

Dilemmas and Breakthroughs in Curriculum Reconstruction of Application-Oriented Universities in the Context of Industry-Education Integration

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Abstract: *The change of the knowledge production mode towards contextualization and problem orientation makes the industrial education integration become an institution environment for curriculum reconstruction in application-oriented universities. However, the mechanisms of enterprise participation in curriculum and the introduction of new industry knowledge into universities remain unstable with the traditional knowledge-based orientation following institutional inertia resulting in the structural misalignment between the curriculum's value positioning and training objectives. By analyzing system elements we find that there exist three dilemmas as systematic barriers: At the objective level, the contest between enterprise job competencies and professional knowledge causes orientation drift; at the content level, the updating of industry knowledge and ossification of disciplinary logic cause organizational dissipation; at the implementation level, the isolation between authentic enterprise contexts and classroom setting hinders knowledge activation. To reconstruct curriculum, it should move beyond the element patching through complex problem solving to anchor integrated objectives, core concepts to build modular and flexible content, and knowledge transformation to form a university-enterprise collaborative project-based mechanism so that shift the curriculum system from value deviation to functional coupling.*

Keywords: *industry-education integration; curriculum reconstruction; application-oriented universities; knowledge production mode; curriculum objectives; curriculum content; curriculum implementation*

Introduction

The structural form and value orientation of the curriculum determines the learner's knowledge landscape and cognitive mode. In the context of industry-education integration, although there has been great progress on concept (project-based teaching, modular courses) about curriculum reform in application-oriented universities; however, it seems that enterprise participation is just signing contracts and unveiling plaques, channel by which new industry knowledge enters universities is still not smooth. Huge gap exists between the result and expectation, the whole curriculum system hasn't fundamentally changed its form, the situation with knowledge transmission being primary and disciplinary logic prevailing remains solid. Why does industry-education integration fails to trigger curriculum reconstruction? What are the deep-seated obstacles? How can we make breakthroughs? Most researches look for solutions from outside perspective: resource input or institution design, but they seldom dig into the tension relationship among the internal elements of the curriculum system. They don't fully understand the structure of the dilemmas, and the strategies put forward only go up to the level of patching. This paper takes the three core elements inside the curriculum system of application-oriented universities – objectives, content, and implementation as objects of study, and analyse respectively their internal dilemmas and mutual reinforcement mechanism under the background of industry-education integration. According to the above analysis, systematic reconstruction path will be explored to give a theoretical reference for curriculum reform.

1. Knowledge Production Transformation and Curriculum Value Orientation Deviation in the Context of Industry-Education Integration

1.1 The New Paradigm of Applied Knowledge Production in Industry-Education Integration and Its Curriculum Demands

The transformation of knowledge production from the old discipline to an open new form that faces complex problems: Paradigm change verifies the value of knowledge products by academic publications and its effectivity on the world. Enterprises become co-subjects for knowledge production at application-oriented universities via industry-education integration. The new industry knowledge comes into universities via projects, standards and technological processes; the problem-oriented and context-embedded nature of their knowledge activities get a completely new basis of legitimacy^[1].

The transformation brings three fundamental requirements on the curriculum of application-oriented universities: curriculum goals address the competency-based change jointly defined by both universities and enterprises; it points at learners' comprehensive ability to find problems, mobilize resources, generate solutions and implement them in real contexts. The curriculum content needs reconstruction according to the contextual integration surrounding authentic enterprise projects or typical industry problems instead of keeping with the logical arrangement of the discipline. Curriculum implementation will set up an open interactive mechanism breaking out from the one-way transmission mode of classroom lectures building a bridge for effective interaction between learners and enterprise technological contexts.

1.2 The Inertial Continuation of the Traditional Knowledge-Based Orientation in Curriculum under Industry-Education Integration

However as we advance on the policy of industry-education integration, the knowledge-based orientation of traditional curricula controls the design and operation of curricula under institutional and cultural inertia. Firstly, it represents the prioritization of some knowledge: curriculum developers are convinced that there exists a stable knowledge core composed of basic concepts and core principles; they choose the curriculum contents based upon the logic of importance within knowledge rather than the logic of enterprise positions and industry applications. Disciplines-centered model for curriculum organization cuts up the integrity of knowledge and complexity of problems by disciplinary boundaries. Enterprise participation in curriculum is mostly confined at internships base or lectures, finding difficulty to enter into the core of content selection and organization.

