Iranian Journal of Educational Sociology

Journal Website

Article history:
Received 01 April 2026
Revised 01 August 2026
Accepted 06 August 2026
Initial Publication 10 September 2026
Final Publication 01 November 2026

Iranian Journal of Educational Sociology

Volume 9, Issue 6, pp 1-18

Quarterly
Iranian Journal of Educational Sociology

E-ISSN: 2645-3460

Designing a Model for Aligning the Curriculum and Assessment System with Industry Needs in Technical and Vocational High Schools in Tehran

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Hajatmand, F., Bani Asadi, N., & Zolfaghari Zafarani, R. (2026). Designing a Model for Aligning the Curriculum and Assessment System with Industry Needs in Technical and Vocational High Schools in Tehran. *Iranian Journal of Educational Sociology*, *9*(6), 1-18.
https://doi.org/10.61838/kman.ijes.1528

A B S T R A C T

Purpose: This study aimed to explain the education–industry gap and design a model for aligning the curriculum and assessment system with industry needs in technical and vocational high schools in Tehran Province during the 2025–2026 academic year.

Methods and Materials: The study adopted a qualitative approach and was conducted through semi-structured interviews with experts, administrators, and teachers. The data were coded and analyzed using thematic analysis and ATLAS.ti software, and the Delphi technique was employed to validate and finalize the model. In the qualitative phase, 15 experts were selected through purposive sampling, and an initial research model was developed after the themes had been extracted. The model was subsequently presented to 58 members of the Delphi panel. Through several rounds of feedback and the achievement of an agreement level exceeding 70%, the validity, coherence, and applicability of its components were confirmed.

Findings: Data analysis through open, axial, and selective coding resulted in the extraction of 16 axial codes and seven selective codes and the development of the conceptual model. The findings indicated that the education–industry gap was evident in dimensions such as the recruitment and empowerment of instructors and students, the alignment of curriculum objectives and content with industrial developments and needs, the adaptation of teaching methods to the actual workplace, and the establishment of a competency-based assessment system. The final model was developed at three interconnected levels: input, comprising the recruitment and empowerment of human resources; process, comprising the alignment of objectives, content, teaching methods, and the assessment system with industry needs; and output, comprising the enhancement of professional competencies, reduction of the education–industry gap, and improvement of the quality of technical and vocational education.

Conclusion: The results emphasize the necessity of transitioning from traditional approaches to a skill-based, competency-based system founded on continuous feedback. Such a transition can strengthen the systematic relationship between technical and vocational education and industry, improve educational quality, and reduce the gap between education and the actual needs of the labor market.

Keywords: *education–industry gap, alignment, curriculum, technical and vocational education, thematic analysis.*

1. Introduction

Technical and vocational education is a central component of national human-capital development because it connects formal education with occupational competence, productivity, employability, and economic participation. Unlike general education, which primarily develops broad cognitive, social, and cultural capacities, technical and vocational education is expected to prepare learners for direct entry into specific occupational fields and enable them to adapt to technological and organizational changes in the workplace. Its effectiveness therefore depends not only on the quality of teaching within educational institutions but also on the degree of correspondence between curricula, instructional practices, assessment systems, and the evolving requirements of industry and the labor market. When these elements are poorly aligned, graduates may obtain formal qualifications without acquiring the practical, technical, interpersonal, and problem-solving competencies required for effective workplace performance. Consequently, the relationship between education and industry has become a major policy and management concern in systems seeking to improve workforce readiness, reduce skills mismatches, and strengthen the social and economic returns of education (Salehi Omran, 2023; Zheng, 2024).

The concept of educational quality is multidimensional and cannot be reduced to examination results, graduation rates, or the availability of physical resources. It encompasses the relevance of educational objectives, the appropriateness of curriculum content, the competence of teachers, the quality of learning environments, the validity of assessment procedures, the responsiveness of institutions to stakeholders, and the extent to which educational outcomes correspond to social and occupational expectations. From this perspective, quality is both an internal and an external construct. Internally, it concerns the effectiveness and coherence of educational processes; externally, it concerns the extent to which education produces outcomes that are valuable to learners, employers, society, and the economy. Measurement of educational quality therefore requires a combination of process indicators, outcome indicators, stakeholder judgments, and evidence of actual performance rather than reliance on a single administrative or academic criterion (Pheng & Rui, 2016; Ryzhov et al., 2021). This broader understanding is particularly important in technical and vocational education, where the ultimate value of learning is closely associated with occupational performance and the capacity to respond to real workplace conditions.

The alignment of educational objectives with industry needs constitutes the first essential dimension of a responsive technical and vocational education system. Educational objectives determine the competencies that learners are expected to acquire and shape subsequent decisions regarding curriculum content, instructional methods, learning environments, and assessment standards. If these objectives are formulated without systematic consultation with employers, professional associations, industry experts, and labor-market institutions, they may reflect outdated occupational models or general educational aspirations rather than current production requirements. Rapid technological change further intensifies this problem, as new occupations emerge, traditional roles are transformed, and employers increasingly require combinations of technical expertise, digital competence, adaptability, communication, teamwork, and problem-solving ability. Research on future engineering and vocational specialists has accordingly emphasized that occupational preparation must be linked to technological innovation, practical training, and the actual competency structures of modern industries (Zheng, 2024). Similarly, the organization of higher skill-based education requires institutional integration, policy coherence, and stronger connections among educational providers, employment structures, and national development priorities (Salehi Omran, 2023).

Curriculum content is the operational expression of educational objectives and represents the knowledge, skills, values, and professional dispositions that learners are expected to develop. In technical and vocational settings, curriculum relevance depends on the extent to which content reflects contemporary technologies, occupational standards, workplace procedures, safety requirements, professional ethics, and the practical challenges encountered in industry. A curriculum that remains fixed while industrial processes change will inevitably widen the education–industry gap. This gap may become particularly visible when educational institutions continue to teach traditional tools, procedures, or software while employers adopt automated systems, digital platforms, artificial intelligence, advanced manufacturing technologies, or new forms of service delivery. The digital transformation of education has created both opportunities and challenges in this respect, requiring curricula to incorporate digital literacy, technology-supported learning, and the ability to work in increasingly data-intensive

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E-ISSN: 2645-3460

environments (Joukar et al., 2024; Nemati & Nazari, 2024). Moreover, the quality of curriculum design must be evaluated not only by the quantity of specialized content but also by its coherence, sequencing, flexibility, and capacity to support the transfer of learning from school to work.

The increasing complexity of occupational roles has also expanded the meaning of professional competence. Contemporary employers commonly expect graduates to possess not only technical or "hard" skills but also communication, teamwork, decision-making, creativity, customer orientation, ethical responsibility, and the capacity to learn continuously. In engineering education, faculty members have been found to conceptualize professional skills in diverse ways, ranging from supplementary interpersonal attributes to integrated dimensions of professional practice, indicating the need for clearer curricular incorporation of such competencies (Beagon & Bowe, 2023). In technical and vocational education, the omission of professional and soft skills may produce graduates who can perform isolated technical tasks but struggle to function effectively in collaborative, unpredictable, or client-centered environments. Strategic competency identification is therefore necessary for curriculum and educational planning, particularly when designing programs for technical and vocational students whose employability depends on the integration of knowledge, practical ability, and professional behavior (Nouri et al., 2019). Creative thinking and problem-solving are similarly important because industrial work rarely consists solely of routine task reproduction; rather, employees must diagnose problems, adapt procedures, and respond to unfamiliar situations (Esmaeilizadeh et al., 2024).

