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Industry-based training needs of higher vocational college teachers: a qualitative study in Jiangsu, China

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ABSTRACT

Higher vocational college teachers are expected to keep pace with industrial change and transform authentic workplace experience into effective practical teaching. However, industry-based training may remain superficial, while teachers' practical teaching problems, professional development needs, and the factors shaping their engagement in such training have been insufficiently examined. This study addressed this gap through a qualitative needs analysis in a higher vocational college in Suzhou, Jiangsu Province, China. Data were collected through semi-structured interviews with vocational teachers, teaching managers, and administrative managers, supplemented by document analysis, and analyzed thematically. The findings reveal three practical teaching problems: limited access to authentic and up-to-date workplace learning, weak pedagogical transformation of industry experience, and insufficient support for implementing practice-oriented teaching. Teachers needed more immersive workplace engagement, support for transforming industry experience into curriculum and teaching, and practical guidance for classroom implementation and assessment. Their engagement was shaped by individual readiness, institutional and organizational support, and the fit between workplace learning and school-based teaching conditions. The study concludes that effective industry-based training should move beyond short-term enterprise exposure and provide structured support for transforming workplace experience into curriculum design, classroom teaching, and assessment practice.

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1. INTRODUCTION

Vocational education is increasingly expected to respond to industrial upgrading, digital transformation, and changing workplace demands [1]–[3]. As key actors in translating these external demands into curriculum and teaching practice, higher vocational college teachers are expected not only to update their industry knowledge, but also to transform workplace experience into teachable and assessable learning practices [4], [5]. Developing this competence through teachers' industry-based training is important because such training can strengthen the authenticity of practical learning, improve the relevance of curriculum content, and support students' readiness for employment [4], [6]. When teachers have limited access to current workplace processes, technical standards, and occupational requirements, practical teaching may become disconnected from real enterprise practices, potentially weakening students' ability to adapt to actual work situations [7], [8].

This issue is especially salient in Jiangsu Province, where advanced manufacturing, modern services, and emerging industries are developing rapidly [9], [10]. Although industry-education integration has been actively promoted, vocational college teachers still face difficulties such as delayed mastery of new technologies, limited opportunities for deep enterprise engagement, and weak pedagogical transformation of industry experience [4], [11], [12]. These difficulties suggest that some industry-based training activities may remain limited to short-term visits, general observation, or policy compliance, rather than functioning as a meaningful process for improving practical teaching competence and curriculum responsiveness.

Existing studies have provided valuable insights into vocational teacher development, industry-education integration, and enterprise-based training mechanisms. However, much of the previous research has focused on policy support, institutional arrangements, and macro-level cooperation models [6]–[8], [13], [14]. Less attention has been given to how teachers actually experience industry-based training in specific institutional and regional contexts, what practical teaching problems they encounter, and what barriers prevent them from transforming industrial experience into learning practices. In particular, the difficulties and support needs involved in moving from workplace experience to curriculum design, classroom implementation, and assessment remain insufficiently examined. This gap limits understanding of why industry-based training does not always lead to meaningful improvement in practical teaching.

To address this gap, this study investigates the practical teaching problems, professional development needs, and factors influencing engagement in industry-based training among higher vocational college teachers in Jiangsu, China. The novelty of this study lies in framing industry-based training as a pedagogically oriented transformation process rather than merely as enterprise exposure or technical updating. Unlike previous studies that mainly focused on policy mechanisms, school-enterprise cooperation, or teachers' access to workplace learning, this study examines how vocational teachers experience the difficulty of converting workplace knowledge into curriculum design, teaching implementation, and assessment practice. In doing so, the study extends the understanding of industry-based teacher training beyond workplace participation by highlighting the pedagogical transformation of industry experience. Specifically, the study asks:

- What practical teaching problems do vocational college teachers face?
- What professional development needs do they perceive in relation to updating industrial knowledge and enhancing practical teaching competence?
- What factors influence their engagement in industry-based training activities?

2. METHOD

2.1. Research context and participants

This study adopted a qualitative research design to examine higher vocational college teachers' practical teaching problems, professional development needs, and engagement in industry-based training. The study was conducted in a higher vocational college in Suzhou, Jiangsu Province, China. Suzhou was selected because it is one of the most economically developed cities in Jiangsu Province, with a strong industrial base, active industry-education integration, and close connections between vocational colleges and regional industries. The selected college was chosen because the study focused on a provincially recognized high-level vocational programme cluster closely related to regional industry. This made the college an information-rich setting for examining teachers' industry-based training and practical teaching within a specific professional field.

