

Project-Based, Competency-Based Teacher Professional Development: Learning, Motivation, and Transfer in the DEJIE Program

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Teacher professional development (TPD) has struggled to produce consistent instructional improvement, particularly in translating professional learning into sustained classroom practice. Grounded in constructivist, heutagogical, and competency-based frameworks, this study examined how a project-based, competency-based TPD program supported teacher learning, motivation, and transfer. Using a multi-source case study design, data were collected from four to five middle and high school teachers through surveys, Canvas learning analytics, and semi-structured follow-up interviews conducted six months after program completion. Findings indicated consistent increases in competency awareness, sustained high levels of confidence and motivation, and meaningful transfer of learning into classroom practice. Active participatory engagement was more strongly associated with competency demonstration than passive content exposure. Program features including core competencies, project cycles, collaborative communities, and targeted feedback emerged as central to learning and transfer. Organizational conditions such as leadership support and time availability significantly shaped transfer outcomes

Keywords: teacher professional development, project-based learning, competency-based approach, teacher motivation, learning transfer, mixed-methods

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Despite decades of sustained investment, teacher professional development (TPD) has yet to yield consistent improvements in classroom instruction across diverse educational contexts. Although TPD is broadly recognized as essential to strengthening teachers' professional knowledge, skills, and practice (Fairman et al., 2020), considerable variability in program purposes, formats, and outcomes continues to impede the identification of design features that reliably support meaningful and lasting instructional change (Desimone & Garet, 2015; Guskey, 2003; Sancar et al., 2021). These challenges are further intensified by the heterogeneous expertise, needs, and working conditions of teachers, who operate within layered classroom, school, and community ecologies under varying degrees of institutional support, making uniform approaches insufficient for the complexity of authentic professional practice (Roseler & Dentzau, 2013; Sancar et al., 2021).

To address these challenges, the field has progressively shifted from brief, decontextualized workshops toward models informed by constructivist and situative perspectives, which frame teacher learning as social, interactive, and grounded in practice (Borko et al., 2010; Desimone, 2011; Desimone & Garet, 2015). This shift converges with advances in adult learning theory, most notably heutagogical frameworks that privilege learner agency, metacognitive awareness, and nonlinear pathways as foundations of meaningful professional growth (Hase & Kenyon, 2001; Stephenson, 1994). Collectively, these perspectives argue for TPD models that balance explicit, practice-oriented structure with sufficient flexibility for teachers to pursue learning trajectories tailored to their students, curricula, and local conditions (Fairman et al., 2020; Sancar et al., 2021).

Despite this theoretical convergence, relatively few empirically examined TPD models have successfully operationalized these principles in ways that are simultaneously rigorous, adaptable, and scalable. Competency-based TPD enacted through project-based learning constitutes one promising yet understudied approach. By specifying explicit, performance-oriented competencies and engaging teachers in the design, implementation, and critical reflection of authentic classroom projects, such programs situate professional learning within genuine instructional challenges while enabling meaningful personalization and differentiation (Mikelsone et al., 2022). The present study addresses this gap through a comprehensive examination of a competency-based, project-based TPD program, assessing its effects on teachers' learning and motivation, exploring the conditions that facilitated or impeded the transfer of new knowledge into practice, and deriving evidence-based insights into program design features that most effectively bridge professional learning and classroom enactment. These findings contribute to an expanding body of scholarship dedicated to translating constructivist and heutagogical principles into actionable TPD design, offering practical implications for program developers, school leaders, and researchers invested in fostering professional learning that produces sustained instructional improvement.

Literature Review

The Landscape of TPD: Persistent Challenges and Evolving Frameworks

The field of TPD is characterized by longstanding conceptual fragmentation and empirical inconsistency. The absence of shared definitions, coherent structural frameworks, and standardized evaluative criteria has substantially hindered efforts to determine which program features consistently produce meaningful and durable improvements in teaching practice (Desimone & Garet, 2015; Guskey, 2003; Sancar et al., 2021). This ambiguity is compounded by the complex, multilayered contexts in which teachers work, including variation in student characteristics, teacher expertise and beliefs, classroom environments, school and community conditions, and the degree of institutional and leadership support available (Roseler & Dentzau, 2013; Sancar et al., 2021). As a result, teachers frequently experience the same TPD as simultaneously too general or too specific, too basic or too advanced, and more or less relevant to their daily practice (Fairman et al., 2020), making uniform approaches inadequate for the diversity of professional contexts in which teachers operate.

Beyond program structure, teacher motivation constitutes a significant and often insufficiently addressed factor in determining whether professional learning translates into sustained instructional change. The extent to which teachers successfully transfer new knowledge into practice is shaped as much by their individual motivational orientations as by the design of the TPD itself (Osman & Warner, 2020). Using expectancy-value theory (Eccles & Wigfield, 1995; Watt & Richardson, 2008) as a framework, Osman and Warner (2020) found that practical concerns such as time, workload, and stress were among the most common reasons teachers did not apply what they learned in TPD, and that these cost-related factors functioned as a distinct motivational barrier rather than simply one component of task value. These findings suggest that even high-quality TPD programs may fail to produce meaningful change in practice if teachers' motivational needs are not deliberately built into program design. Wlodkowski (2003) similarly argues that intrinsic motivation in TPD depends on four interrelated conditions: establishing inclusion so that teachers feel respected and connected, cultivating a favorable attitude through relevance and learner choice, enhancing meaning by incorporating teachers' perspectives and values, and engendering competence so that teachers develop confidence in their capacity to apply new learning. All four conditions are directly linked to the likelihood of transfer, and their absence in traditional TPD formats contributes substantially to weak and inconsistent implementation outcomes (Wlodkowski, 2003).

Features of Effective Teacher Professional Development

In response to these challenges, a substantial body of research has converged on a set of core design features consistently associated with effective TPD, including sustained duration, structured collaboration, alignment with reforms and research, relevance to teacher practice, inquiry and active learning, and supportive instructional practices such as coaching and mentoring (Borko et al., 2010; Darling-Hammond et al., 2017; Desimone, 2011).