Teaching methods represent another critical mechanism through which curricular intentions are converted into learner competencies. Traditional lecture-centered approaches may be useful for explaining concepts, but they are insufficient when the desired learning outcomes involve equipment operation, production procedures, teamwork, troubleshooting, safety behavior, or performance under realistic time and quality constraints. Technical and vocational education therefore requires active, experiential, project-based, problem-based, workshop-based, and work-integrated approaches that allow learners to apply knowledge in authentic or simulated occupational contexts. The design of learning spaces can either support or restrict such approaches. Innovative and flexible educational environments can facilitate collaboration, creativity, practical experimentation, and the development of twenty-first-century competencies, whereas conventional classroom arrangements may reinforce passive and teacher-centered instruction (Farajinejad Jahromi et al., 2025). Accordingly, the physical and technological organization of technical schools should be considered part of curriculum implementation rather than merely an infrastructural matter.

The competence of instructors is equally decisive in determining whether technical and vocational curricula remain connected to industry. Effective instructors require a combination of subject-matter knowledge, practical occupational experience, pedagogical competence, assessment literacy, digital capability, and familiarity with emerging industry standards. Possession of an advanced academic degree does not necessarily guarantee the ability to teach practical skills, manage workshops, assess performance, or demonstrate contemporary industrial procedures. Conversely, extensive occupational experience alone may not ensure competence in instructional design, learner guidance, classroom management, or valid assessment. Recruitment and professional development systems must therefore seek an appropriate integration of industrial and pedagogical qualifications. International frameworks on teaching and learning emphasize the significance of teacher knowledge, instructional practice, professional learning, collaboration, working conditions, and institutional leadership in shaping educational quality (Ainley & Schulz, 2025). Studies of in-service teachers' assessment needs likewise show that educators may require targeted professional development in testing, evaluation, and the interpretation of learner performance (Canlı & Altay, 2024).

Training-needs assessment is essential for ensuring that instructor development programs respond to actual performance gaps rather than being based on general, repetitive, or administratively convenient topics. Effective needs assessment identifies discrepancies between current and expected performance at organizational, occupational, and individual levels and uses these findings to prioritize training content, methods, and resources. Evidence from public-sector training systems indicates that weak needs-assessment processes can reduce the relevance and effectiveness of professional development programs (Balisi, 2014). Within technical and vocational education, this concern is especially important because instructors must continually update their knowledge in response to technological change. Digital literacy training can improve the quality of teachers' technology use when it is appropriately connected to classroom and instructional

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E-ISSN: 2645-3460

requirements (Nemati & Nazari, 2024). Likewise, improving specialized subject instruction requires systematic attention to teacher competence, instructional resources, curriculum relevance, and contextual barriers rather than isolated interventions (Abolhasani Dargah, 2025).

The recruitment and admission of students also influence the effectiveness of technical and vocational education. When students enter vocational programs without adequate information, motivation, aptitude assessment, or career guidance, educational institutions may face substantial heterogeneity in learner readiness, commitment, and expectations. Such heterogeneity can complicate instruction, reduce engagement, and contribute to dropout, low achievement, or weak occupational identity. Competency-oriented admission does not necessarily imply restrictive exclusion; rather, it requires mechanisms for identifying interests, strengths, learning needs, and the degree of fit between learners and occupational pathways. Proper academic and career guidance can help students select fields consistent with their abilities and employment opportunities. This issue must also be considered in relation to the historical development of education in Iran, where structural changes, policy discontinuities, centralized decision-making, and the varying status of practical and theoretical education have shaped the strengths and weaknesses of the educational system (Safari Mahjanabadi et al., 2019). A more responsive admission system can therefore contribute to both educational equity and improved program effectiveness.

Assessment is one of the most influential components of curriculum implementation because it communicates what forms of learning are valued and determines how competence is recognized. If assessment primarily emphasizes written examinations and theoretical recall, teachers and students are likely to prioritize memorization even when the official curriculum highlights practical competence. In contrast, competency-based assessment requires learners to demonstrate their ability to perform tasks, solve problems, apply standards, use tools safely, produce acceptable outputs, and transfer knowledge to realistic situations. Such assessment may include practical examinations, projects, portfolios, workplace observations, simulations, performance tasks, and evaluations by industry experts. The validity of these methods depends on the clarity of performance criteria, the reliability of scoring, the authenticity of tasks, and the extent to which assessment conditions resemble occupational practice. The pathology of educational evaluation systems has shown that formal evaluation mechanisms may become fragmented, bureaucratic, or insufficiently connected to quality assurance and improvement (Akbari et al., 2020). Internal evaluation studies similarly demonstrate the need to assess educational objectives, faculty performance, curriculum, learning resources, students, and institutional processes as interconnected components rather than isolated variables (Baniasadi et al., 2015).

Teacher performance assessment is closely related to learner assessment but serves a distinct managerial function. A credible performance-management system should clarify expectations, evaluate relevant evidence, provide developmental feedback, recognize effective performance, and support corrective action where necessary. Performance assessment loses legitimacy when it is ceremonial, based exclusively on administrative documentation, dependent on brief observations, or disconnected from professional development and employment decisions. Evidence-based performance management emphasizes the continuous cycle of planning, monitoring, reviewing, feedback, capability development, and improvement (Armstrong, 2020). Applied to technical and vocational schools, this means that instructor evaluation should include the currency of technical knowledge, the quality of practical instruction, student learning, workshop management, industry engagement, contribution to curriculum updating, and the employment-related outcomes of graduates. Evaluation should therefore function as a learning and improvement mechanism rather than merely as an inspection process.

The successful implementation of educational reform also depends on institutional and policy conditions. Even well-designed curricula may produce limited results when schools lack adequate equipment, stable funding, qualified personnel, organizational autonomy, effective leadership, or mechanisms for collaboration with external stakeholders. Iranian educational reforms have frequently faced implementation challenges related to structural constraints, insufficient resources, inconsistency between policy and practice, and limited institutional preparedness (Arab & Mirzaei, 2024). Broader educational research has likewise emphasized that improving school quality requires attention to the integrated contributions of curriculum, teachers, management, psychology, planning, and educational sciences (Rezaei et al., 2024). In technical and vocational education, these implementation challenges may be intensified by the high cost of equipment, the rapid obsolescence of technologies, and the administrative

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complexity of establishing sustainable partnerships with industrial organizations.

The relationship between technical and vocational education and sustainable development provides an additional rationale for strengthening education–industry alignment. Skills education can contribute to sustainable economic participation by improving employability, supporting productive citizenship, and preparing individuals to engage responsibly with social and environmental challenges. Attitudes toward education for sustainable development are associated with broader dimensions of citizenship culture, suggesting that education should prepare learners not only for employment but also for responsible participation in society (Sarikhani Ghaleh Babakhani & Baniasadi, 2019). From this perspective, technical competence should be integrated with ethical awareness, environmental responsibility, social cooperation, and the capacity to contribute to sustainable production and service systems. The education–industry relationship should therefore not be interpreted narrowly as the immediate supply of labor to employers; it should also support long-term professional development, social inclusion, innovation, and sustainable national capacity.

Quality improvement requires a systematic model that integrates input, process, and output dimensions. Inputs include the recruitment, qualifications, motivation, and competencies of instructors and students, as well as institutional resources and learning environments. Process dimensions include the alignment of objectives, curriculum content, teaching methods, professional development, and assessment practices with industry and societal needs. Outputs include the demonstrated competencies of graduates, employability, employer satisfaction, instructional effectiveness, and the overall reduction of the gap between education and work. Feedback mechanisms connect these levels by ensuring that assessment results, industry developments, graduate outcomes, and stakeholder judgments are used to revise recruitment criteria, curriculum content, teaching strategies, and instructor-development programs. Such a model is consistent with the principle that quality assurance must be continuous, evidence-based, and improvement-oriented rather than limited to periodic administrative evaluation (Akbari et al., 2020; Armstrong, 2020).

