

School-Level Governance Logic and Effectiveness Evaluation of Quality Control in Graduate Training Stages

Jingjing Li*

Jiangsu Ocean University, Lianyungang, 222000, China

*Corresponding author: 2024060003@jou.edu.cn

Abstract: *Quality control at graduate training stages relies greatly upon college-level governance capability, but graduate students who are majoring in professional degree programs have academic norms and engineering practice. Little explanation exists regarding the internal mechanism between college governance and quality control and there is no scenario-based analysis of engineering professional degrees. Taking the master's program for the professional degree in Ocean Engineering as the research sample, we analysed the logic of college governance including governance structure, rights and responsibilities of actors and rule operation. Constructed a system of effectiveness evaluation based on evaluation framework, indicator system and quality standards. Governance structure affects control effectiveness through allocation of resources and flow of information, whereas governance behavior mediates and transmits it; governance optimization and evaluation feedback form a dynamic interactive closed loop. It reveals that governance structure offers the foundation conditions for quality control, adjustment of governance behavior is important to improve control effectiveness, and evaluation feedback is an institutional prerequisite for continuous governance iteration; Implementing quality governance for engineering professional degrees requires balancing academic training with engineering practice. This study can provide theoretical references and practical ideas for college governance of the quality of graduate training for engineering professional degrees in local colleges and universities.*

Keywords: *graduate training stages; quality control; college governance; effectiveness evaluation; professional degree*

Introduction

Quality control in the stage of graduate training is an important institution for ensuring the level of degree conferral. With the expansion of the size of China's graduate education and the rising proportion of professional degree graduate students, there has been increased management complexity regarding key stages such as course study, topic selection and proposal defense, mid-term assessment, professional practice, and thesis defense. College is directly responsible for implementing quality control in graduate training: it governs whether various training systems can be well implemented. Existing research mainly concentrates on macro-quality assurance system from the national and institutional level or adopts a micro-perspective that focuses on the individual supervisory behavior of advisors, but does not review the governance logic at the college level and the internal relation between governance mechanism and effectiveness evaluation systematically, especially lacks analyzing integration with regard to the real scenario of engineering professional degree training.

Ocean Engineering is an engineering professional degree field that serves the strategy of building a maritime power. The talent cultivation targets at producing high level engineering application oriented talents; other than the basic academic ability training, it has strict demands upon the engineering practice experience and solving real technical problem abilities of graduate students in the ocean engineering industry. Professional degree requires both academic standards and engineering practice standards when conducting college governance compared with academic degrees, which makes the contradiction and tension in quality control more prominent. Based on the practice of the graduate training program for the professional degree in Ocean Engineering from the perspective of college governance, we analyze the internal governance logic of quality control in graduate training stages, construct the dimension system for effectiveness evaluation, clarify the mechanism of interaction between governance mechanisms and effectiveness evaluation, providing theoretical support for quality

control in graduate training stages of engineering professional degree graduate students in local colleges and universities.

1. College Governance Logic of Quality Control in Graduate Training Stages

1.1 Multi-Level Collaborative College Governance Structure

Quality Control During Graduate Training Stage Three levels of collaboration between "academic decision-making - administrative management - execution and operation" within the college. Academic Decision-Making Level: It stresses the role of College Degree Evaluation Sub-Committee which mainly reviews and approves training programs; sets up standard for degree conferring; decides academic misconduct; assesses outcome of professional practice. Not only it conforms to the inherent laws of disciplinary knowledge production, but also follows the talent cultivation orientation of engineering professional degrees. Administrative Management Level: Vice dean in charge of graduate affairs and teaching secretary are the main members of this level who execute the regulations from the university level and accomplish credit management, time-node control (proposal defense, mid-term assessment); schedule academic affairs; collect quality data according to the principle of effective execution in bureaucratic organizations. Execution and Operation Level: It interacts with all aspects of supervisor guidance, classroom teaching, professional practice at off-campus bases, as a terminal interface implementing various quality control measures^[1].

The different quality functions are taken on by academic, administrative and supervisory organizations in the college. Academic organizations verify the completeness of the knowledge system of training programs, and assess the innovation and engineering application value of degree theses; Administrative organizations guarantee the chronological progress of all training stages, and promote the execution of institutional norms; Supervisory organizations take various means (teaching supervision, blind review of degree theses, thesis sampling inspection, review of professional practice reports) for independent external review outside the training process. Professional practice stage is a key quality control point which distinguishes it from academic degrees such as Ocean Engineering. To carry out quality assurance during professional practice stage needs cooperation between academic and administrative organizations and off-campus practice supervisors. The extent of their coordination decides the effect of quality control over the whole training process.