Sustained duration is foundational. Teachers require adequate time to encounter new ideas, experiment with their application, and engage in iterative reflection before meaningful changes in practice take hold (Darling-Hammond et al., 2017). Desimone (2011) recommends that high-quality TPD spans at least one semester and involves no fewer than 20 contact hours, a threshold supported by evidence that brief, episodic interventions rarely produce lasting instructional change (Borko et al., 2010; Matherson & Windle, 2017). Structured collaboration is equally central, enabling teachers to share ideas, co-construct knowledge, and engage in joint problem-solving organized around locally relevant problems of practice (Borko et al., 2010; Darling-Hammond et al., 2017). These structures build professional trust and community, and Vescio et al. (2008) found that participation in professional learning communities was consistently associated with improvements in teaching practice and student learning outcomes.

Alignment with current research, theory, and school reform initiatives is another distinguishing feature. TPD that models the instructional practices it promotes, often called “modeling the model,” gives teachers the opportunity to experience new approaches as learners before applying them in their classrooms, building confidence and readiness for implementation (Darling-Hammond et al., 2017; Desimone, 2011; Matherson & Windle, 2017). Fairman et al. (2020) found that school-based TPD connected to reform priorities was perceived as more relevant and more closely aligned with research-based instruction. Relevance, in turn, refers to the degree to which TPD content and structure reflect teachers’ professional perspectives, values, and instructional goals (Wlodkowski, 2003). When teachers perceive TPD as directly connected to their daily work and their students’ needs, they are more likely to engage fully and more likely to transfer new learning into practice (Matherson & Windle, 2017; Wlodkowski, 2003).

Programs that position teachers as active agents who direct their own inquiry, reflection, and experimentation produce stronger engagement and greater motivation than passive, transmission-oriented formats (Borko et al., 2010; Fairman et al., 2020). Opportunities to observe instruction, analyze student work, and receive targeted feedback further deepen learning and support transfer (Desimone, 2011). Finally, supportive instructional practices such as coaching and mentoring are critical mechanisms for connecting professional learning to classroom enactment (Sancar et al., 2021). Knight (2007) demonstrated that instructional coaching embedded within ongoing professional learning produces substantially greater transfer than standalone professional development activities, underscoring the importance of individualized, continuous support as a structural feature of effective TPD design.

Competency-Based TPD Through a Project-Based Approach

While the features described above represent well-established markers of effective TPD, they do not in themselves constitute a unified program model. Competency-based TPD implemented through project-based learning offers a coherent framework that directly targets four core weaknesses of conventional TPD: limited relevance, weak transfer, insufficient responsiveness to teacher diversity, and inadequate attention to motivation and contextual variability.

Competency-based TPD begins with explicit, practice-oriented competencies that define what teachers should know and be able to do within their own instructional contexts (Day, 2017; Savard & Cyr, 2018). By clearly stating expected learning outcomes, this approach removes much of the uncertainty about what counts as effective TPD and makes it easier to see how professional learning connects to actual changes in teaching. When performance tasks and assessments are aligned with target competencies, teachers can more readily understand the connection between their professional learning and their classroom responsibilities, strengthening both perceived relevance and the likelihood of transfer (Savard & Cyr, 2018; Wlodkowski, 2003). Blömeke et al. (2015) argue that competency frameworks work best when they connect what teachers know and believe to what they actually do in the classroom, a principle that applies equally to in-service professional development.

Embedding these competencies within a project-based structure shifts teachers from passive recipients of information to active, engaged learners who take sustained ownership of their professional growth. Teachers design, implement, and iteratively refine authentic classroom projects aligned with target competencies, engaging in the same inquiry-driven, problem-centered learning they are expected to facilitate with their own students (Borko et al., 2010; Desimone & Garet, 2015; Fairman et al., 2020). Teachers continuously move back and forth between professional learning activities and classroom practice, supporting lasting change rather than temporary or isolated shifts in instruction (Mikelsone et al., 2022; Savard & Cyr, 2018). Because projects are situated in teachers' own classrooms and responsive to their students and curricula, learning is naturally contextualized, addressing the concern that TPD is too generic or disconnected from local realities (Roseler & Dentzau, 2013; Sancar et al., 2021; Savard & Cyr, 2018). This structure also allows teachers to work toward mastery at differentiated paces along learning pathways tailored to their prior knowledge, professional roles, and needs (Mikelsone et al., 2022), reflecting heutagogical principles of self-determined learning that can significantly enhance intrinsic motivation (Hase & Kenyon, 2001; Wlodkowski, 2003).

Collaboration within this model is organized around authentic, shared professional work: teachers co-design, critique, and refine projects targeting common competencies, building professional communities centered on genuine classroom challenges (Borko et al., 2010; Darling-Hammond et al., 2017; Sancar et al., 2021). These communities foster the social inclusion, shared purpose, and mutual accountability that underpin Wlodkowski's motivational conditions and expectancy-value perspectives, helping teachers sustain effort despite implementation costs related to time, workload, and perceived risk (Osman & Warner, 2020; Wlodkowski, 2003). Stoll et al. (2006) found that professional learning communities built on shared values, reflective inquiry, and collective commitment to student outcomes were among the most effective structures for sustaining instructional improvement. Because teachers demonstrate competency through authentic classroom enactments, the feedback they receive is specific, timely, and grounded in their actual professional contexts (Savard & Cyr, 2018), strengthening their sense of competence and expectancy for success, two of the most powerful predictors of motivation to implement new

practices (Eccles & Wigfield, 1995; Osman & Warner, 2020; Wlodkowski, 2003). As teachers repeatedly try out and refine their projects and observe their impact on student learning, they become more likely to view the costs of implementation as worthwhile, directly addressing one of the most commonly reported barriers to transfer in traditional TPD (Mikelsone et al., 2022; Osman & Warner, 2020). Despite this theoretical promise, empirical research examining how such programs operate in practice, how they influence teacher learning and motivation, and which design features most effectively support transfer remains limited.

Purpose and Research Questions

This study aims to provide an in-depth examination of a competency-based, project-based TPD program by evaluating its impact on teachers' learning and motivation, identifying facilitators and barriers to the transfer of learning, and generating insights into the program design features that most effectively bridge the gap between professional learning and its practical enactment in classrooms. To address this aim, the following research questions guide the study:

1. How does learner engagement in the competency-based, project-based TPD program impact participants' mastery-level competencies?
2. How do teachers perceive the impact of the competency-based, project-based TPD program on their confidence in learning, motivation to learn, and motivation to transfer?
3. Which features of the competency-based, project-based TPD program influence the transfer of learning?
4. What are the facilitators and barriers to the transfer of learning?