Despite the recognized importance of education–industry alignment, technical and vocational schools continue to face several interconnected challenges, including credential-oriented recruitment, inadequate industrial experience among some instructors, uneven student admission practices, delayed curriculum revision, limited coverage of emerging technologies, insufficient attention to soft skills, theory-dominated instruction, weak simulation of workplace conditions, and assessment systems that do not fully measure occupational competence. These concerns are compounded by limitations in institutional collaboration, professional development, performance evaluation, and the use of evidence for continuous improvement. Although previous studies have examined educational quality, competency development, internal evaluation, teacher training, digital literacy, educational planning, and skill-based higher education, there remains a need for an integrated model that explains how recruitment, curriculum, teaching, and assessment can be systematically aligned with industry and societal requirements in technical and vocational high schools (Beagon & Bowe, 2023; Joukar et al., 2024; Nouri et al., 2019).

Accordingly, the aim of this study was to design a model for aligning recruitment and key stakeholder competencies, the curriculum, and the assessment system with the requirements of industry and society in technical and vocational high schools in Tehran.

2. Methods and Materials

The present study aimed to design a model for "aligning the curriculum and assessment system with industry needs." In terms of purpose, it was an applied study, while in terms of its nature and methodology, it was classified as qualitative exploratory research. The study was conducted during the 2025–2026 academic year in technical and vocational high schools in Tehran. The operational research process used to develop the final model was based on thematic analysis and the qualitative Delphi technique. In the first stage, the process began with a documentary review and qualitative content analysis of specialized literature and high-level policy documents, including the Fundamental Transformation Document of Education, technical and vocational curriculum documents, and labor-market needs-assessment reports related to industries in Tehran. During this stage, note-taking and open coding were used to identify concepts associated with industry-required competencies and to develop an initial inventory of model indicators. Subsequently, purposive and judgmental sampling was employed to select participants for the contextualization of these components and the development of the conceptual model. The participants included three groups:

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administrators, experienced teachers with more than 10 years of teaching experience and five years of executive or research experience, and upper-secondary students. Among them, 17 qualified experts were also selected as members of the Delphi panel. Data were collected through in-depth semi-structured interviews, which constituted the most extensive operational stage of the study and were conducted in accordance with rigorous educational and ethical protocols. Before each interview, the participants were provided with a brief definition of the concepts associated with quality assessment. The duration of the interviews was not restricted and was determined flexibly according to the richness and quality of the data. All sessions were privately recorded at the interviewees' workplaces and transcribed verbatim to ensure analytical accuracy. The interview data were entered into ATLAS.ti software for organization and structured analysis and were analyzed through open, axial, and selective coding using thematic analysis to extract the basic, subordinate, and overarching themes of the study. To finalize the model and achieve expert consensus, the preliminary model generated through the software was then presented to 58 Delphi panel experts. During iterative rounds, structured Likert-scale questionnaires were used to make the necessary revisions until a consensus level exceeding 70% was achieved for all indicators. This process resulted in the development of a final model for improving the quality of education in Tehran's technical and vocational high schools in accordance with industry needs. Finally, to ensure the credibility and validity of the findings, data-source triangulation, member checking, and verification of the coding by a research colleague were employed to establish the trustworthiness of the analytical process throughout all stages of the study. In this research, 15 experts and specialists in technical and vocational education were purposively selected as interviewees. They included administrators and deputy administrators of technical and vocational high schools, university faculty members, organizational experts, educational consultants, and professionals active in industry and skills training who possessed diverse experience at executive, educational, and policymaking levels.

Table 1

Demographic Characteristics of the Interviewees

Code	Name	Gender	Age	Occupation	Educational Qualification	Work Experience (Years)
P1	Karimi	Male	52	Center director, deputy director of education, and director-general in one of the country's industrial provinces	PhD in Educational Administration	20
P2	Ahmadi	Male	48	Instructor at Shahid Chamran Technical and Vocational Center in Tehran and welding consultant in an industrial workshop	Associate degree in Welding	25
P3	Rezaei	Male	24	Mobile phone repair technician	Diploma in Experimental Sciences	2
P4	Nouri	Female	38	Office for the Development of Occupational Skill Standards	PhD in Curriculum Planning	12
P5	Kazemi	Male	45	Executive deputy of a technical and vocational high school	PhD in Educational Administration	24
P6	Rahimi	Male	52	Organizational management	PhD in Educational Administration	20
P7	Safari	Male	29	Teacher at a technical and vocational high school	Master's degree in Information Technology	14
P8	Mostafavi	Male	55	Technical deputy of technical and vocational high schools	Master's degree in Electronic Engineering	18
P9	Karimi	Male	42	Deputy administrator of a technical and vocational high school in District 12	Master's degree in Human Resource Management	20
P10	Eslami	Female	37	Counselor	Master's degree in Academic Counseling	15
P11	Entezari	Male	50	University faculty member	PhD in Human Resource Management	25
P12	Vakili	Male	53	Administrative affairs and records officer	Bachelor's degree in Solid Mechanics	12
P13	Iranshahi	Female	48	Principal of a Kar-Danesh and technical and vocational high school in District 8	Master's degree in Educational Planning	18
P14	Azampour	Male	70	Principal of Karamouz High School in District 4	Master's degree in Management	51
P15	Firouzi	Male	55	Principal of Karamouz High School in District 2	Master's degree in Architecture	27

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E-ISSN: 2645-3460

In terms of demographic characteristics, the sample included men and women ranging in age from 24 to 70 years, reflecting generational diversity among the experts. The participants' educational qualifications ranged from a high school diploma to a doctoral degree in educational administration, curriculum planning, engineering, counseling, and other related fields. Their work experience ranged from two to 51 years, indicating that the study incorporated the perspectives of individuals with varying levels of occupational and professional experience. This diversity in the interviewees' personal and professional characteristics provided the necessary foundation for obtaining rich and multidimensional data concerning the research topic.

3. Findings and Results

The findings of the thematic analysis indicate that recruitment procedures and entry conditions for instructors and students play a fundamental role in the quality of technical and vocational education. At the instructor level, a combination of specialized knowledge, practical experience, and teaching capabilities is essential, while deficiencies in pedagogical skills resulting from certain nonspecialized recruitment procedures were identified as a challenge. The use of instructors with actual industrial experience was also emphasized as an influential factor in improving educational quality.

At the student level, the necessity of transitioning from traditional selection procedures to competency-based approaches, including aptitude-based academic guidance and practical assessment of skills, was highlighted. Overall, the findings emphasize the need to revise recruitment criteria and move toward a competency-based system in order to align education with labor-market needs. The interview findings are presented below.

The findings indicate that the quality of technical and vocational education depends on the recruitment of instructors and students. The results emphasize the use of instructors who possess specialized knowledge and industrial experience, competency-based academic guidance, and practical skills assessment. In general, transitioning toward a competency-based recruitment and assessment system was identified as one of the requirements for improving educational quality.