A purposive sampling strategy with maximum variation was used to select participants who could provide different perspectives on teachers' industry-based training and practical teaching. The final sample included 20 participants: 12 professional teachers, 4 teaching managers, and 4 administrative managers. The professional teachers represented different levels of teaching experience, including early-career, mid-career, and senior teachers. Teaching managers were included because they were familiar with curriculum implementation and professional programme development, while administrative managers were included because they were involved in teacher development, academic affairs, and school-enterprise cooperation. This combination of participants allowed the study to capture both teachers' classroom-based experiences and institutional perspectives on industry-based training. The participant characteristics are summarized in Table 1.

2.2. Data collection

Data were collected through semi-structured interviews and document analysis. The interviews were designed around three domains corresponding to the research questions: practical teaching problems, professional development needs, and factors influencing engagement in industry-based training. The interview guide was developed based on the study objectives and relevant literature, and was refined through expert review to improve the clarity and relevance of the questions.

Individual interviews were conducted from November to December 2025, with each interview lasting approximately 30 minutes. Before the interviews, participants were informed of the study purpose and provided consent for participation and audio recording. All interviews were audio-recorded and transcribed verbatim for analysis. Document analysis was conducted to supplement and triangulate the interview data. The reviewed documents included policy documents, lesson plans, and teaching supervision records related to practical teaching problems, curriculum alignment, and institutional support for industry-based training.

Table 1. Participant characteristics

No.	Code	Gender	Age	Degree	Major/department	Group identity
1	PT1	Male	32	Ph.D.	Textile Inspection and Trade	Professional teachers with 1-3 years of teaching experience
2	PT2	Female	29	Ph.D.	Modern Textile Technology	
3	PT3	Female	31	Ph.D.	Textile Inspection and Trade	
4	PT4	Female	33	Ph.D.	Digital Dyeing and Finishing Technology	Professional teachers with 4-10 years of teaching experience
5	PT5	Male	37	Ph.D.	Textile Inspection and Trade	
6	PT6	Female	33	Ph.D.	Digital Dyeing and Finishing Technology	
7	PT7	Female	38	Ph.D.	Textile Inspection and Trade	
8	PT8	Female	33	Ph.D.	Analysis and Inspection	
9	PT9	Male	40	Ph.D.	Modern Textile Technology	
10	PT10	Male	46	Ph.D.	Digital Dyeing and Finishing Technology	Professional teachers with more than 10 years of teaching experience
11	PT11	Female	43	Master	Textile Inspection and Trade	
12	PT12	Female	48	Master	Fashion Design and Technology	
13	TM1	Female	45	Ph.D.	Textile Inspection and Trade	Teaching managers
14	TM2	Female	46	Master	Analysis and Inspection	
15	TM3	Male	41	Ph.D.	Modern Textile Technology	
16	TM4	Female	48	Master	Fashion Design and Technology	
17	AM1	Female	44	Master	Human Resources Office	Administrative managers
18	AM2	Male	41	Master	Academic Affairs Office	
19	AM3	Female	53	Master	Office of University-Enterprise Cooperation	
20	AM4	Male	43	Master	Academic Affairs Office	

2.3. Data analysis and trustworthiness

The data were analyzed using thematic analysis, which is suitable for identifying and interpreting recurring patterns in qualitative data [15], [16]. The analysis followed a systematic process. First, the interview transcripts and relevant documents were read repeatedly to gain familiarity with the data. Second, an initial coding framework was developed according to the three research questions, namely practical teaching problems, professional development needs, and factors influencing engagement in industry-based training. Third, open coding was conducted to identify important ideas and emerging categories from the data. Fourth, related codes were compared, grouped, and refined into broader themes and subthemes. Finally, the themes were reviewed against the original transcripts and documentary evidence to ensure that they accurately reflected the data.

The analysis combined deductive and inductive logics. Deductively, the three research questions provided the initial structure for organizing the data. Inductively, new codes and subthemes were generated from participants' accounts when they provided details not fully captured by the initial framework. Comparisons were also made across participant groups, including professional teachers, teaching managers, and administrative managers, to identify common patterns and differences in perspectives. This process produced three major thematic domains: practical teaching problems, professional development needs, and factors influencing engagement in industry-based training. The corresponding subthemes are presented in Table 2.