The deeper inertia lies in the linearity of curriculum content: sequential placement from foundation to application, from theory to practice suggests the existence of theoretical knowledge that does not depend on any practical context but when solving real world problems, invoking and integrating knowledge happens exactly in this context rather than before. Paradoxically there is a gap between curriculum's objectives for application-oriented universities (emphasizing application ability and professional competence), while operational reality has knowledge transmission and discipline logic still serving as substantial dominators. The new industry knowledge comes into university by passing through the filter of the disciplinary framework, and reforms are only adding some practical links within the original framework without touching the deep structure of value orientation^[2].

1.3 Structural Misalignment between Curriculum Value Positioning and Talent Cultivation Objectives in Industry-Education Integration

If during the process of integrating industry with education it necessitates changing the curricula into competency based and contextualized approach but keeping on the traditional knowledge-based approach, then there will be a conflict between them. The conflict may reflect itself through a systematic deviation from the value logic that follows the daily operation of the curriculum and the employment needs of the enterprise. Although the goal of cultivating talent has obviously pointed out the need for learners' action competence within professional context; however, the judgment of knowledge value made by curriculum designers still relies on the systematicity of disciplinary knowledge. Cultivation of ability is considered as an application of knowledge which is subordinate to knowledge transmission, and the focus of curriculum evaluation still leans towards the degree of mastering some knowledge.

The misalignment runs through every link of the curriculum system: Object element points at

competence and action; Value orientation element points at knowledge and disciplines. Contradiction is always transformed into practical contradictions on content selection, teaching implementation and outcome evaluation that causes a deviation from curriculum output and industry needs. Inertia and self-consistency exist in curriculum operation so we are hard to detect such deviation during our daily teaching. We only have no choice but to deeply adjust the curriculum value positioning once graduates exhibit a rupture between knowledge and ability in their career development.

2. Deep-Seated Dilemmas of Curriculum Reconstruction in Industry-Education Integration: An Attribution Analysis Based on System Elements

2.1 Drift in Objective Orientation: The Dilemma of the Contest between Enterprise Job Competencies and Professional Knowledge

Dilemma for curriculum objectives of application-oriented universities under industry-education integration: How much do we emphasize transfer of competencies required by enterprise positions vs adherence to transmission of systematic knowledge in a given professional field? Enterprise job competencies require adaptability of learners to transcend specific disciplinary boundaries, cope with various professional contexts; whereas professional knowledge provides them with conceptual frameworks and methodologies on which cognitive activities rely. This conflict is not theoretical but reflected in concrete conflicts when making such decisions as allocating class hours or choosing teaching priorities or setting up evaluation criteria. To achieve both because of limited curriculum capacity becomes difficult – improving one will significantly weaken the other (zero-sum game structure)^[3].

Game dilemma makes that curriculum goals drift between negotiations with universities/enterprises and operations. A balancing discursive strategy of competencies and knowledge according to the wording, however, due to the intervention of various factors (the operability of evaluation, the inertia of teachers' knowledge structure, and modes of allocating teaching resources), the transmission of professional knowledge is dominant for its clear path and measurable effect when job competencies being continuously marginalized by the compression of class hours as a result of the lack of enterprise's participation in the objective formulation. Drifts in objectives make that the curriculum can't build up a stable logic of competency development; there will be an either-or choice pressure on students about their knowledge reserve or ability development.

2.2 Dissipation in Content Selection: The Dilemma of New Industry Knowledge Entering Universities and the Ossification of Disciplinary Logic

The gap between the update speed of curriculum content and the iteration rate of industry knowledge grows wider. Industries served by application-oriented universities frequently experience technological updates, new operating standards, process methods, design concepts emerge continually. In order to follow the teaching content on the forefront, cutting-edge knowledge possessed by enterprises in industry-education integration needs to be rapidly integrated into the curriculum system. Curriculum content cannot be replaced just like replacing parts because it is embedded within a knowledge structure based upon disciplinary logic, addition or deletion of some parts can break down the integrity and coherence of the whole knowledge system. Disciplinary logic offers a stable organization for curriculum content due to its high degree of systematicity and self-consistency but restricts the entry channel of knowledge very severely: new enterprise technologies and new standards usually find themselves difficult to fit in the curriculum.

Dissipation occurs. Alternating maintenance of integrity of the disciplinary system with updating of industry knowledge, complex arguments and approvals are needed for each content adjustment. The knowledge that eventually enters into the curriculum always follows the pace of actual industry applications. Worse still, this dissipation seems both temporally delayed as well as internally conflicted on knowledge selection criteria: Depth demanded by disciplinary logic vs Breadth demanded by the updating of industry knowledge cannot be satisfied simultaneously. Tug-of-war between systematicity and timeliness results in gradual loss of a clear profile from curriculum content which cannot fully present the internal architecture of the discipline nor can it accurately follow the cutting-edge developments of the industry. Organization of knowledge is in a constant transition state^[4].