Table 2

Thematic Network: Analysis of Recruitment Processes, Academic Level Classification, and Skill Qualifications of Key Stakeholders

Selective Coding—Overarching Themes/Criteria	Axial Coding—Organizing Themes/Indicators	Open Coding—Basic Themes
Recruitment procedures and entry conditions for instructors and students	Recruitment procedures and entry conditions for instructors	Access to experienced teaching staff; employing graduates as instructors; using experienced vocational instructors; sharing personnel with the Ministry of Education; recruiting media-oriented personnel; adverse consequences of closing teacher-training centers; nonspecialized recruitment of engineers; and lack of teaching skills
Recruitment procedures and entry conditions for instructors and students	Recruitment procedures and entry conditions for students	High student intake; absence of grade-point-average-based selection; academic guidance based on awareness and interviews; consideration of educational background during admission; and competency-based academic guidance
Instructors' educational qualification levels and students' levels of academic progress	Students' levels of academic progress and grades obtained	Digitalization of assignments and examinations; continuous assessment and workshop-based skills assessment; prioritization of learning over grade orientation; structure of the assessment system; and integration of practical and theoretical grades
Instructors' educational qualification levels and students' levels of academic progress	Instructors' educational qualification levels	Questioning the necessity of formal education; specialization of teaching staff; improvement of specialized capabilities; necessity of teacher empowerment; performance of the teacher-as-mentor role; and instructor specialization
Instructors' educational qualification levels and students' levels of academic progress	Level of skills acquired by instructors	Mastery of modern skill standards; ability to work with new workshop equipment; transfer of practical experience to students; and up-to-date technical knowledge

The criterion of "recruitment procedures and entry conditions for instructors and students" reflects the gap between the credential-oriented structure of education and the actual needs of industry. With respect to instructors, P1 and P9 referred to budgetary and salary-related problems. P12 and P4 also discussed the predominance of credentialism and the inadequacy of academic qualifications as guarantees of teaching quality. Furthermore, P8 emphasized instructors' practical skills, while P12, P7, P15, P3, and P5 regarded the recruitment of personnel with industrial experience and actual work experience as essential.

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With respect to students, P6, P4, and P10 considered open admission a factor contributing to heterogeneity in students' educational levels and reduced motivation among some learners. To address this challenge, P5 emphasized recruiting talented individuals, P12 emphasized interviews and motivation assessment, and P7 and P8 emphasized entrance examinations. In the area of assessment, P12, P15, P11, and P10 stressed the assessment of specialized, soft, and multidimensional skills in accordance with labor-market needs, while P8 recommended redesigning the assessment system on the basis of continuous assessment and the simulation of actual industrial conditions. Overall, the findings emphasize the need to transition from credential orientation to skill orientation, strengthen relationships with industry, and revise recruitment and assessment systems.

The findings indicate that, in skills-based education, merely upgrading instructors' academic qualifications does not guarantee educational quality. P13 stated that "there are no instructors with qualifications below a bachelor's degree," while P1 and P14 referred to the increasing educational qualifications of instructors at the master's and doctoral levels. Nevertheless, P1 and P4 noted that "a higher qualification does not necessarily signify practical competence or teaching quality." These findings reflect the predominance of credentialism over professional competence. In the skills dimension, the gap between formal education and industry needs remains. P5 referred to instructors' "limited practical skills," while P2 identified the "theory-oriented nature of in-service training programs" as one of the factors contributing to this gap. P8 further stated that a technical instructor must possess "golden hands," referring to exceptional hands-on expertise. In the same context, P9 and P12 stated that many instructors are unfamiliar with "the actual production-line environment and up-to-date industry standards." Consequently, upgrading academic qualifications without industrial experience has a limited effect on students' progress. P12 and P15 emphasized recruiting experienced instructors and using highly experienced vocational trainers, while P3 regarded direct labor-market experience as a factor contributing to an instructor's success. P7 also considered mastery of "artificial intelligence tools and emerging technologies" essential. With respect to students, although some were capable of "entering the income-generating cycle directly," P15 continued to emphasize mastery of "specialized labor-market software." In the area of assessment, P12, P10, and P8 regarded current skill levels and assessment procedures as inadequate, while P11 emphasized "comprehensive and multidimensional" assessment. Heterogeneity in academic levels and admission without aptitude assessment were also identified as factors contributing to declining quality. Overall, improving the quality of skills-based education requires reducing the gap between credentials and skills, strengthening relationships with industry, and revising student recruitment and assessment systems.

The dynamism of technical and vocational education requires the alignment of the curriculum and assessment system with industry needs. Accordingly, educational objectives, content, teaching methods, and assessment procedures must be revised in accordance with labor-market developments. Teacher performance assessment should not be based solely on administrative criteria; rather, teachers' ability to provide up-to-date, skill-based instruction aligned with industry needs should also be considered.

Table 3

Analysis of Themes Related to the Alignment of the Curriculum and Assessment System with the Requirements of Industry and Society

Selective Coding—Overarching Themes/Criteria	Axial Coding—Organizing Themes/Indicators	Open Coding—Basic Themes
Alignment of technical and vocational education objectives with societal needs, including industry and the labor market	Degree of alignment between technical and vocational education objectives and industry	Time lag between education and technology; continuous monitoring of industry needs; inconsistency between programs and current needs; lagging behind emerging technologies; slow revision of occupational skill standards; failure to address the needs of emerging occupations; and lack of alignment between programs and production requirements
Alignment of technical and vocational education objectives with societal needs, including industry and the labor market	Degree of alignment between technical and vocational education objectives and societal needs	Alignment of skills with societal needs; ineffectiveness of employment-oriented programs; and balance between general and specialized courses
Alignment of technical and vocational education objectives with societal needs, including industry and the labor market	Alignment with industry and the labor market	Continuous curriculum updating; structural distinction between technical and vocational education and the Kar-Danesh branch; ineffective assessments of educational quality; and the need to focus on professional development

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Alignment of technical and vocational curriculum content with societal needs, including industry and work	Degree of alignment and compatibility between technical and vocational curriculum content and industry	Shortage of modern educational content; focus on traditional skills; lack of instruction in international standards; content aligned with company needs; emphasis on modern skills training; provision of complementary specialized content; preference for closed curricula; and time lag between curriculum content and industry
Alignment of technical and vocational curriculum content with societal needs, including industry and work	Degree of alignment between technical and vocational curriculum content and societal needs	Neglect of soft-skills training; focus on hard skills; ineffective educational content; removal of arts courses; rigidity of approved courses; and necessity of curriculum flexibility
Alignment of technical and vocational teaching and instructional methods with societal needs, including industry and work	Degree of alignment between technical and vocational teaching methods and industry	Continued use of theoretical teaching methods; failure to simulate actual industrial conditions; effectiveness of learning in real-world environments; practical and project-based teaching; teaching beyond the formal framework; implementation of the flipped-learning model; transfer of instruction to industrial workshops; need for constructivist learning; and creativity-based education
Alignment of technical and vocational teaching and instructional methods with societal needs, including industry and work	Degree of alignment between technical and vocational teaching methods and societal needs	Ineffectiveness of virtual education; inappropriate prioritization of theoretical courses; and predominance of theory over practical instruction
Alignment of knowledge and skills assessment methods with societal needs, including industry and work	Degree of alignment between knowledge and skills assessment procedures in technical and vocational education and industry	Simple and limited skills examinations; necessity of industry supervision over examinations; final-project-based assessment; need to supervise internship quality; assessment by occupational and trade experts; deficiencies in assessing emerging skills; assessment under simulated conditions; and graduates' inadequate practical skills
Alignment of knowledge and skills assessment methods with societal needs, including industry and work	Degree of alignment between knowledge and skills assessment procedures in technical and vocational education and societal needs	Weak supervision over grades; continuous workshop-based assessment; necessity of evaluating problem-solving ability; and the gap between skills training and the labor market
Alignment of the teacher performance assessment system with societal needs, including industry and the labor market	Degree of alignment between the teacher performance assessment system in technical and vocational education and industry	Instructor assessment affecting employment contracts; instructor assessment by employers; increased transparency in the instructor assessment system; evaluation of the currency of instructors' knowledge; and limited training in modern instructional methods
Alignment of the teacher performance assessment system with societal needs, including industry and the labor market	Degree of alignment between the teacher performance assessment system in technical and vocational education and societal needs	Superficiality of traditional assessment systems; lack of mechanisms for improving instructor performance; ambiguity regarding the consequences of instructor surveys; performance assessment by administrators; continued employment of underperforming instructors; and dependence of assessment on administrators

