

Exploration of KPI-Centric Course Assessment Models in the Context of the “Dual High-Level” Initiative

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Abstract: The “Dual High-Level” initiative is steering vocational education towards a transformative shift, emphasizing competencies over mere knowledge in course evaluations. Taking the course *Structural Design and Techniques of Women’s Apparel* as a focal point, this study leverages Key Performance Indicators (KPIs) theory to construct a comprehensive three-dimensional assessment framework encompassing goals, indicators, and evaluations. By breaking down course objectives into quantifiable skills and aptitudes, and integrating formative assessments with collaborative appraisals between educational institutions and industry stakeholders, this model ensures a close alignment of assessments with industry requisites and job standards. Research findings underscore that this system significantly heightens students’ practical proficiencies and professional competencies, offering valuable insights for the reform of vocational course assessments embodied within the “Dual High-Level” initiative.

Keywords: Dual High-Level Initiative; Key Performance Indicators (KPIs); Curriculum Assessment; Women’S Apparel Structural Design and Techniques; Vocational Education

1. Introduction

The initial phase of the “Dual High-Level” initiative has yielded significant results in the integration of industry and education. However, it currently faces three major challenges: establishing high-quality governance models, organizing implementation effectively, and setting performance targets^[1]. Particularly under the policy guidance to deepen the integration of industry and education, strengthen collaboration between schools and enterprises, and enhance the work-integrated learning, there is a clear indication that curriculum frameworks and assessment methods urgently need to align with industry job standards^[2]. As a core course in the

field of fashion, *Structural Design and Techniques of Women’s Apparel* encounters issues in traditional assessments such as a focus on outcomes over processes, unclear evaluation criteria, and a disconnect from industry demands. These challenges hinder the ability to meet the requirements for cultivating technical and skilled talents under the “Dual High-Level” initiative. The Key Performance Indicators (KPI) theory advocates for measuring goal achievement through quantifiable indicators. By integrating this theory into course assessment, a closed-loop management system encompassing teaching, learning, and evaluation can be established, facilitating a shift in assessment mechanisms from a focus on grades to a focus on competencies^[3]. This study aims to explore the application value of KPIs in the development of vocational education under the “Dual High-Level” initiative. It seeks to analyze the limitations of current assessment models in professional courses, establish a curriculum assessment framework based on KPIs, and empirically evaluate its effectiveness in the *Structural Design and Techniques of Women’s Apparel* course. The objective is to provide theoretical insights and practical paradigms for the reform of vocational education course assessments.

2. Theoretical Foundation and Current Analysis

2.1 Core Requirements for Course Assessment in the Context of the “Dual High-Level” Initiative

The focal point of the “Dual High-Level” development lies in nurturing “highly skilled technical talents”, with its essence residing in the innovation of course assessment systems^[4]. It is imperative that these systems embody three core characteristics: Firstly, vocational orientation, emphasizing precise alignment with technical standards in the apparel industry (such as GB/T 2660-2021 *Shirts*). This integration involves

incorporating specific parameter requirements into the teaching content to ensure that students grasp industry norms. Secondly, process-oriented, prioritizing the dynamic evolution of skill formation. Through staged assessments, practical feedback, and ongoing tracking, the trajectory of students' capacity enhancement is comprehensively captured. Lastly, collaborative, actively involving industry experts and organizations in the evaluation mechanism. This could entail establishing joint review panels, industry-certified assessments, and internship programs to promote deep integration between industry and education, thereby enhancing the effectiveness of talent cultivation^[5].

2.2 Integration of KPI Theory in Course Assessment

The KPI theory establishes a complete management closed loop through the essential components of "goal decomposition, indicator quantification, and performance evaluation", ensuring the systematic and effective oversight of performance^[6]. Within the realm of course assessment, this approach necessitates an initial clarification of the course's educational objectives, such as the ability to independently navigate the industrial production processes of women's apparel. These objectives are then methodically broken down into three key categories of KPI indicators: knowledge, skills, and professional competencies. Knowledge indicators concentrate on students' comprehension and retention of theoretical foundations, including mastering the principles underlying women's apparel production processes. Skills indicators highlight the proficiency in practical operational tasks, such as operating sewing equipment and executing manufacturing processes. Concurrently, indicators for professional competencies encompass soft skill dimensions like professional demeanor, teamwork, and innovative thinking^[7]. By amalgamating various data sources, ranging from sewing process operation videos for visual skill assessments to finished product inspection reports for quantifying the application of knowledge, and student peer evaluations to gauge competency levels, a precise and impartial evaluation of learning outcomes is achieved. This approach not only enhances the specificity and equity of assessments but also propels the efficient

attainment of teaching objectives and the comprehensive development of students' holistic capabilities^[8].