Methods

Designing for Equity, Justice, and Innovation in Education (DEJIE) Pilot Program

In spring 2023, the Designing for Equity, Justice, and Innovation in Education (DEJIE) pilot program was offered online by a midwestern university, targeting middle and high school educators across a 14-week period with weekly three-hour synchronous sessions. Grounded in the structural principles of competency-based, project-based TPD, the program was organized around three explicit, practice-oriented competencies: Teaching for Justice (TfJ), Thinking Like a Designer (TLaD), and Grounding in the Science of Learning and Development (GSLD). These competencies provided clear, measurable targets for professional learning, guided both the modular coursework and the culminating project work, and established the evaluative framework through which teacher growth was assessed throughout the program.

The program was organized into two sequenced phases. During the first six weeks (hereafter referred to as the Foundation Institute), participants engaged in self-guided online modules, instructor-led activities, and case studies designed to build professional relationships, establish a collaborative community, and prompt critical reflection on their teaching practice. This phase laid the conceptual and rela-

tional foundation needed for the project work that followed. In the subsequent eight-week project phase, teachers developed their own driving questions and designed learner-focused classroom projects guided by the seven Essential Project Design Elements (Larmer & Mergendoller, 2015). Because projects were grounded in teachers' own classrooms, students, and curricula, learning was naturally personalized and responsive to the diverse professional contexts participants brought to the program.

Throughout both phases, weekly synchronous meetings served as structured spaces for collaborative feedback, iterative refinement, and community building, directly reflecting the collaborative architecture of effective project-based TPD. The project phase also functioned as a form of performance-based assessment, with teachers iteratively designing, testing, and refining their projects and receiving targeted feedback on evidence of competency as it emerged in authentic classroom work. The program culminated in a public showcase in which participants shared their project designs, implementation results, and professional reflections with peers and community members, an experience that reinforced accountability, deepened metacognitive awareness, and demonstrated mastery in a meaningful, real-world context. By deliberately moving teachers between conceptual learning and classroom-based design throughout the 14 weeks, DEJIE embodied the "modeling the model" principle and worked to narrow the gap between professional learning and instructional practice in ways consistent with the features of effective TPD identified in the literature.

Data Sources

This study used three data sources to address its research questions: surveys, Canvas learning analytics, and follow-up interviews. These sources were selected to provide both quantitative and qualitative evidence of teacher learning, motivation, engagement, competency mastery, and the transfer of learning into classroom practice. The participants, data collection procedures, and analysis approach for each source are described below.

Surveys

Participants. Three surveys were administered to DEJIE participants at three points: Week 1 (program entry), Week 6 (end of the cognitive phase), and Week 14 (program completion). Ten educators participated in the DEJIE pilot program, of whom eight consented to the use of their survey data. To ensure analytical consistency and allow for meaningful examination of change over time, analyses focus on the four participants who completed all three surveys and also participated in the follow-up interviews.

Data Collection. Surveys were administered online at each of the three points. The phased introduction of motivation to transfer items in Weeks 6 and 14 reflects the conceptual logic that motivation to transfer is most meaningfully assessed after participants have had sufficient exposure to program content and have begun engaging in classroom-based project work.

Data Analysis. To examine how participants' perceptions changed across the program, mean scores were calculated for each survey section at Weeks 1, 6, and 14. Awareness of the three core competencies was measured using three items rated on a 1 to 10 scale, with scores averaged to produce an overall awareness index. Confidence in learning, motivation to learn, and motivation to transfer, measured at both general and competency-specific levels, were each assessed using multiple items that were averaged to create composite indices (see Supplementary 1). Because motivation to transfer is conceptually dependent on prior learning, it was only analyzed at Weeks 6 and 14.

Descriptive statistics were computed for each composite index at each time point, and patterns of change were visualized graphically. Given the repeated-measures structure of the data and the very small sample size ($n = 4$), a Friedman test was used to assess overall differences across time points, with Wilcoxon Signed-Rank tests conducted as post-hoc pairwise comparisons. Effect sizes were calculated using rank-biserial correlation (r), and confidence intervals were not reported as they would be too wide to be meaningfully interpretable given the sample size. These analyses were intended to be exploratory and descriptive rather than inferential, and findings should be interpreted accordingly. Statistical results are reported alongside effect sizes to provide a fuller picture of the magnitude of observed changes, while acknowledging that the limited sample size substantially constrains statistical power and the generalizability of findings.

Canvas Learning Analytics

Participants. All ten DEJIE participants engaged with course materials and assessments through the Canvas learning management system (LMS). Analyses for this data source are based on the four participants who provided consent for the use of their Canvas data.

Data Collection. Canvas analytics were used to generate quantitative indicators of two constructs central to the study's research questions: engagement with the TPD program and mastery of target competencies. Data were collected over approximately eight months, spanning the duration of the program and a follow-up period after its conclusion. Engagement was operationalized using two indicators: total page views and total number of participations, defined as learner-generated inputs such as discussion posts and assignment submissions. Competency mastery was operationalized using gradebook ratings on summative assessments, which were scored on a three-level scale: Meets Learning Objective, Developing, or Not Yet. Of the 13 targeted competency assessments, the number rated as Meets Learning Objective was calculated for each participant as an indicator of demonstrated mastery.

Data Analysis. Descriptive statistics were used to summarize engagement and mastery indicators for each participant. These quantitative indicators were then examined alongside survey-based measures to explore potential relationships between engagement, perceived learning, and demonstrated competency mastery, providing a more comprehensive picture of how participation in the program related to learning outcomes.

Follow-up Interviews

Participants. Of the ten educators who completed the DEJIE program and consented to participate in the study, five took part in follow-up interviews. The interview sample included middle and high school teachers from five subject areas: English, mathematics, business, performing arts, and social studies. Participants were located across four states: Kansas, Massachusetts, Missouri, and Texas. The sample comprised one man and four women; three identified as white, one as African American, and one as two or more races. Teaching experience ranged from one to four years for two participants to more than ten years for three participants.