The three-stage findings indicate that the technical and vocational education system continues to be affected by a "time lag between education and technology," a "focus on traditional skills," and the "predominance of theoretical teaching methods." P2 and P6 regarded this gap as the principal cause of the misalignment between education and industry needs, while P8 emphasized the necessity of "transferring instruction to industrial workshops." In this context, P7 regarded the "flipped-learning model" as a strategy for making learning more experience-based, while P11 emphasized "assessment by occupational and trade experts." These perspectives indicate that the continuation of classroom-centered education has reduced the effectiveness of skilled-workforce development.

Criterion of the Alignment of Technical and Vocational Education Objectives with Societal Needs, Industry, and the Labor Market

The findings indicate that the "alignment of technical and vocational education objectives with the needs of society, industry, and the labor market" has not yet been fully achieved, and that a gap remains between educational objectives and actual labor-market developments. P2 and P6 believed that educational programs have not kept pace with the rapid rate of technological change, while P3 criticized the distance between centrally formulated objectives and industrial realities. In contrast, P5 and P9 emphasized that educational objectives should be redefined on the basis of "competency orientation" and the actual requirements of occupations so that graduates are effectively prepared to enter the labor market. At the implementation level, the interviewees referred to the weakness of systematic relationships with industry. P7 and P8 regarded collaboration with industries as essential for identifying skill requirements, while P11 maintained that education should

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shift toward "emerging skills and contemporary technologies." Nevertheless, P4 and P12 noted that closed structures and a focus on traditional subjects have restricted educational flexibility and resulted in many students being prepared only for low-level occupations. From an improvement perspective, P10 and P13 emphasized reforming the admission system, assessing aptitude, and increasing skill orientation. P14 identified "increasing the number of hours allocated to practical instruction," while P15 identified "bringing curriculum content closer to actual labor-market needs" as the principal solution. These perspectives indicate that strengthening the relationship between education and industry, continuously revising educational objectives and curriculum content, and addressing students' motivation and aptitude are prerequisites for improving employability and the effectiveness of the technical and vocational education system.

Criterion of the Alignment of Technical and Vocational Curriculum Content with Societal, Industrial, and Occupational Needs

The findings indicate that the "alignment of technical and vocational curriculum content with the needs of society, industry, and the labor market" continues to be affected by a serious gap. P2 and P6 referred to the "slow updating of course syllabi," while P4 emphasized that educational content has fallen behind rapid industrial developments. This gap is more pronounced in emerging technologies such as "artificial intelligence" and "robotics." In this context, P8 and P11 emphasized the necessity of "collaboratively developed content" and the use of "specialized software" to align education with actual labor-market needs.

From an applied perspective, the interviewees believed that curriculum content should move beyond a purely theoretical orientation. P3 and P7 regarded the addition of "practical skills" and "soft skills, such as communication and customer service," as essential, while P12 emphasized designing content in accordance with company needs. P10 and P15 also considered attention to "students' individual interests" and the use of "supplementary resources," such as scholarly periodicals, important for keeping education up to date. The findings indicate that the principal obstacle extends beyond the content itself and includes rigid and inflexible administrative structures. Therefore, reducing the gap between education and employment requires continuous revision of course syllabi with the direct participation of employers and a transition toward a practical, skill-oriented approach.

Criterion of the Alignment of Technical and Vocational Teaching Methods with Societal, Industrial, and Occupational Needs

The findings indicate that the "alignment of technical and vocational teaching methods with the needs of society, industry, and the labor market" remains considerably distant from desirable industrial models. P2 and P6 believed that current methods are unable to reproduce actual working conditions and referred to education's inability to simulate "high-speed work, team coordination, and operational pressure." In this context, P8 emphasized that education should be transferred from "abstract classroom environments to industrial workshops" so that learning can extend beyond the theoretical level. P3 considered learning in "the instructor's actual repair shop" effective, while P11 identified projects such as "building small rally cars" as examples of effective education. In contrast, P4 and P9 regarded dependence on "lecture- and textbook-based methods" as one of the principal obstacles to improving educational quality. These perspectives indicate that the continuation of theoretical instruction increases the distance between students and real-world working situations. From an analytical perspective, the interviewees emphasized the necessity of an educational paradigm shift. P7 and P12 considered "constructivism, project-based learning, and problem-solving approaches" more appropriate, while P10 and P15 recommended "flipped instruction" and "blended learning" to improve educational effectiveness. However, P5 expressed doubts regarding virtual education for practical skills and did not regard "watching videos" as sufficient. These findings indicate that technical skills are developed through practical experience to a greater extent than through theoretical instruction. Consequently, improving technical and vocational education requires a transition from "grade orientation" to "skills quality" and the strengthening of practical and project-based instruction.

Criterion of the Alignment of Knowledge and Skills Assessment Methods with Societal, Industrial, and Occupational Needs

The findings indicate that the "alignment of assessment methods with the needs of society, industry, and work" constitutes the connecting link between education and the actual world of work. Nevertheless, P1 and P5 believed that current examinations are unable to measure "complex industrial skills." For example, skills such as "6G welding in difficult positions" are not covered by existing assessments. P8 also emphasized that these assessments "do not possess the comprehensiveness required to cover actual workplace

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conditions." In this context, P4 recommended assessment "by independent industry specialists" or "in the actual workplace and by employers," while P12 and P15 emphasized the use of "portfolios," "Moodle," and "graduates' employment rates" to assess competencies more accurately. P3 and P7 further emphasized the importance of assessing soft skills such as "customer service, problem solving, and teamwork," while P10 proposed that final assessment should be based on "simulated practical projects" and portfolio defense. Overall, the perspectives indicate that improving assessment validity requires transitioning from theoretical examinations to performance-based assessment conducted in collaboration with industry.

Criterion of the Alignment of the Teacher Performance Assessment System with Societal, Industrial, and Labor-Market Needs

The findings indicate that the "teacher performance assessment system in relation to societal, industrial, and labor-market needs" remains distant from the desired condition and is primarily implemented through administrative mechanisms and superficial assessments. In this regard, P1 described the current process as "ceremonial and limited to brief visits," while P4 regarded it as lacking the effectiveness required to improve teaching quality. This suggests that current assessment is primarily supervisory in nature and functions to a limited extent as a mechanism for performance correction and improvement of educational processes. In contrast, the participants emphasized the necessity of revising assessment indicators and moving toward skill-based criteria aligned with actual industrial environments. For example, P2 and P6 believed that teacher assessment would be effective when conducted by employers within actual industrial settings so that teachers' professional capabilities could be evaluated under practical conditions. P8 also identified teachers' participation in content development and the supervision of actual industrial projects as important professional assessment indicators. P3 and P7 considered the use of modern learning-management systems, such as Moodle, and the examination of graduates' employment status important criteria for assessing teacher effectiveness. In addition, P10 emphasized the role of in-service training in updating instructors' knowledge and capabilities. In this context, P11 and P15 identified the superficiality of assessments and the absence of effective and timely feedback as the principal weaknesses of the existing system. They believed that assessment results should be made available to educational planners so that they could be used to revise programs and improve educational quality. Overall, the findings indicate that the teacher assessment system should move away from exclusively administrative approaches and toward professional, skill-based, and outcome-based assessment so that it can effectively contribute to improving educational quality and aligning education with industry needs.

