduafemhe, E. M. (2019). Development and validation of additional cognitive and psychomotor skills contents for satellite transmission and reception module for technical colleges in Nigeria. *An Unpublished PhD Thesis presented to the Department of industrial and technology Education, Federal University of Technology Minna, Niger state, Nigeria*.

Wahid, M. S. A., & Widoyoko, B. S. (2015). Pengaruh Motivasi, Lingkungan Kerja Dan Pelatihan-Pelatihan Terhadap Kinerja Guru PNS Di Taman Kanak-kanak/Sekolah Dasar Kecamatan Ngawen Kabupaten Blora The Influence of Motivation, Work Environment and Training on Performance of Civil Servant Teachers in Kindergarten/Elementary School District Ngawen Blora. *Jurnal Magister*, *2*(7).

Wei, L. (2021). Teaching Academic Vocabulary to English Language Learners (ELLs). *Theory & Practice in Language Studies (TPLS)*, *11*(12). https://doi.org/10.17507/tpls.1112.01

Wheelahan, L. (2007). How competency-based training locks the working class out of powerful knowledge: A modified Bernsteinian analysis. *British Journal of Sociology of Education*, *28*(5), 637-651. https://doi.org/10.1080/01425690701505540

Winch, C. (2013). Curriculum design and epistemic ascent. *Journal of Philosophy of Education*, *47*(1), 128-146. https://doi.org/10.1111/1467-9752.12006

ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)