Data Collection. Follow-up interviews were conducted approximately six months after the conclusion of the DEJIE program, providing sufficient time for participants to have attempted to apply their learning in their classrooms and to reflect meaningfully on their transfer experiences. Interviews were conducted individually via Zoom using a semi-structured protocol of 16 questions organized into three thematic sections: perceptions of the DEJIE pilot program, experiences with the transfer of learning into practice, and factors that facilitated or hindered transfer (see Supplementary 2). Interviewers followed the protocol consistently while using additional probes when needed to encourage deeper responses. Minimal direction was provided beyond the core questions in order to keep the focus on participants' own perspectives and experiences. Each interview lasted approximately one hour, was audio-recorded with participants' consent, and was transcribed for analysis.

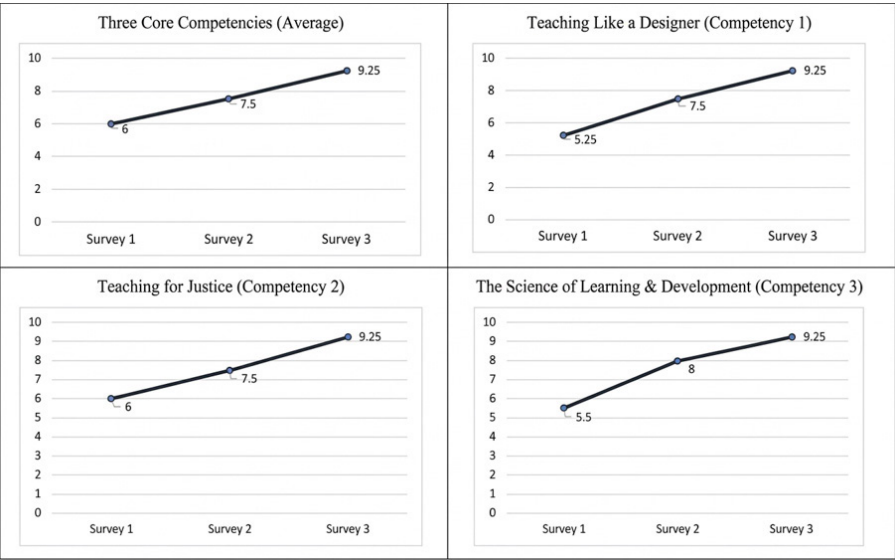
Data Analysis. Interview transcripts were imported into NVivo Release 1.0 for systematic thematic analysis following the six-phase framework described by Braun and Clarke (2006). To strengthen the trustworthiness and credibility of the analysis, two independent coding teams worked separately to identify themes related to participants' program experiences, transfer of learning, and perceived facilitators and barriers to implementation. The first coding team consisted of two researchers and the second consisted of three researchers. Following independent coding, discrepancies between teams were discussed collaboratively until consensus was reached, a process that enhanced the reliability and analytical rigor of the findings. This study was approved by the University of Kansas Institutional Review Board (KU IRB).

Results

Results of Surveys

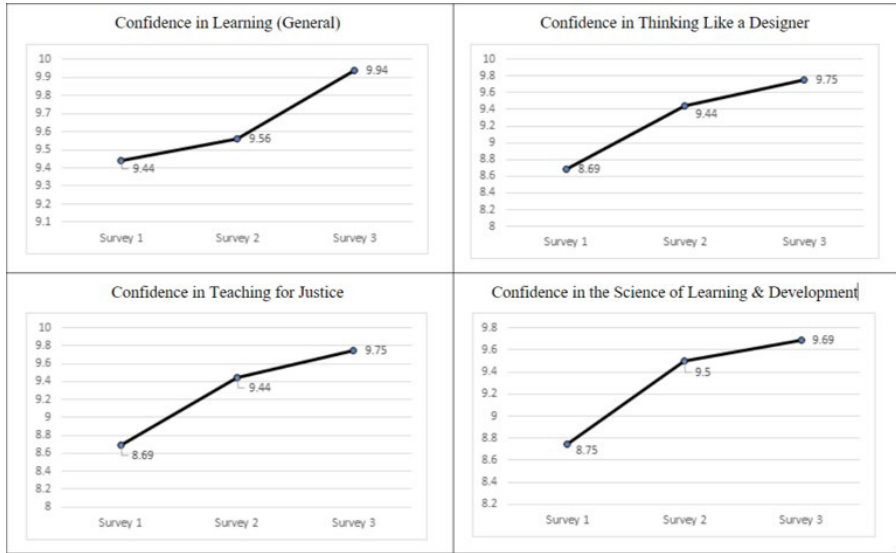
We gathered learners' perceptions regarding awareness of the three core competencies covered in the program during Weeks 1, 6, and 14: TfJ, TLdD, and GSLD. Figure 1 shows a general increase in awareness of the competencies from somewhat familiar (6) to very familiar (9.25). Specifically, awareness of each core competency increased to very familiar as the program progressed. Figure 1 shows an increase in overall awareness and awareness of specific competencies.

Figure 1
Awareness on the Three Core Competencies (Average) and Each Individual Competency



Note. Responses were collected using a 10-point Likert scale, where 1 indicates “Not Familiar” and 10 indicates “Very Familiar.”