The Delphi technique was used to validate the components extracted from the qualitative phase and achieve expert consensus regarding them. During this stage, indicators related to recruitment processes, academic level classification, and the skill qualifications of key stakeholders were evaluated in two consecutive Delphi rounds, and the degree of expert agreement regarding the importance of each indicator was measured. Table 4 presents the results of the first and second Delphi rounds.

The results presented in Table 4 indicate that all indicators associated with recruitment processes, academic level classification, and the skill qualifications of key stakeholders received high levels of expert consensus. The consensus level in the first round ranged from 86.2% to 98.3%, while that of the second round ranged from 87.9% to 100%. The means of all items were also greater than 4.38, indicating that the experts considered these components highly important. The highest levels of consensus in the second round were obtained for the indicators "level of skills acquired by instructors" and "degree of alignment between technical and vocational education objectives and societal needs," both of which received 100% agreement. The indicator "alignment with industry and the labor market," with a mean of 4.69, was also identified as one of the most important components of this dimension. In general, the increase or stability of consensus levels and the relative reduction in standard deviations during the second round indicate greater convergence among the experts' views regarding the importance of these indicators. Because all indicators achieved consensus levels above the established criterion of 70% in the second round and the changes in their means and standard deviations compared with those of the first round were highly limited, relative stability in the experts' responses can be inferred. Therefore, because the desired consensus level was achieved and no meaningful changes were observed in the results, the Delphi process was concluded at the end of the second round. Figure 1 presents the research model.

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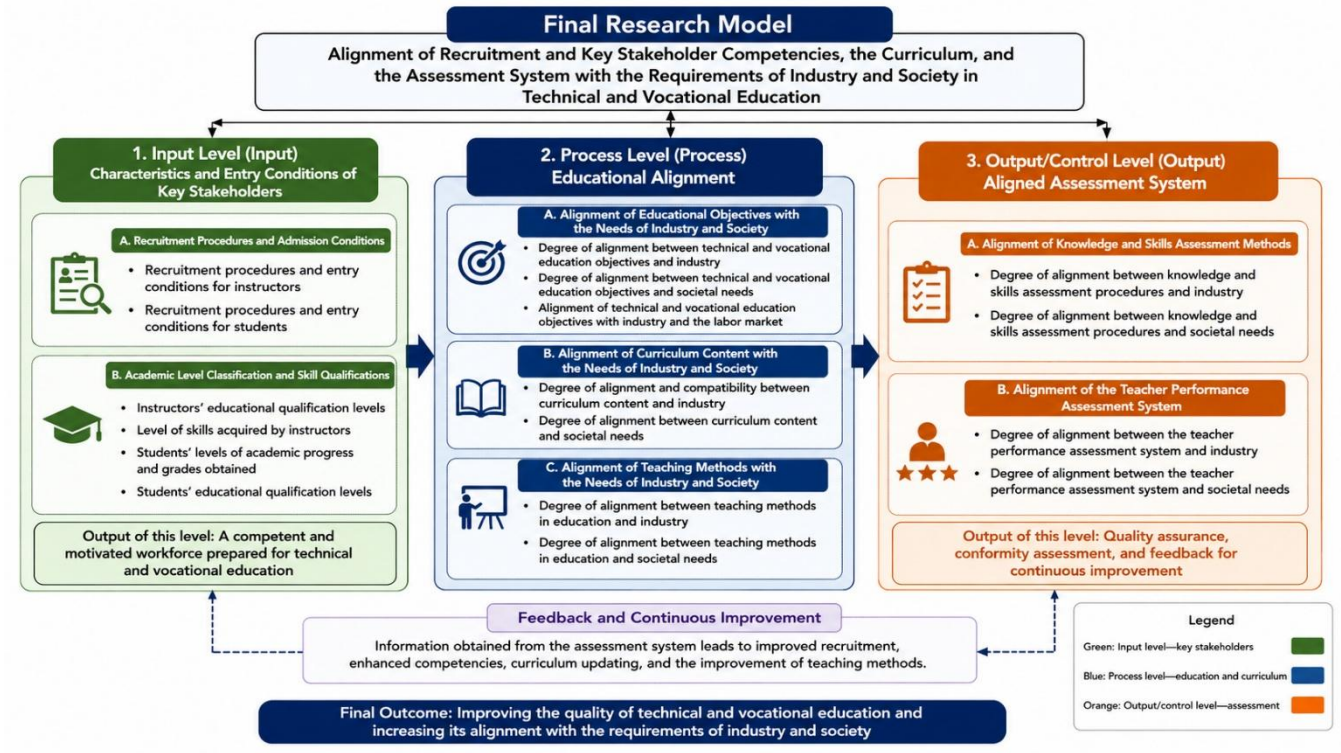
Table 4

Results of the First and Second Delphi Rounds for the Themes of Recruitment Processes, Academic Level Classification, and Skill Qualifications of Key Stakeholders

Indicator	Consensus, Round 1	Mean 1	SD 1	Consensus, Round 2	Mean 2	SD 2
Recruitment procedures and entry conditions for instructors	96.60%	4.66	0.55	98.30%	4.67	0.51
Recruitment procedures and entry conditions for students	89.70%	4.45	0.68	93.10%	4.48	0.63
Students' levels of academic progress and grades obtained	93.10%	4.43	0.62	94.80%	4.47	0.60
Instructors' educational qualification levels	86.20%	4.38	0.72	87.90%	4.41	0.70
Level of skills acquired by instructors	96.60%	4.59	0.56	100.00%	4.62	0.49
Degree of alignment between technical and vocational education objectives and industry	96.50%	4.64	0.55	98.20%	4.66	0.52
Degree of alignment between technical and vocational education objectives and societal needs	96.60%	4.60	0.56	100.00%	4.66	0.48
Alignment with industry and the labor market	98.30%	4.69	0.50	98.30%	4.69	0.50
Degree of alignment and compatibility between curriculum content and industry	93.10%	4.57	0.62	93.10%	4.57	0.62
Degree of alignment between curriculum content and societal needs	93.10%	4.52	0.63	96.50%	4.57	0.57
Degree of alignment between teaching methods and industry	98.30%	4.60	0.53	98.30%	4.60	0.53
Degree of alignment between teaching methods and societal needs	93.10%	4.53	0.68	93.10%	4.53	0.68
Degree of alignment between knowledge and skills assessment procedures and industry	93.10%	4.48	0.63	96.60%	4.52	0.57
Degree of alignment between knowledge and skills assessment procedures and societal needs	96.50%	4.55	0.57	98.20%	4.59	0.53
Degree of alignment between the teacher performance assessment system and industry	96.60%	4.53	0.57	98.30%	4.57	0.53
Degree of alignment between the teacher performance assessment system and societal needs	93.10%	4.53	0.63	94.80%	4.55	0.60

Figure 1

Final research model



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4. Discussion and Conclusion

The present study aimed to design a model for aligning recruitment and key stakeholder competencies, the curriculum, and the assessment system with the requirements of industry and society in technical and vocational high schools in Tehran. The findings showed that the education–industry gap is not attributable to a single curricular or administrative weakness; rather, it emerges from the interaction of deficiencies at the input, process, and output levels of the educational system. At the input level, the recruitment and professional preparation of instructors and the admission and guidance of students were identified as central determinants of educational quality. At the process level, the findings emphasized the need to align educational objectives, curriculum content, and teaching methods with technological developments, occupational standards, and labor-market requirements. At the output and control level, the study highlighted the necessity of competency-based assessment of students and professional, outcome-oriented assessment of instructors. The Delphi findings further confirmed the importance, coherence, and practical relevance of these components, as all indicators achieved consensus levels above 70%, and several indicators reached nearly complete or complete agreement among experts.