2.3 Survey on the Current State of Assessment in the Course *Structural Design and Techniques of Women's Apparel*

A specialized survey was conducted on the 2024 cohort of students (totaling 130 individuals) and relevant instructors (8 individuals) in a higher vocational college's Apparel and Fashion Design program. The investigation unearthed several issues in the course assessment segment, with specific findings outlined as follows:

2.3.1 Disparity in assessment content distribution

The survey revealed a significant imbalance in the distribution of assessment weightage, with a staggering 78% of the assessment focus concentrated on a single finished production task (such as completing a designated style of dress). This emphasis on end-of-term product creation neglects core competency development during students' learning processes, such as the comprehension and application of principles in garment structure design (like precise pattern drafting based on style diagrams) and the continual enhancement of technical skills (such as adjusting stitching methods based on fabric characteristics and improving process efficiency), crucial competencies that are generally overlooked or underweighted.

2.3.2 Homogeneity in evaluation entities

The composition of evaluation bodies is overly homogeneous, with 92% of the grading dependent solely on individual judgments of instructors, lacking diverse evaluation perspectives and standards from the industry or businesses. This singular evaluation model hampers the accurate reflection of students' skill levels in alignment with the practical demands of industry positions. It also fails to incorporate practical guidance from industry production standards and market feedback mechanisms of considerable instructional value.

2.3.3 Inadequate quantification in indicator systems

Within the current assessment indicator system, only around 35% of indicators possess clear and measurable quantitative standards (e.g., "strict control of component dimensions within a ≤ 2 cm margin of error"). The majority of other indicators (like "craftsmanship aesthetics", "overall harmony of effects", "precision in detail

refinement”) heavily rely on instructors’ subjective perceptions and experiential judgments for scoring, lacking unified, objective metrics and detailed grading rubrics. This absence compromises fairness and comparability due to the absence of a standardized evaluation scale and comprehensive grading guidelines.

3. Establishing an Assessment System for *Structural Design and Techniques of Women’s Apparel* Based on Key Performance Indicators

3.1 Decomposition of Course Development Objectives

Aligned with the “dual high” talent development program for apparel professionals, this course refines overall development objectives into three core dimensions:

Knowledge Objectives: Students are required to systematically grasp the fundamental principles of women’s apparel structure design, including methods for designing common styles, standard specifications for typical craftsmanship techniques, and characteristics of relevant materials.

Skill Objectives: Students should be capable of independently executing the entire process from style analysis, structural design, pattern drafting, cutting, sewing, to final product creation, proficiently addressing technical issues throughout the production stages.

Professional Competencies: Students are expected to possess a strong quality consciousness, effectively communicate in teamwork settings, proactively tackle real-world challenges, while nurturing innovative thinking, a sense of responsibility, and professional integrity.

3.2 Design of KPI System

Achieving this through a three-step method of “Job Demand Survey - Indicator Selection - Weight Allocation” entails the following: initially, conducting a survey of job demands to clarify crucial performance areas; subsequently, selecting relevant and measurable performance indicators; lastly, appropriately allocating weights to each indicator to ensure system equilibrium. Ultimately, a three-tier KPI indicator system encompassing strategic, departmental, and position-specific objectives is constructed (as illustrated in Table 1).

Table 1. Key Performance Indicators for Assessment in *Structural Design and Techniques of Women’s Apparel*