2.3 The Absence of Context Creation: The Isolation Dilemma between Authentic Enterprise Contexts and Classroom Teaching Fields

The implementation of curricula requires isolation of university-enterprise contexts. Classroom teaching as an institutionalized means of transferring knowledge has fixed spatiotemporal boundaries with specific teacher-student roles and controlled interactions that ensure the planability and executability of teaching activities: It is an isolating apparatus that separates knowledge from its context of generation and application. Knowledge is delivered to students in a decontextualized way – problems are pre-structured, conditions are specified, paths toward answers are roughly defined, what students experience are cognitive tasks processed through pedagogy instead of authentic enterprise problems.

The implications of such an isolation are profound: If we teach knowledge without context of its production then we give our students only abstract form of knowledge; activation implies ability to decide when to invoke which knowledge, how to adapt your cognitive strategy under uncertain situation, how to turn abstract principle into operative plan suitable for specific context – these are exactly those cognitive qualities that cannot be transmitted by decontextualized lecturing. As long as enterprise participation in the curriculum remains mere visit and internship there will never be a fundamental bridge from the classroom teaching field to authentic problem contexts just by summing up more cases and bring in industry materials--lack of creating context is fundamentally a structural issue not a matter of content. Spatiotemporal arrangement of the classroom, pattern of interaction among teachers and students, ways of presenting knowledge creates a different cognitive environment structurally compared to authentic ones. Ways of invoking knowledge formed therein might fail when facing problems outside the classroom. It is a deep-seated dilemma that needs confronting while implementing curriculum reconstruction.

3. Breakthrough Paths for Curriculum Reconstruction in Industry-Education Integration: From Element Patching to Systemic Reengineering

3.1 Universities and Enterprises Jointly Establish Integrated Curriculum Objectives Anchored in Complex Problem Solving

The resolution of the drift in objective orientation is for both universities and enterprises to establish a new integrative anchor for the curriculum objective system integrating enterprise job competencies and professional knowledge (the cognitive foundation on which professional knowledge depends), drawing from the application contexts where job competencies are generated – escape the either-or zero-sum game between them. The role played by complex problem solving. The solutions to complex problems in industry-education integration generally possess the characteristics of interdisciplinary, ill-structured, and context-embedding. To solve such problems we need to invoke simultaneously: deep knowledge in certain field, cross-domain information integration ability, judgment ability and decision-making ability. Using complex problem solving as an integrative anchor of curriculum objectives implies that objectives will not be classified based on their knowledge types or abilities; rather it is whether they can perform effective cognitive actions when facing ill-structured problems of various complexities become the unifying criterion^[5].

The anchor changes our way of designing our curriculum objectives: From declaring lists of knowledge mastery towards describing trajectories of ability development – what complex problems contexts learners are supposed to be able to deal with at different stages; what knowledge resources and cognitive strategies they have to invoke. The professional knowledge is not anymore something that is listed but part of the trajectory of ability development as a resource needed for problem solving. Enterprise job competencies lose their abstraction and get behavioral representation by specifying them in the specific links of problem solving. All pieces of the previously scattered (sometimes conflicting) objectives find their rightful place within the cognitive framework of problem solving leading to consistency in terms of the internal logic at the level of curriculum formulation.

3.2 Constructing Flexible Curriculum Content with Core Concepts as the Hub and New Industry Knowledge as Modules

Under the guidance of integrated objectives, curriculum content needs to depart from the ossified structure of disciplinary logic and form a flexible structure with the systematicity in organizing

knowledge and also responding to the updating of industry knowledge. Key is core concepts: each discipline or interdisciplinary field has some nodal concepts which are at the center of the knowledge network. These concepts have relatively high explanatory power and transferability; they could integrate many phenomena, facts, and principles into a concise cognitive framework. Curriculum content using core concepts rather than traditional chapters for organization will gain cross-boundary flexibility while maintaining their knowledge depth because those core concepts themselves have explanatory effectiveness across different application contexts.

The modular structure can be flexible. Learning modules based on core concepts have complete learning objectives, content boundaries and evaluation criteria; They are connected through conceptual association rather than linearity. New industries knowledge inside enterprise can be embedded into corresponding modules which has been certified by the curriculum committee. When there is an important update in knowledge in a certain field, it needs just for this module to iterate without compiling all curriculum sequences again. Different combination of modules according to learners' level of cognitive development will produce learning paths of different direction and depth. It buffers the tension between the industry updating requirements and the systematicity requirements of curriculum content so as to make the curriculum gradually iterate but keep stable overall architecture.