Several strategies were used to enhance the credibility and trustworthiness of the qualitative analysis. First, data triangulation was conducted by comparing interview findings with policy documents, lesson plans, and teaching supervision records. These documents were used to corroborate, contextualize, and refine the themes generated from the interviews. Second, interview transcripts were checked against the audio recordings to ensure accuracy. Third, researcher reflection notes were used throughout the analysis to record emerging interpretations and analytic decisions. Finally, peer debriefing was conducted with a peer experienced in vocational education research and qualitative analysis. The peer reviewed the initial coding framework, selected coded excerpts, and the clarity of the final theme and subtheme names. This feedback was used to refine overlapping codes, clarify subtheme labels, and recheck selected excerpts against the original transcripts and documentary evidence. Together, these procedures helped improve the credibility, transparency, and dependability of the qualitative analysis [17].

Table 2. Themes and subthemes of the analysis

Theme	Subtheme	Brief description
Practical teaching problems	Limited access to authentic and up-to-date workplace learning	Teachers lacked timely, in-depth access to current workplace processes, technologies, and standards.
	Weak pedagogical transformation of industry experience	Teachers had difficulty converting workplace experience into teachable and assessable classroom resources.
	Insufficient support for implementing practice-oriented teaching	Practice-oriented teaching was constrained by classroom management demands, equipment limitations, and weak alignment with enterprise reality.
Professional development needs	Industry updating and authentic workplace engagement	Teachers needed immersive, practice-based exposure to current workplace processes and practices.
	Pedagogical transformation and curriculum alignment	Teachers needed support in selecting workplace materials and aligning industry knowledge with curriculum and evaluation requirements.
	Practical teaching implementation and classroom adaptation	Teachers needed support in organizing hands-on teaching and adapting industry knowledge to classroom realities.
Factors influencing engagement in industry-based training	Individual readiness and professional orientation	Participation depended on teachers' motivation, professional priorities, and interpretive capacity.
	Institutional and organizational conditions	Participation was shaped by school-level coordination, administrative support, and time arrangements.
	Workplace and instructional contextual fit	The impact of training depended on the fit between workplace learning, training content, equipment conditions, and teaching needs.

3. RESULTS AND DISCUSSION

3.1. Results

The thematic analysis generated three major themes corresponding to the research questions: practical teaching problems, professional development needs, and factors influencing engagement in industry-based training. These themes were developed from repeated patterns across interviews with professional teachers, teaching managers, and administrative managers. The following sections present the findings descriptively, with representative quotations used to illustrate participants' accounts.

3.1.1. Practical teaching problems

Participants reported three main practical teaching problems: limited access to authentic and up-to-date workplace learning, weak pedagogical transformation of industry experience, and insufficient support for implementing practice-oriented teaching. These problems were reflected across all three participant groups. The following paragraphs present each problem with examples from participants' responses.

First, participants indicated that their access to current workplace processes, technologies, and standards was limited. Although schools sometimes arranged enterprise practice or related training, these opportunities were often insufficient in both quantity and quality. One mid-career professional teacher (PT6) explained that "*the information we obtain is not timely, and the channels are relatively single*." Participants also emphasized that enterprise placements sometimes remained superficial. As one senior professional teacher (PT12) stated, "*everything you learn is just on the surface, you can not get in deep*." Managers (AM1; AM2; TM3) further observed that "*training opportunities were limited, outcomes were uneven, and structured mentoring was often lacking*."

Second, participants described difficulties in transforming industry experience into teaching. Even when teachers gained some exposure to enterprise practice, they often struggled to identify what workplace knowledge, materials, cases, and technical processes were valuable for classroom use. This problem was particularly evident among younger teachers, who lacked guidance on how to collect teaching resources during enterprise practice. One early-career professional teacher (PT1) noted that "*new teachers often can't tell which things are more important for teaching students*." Participants also reported a mismatch between enterprise practices and classroom teaching needs. "*Some skills emphasized in class were not highly valued in enterprises, while some abilities required by enterprises were not sufficiently reflected in teaching*" (PT2). An administrative manager (AM1) summarized this difficulty by stating that "*the key task was to translate the latest technical capabilities and production levels of the industry into education and teaching*."

Third, participants reported insufficient support for implementing practice-oriented teaching in classroom settings. Several teachers described difficulties in managing hands-on teaching, especially when students progressed at different speeds or required repeated demonstrations. One teacher (PT8) explained that

"*some kids finish fast, some are slow, and that causes issues for the whole course*." Participants also mentioned limitations in equipment and practice scenarios. "*In some cases, safety restrictions or equipment conditions meant that students could only watch videos or use virtual simulation instead of completing hands-on tasks themselves*" (PT2; PT10).

3.1.2. Professional development needs

Participants' professional development needs closely corresponded to the practical teaching problems identified. These needs were mainly related to industry updating and authentic workplace engagement, pedagogical transformation and curriculum alignment, and practical teaching implementation and classroom adaptation. Participants described these needs in relation to both enterprise-based learning and school-based teaching practice.