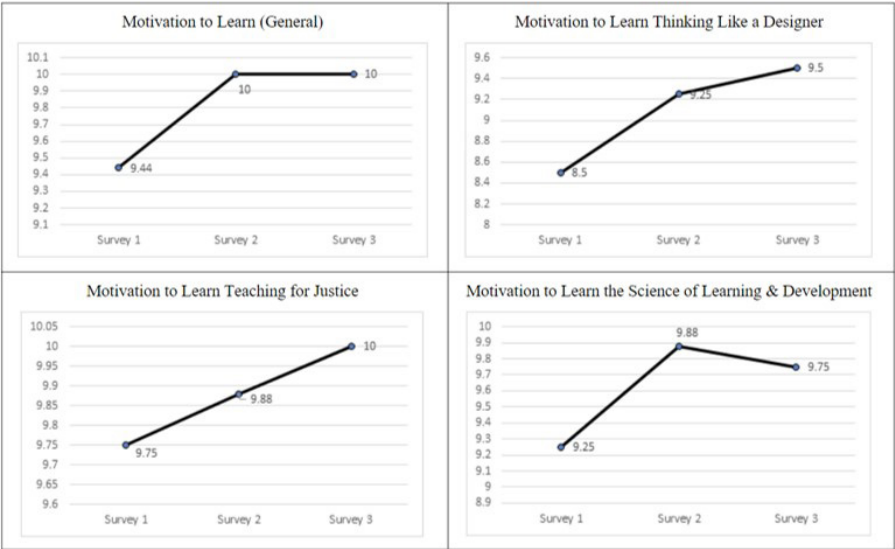
We also analyzed learners’ perceptions of general confidence in learning and confidence in the three core competencies. Overall, respondents’ confidence in learning was high, starting at 9.44 and increasing to 9.94 by the end of the program. Confidence in the three core competencies rose from 8.69 to 9.75 over time. Confidence in the three core competencies increased more sharply from Week 1 to Week 6 than from Week 6 to Week 14. After completing the Foundation Institute (the cognitive phase), their confidence experienced a slight decrease. However, the Project Cycle instilled in them the confidence to effectively apply the knowledge and skills they gained from the program by the end. Figure 2 illustrates an increase in overall confidence in learning as well as confidence in specific competencies.

Figure 2*Confidence in Learning (General) and the Three Core Competencies*

Note. Responses were collected using a 10-point Likert scale, where 1 indicates “Strongly Disagree” and 10 indicates “Strongly Agree.”

We examined learners’ perceptions of general motivation to learn and motivation to learn specifically related to the three core competencies. Overall, respondents’ motivation to learn was high, starting at 9.44 and increasing to 10 by the end of the program. This trend was also observed in the competencies TfJ and TLaD. However, motivation to learn GSLD increased from 9.25 in Week 1 to 9.88 in Week 6, then slightly decreased to 9.75. Learners had very high motivation to learn the program’s topics initially, and it was sustained and peaked at the end. Figure 3 shows an increase in both overall motivation to learn and motivation to learn specific competencies.

Figure 3
Motivation to Learn (General) and the Three Core Competencies

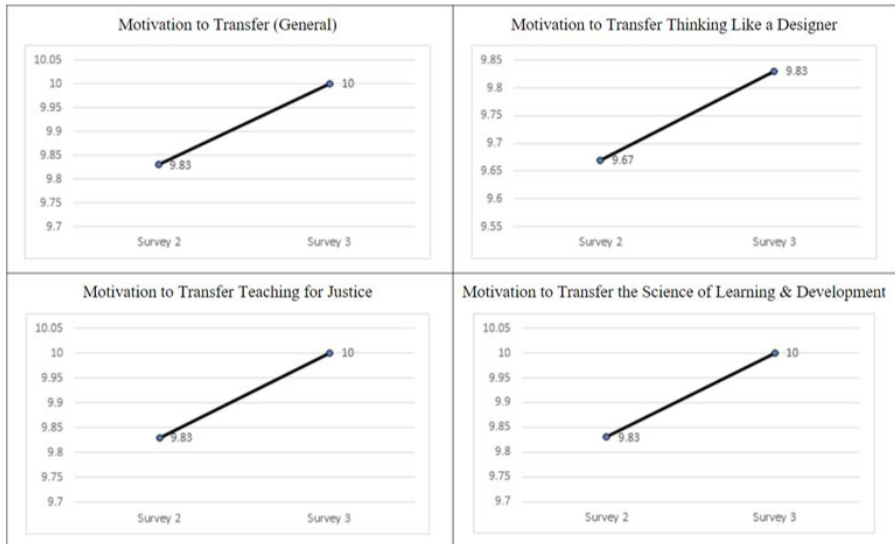


Note. Responses were collected using a 10-point Likert scale, where 1 indicates “Strongly Disagree” and 10 indicates “Strongly Agree.”

Overall, respondents’ motivation to transfer was high, starting at 9.83 and increasing to 10 by the end of the program. This trend was consistent across all three competencies, rising from 9.67 to 10. In sum, learners strongly desire to apply the knowledge and skills acquired from the program to their contexts. Their motivation to transfer remained consistent and sustained until the program’s conclusion. Figure 4 demonstrates an increase in both overall motivation to transfer and motivation to transfer specific competencies.

Figure 4

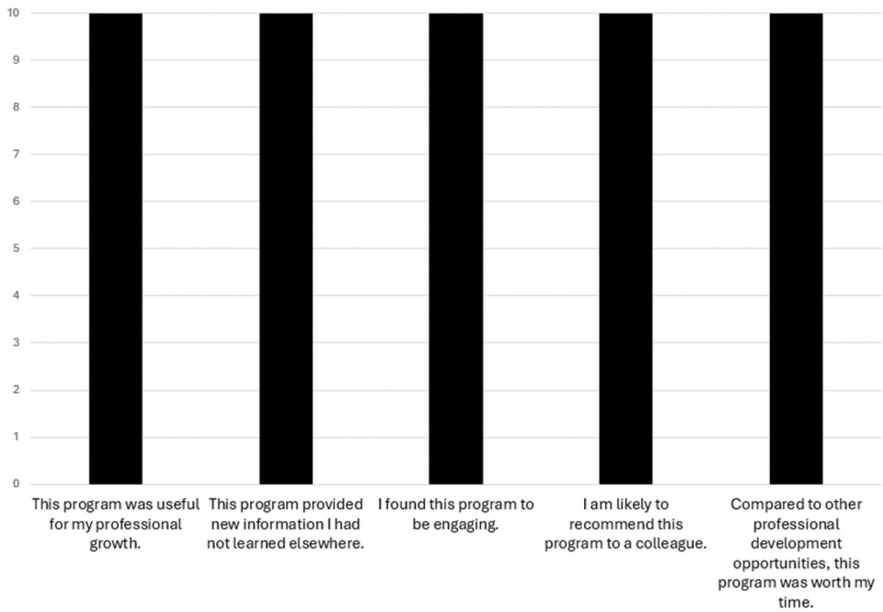
Motivation to Transfer (General) and the Three Core Competencies



Note. Responses were collected using a 10-point Likert scale, where 1 indicates “Strongly Disagree” and 10 indicates “Strongly Agree.”