Primary Indicator	Secondary Indicator	Tertiary KPI Indicator	Assessment Value (out of 100)	Evaluation Criteria (Example)	Data Source
Skill Objectives (60%)	Structural Design Capability	Accuracy in Drafting (dimensional error $\leq 1\text{cm}$)	15	Conformance of garment body, sleeves, collar to design requirements	CAD drawing check, instructor evaluation
	Craftsmanship Proficiency	Standardization in Stitching (stitch length 3cm/13 stitches, no skipped stitches, no wrinkles, etc.)	20	Enterprise craftsmanship standards (e.g., YKK zipper installation specifications)	Process videos, industry mentor evaluation
	Finished Product Quality Control	Finished Product Compliance Rate (meeting standards in appearance, dimensions, durability)	25	GB/T 2662-2021 "Cotton Apparel" Standard	Third-party testing, finished product score sheet
Professional Competencies (30%)	Teamwork and Conduct	Team Collaboration Efficiency (rate of on-time completion for group tasks)	10	Completion time of design task for a 3-person group ≤ 48 hours	Peer evaluation within group, task logs
	Problem-Solving Skills	Effectiveness of Craftsmanship Improvement Schemes for Defects	15	Proposing 3 or more solutions for 1 craftsmanship issue	Presentation records, industry mentor feedback
	Adherence to Safety Regulations	Number of Equipment Operation Violations (≤ 1 time/semester)	5	Safe operation protocol for garment cutting equipment	Practical training supervision records
Knowledge Objectives (10%)	Theoretical Application Proficiency	Rationality in Craftsmanship Design	10	Selecting suitable stitching techniques based on fabric properties (e.g., using zig-zag stitches for stretch fabrics)	Project reports, classroom inquiries

Note: Weights were determined using the Delphi method involving input from 4 industry experts, 6

teachers, and 2 industry association representatives.

3.3 Implementation Process of Assessment

Employing a “three-tier progressive” assessment approach to achieve integration of “process, outcome, and feedback”:

3.3.1 Pre-class phase

An indicator visualization strategy was implemented to ensure all participants comprehended task requirements in advance. This entailed releasing the *KPI Assessment Manual*, systematically outlining key indicators, quantified standards, and detailed scoring criteria for each stage of tasks (e.g., “Shirt Structural Design”, “Dress Sewing”) for students to grasp execution goals clearly. Additionally, introducing real enterprise orders as project platforms (e.g., a certain brand’s autumn shirt production task) enhanced practicality and applicability, assisted students in enhancing skills in simulated or real environments.

3.3.2 In-class phase: process assessment (60%)

Stage Task Assessment: Dividing the course into five stages— “Style Analysis - Structural Design - Cutting - Stitching – Pressing”, with KPI assessments conducted at the end of each stage (e.g., a deduction of 5 points per instance in the “Cutting Stage” for cutting accuracy errors exceeding 2cm).

Dynamic Feedback Mechanism: Generating stage reports through a combination of “Student self-assessment (30%) + Peer evaluation (20%) + Instructor assessment (50%)” to address substandard indicators (e.g., scheduling targeted retraining for issues like “uneven collar stitching”).

3.3.3 End-of-term assessment: comprehensive evaluation (40%)

Finished Product Creation: Completing enterprise order styles (e.g., A-line dresses), submitting “design proposals + technical documents + finished products”, assessed by a joint review panel comprising enterprise technical supervisors (2 individuals) and professional educators (3 individuals) based on KPI indicators.

Presentation and Self-Assessment: Students present “indicator achievement status-issues improvement process”, with a focus on assessing problem-solving skills (e.g., explaining the “impact of fabric shrinkage on structural design and solutions”).

4 Case Study Application and Effectiveness

Analysis

4.1 Implementation Targets and Processes

The selected subjects for implementation were the 2024 cohort students majoring in Fashion Design at a certain vocational college, comprising 70 students in 2 experimental classes and 70 students in 2 control groups. The experimental classes were assessed using the KPI methodology, whereas the control groups adhered to the traditional assessment approach of “final product submission + theoretical written exams”. The course focused on two quintessential projects, “Women’s Blouse” and “Dress”, with a duration of 16 weeks.

4.2 Effectiveness Analysis

4.2.1 Enhancement of student skill levels

The pass rate of final products in the experimental classes (85%) showed a remarkable 23% increase compared to the control groups (62%), with notable improvements in “Structural Drawing Accuracy” (92% vs. 75%) and “Craftsmanship Norms” (88% vs. 68%) as indicated in Table 2.

4.2.2 Feedback from enterprises

Students in the experimental classes showcased a reduction in the “Adaptation Period to Job Roles” to 1 week during internships (compared to 3 weeks for the control groups), with a commendable rating of 4.2 (on a 5-point scale) for their “Ability in Handling Craftsmanship Issues” (in contrast to 3.0 for the control groups).

4.2.3 Pedagogical enhancements by instructors

Utilizing KPI data feedback, instructors refined their teaching focus. Addressing the initial low attainment rate (65%) in the “Collar Stitching” indicator, they introduced a practical training module on “Integrating Three-Dimensional Cutting with Flat Pattern Design”, leading to a subsequent attainment rate increase to 90%.