1.2 Mechanism for Allocating Rights and Responsibilities among Multiple Actors

The main rights and responsibilities of quality control in graduate training stages belong to supervisors, degree program directors and the college leader in charge. There are two kinds of supervisors for professional degrees - on-campus academic supervisors and off-campus practice supervisors: The former have the primary responsibility during the whole process of graduate training, whose rights and responsibilities include deciding topic direction, controlling research progress, educating academic norms, preliminary reviewing the quality of degree thesis; Off-campus practice supervisors focuses on guiding graduate students' engineering practice stage and evaluating the engineering projects that they participated in and their practice performance. Degree program director acts as an intermediary connecting the college management and the supervisor group, who coordinates such matters like organizing the revision of training programs, coordinating proposal defense review, arbitrating mid-term assessments, forming defense committees etc., the degree program director has to balance the dual tasks of academic judgment and administrative coordination especially need to coordinate evaluation criteria among different research directions in Ocean Engineering (ship design, fluid mechanics, unmanned surface vehicles, marine resource equipment). In the macro-level coordinating level, the college leader in charge allocates training funds, schedules laboratory and off-campus practice base resources, adjudicating disputes about training quality which facilitates the adaptive transformation of university-level regulations within the college. It theoretically achieves a balanced configuration with a separation of decision-making power, execution power, and supervision power but in fact, it tends to encounter the practical dilemma of overlapping rights and responsibilities and nominal accountability under the dual-supervisor model for professional degrees where the boundary of rights and responsibilities between on-campus academic supervisors and off-campus practice supervisors is easy to blur, and responsibility shift easily happens upon the occurrence of quality problems in professional practice. When there is disagreement between supervisors and students over topic choice, when the mid-term assessment is unqualified or the professional practice is judged as unqualified, if the mediation power, adjudication power, and appeal channels are unclear, then this

situation will lead to a management vacuum at the junctions between stages and increase the cost of quality management institutionally^[2].

1.3 Inherent Tensions in Institutional Operation

Every college implementing the training regulations on university level will face the contradiction between rigid institutions and flexible academics; therefore in terms of engineering professional degrees there exists another contradiction between academic evaluation standards vs engineering practice evaluation standards. Uniform baselines set up by universities (credit standards, proposal defense time nodes, thesis duplication rates etc.), but there exist objective differences among different research directions under the same discipline: Prototype development and large-scale offshore test projects in the field of Ocean Engineering takes longer times than simulation and numerical projects do which makes it hard to adapt to the uniform institutional standards upon implementation. Meanwhile, Ocean Engineering is a very specialized field with few experts for peer review within narrow specialties. Comments from the double-blind review model lacks engineering relevance, colleges have to balance procedural fairness vs precision of academic and engineering evaluation.

There are many participative processes in revising governing colleges such as reviewing by the academic committee or collecting supervisor opinions, however, lagging institution updates don't promptly address new quality evaluation problems that emerge on interdisciplinary research directions (e.g., marine intelligent equipment and unmanned surface vessel swarms) which doesn't have to be completely solved – it is an institutional normalcy which should be constantly managed. Rigid rules protect the quality bottom line for credits, time nodes, and academic ethics; meanwhile, some flexibility could cater to various needs from different directions and different types of projects, achieving a dynamic balance between a unified quality bottom line and discipline diversity.

2. Dimensional Construction of Effectiveness Evaluation of Quality Control in Graduate Training Stages

2.1 The “Input – Process – Outcome ” Evaluation Framework

The effectiveness evaluation of quality control at different levels of graduate training is not equal to evaluating the results of degree thesis; particularly for engineering professional degrees, it can not only evaluate the theoretical output of theses, but also assess the engineering practice ability. Here we construct a three-dimensional "input – process – outcome" evaluation framework: input refers to software and hardware including the level of dual-supervisor team development, laboratory and experimental platform conditions, literature and course resources, and the development of off-campus practice bases; the level of resource supply determines the upper limit of training quality. Process refers to the quality of course teaching, the depth of proposal defense argumentation, the screening effectiveness of mid-term assessment, the completion of professional practice, and the phased progress of the thesis which fully describes the growth trajectory of graduate students' academic and engineering abilities. Outcome refers to the quality of degree thesis, research output, the effectiveness of solving engineering problems and feedback from the industry employment market, reflecting the terminal effectiveness of quality control. Three dimensions are a causal chain, beginning with any one dimension will not fully reflect the true effectiveness of control.

Also we should differentiate between the boundary of function for formative evaluation and summative evaluation; the first one focuses on diagnosis improvements throughout the training process whose result serves targeted intervention (if a mid-term assessment discovers weaknesses in simulation ability or professional practice shows lack of engineering training, then there are timely measures taken accordingly), while the second aims at qualification determination at the time of degree conferral with a conclusive nature. We need to differ the tools and evaluation criteria used by these two kinds of evaluations so as to avoid confusing their roles leading to too much conclusion based on process data or summative determinations without supporting process evidence. Professional practice in the Ocean Engineering professional degree is a typical composite evaluation requiring us to track the whole practice process and make summative determinations on practice reports and completion of engineering tasks^[3].