First, participants expressed a need for more immersive and authentic forms of industry-based training. They described more useful professional development as direct engagement with current workplace processes rather than short visits or lecture-based activities. One senior professional teacher (PT12) explained that after a longer period of enterprise practice, "*I really, truly got to experience their production status*." A teaching manager (TM3) further emphasized that hands-on engagement was necessary for teachers to "*actually learn some skills*." Participants also "*expected more timely access to new processes, current technologies, and enterprise guidance before and during training*" (PT1; PT9; TM3).

Second, participants emphasized the need for support in transforming industry experience into curriculum and teaching. Teachers needed guidance on how to identify enterprise cases, first-hand materials, physical objects, and technical examples that could be converted into classroom resources. One teacher (PT3) expressed interest in training on "*how to adjust teaching methods in response to dynamic industry developments and to optimize our own courses in a more targeted and practical way*." Participants also "*needed support in aligning industry knowledge with curriculum content, evaluation standards, competitions, and certifications, so that these requirements could be integrated into routine professional courses rather than treated as separate activities*" (PT11; AM2; TM2).

Third, participants identified needs related to classroom implementation. They needed support in organizing hands-on activities, managing differentiated student progress, improving student participation, and designing appropriate assessment methods. One teacher (PT8) emphasized the need to "*improve our ability to control progress and time in practical teaching*." Participants (TM3) also mentioned "*the need to use digital tools, artificial intelligence, and virtual simulation more effectively in textile and fashion-related practical teaching*." Another participant (PT11) emphasized "*clearer assessment criteria and more feasible methods for evaluating students' practical performance*."

3.1.3. Factors influencing engagement in industry-based training

Teachers' engagement in industry-based training was shaped by individual readiness, institutional and organizational conditions, and the fit between workplace learning and school-based teaching contexts. Across professional teachers, teaching managers, and administrative managers, participants referred to factors such as motivation, workload, school-level coordination, enterprise participation, and the relevance of training content to teaching needs. The following paragraphs present these factors within the three dimensions.

At the individual level, participants suggested that teachers' motivation depended partly on whether they viewed industry-based training as central to vocational teaching improvement. One senior professional teacher (PT10) observed that "*some teachers were more concerned with professional titles, assessments, publishing SCI papers than with courses, teaching materials, talent training*." Participants (AM2; TM3) also mentioned "*limited understanding of regional industries and insufficient reflection on practical teaching as factors related to teachers' engagement*."

At the institutional level, participants emphasized the importance of school-level coordination, administrative support, time arrangements, and resource allocation. Without such support, training plans were difficult to implement. One administrative manager (AM1) stated that "*from having an idea to actually implementing it, nine times out of ten, it falls through*." Time constraints were also frequently mentioned "*teachers had heavy teaching workloads, while enterprise engineers and core technical staff were often too busy to participate regularly in teaching or training activities*" (PT3; TM4). Participants (AM3; TM4) also reported that "*school-enterprise collaboration could be constrained by trade secrets, different institutional goals, and limited compensation mechanisms*."

At the contextual level, training relevance, equipment conditions, and students' practical learning needs influenced teachers' engagement. Participants considered training useful when it was closely connected to their courses, professional fields, and practical teaching needs. For example, one administrative manager (AM1) described previous AI-related training as "*not targeted, not specific enough*." Another participant (PT10) also noted "*that gaps between school equipment and enterprise production conditions made it difficult to use workplace learning in classroom teaching*."

3.2. Discussion

3.2.1. Pedagogical transformation in industry-based training

The findings suggest that industry-based training for higher vocational college teachers should not be understood only as a matter of providing enterprise access. Although access to authentic and up-to-date workplace learning remains important, the more central challenge identified in this study is the pedagogical transformation of industry experience into teaching practice. Teachers may observe workplace processes, collect enterprise materials, or learn about new technologies, but these experiences do not automatically become curriculum content, classroom teaching activities, or assessment practices. This explains why some industry-based training activities may have limited effects when they remain at the level of short-term visits, general observation, or technical updating. Therefore, the educational value of industry-based training depends not only on workplace participation, but also on whether industry experience can be selected, adapted, sequenced, and assessed for school-based teaching. This interpretation is consistent with previous studies showing that vocational teachers' workplace learning becomes valuable when it supports school-based teaching practice and curriculum development [4], [5], [7], [18]−[20].