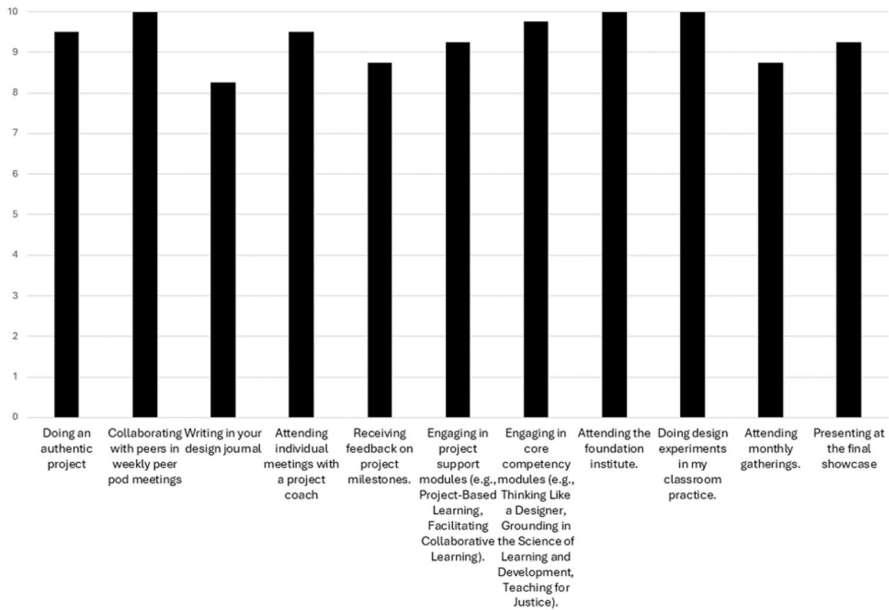
In the survey, we sought learners’ opinions on the program’s quality and specific program features to gain ideas for improvement in the future. All the respondents provided the highest ratings for the five survey items (see Supplementary 1). In addition to their comments, the program had the following effects on them: (1) it inspired, motivated, and challenged them, (2) it enhanced their thinking and knowledge base on the topics, and (3) it increased their motivation to apply the knowledge and skills gained from the program to their contexts. Figure 5 shows their ratings of the quality of the program.

Figure 5
Overall Quality of the Program: Thought on Program Experience



Note. Responses were collected using a 10-point Likert scale, where 1 indicates “Strongly Disagree” and 10 indicates “Strongly Agree.”

Regarding the program features, we asked learners to rate which program features impacted their learning. The top three program features that promoted their learning were as follows: “Attending the foundation institute,” “Engaging in design experiments in my classroom practice,” and “Collaborating with peers in weekly peer pod meetings.” “Engaging in core competency modules,” “Participating in an authentic project,” and “Project coaching” were the second top program features that enhanced their learning. Figure 6 shows their rating of program features that promote their learning.

Figure 6*Overall Quality of the Program: Program Features that Promote Their Learning*

Note. Responses were collected using a 10-point Likert scale, where 1 indicates “Did Not Contribute” and 10 indicates “Highly Contributed.”

Friedman tests, used to compare multiple related samples, examined changes across three consecutive surveys (Survey 1(S1), Survey 2(S2), Survey 3(S3)). Significant differences were found only in awareness ratings across competencies ($\chi^2(2) = 8.00, p = .018$), with mean ranks indicating the lowest awareness at S1 and the highest at S3. No significant differences were observed for other variables such as CIL ($\chi^2(2) = 2.00, p = .368$), CITLD ($\chi^2(2) = 3.00, p = .223$), CITFJ ($\chi^2(2) = 3.714, p = .156$), CIGSLD ($\chi^2(2) = 3.00, p = .223$), MTL ($\chi^2(2) = 4.00, p = .135$), MTLTLD ($\chi^2(2) = 1.40, p = .497$), MTLTFJ ($\chi^2(2) = 2.00, p = .368$), or MTLGSLD ($\chi^2(2) = 2.00, p = .368$).

Following a non-significant Friedman test, the post-hoc Wilcoxon Signed-Rank tests explored changes across three time points (S1, S2, S3) in variables, along with the Rank-Biserial Correlation (r) for effect sizes. Even though the overall Friedman test didn’t find a significant difference across all the related variables, calculating effect sizes can still be valuable since with a small sample size, the statistical power of the Friedman test is low, and effect sizes still provide a way of assessing the practical importance of observed trends, even when statistical significance is lacking.

Overall, while statistical significance ($p < .05$) was not achieved for any comparison in the Wilcoxon Signed-Rank tests, notable trends emerged, particularly in

awareness and motivation. For awareness of core competencies, a consistent trend of increased awareness was observed, with large effect sizes ($r = 1.00$) despite marginal p -values ($p = .068$), suggesting a strong, though underpowered, increase. Confidence variables showed mixed results: general confidence exhibited weak or no trends ($r = 0.00$ to 0.50), while specific competencies displayed moderate effect sizes ($r = 0.50$ to 0.75), indicating potential, but non-significant, shifts.

MTL variables, both general and specific, showed moderate to large effect sizes ($r = 0.50$ to 1.00), suggesting consistent trends despite the lack of statistical significance. Specifically, MTL about GSLD showed particularly large effects. For general MTL, a large effect was observed ($r = -0.50$), indicating a potential increase from S2 to S3. Similarly, substantial, though non-significant, increases were observed in MTL about TfJ and GSLD ($r = -0.50$ for both). Conversely, MTL about TLad showed a small effect ($r = -0.224$), indicating a minimal change.

For general MTT, a large effect was observed ($r = -0.50$), suggesting a potentially meaningful increase in MTT from S2 to S3, even though this difference did not reach statistical significance with the current sample size. Similarly, for MTT regarding TfJ and GSLD, large effects were also found ($r = -0.50$ for both), indicating substantial, though non-significant, increases in MTT. Conversely, MTT regarding TLad showed a small effect ($r = -0.224$), suggesting a minimal, practically insignificant difference between S2 and S3.