2.2 Indicator System and Quantification Strategy

Effectiveness Evaluation Indicator System: Based on the key quality control points at every stage, integrating theory with operability, adding observation indicators unique to engineering practice for professional degrees. Selecting course advancedness coefficient, depth of teaching interaction, and coverage rate of frontier technology courses during the course study stage to assess the shaping effect of courses on students' engineering and academic thinking; observing frontier nature of topic selection, completeness of research design, quality of literature review, and engineering application value of topic selection based on industry needs in the proposal defense stage; emphasizing consistency of research progress, phased output of results, reasonableness of research method adjustment, and phased effectiveness of previous professional practice in the mid-term assessment stage; Professional practice is a exclusive control point for professional degrees, setting indicators including completion rate of the practice plan, degree of participating in engineering tasks, evaluation by off-campus supervisors, and quality of practice summary reports; checking academic norms, level of innovative contribution, effectiveness of solving engineering problems, and quality of defense presentation in the defense stage. These indicators are not just listed out, focusing on the core observation points that have discriminative power for training quality.

Quantify differently by different indicators: Objective indicators like credits, practice duration, number of research outputs can easily be counted and statistical analysis is possible but in case of those with high subjectivity (topic innovation, engineering application value) we need to use a multi-dimensional structured scoring scale, refine the scoring anchors and reduce evaluator's subjective bias; Weights are not equal anymore, tilting towards irreversible and very difficult stages like proposal defense, professional practice, and degree thesis. Set up a periodic calibration mechanism for indicators — When ocean engineering industry technology iterates, ineffective indicators will be quickly removed and add new observation dimensions that correspond to emerging research directions.

2.3 Quality Standards and Their Applicable Boundaries

Quality standards for training stages should take into account differences in disciplinary paradigms; There is a trade-off between academic standards and engineering standards within engineering professional degrees. Theoretical aspects of quality standards are composed of four levels: Degree of Knowledge Innovation, Methodological Standardization, Rigor of Argumentation, and Engineering or Academic Impact. Different disciplines emphasize different aspects among these four. For engineering professional degree in Ocean Engineering we can not judge only on theoretical innovation but the engineering application value of the topic takes up an important position too. Transforming abstract academic and engineering judgment to observable and verifiable textual and behavioral characteristics reduces disagreements when scored by reviewers with clear quality expectations for supervisors and students.

Reasonable setting of boundaries of quality standards. Various evaluation criteria for different directions (e.g., fluid simulation research, prototype development of marine engineering equipment or ocean energy development) are not totally consistent in Ocean Engineering, which makes it easy to hide differences within the discipline. Colleges should create a transformation channel from the university level unified training specifications to the community of disciplines and industry practice convention; ensure conformity with the basic requirements of the university while adapting to the actual development of the discipline. With the continuous emergence of new technologies and interdisciplinary issues in the field of Ocean Engineering, we need to maintain an institutional revision channel, evolve dynamically according to the academic ecosystem and industrial technology without constantly adding exception clauses^[4].

3. The Linking Mechanism between College Governance Logic and Effectiveness Evaluation

3.1 Influence Paths of Governance Structure on Effectiveness

The influence of College governance on quality control effectiveness mainly lies in resource allocation model and flow of decision-making information: Resource allocation model decides distribution of scarce resources (faculty, experimental platform, funding, off-campus practice base), if skewed towards key nodes such as proposal defense argumentation, mid-term assessment and professional practice, then supply of review capacity and practice platforms will be guaranteed which

strengthen effectiveness of stage-based gatekeeping; if distributed evenly, lack of depth of review at key nodes that directly weaken control effectiveness. Lack of off-campus practice base resources in Ocean Engineering professional degree will directly lead to a decline of quality of the professional practice stage. Flow of decision-making information determines the efficiency of collection, aggregation and feedback on quality data. If there are too many governance layers, transmission of quality information will be delayed, miss the best time point for intervention in student's problem; if simplify the hierarchy too much, information is transmitted quickly but there will be no necessary review step so that it is hard to guarantee the authenticity of information. The information chain for professional degrees should reach off-campus practice supervisors; whether practice evaluation information can flow smoothly back to the college directly affect the effectiveness of control in the practice stage. Degree of balancing academic power with administrative power determine capability of balancing academic professional judgment and administrative execution efficiency when transform evaluation data into governance decisions.