4.2.4 Examination of assessment reliability and validity

Reliability: By conducting a Cronbach’s α coefficient test, the internal consistency within the indicator system yielded an α of 0.87 (>0.8), ensuring the reliability of the evaluation outcomes.

Validity: The correlation coefficient $r=0.79$ ($P<0.01$) from the collaborative school-enterprise evaluation indicates a high alignment between KPI indicators and industry

demands^[8], as shown in Table 2.

Table 2. Comparison of Assessment Outcomes

Indicator	Experimental Classes (KPI Assessment)	Control Classes (Traditional Assessment)	Differential Rate
Final Product Pass Rate (%)	85	62	+23%
Structural Drawing Accuracy (%)	92	75	+17%
Enterprise Internship Evaluation (5-point scale)	4.2	3.0	+40%

The data reveals that following the implementation of the KPI assessment model, there was a notable enhancement in product quality control, with a 23-percentage point increase in product pass rates compared to traditional methods. This model demands higher levels of technical operational standardization, leading to improved accuracy in structural drawing and a reduction in rework risks. The practical skills and professional competencies of students in the experimental classes garnered increased recognition from enterprises, with a significant disparity in ratings, illustrating the reinforcing role of KPI in fostering comprehensive abilities. The KPI assessment system surpasses traditional methods in quality control, technical precision, and practical capabilities, with a 40% differential rate in internship evaluations, aligning more closely with industry requirements.

5. Issues and Optimization Recommendations

5.1 Issues in Implementation

Complexity in Indicator Design: Some professional competency indicators (e.g., “Innovative Ability”) are challenging to quantify due to the lack of standardized objective criteria. These indicators heavily rely on the subjective judgment of teachers or evaluators, leading to potential inconsistencies, biases, or disputes in the evaluation process.

High Evaluation Costs: Collaborative school-enterprise evaluations require regular involvement of industry mentors in the assessment process. However, due to the busy schedules of industry mentors, conflicts in time coordination between schools and enterprises, as well as difficulties in resource allocation, the coordination process becomes significantly challenging. As a result, it consumes substantial additional time and financial resources.

Inadequate Student Adaptability: During the initial stages of project implementation, students feel overwhelmed by the “multi-dimensional, high-frequency assessment” approach,

exhibiting resistance. This stems from the unfamiliarity with the new assessment mechanism, increased academic burdens, subsequently impacting overall participation and learning outcomes.

5.2 Optimization Directions

Development of Intelligent Evaluation Tools: The integration of clothing CAD software data, such as the functionality of “Structure Error Automatic Detection” in Richpeace CAD, and AI image recognition for detecting needle spacing and stitch lines, could potentially facilitate the quantification.

Enhancement of Enterprise Participation Mechanisms: A collaborative effort with industry associations to establish a “Assessment Standard Repository” can facilitate the engagement of industry mentors in remote evaluations through online platforms, thereby reducing time constraints.

Empowerment of Student Agency: By fostering student involvement in the “Co-creation of Indicators” through participation in indicator weight voting, and providing “Evaluation Training” to teach students how to conduct unbiased peer assessments, there is potential for enhanced recognition within the evaluation process.

6. Conclusion

This study formulated a KPI-based assessment system for the course *Structural Design and Techniques of Women's Apparel*, aligning with the in-depth implementation of the “Dual High-Level” initiative. Through a comprehensive approach of “Goal Quantification - Process Control - School-Enterprise Collaboration”, the course objectives are systematically broken down into measurable indicators. This approach strengthens the dynamic monitoring of the teaching process and integrates enterprise resources for collaborative assessment. This method effectively aligns the dimension of “capability assessment” with the deep

connection to students' future job requirements. Practical application has demonstrated that this system not only significantly enhances students' practical skills in core technical areas such as clothing structure design and sewing craftsmanship but also comprehensively reinforces their professional qualities, including teamwork, quality awareness, and innovative thinking. It establishes a replicable and scalable model for the reform of vocational college course assessments. In the future, further integration of intelligent evaluation tools (such as big data analysis and AI-assisted diagnostics) and cutting-edge industry resources (such as real-time feedback from enterprises) is needed. This integration will dynamically optimize the assessment mechanism, driving the assessment model towards personalized learning path customization and precise capability diagnosis. This shift aims to move away from the traditional "standardized" evaluation towards a direction of "personalized learning path customization" and "precision capability diagnosis", meeting the new requirements for high-quality development in vocational education.

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