These results demonstrate that while statistical significance was not achieved, the Rank-Biserial correlation provided valuable insights into the magnitude of observed effects. The lack of statistical significance across most variables is likely due to the small sample size, limiting statistical power. However, the presence of moderate to large effect sizes suggests potentially meaningful trends that warrant further investigation with larger samples.

Results of Canvas Data Analysis

Table 1 shows the results of the Canvas data analysis. Participants' page views ranged from around 1,500 to around 3,300, during and after the TPD. Participations, which included submitting assessments, responding to assignments, and discussion forums, ranged from 1 to 17. Most participants were able to successfully demonstrate most of the TPD competencies. One participant did not submit any assessments and therefore did not demonstrate any competencies. No participants successfully demonstrated all the competencies.

Table 1
Results of Canvas Learning Data

Participant	Page Views	Participations	Competencies Demonstrated (Out of 13)
2	2,051	13	8
3	1,505	10	9
4	3,300	17	12
5	2,618	1	0

There was not a consistent pattern of engagement. Participant 4 was the most highly engaged participant, with the most page views and participation, and demonstrated the most competencies. Participant 1 demonstrated a pattern of passive high engagement, with the second most page views but few participations and failed attempts to demonstrate any program competencies. Participants 2 and 3 engaged moderately and demonstrated over half of the TPD competencies. Participants 2, 3, and 4 all engaged in more participatory behaviors in the course, and all of these participants demonstrated over half of the TPD competencies by program completion. Participant 5 had only one participation throughout the course and demonstrated zero TPD competencies by program completion. Participation, therefore, is a stronger indicator of future competency demonstration than page views.

Results of Follow-up Interview Data

During the follow-up interviews, three key questions were asked to participants: (1) which program design features had the most significant impact on their learning and application, (2) their transfer experiences when applying what they learned from the DEJIE program, and (3) the factors that facilitated or hindered their ability to apply their knowledge and skills. This section will discuss the program features that supported knowledge transfer, the participants' transfer experiences, and the challenges or supports they encountered. Direct quotes from the follow-up interviews corresponding to each theme can be found in Supplementary 3.

Theme 1. Program Design Features that Influenced Learning and Transfer

Participants identified several key program design features that significantly influenced their learning and transfer, including core competencies, learning communities, instructor feedback, faculty mentorship, project cycles, and weekly gatherings.

Core Competencies. Participants highlighted the importance of TfJ and TLAd in their teaching. TfJ was particularly useful for addressing diversity in student populations, including race, ethnicity, language, and learning needs. Participant 1 used TfJ to address social justice concerns among middle school students, while Participant 2 applied it to pursue equity in a predominantly white school. TLAd was valued as a problem-solving framework that helped teachers understand student preferences and needs. For instance, Participant 2 used TLAd to develop a community agreement activity, and Participant 3 found it helpful for focusing on lesson goals and

engaging unmotivated students. In contrast, some participants found GSLD less relevant, considering it familiar or less critical compared to TfJ. Participant 1 placed less emphasis on this competency, considering TfJ to be a more critical competency. Similarly, Participant 3 felt that the GSLD was already familiar, compared to the other competencies.

Learning Communities. Participants also emphasized that the learning community was invaluable for completing their individual projects while collaborating with facilitators and colleagues. Some participants noted that they took on the responsibility of encouraging and improving each other's projects through regular communication within the learning community. The collaborative environment motivated them to transfer knowledge and skills actively. For instance, Participant 2 highlighted that sharing projects and personal updates within the learning community fostered a supportive, engaging atmosphere that enhanced collaboration and motivation. Participant 5 had a similar experience, stating that the learning community was a support system, making challenging tasks more manageable and boosting their motivation to transfer skills. In sum, the learning community fostered a supportive and collaborative environment where participants became more engaged in their projects and were more motivated to transfer their learning into practice.

Feedback from the Instructor. Participants also emphasized that feedback from the instructor was clear, well-structured, and effective in helping learners refocus and improve in specific areas of core competencies. For instance, Participant 3 expressed that the instructor's feedback allowed them to understand exactly what was expected and what areas needed improvement, aligning with specific criteria or competencies. Their specific feedback helped them focus on particular aspects that needed attention. Participant 2 agreed that the instructor's written feedback helped them refocus on meeting the competencies. Feedback from the instructor helped participants complete the program successfully and thus motivated them to transfer their learning.

Faculty Mentorship. Participants also highlighted the faculty mentorship integrated into their experiences during the program. For instance, accessing their mentor via Zoom for open conversations was perceived as "really helpful," indicating the mentorship provided meaningful support for reflection on their work. Through discussions with their mentor, Participant 2 gained a deeper understanding of their learner's needs, particularly the value students place on collaborative work. Allowing for a shift of their perception from being grade-focused to being collaboration-focused. Participant 4 also echoed the impactful ongoing coaching and support from the faculty. This participant struggled initially but found clarity and direction through the mentorship. Faculty mentors provided meaningful support for participants to reflect on their work in a meaningful way and thus helped them succeed in their projects. They acknowledged that faculty mentorship effectively supported their transfer.

Project Cycle. Participants found that the project cycle was valuable because it led to action and ultimately improved their teaching by the end of the project cycle. For instance, Participant 2 appreciated how implementing a project gave them

insights that led to revising and updating their initial ideas, allowing for iterative changes and adaptations while responding to evolving ideas and feedback. Participant 3 emphasized the significant impact of the project cycle on their work because it enabled them to reshape their unit test and final project, transforming their approach and outputs.

Virtual Weekly Meetings. Participants noted virtual weekly meetings were helpful for their learning and transfer efforts. For instance, Participant 3 described how the virtual weekly meetings facilitated the sharing of ideas across different backgrounds and regions. This helped participants find common goals and blend ideas, suggesting that the meetings fostered a sense of community and shared purpose. Participant 5 also appreciated that the weekly meetings led to collaboration with other learners and facilitators during the meetings. The discussions and engagement during the meetings provided valuable support and interaction.

Theme 2. Experiences of Transferring Core Competencies

Participants described how they transferred the core competencies gained from the program into their teaching practices, emphasizing that their experiences during the project cycle facilitated this transfer of learning.