One of the principal findings concerned the recruitment procedures and entry conditions of instructors. Participants emphasized that the effectiveness of technical and vocational education depends on instructors who possess an integrated combination of specialized knowledge, pedagogical competence, practical skills, and direct industrial experience. The results also indicated that academic qualifications alone do not guarantee high-quality teaching or professional competence. This finding is consistent with the distinction between formal credentials and actual professional capabilities. In technical and vocational education, instructors must be able to demonstrate occupational tasks, use contemporary tools and equipment, manage workshops, transfer tacit knowledge, and connect theoretical concepts with workplace practice. Accordingly, the findings support the view that teacher quality should be evaluated through multidimensional professional standards rather than solely through academic degrees. The TALIS conceptual framework similarly emphasizes that teacher effectiveness is shaped by professional knowledge, instructional practice, professional learning, collaboration, and working conditions rather than by formal qualifications alone (Ainley & Schulz, 2025). In the same vein, research on professional skills in engineering education has shown that professional competence is understood as an integration of technical knowledge, interpersonal capability, problem-solving, and practical performance (Beagon & Bowe, 2023).

The emphasis placed on instructors' industrial experience also reflects the practical nature of vocational learning. Participants repeatedly stated that instructors unfamiliar with actual production environments, contemporary industry standards, emerging technologies, and workplace pressures may be unable to prepare students adequately for employment. This result is aligned with studies emphasizing that future engineering and vocational specialists must be trained in environments connected to modern industrial practice and technological change (Zheng, 2024). It is also consistent with the strategic competencies identified for technical and vocational students, including occupational knowledge, adaptability, practical capability, and the ability to respond to changing employment conditions (Nouri et al., 2019). Therefore, the findings suggest that instructor recruitment should prioritize not only educational qualifications but also verified occupational experience, current technical competence, and the ability to translate workplace experience into effective learning activities.

Another important finding was the need for systematic professional development and training-needs assessment for instructors. Participants reported that some in-service programs are predominantly theoretical, repetitive, and insufficiently connected to workplace developments. This indicates that professional development may fail to improve teaching when it is not based on clearly identified competency gaps. Balisi argued that training-needs assessment is essential for linking professional development to actual organizational and occupational requirements and preventing the inefficient allocation of training resources (Balisi, 2014). The present findings support this argument by showing that instructors require continuing development in areas such as emerging technologies, artificial intelligence, specialized software, practical assessment, project-based teaching, and workshop management. Similar concerns have been reported regarding teachers' assessment literacy, where targeted in-service training is necessary to improve the design and implementation of valid testing and evaluation procedures (Canlı & Altay, 2024). Furthermore, evidence regarding digital literacy training suggests that professional development can improve the quality of technology use

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when it is linked directly to instructional practice (Nemati & Nazari, 2024).

The findings also demonstrated that student admission and academic guidance should move from open or predominantly grade-based procedures toward competency-oriented and aptitude-informed approaches. Participants viewed the absence of adequate motivation assessment, interviews, entrance examinations, and informed academic guidance as contributing to heterogeneity in students' readiness and commitment. This heterogeneity may reduce instructional effectiveness because technical and vocational programs require active engagement, sustained practical effort, occupational interest, and a degree of alignment between individual aptitude and the selected specialization. The historical development of the Iranian education system has involved tensions between theoretical and practical pathways, centralized decision-making, and differing social attitudes toward vocational education (Safari Mahjanabadi et al., 2019). The present findings suggest that these historical and structural conditions continue to influence student selection and the status of vocational pathways. A more informed and competency-based guidance system may therefore improve student motivation, program retention, occupational identity, and eventual employability.

At the process level, the study found that the objectives of technical and vocational education are not fully aligned with the evolving needs of industry and society. Participants identified a persistent time lag between education and technology, limited coverage of emerging occupations, and insufficient monitoring of labor-market changes. This result suggests that educational objectives may become outdated when they are formulated centrally and revised slowly without sustained participation from employers, industrial specialists, professional associations, and graduates. The organization of skill-based education requires structural coordination between educational institutions and employment systems, as well as integrated policymaking across training sectors (Salehi Omran, 2023). The findings therefore reinforce the need for systematic industry participation in defining occupational competencies and revising educational objectives. They also align with research emphasizing that vocational education must prepare learners for current technological environments rather than for static occupational models (Zheng, 2024).

The misalignment of curriculum content with industry needs was another major finding. Participants noted that some curricula remain focused on traditional skills and fail to incorporate artificial intelligence, robotics, digital systems, specialized software, international standards, and contemporary occupational practices. This curricular time lag may produce graduates whose knowledge is formally certified but operationally outdated. Education in the digital age requires curricula to respond to rapid technological change and to integrate digital learning opportunities with disciplinary and occupational knowledge (Joukar et al., 2024). Moreover, teachers' capacity to use technology effectively influences whether digital curriculum reforms are implemented meaningfully or remain superficial (Nemati & Nazari, 2024). The results also support the argument that improving instructional quality requires coordinated attention to curriculum content, teacher competence, instructional resources, and contextual barriers (Abolhasani Dargah, 2025). Thus, curriculum updating should be continuous, evidence-based, and informed by industry needs assessments rather than conducted only through lengthy periodic revisions.

The findings further showed that technical and vocational curricula insufficiently address soft and professional skills. Participants emphasized communication, customer service, teamwork, creativity, problem-solving, and adaptability as essential occupational competencies. This result corresponds with research indicating that professional skills in engineering education should not be treated as peripheral additions but as integrated components of professional formation (Beagon & Bowe, 2023). It also aligns with the emphasis placed on creative thinking and problem-solving in educational transformation, particularly because contemporary workplaces require learners to manage unfamiliar and complex situations rather than merely reproduce prescribed procedures (Esmaeilizadeh et al., 2024). The implication is that soft skills should be explicitly incorporated into curriculum objectives, practical projects, classroom activities, and assessment rubrics. Their development should not be left to incidental learning or assumed to occur automatically through technical instruction.

The results concerning teaching methods indicated that theory-oriented, lecture-based, and textbook-centered instruction remains a significant barrier to effective vocational preparation. Participants emphasized that authentic learning occurs more effectively in industrial workshops, repair centers, simulated workplaces, and project-based environments. They recommended constructivist learning, problem-based learning, flipped instruction, blended learning, and real industrial projects. These findings are theoretically consistent with the practical

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and situated nature of vocational competence. Skills are strengthened when students interact with real tools, constraints, standards, clients, and collaborative tasks. Innovative learning-space design can support such processes by creating flexible environments for experimentation, collaboration, creativity, and active learning (Farajinejad Jahromi et al., 2025). Conversely, unsuitable physical environments may reinforce passive instruction and limit the implementation of modern teaching approaches. The findings therefore indicate that reforming teaching methods requires parallel investment in workshop infrastructure, technology, equipment, and partnerships with industrial workplaces.