3.3 Creating a Project-Based Curriculum Implementation Mechanism Based on University-Enterprise Collaboration and Knowledge Transformation as the Carrier

Finally, guarantee the goal anchors and content structure at the implementation level by means of a university-enterprise collaboration mechanism. In order to connect authentic enterprise context and the field of classroom teaching, we should embed into our curriculum an implementation carrier which simulates the authentic cognitive contexts. Unlike traditional teaching case or exercise in class, authentic enterprise project is open of problems, continuous of process, concrete of outcome, requiring independent or cooperative completion of cognitive task with practical orientation within time span/resource constraint. Projects have no role as extra exercises after knowledge transmission, but they are the core carrier for knowledge transformation^[6] in the curriculum.

The Knowledge Transformation has a double meaning: Cognitively for individuals means to invoke, reorganization, verify the conceptual knowledge learned by module through project tasks, making abstract knowledge contextualized; For knowledge forms, means generate knowledge products (technical solutions, operating procedures or analytical reports) which are practically useful using disciplining knowledge to solve problems. In designing the project-based mechanism, we should take into account two points: Firstly, the degree of project complexity corresponds to the curriculum objective anchor, and have functions of cultivating problem-solving ability at different stages according to the stage of projects; Secondly, Keep open problems rather than be operationalized as clear sequenced execution steps, let learners go through an entire process of knowledge invocation and decision-making under uncertainty. Through collaboration with university-enterprise dual mentors, integrating knowledge learning and knowledge application not only in time but also merging them in space, fundamentally changing the structural isolation between classroom context and authentic contexts.

Conclusion

The essence of curriculum reconstruction does not lie just in adding/deleting curriculum contents or improving partially teaching methods, but a profound change for the curriculum system from the perspectives of value orientation and structure. We reveal structural dilemmas met by the curricula of application-oriented universities at objectives, content, and implementation level as well as the systemic lock-in effect generated by their mutual reinforcement under the perspective of industry-education integration and transformation of knowledge production mode: the contest between enterprise job competencies and professional knowledge causes continuously drifting curriculum orientation at the objective level; the tug-of-war between industry knowledge updating and disciplinary logic generates organizational dissipation at the content level; the isolation between authentic enterprise contexts and the classroom field prevents knowledge activation at the implementation level. These dilemmas are not isolated hurdles that are all isomorphic with the deep-rooted source of the knowledge-based view of curriculum, forming structural resistance hard to be shaken off by local reforms.

From this, the breakthrough paths proposed by our study suggest systematic reengineering rather

than element patching; through universities and enterprises jointly anchoring integrated objectives in complex problem solving, building modular content with core concepts as the hub, and setting up a project-based implementation mechanism with knowledge transformation as the carrier, making all elements in the curriculum internally consistent based on a new value framework, transforming the cycle of dilemmas into one of optimization. Future research we can focus on the differentiated manifestation of curriculum reconstruction under industry-education integration across different disciplines, investigating the specific transformation method of objective anchoring, content organization and implementation carriers according to different type of curriculum form, and tracking the real effect of curriculum reconstruction on students' cognitive structure via empirical methods, which will provide an empirical test and revision for the theoretical framework.

References

- [1] Tian Zhenping and Xie Yincheng. "Research on the Construction Ideas and Practical Paths of Industry-Education Integration Courses in Application-Oriented Undergraduate Universities." *Modern Business Trade Industry* 14(2025): 212-216.
- [2] Hu Wanshan. "The Practical Needs, Practical Dilemmas, and Reform Strategies for Building High-Level Application-Oriented Universities." *Contemporary Education Forum* 3(2024): 1-8.
- [3] Fang Su. "Research on the Construction of Competency-Oriented Curriculum Systems in Application-Oriented Universities." *Journal of Nanjing Institute of Technology (Social Science Edition)* 23.4(2023): 74-78.
- [4] Nie Yongcheng and Dong Zefang. "Exploring the Paths of Curriculum Reform in Application-Oriented Universities in the Context of the Transformation of Knowledge Production Modes." *Hubei Social Sciences* 1(2020): 144-150.
- [5] Li Yan. "Reflections on Deep Modular Teaching Reform in Application-Oriented Undergraduate Education Based on Industry-Education Integration." *Education and Vocation* 12(2020): 92-97.
- [6] Nie Yongcheng and Dong Zefang. "Exploring the Paths of Curriculum Reform in Application-Oriented Universities in the Context of the Transformation of Knowledge Production Modes." *Hubei Social Sciences* 1(2020): 144-150.