This interpretation also helps explain the professional development needs reported by participants. Teachers needed not only more immersive workplace engagement, but also guidance on how to connect workplace experience with curriculum design, teaching implementation, and assessment practice. Before entering enterprises, teachers need preparation on what to observe and what kinds of workplace materials may be useful for teaching. During enterprise engagement, they need opportunities for authentic participation, enterprise mentoring, and access to current production processes and workplace tasks. After returning to school, they need support in adapting workplace materials, redesigning course content, organizing practical teaching activities, and developing feasible assessment methods. This view aligns with learning transfer, experiential learning, and situated learning perspectives, which emphasize authentic participation, reflection, and supportive conditions for applying learning in practice [21]−[26]. The findings further indicate that pedagogical transformation is influenced by individual, institutional, and contextual conditions. Teachers' engagement was related to their motivation, professional priorities, and understanding of industry practice, while school-level coordination, workload arrangements, enterprise participation, and training relevance affected whether workplace learning could be applied in classroom teaching. In this sense, industry-based training should be viewed as a systemic professional learning process rather than an individual responsibility alone. This is consistent with studies showing that vocational teacher development is shaped by workplace access, institutional support, collaboration quality, and the fit between workplace learning and school-based teaching conditions [8], [13], [27]−[29], and with organizational support theory [30].

3.2.2. Theoretical and practical contributions

This study makes a theoretical contribution by highlighting pedagogical transformation as a central process in industry-based teacher training. Previous studies have provided valuable insights into vocational teachers' workplace learning and industry-based training. Much of this work has examined teachers' access to workplace learning, as well as the policy, institutional, and school-enterprise cooperation mechanisms that support such training. This study extends this discussion by showing that the key issue is not only whether teachers can access enterprise practice, but also how they transform workplace experience into curriculum content, classroom teaching activities, and assessment practices. In this way, the study clarifies the intermediate process through which workplace learning becomes educationally meaningful for vocational teaching.

The study also makes a practical contribution by identifying the types of support needed to improve the usefulness of industry-based training for practical teaching. The findings suggest that vocational colleges should provide guidance before enterprise practice, mentoring during workplace engagement, and follow-up support after teachers return to school. Such support can help teachers transform enterprise cases into teaching resources, technical processes into practical tasks, and workplace standards into assessment criteria. This is particularly important for higher vocational colleges seeking to use teacher training to support curriculum renewal, improve practical teaching, and enhance students' readiness for workplace transition.

4. CONCLUSION

This study examined the practical teaching problems, professional development needs, and factors influencing engagement in industry-based training among higher vocational college teachers in Jiangsu, China. The findings contribute to vocational teacher development research by showing that the central challenge is not only insufficient access to enterprise practice, but also the weak pedagogical transformation of industry experience into practical teaching. Teachers need more than opportunities to enter enterprises; they also need support in transforming workplace experience into curriculum design, classroom teaching, and assessment practice.

The study also offers practical implications for vocational colleges and policymakers. Industry-based training should move beyond short-term enterprise exposure and provide integrated support before, during, and after enterprise practice, including industry mentoring, follow-up curriculum development, and pedagogical assistance. Such support can help teachers transform workplace experience into curriculum design, classroom teaching activities, and assessment practice. At the policy level, clearer mechanisms are needed for enterprise mentor participation, teacher workload adjustment, training incentives, and sustained curriculum development based on industry experience.

Several limitations should be acknowledged. First, this study was conducted in one higher vocational college in Jiangsu Province and focused on a textile-related discipline cluster. Therefore, the findings may not fully represent vocational colleges in other regions, institutional types, or professional fields. Second, the study was based mainly on interviews and document analysis, which means that the findings reflect participants' reported experiences and institutional documents rather than long-term observation of classroom practice. Third, because this study was designed as a needs analysis, it did not examine how the identified needs were addressed through a subsequent training intervention or how teachers' classroom practices changed over time. Future research could examine similar issues in other vocational colleges, professional fields, and regional contexts, and could further develop and evaluate structured industry-based training programmes that support the transformation of workplace experience into curriculum design, classroom teaching activities, and assessment practice.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interest associated with this publication.

INFORMED CONSENT

All individuals who participated in this study provided their informed consent prior to inclusion.

ETHICAL APPROVAL

Formal ethical approval was not required for this study under the relevant institutional guidelines. The study was conducted in accordance with applicable ethical standards, and informed consent was obtained from all participants.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to privacy and confidentiality restrictions related to the research participants.

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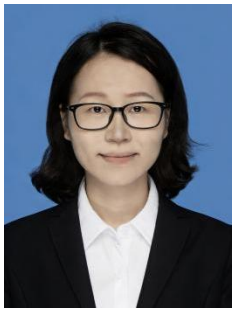
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