The study also identified important limitations in virtual education for practical and workshop-based learning. Although digital tools can enrich theoretical instruction, provide demonstrations, support flipped learning, and facilitate access to learning resources, participants argued that watching videos cannot substitute for direct practical experience. This does not mean that technology is irrelevant to vocational education; rather, it suggests that its use should complement rather than replace hands-on learning. Digital education offers opportunities for simulation, assessment, content delivery, and collaborative learning, but its effectiveness depends on appropriate instructional design and integration with physical practice (Joukar et al., 2024). The result therefore supports a blended model in which digital tools prepare students for workshop activities, reinforce learning, and provide feedback, while core occupational competencies are developed through supervised performance.

A further major finding related to the inadequacy of existing student assessment methods. Participants reported that current examinations are often too simple, theoretical, or limited to measure complex occupational competencies. They recommended performance-based assessment, practical projects, portfolios, simulation, workplace observation, assessment by industry specialists, and the inclusion of soft skills. This finding is consistent with studies identifying fragmentation and proceduralism in educational evaluation and quality-assurance systems (Akbari et al., 2020). It also corresponds with internal evaluation research emphasizing that educational quality should be assessed through multiple interconnected dimensions, including curriculum, teaching, students, resources, and educational outcomes (Baniasadi et al., 2015). The present study extends these findings by showing that, in technical and vocational education, assessment validity depends particularly on authenticity. An assessment system cannot claim to measure occupational competence if tasks, equipment, standards, and performance conditions differ substantially from those encountered in the workplace.

Participants also emphasized the need for industry involvement in student assessment. Assessment by employers, trade specialists, or independent industrial evaluators was viewed as a mechanism for improving objectivity, relevance, and labor-market credibility. Such participation can ensure that performance standards correspond to actual workplace expectations and may strengthen employer confidence in qualifications. At the same time, industrial involvement should be governed by transparent criteria, assessor training, and standardized rubrics to prevent inconsistency. The broader conception of educational quality proposed by Ryzhov and colleagues supports the use of multiple indicators and methods rather than dependence on a single examination or administrative measure (Ryzhov et al., 2021). The present findings similarly suggest that technical competence should be measured through a combination of continuous workshop assessment, final projects, portfolios, simulated and authentic tasks, problem-solving, teamwork, and graduate employment outcomes.

The teacher performance assessment system was also found to be insufficiently connected to educational improvement and industry needs. Participants described existing assessments as superficial, administrative, and sometimes ceremonial. They indicated that brief managerial observations and routine documentation do not adequately measure instructors' technical currency, practical teaching ability, student outcomes, industry engagement, or contribution to curriculum development. This result is consistent with evidence-based performance-management principles, which define performance assessment as a continuous process of expectation setting, monitoring, feedback, review, and development rather than as a periodic bureaucratic event (Armstrong, 2020). The findings therefore suggest that teacher assessment should include multiple evidence sources, such as classroom and workshop observation, student skill development, participation in industrial projects, professional updating, employer feedback, digital competence, and graduates' employment outcomes.

The final three-level model developed in the study demonstrates that quality improvement depends on the integration of inputs, educational processes, and assessment outputs through a continuous feedback mechanism. This

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systems perspective is important because isolated reforms are unlikely to succeed. Recruiting competent instructors without updating curricula will not resolve the education–industry gap; modernizing curricula without changing assessment will encourage continued grade orientation; and revising assessment without providing suitable learning environments will create expectations that students have not been prepared to meet. The challenges reported in implementing major educational transformation policies in Iran similarly show that policy objectives may not be realized when institutional capacity, resources, implementation mechanisms, and stakeholder coordination are insufficient (Arab & Mirzaei, 2024). Improvements in educational quality therefore require coherent management across recruitment, curriculum development, professional learning, teaching, assessment, infrastructure, and industry partnerships (Rezaei et al., 2024).

The feedback component of the model is especially significant because it transforms assessment from a terminal activity into a mechanism for organizational learning. Information derived from student performance, teacher evaluation, employer feedback, graduate employment, and technological change should be used to revise admission procedures, identify professional development needs, update curricula, and improve teaching methods. This approach is consistent with quality-assurance systems that emphasize continuous improvement rather than compliance alone (Akbari et al., 2020). It also corresponds with service-quality perspectives in which quality is determined through the systematic relationship among stakeholder expectations, service processes, performance standards, and improvement mechanisms (Pheng & Rui, 2016). In technical and vocational education, feedback must therefore circulate among schools, policymakers, employers, instructors, students, and graduates.

Finally, the findings have implications beyond immediate employment preparation. Technical and vocational education contributes to citizenship, social participation, sustainable production, and national development. The identified emphasis on professional ethics, teamwork, adaptability, and social responsiveness is compatible with the relationship between education for sustainable development and citizenship culture (Sarikhani Ghaleh Babakhani & Baniasadi, 2019). An aligned technical and vocational system should therefore prepare students not only to obtain employment but also to participate responsibly in changing workplaces and society. Overall, the model developed in this study suggests that reducing the education–industry gap requires a transition from credential orientation to competency orientation, from static curricula to continuous updating, from theoretical instruction to authentic learning, and from administrative evaluation to evidence-based assessment and feedback.

This study had several limitations. First, the qualitative data were collected from a purposively selected group of experts, administrators, instructors, and other stakeholders associated with technical and vocational education in Tehran; therefore, the findings may not fully represent the conditions of technical and vocational schools in other provinces, rural regions, or areas with different industrial structures. Second, the study relied primarily on interview data and expert consensus, which may have been influenced by participants' professional experiences, organizational positions, and subjective interpretations. Third, although the Delphi process strengthened the validity of the model, the proposed relationships among the input, process, and output components were not tested quantitatively. Fourth, the study did not directly assess students' occupational performance, employers' satisfaction, graduate employment trajectories, or the long-term outcomes of curriculum alignment. Finally, inconsistencies in access to industrial partners, workshop facilities, and institutional documents may have limited the depth of comparison across different technical and vocational schools.

Future studies should quantitatively test the proposed model using structural equation modeling or multilevel analysis with larger samples of instructors, students, administrators, employers, and graduates. Comparative studies should examine whether the model remains valid across different provinces, technical disciplines, school types, and industrial sectors. Longitudinal research is also needed to determine whether curriculum and assessment alignment improves practical competence, employability, job retention, employer satisfaction, and career development. Future researchers could design and evaluate intervention programs based on individual model components, such as industry-based instructor training, competency-oriented student admission, project-based curricula, or authentic assessment systems. Additional studies should investigate the perspectives of students, parents, employers, professional associations, and recent graduates in greater depth. Research may also examine the role of artificial intelligence, virtual simulation, digital portfolios, learning-management systems, and data analytics in strengthening continuous assessment and education–industry feedback.

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Educational policymakers and technical and vocational administrators should establish formal mechanisms for the continuous participation of employers and industry specialists in curriculum development, occupational-standard revision, instructor recruitment, and student assessment. Instructor selection should be based on a balanced evaluation of academic qualifications, pedagogical competence, practical skills, and verified industrial experience. Schools should implement systematic training-needs assessments and provide instructors with regular opportunities to work in industrial environments and update their technological knowledge. Student admission and academic guidance should incorporate interest, aptitude, motivation, and practical readiness. Curriculum content should be reviewed regularly and should include emerging technologies, specialized software, international standards, soft skills, problem-solving, teamwork, and professional ethics. Teaching should increasingly use workshops, authentic projects, industrial placements, simulations, and blended learning. Student assessment should shift from predominantly written examinations to performance-based assessment, portfolios, practical projects, workplace observation, and evaluation by trained industry assessors. Teacher performance evaluation should be continuous, transparent, developmental, and linked to professional growth, instructional improvement, industry engagement, and student competency outcomes.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We hereby thank all participants for agreeing to record the interview and participate in the research.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

All procedures performed in studies involving human participants were under the ethical standards of the institutional and, or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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