3.2 The Mediating Effect of Governance Behavior

Governing behavior is a mediator transmitting the governance structure and control effectiveness, primarily embodied in the flexibility strategy of implementing institutions and coordination of multi-stage links. The meaning of flexibility strategy refers to adapting based on context-according to the reality of disciplines to the university-level unified regulations. When it is flexibly adapted, it will adapt to the difference of experimental cycles of projects in different directions of Ocean Engineering and correctly understand the assessment criteria for mid-term assessment and professional practice; if not, there will be two extreme situations: one side of being too strictly controlled inhibiting the reasonable discretionary decision-making by supervisors while another side of being too much laxity breaking the quality bottom line reducing the practice-oriented training direction of professional degrees. The meaning of coordination of linkage refers to closed-loop interconnection between course - proposal defense - mid-term - professional practice - degree thesis. Whether the research deficiencies indicated in the proposal report are reviewed at the mid-term stage or whether the experimental shortcomings found at the mid-term stage are remedied in the thesis stage, and whether the engineering cases obtained through professional practice can be fed back into degree thesis research depend on the active carry-out of linkage by the governance behavior of the college under the same governance structure. There will be great differences in quality effectiveness when governance behavior is implemented, which also verifies the independent mediating effect of governance behavior.

3.3 Interactive Mechanism between Governance Optimization and Evaluation Feedback

The mutual driving dynamics closed loop of governance logic optimization and effectiveness evaluation feedback decides the self-improvement capability of the whole quality control system; Different process data obtained from effectiveness evaluation should be fed back to the college governance decision-making system as the empirical basis for adjusting institutions. The weak link found out by the evaluation result gives the direction of governance improvement: if there are intensive appearance of insufficient engineering application ability during defense, then loophole in professional practice control. Implementation of the information of evaluation feedback is a process of problem attribution, scheme design, effect prediction and trial adjustment. There exists a long-cycle lag effect of graduate training, the effect of governance adjustment will only manifest itself after a complete training cycle before appearing in evaluation data. Focus on the vertical cycle comparison when interpreting evaluation feedback, we can't make hasty adjustments based on short-term data fluctuations. Need to use both annual comprehensive evaluation and phased monitoring to balance systematic diagnosis with timely correction at the same time, establish clear response rules which specify what level of disposal corresponds to different evaluation results so that we don't suspend evaluation feedback rendering it ineffective. Iterative feedback promotes the dynamic equilibrium between goal setting and implementation in each stage^[5].

4. Conclusions and Implications

4.1 Conclusions

The quality control in college consists of three levels: academic decision making, administrative management and execution and operation (there exist division of labor and collaboration within

academic, administrative and supervisory organizations), it's easy to happen overlapping rights and responsibilities and nominal accountability when distributing rights and responsibilities among multiple governance actors, and the conflict between rigid institution and discipline and industry difference is a normal state of operation. The effectiveness evaluation for engineering professional degrees needs to set up a three-dimensional input – process – outcome evaluation framework, determine the boundary of formative evaluation and summative evaluation, build an indicator system and quality standards that balances academic and engineering value. From the perspective of internal mechanism, the governance structure sets the basis of control effectiveness based on resource allocation and information flow; governance behavior mediates and transmits between structure and effectiveness; governance logic optimization and effectiveness evaluation feedback constitute a closed loop. Quality governance of colleges for engineering professional degrees like Ocean Engineering can't copy the management model of academic degrees but need to balance the two training goals of academic training and engineering practice.

4.2 Implications

Clarify the boundary of rights and responsibilities of multiple actors and improve the collaborative governance mechanism of dual supervisors. Clarify the list of rights and responsibilities of on-campus academic supervisors, off-campus practice supervisors, degree program director and the college leader in charge; Clarify the boundary for dual supervisors performing their duties; Incorporate evaluation by off-campus practice supervisor into the formal assessment basis for professional practice and mid-term assessment; Improve the appeal and disposal process for quality disputes; Eliminate management vacuums at critical stages.

Secondly, conform to the institutional bottom line and accommodate disciplinary differences: Abide strictly by rigid institutional rules (credits, proposal defense, mid-term assessment, professional practice) - protect the procedural red line; Respect the objective differences among different research directions within a discipline, enhance the complementarity of blind review and intra-college academic re-review, unifying procedural fairness and precision of engineering evaluation.

Thirdly, establish an appropriate evaluation system for professional degrees. Optimize the process-based evaluation of professional practice; Adjust the weight distribution of the indicators; Often update the evaluation observation points; Adapt to technological development in the ocean engineering industry.

Fourth, Open the closed loop of evaluation – governance feedback: The college should combine all kinds of quality data acquired from proposal defense, mid-term assessment, professional practice, blind review, and defense; find shortcomings in the training system, promote dynamic revision at institutions, and constantly improve the quality of graduate training.

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