Transfer of Core Competencies. Participant 4 used TfJ to implement inclusive strategies, such as the “Notice and Wonder” technique and the “Question Formulation Technique,” to promote a more equitable learning environment. TLAd supported participants in addressing classroom challenges through an iterative process of reflection and strategy adjustment, enabling continuous improvement in their teaching. Additionally, Participant 2 applied GSLD by identifying and utilizing students’ strengths and assets to enhance their learning experience. In conclusion, participants demonstrated that the application of TfJ, TLAd, and GSLD enhanced their ability to reflect on and improve their teaching practices. This transfer experience contributed to more effective and responsive classroom management and instruction.

Transfer of Project Cycle. Participants mentioned that they strived to apply the knowledge and skills gained from the program to their contexts. Participant 2 noted that they frequently used the final product of their project cycle and introduced it to their entire high school team to establish student-driven norms in the classrooms, which has made a significant difference. Other teachers also reported positive impacts in their classrooms. Participant 5 indicated that they often referred to their project, researching how students in their business class performed before and after implementing it. The results showed a significant improvement, with more students passing than failing due to changes in their teaching approach to the new project.

Theme 3. Facilitators and Barriers of Transfer

Although participants completed the DEJIE pilot program and had the highest level of motivation to transfer their learning to their practices at the end of the program, they encountered challenges in transferring the knowledge and skills gained from the program to their specific contexts. When asked about the facilitators and barriers to this transfer, participants identified the following factors:

Facilitators of Transfer. Several facilitators of transfer were found as follows:

Supervisor Support. Participant 2 mentioned receiving strong support from their department head (supervisor) while taking the DEJIE program, even though the rest of their colleagues were not as supportive. For instance, the department head proactively supported Participant 2's professional development by providing opportunities to apply new learning and experiment with different teaching methods.

Extended Duration. Participant 2 highlighted the extended duration of the TPD as a facilitating factor because having enough time allowed them to try new approaches and develop ideas. Being able to observe the progress of these ideas over months or years was a significant facilitator.

Discretion. Participants also valued the discretion or freedom to apply their learning to their teaching practices. Participants 1 and 2 mentioned the freedom to implement what they learned from the DEJIE program into their teaching practices, facilitated their transfer activities.

The Program Period and Delivery Format. Participant 3 noted that the timing and virtual delivery format of the DEJIE program were crucial for facilitating learning transfer. The summer schedule allowed educators to review and enhance their lesson plans for the upcoming semester, while thoughtfully scheduled Saturday sessions provided a focused environment free from the pressures of the school day.

Project Cycle. Participant 3 mentioned another helpful facilitator is creating and implementing learning in the classroom through the project cycle. As participants worked on their projects, they spurred them to consider the direct impact on learners.

Barriers of Transfer. Several barriers of transfer were found as follows:

Subjects or Contents Suitable for the Target Age Group. Participant 1 pointed out that the DEJIE program content should be developed with consideration for the age group that participants teach. For instance, some projects might be better suited for high school or college students rather than the 6th, 7th, or 8th graders that Participant 1 teaches, as the content may be too advanced for younger students.

Resistance to Change. Participant 2 addressed resistance to change within the school. For instance, there was always some resistance to new programs, which could stem from a lack of awareness about them. As a result, resistance to change consistently posed a barrier to the transfer of learning.

Time Constraints. Participant 2 highlighted time as the most challenging barrier to transfer, noting that educators are constantly racing against a schedule set long ago. Therefore, they must find ways to secure time to implement their learning. Otherwise, their efforts to transfer learning will fail.

Discussion

This study examined how a project-based, competency-based TPD program supported teachers' learning, motivation, and transfer, and how engagement patterns related to demonstrated competencies. Overall, the findings suggest that while quantitative evidence is necessarily tentative due to the small sample size, the DEJIE

program showed promising patterns in participants' awareness of core competencies, confidence, motivation to learn and transfer, and application of learning in practice.

Engagement and Competency Demonstration

The Canvas data indicated that different forms of engagement were not equally informative. Page views varied widely but did not show a consistent relationship with competency demonstration; one participant with high page views demonstrated no competencies, whereas others with more moderate page views demonstrated over half of the targeted competencies (Haney et al., 2016). In contrast, participatory behaviors such as submitting assignments and contributing to discussions aligned more closely with competency attainment. Participants with higher levels of participation demonstrated more competencies than those with minimal participation, suggesting that active, task-focused engagement is more strongly associated with mastery than passive exposure to materials. This pattern is consistent with prior work indicating that interactive engagement is more predictive of performance than simple access or clicks and aligns with competency-based models that emphasize performance and demonstration over seat time or exposure (Giesbers et al., 2013).

Changes in Awareness, Confidence, and Motivation

Survey results showed very high initial levels of confidence and motivation, which were sustained or slightly increased over time, and a clearer upward trend in awareness of the three core competencies. Although only awareness showed a statistically significant change in the Friedman tests, effect size estimates pointed to moderate to large changes in several constructs, particularly awareness and motivation (both to learn and to transfer). Given the extremely small sample ($n = 4$), the lack of statistical significance is expected and should not be interpreted as evidence of no effect; rather, the effect sizes indicate potentially meaningful shifts that merit examination in larger samples.

Patterns across the three time points are also consistent with the program's two-phase design. Awareness and confidence in the specific competencies rose most sharply during the Foundation Institute, when participants engaged with core ideas and cases, and then stabilized or were reinforced during the project cycle. Motivation to learn and motivation to transfer remained high throughout and, in some cases, increased toward the end of the program, suggesting that participants not only valued the content but also remained committed to applying it. These trends align with research indicating that relevance, autonomy, and clear competence expectations are associated with higher intrinsic motivation and stronger intentions to transfer learning.

Program Features That Supported Learning and Transfer

Across surveys and interviews, several design features emerged as particularly influential for learning and transfer: the core competencies, the Foundation Institute, the project cycle, collaborative learning communities, and targeted feedback and mentorship. Participants consistently described TfJ and TLaD as highly relevant to

their current instructional challenges and to their students' needs, and they drew on these competencies to design and refine classroom practices (Darling-Hammond et al., 2017). GSLD was perceived as somewhat less novel or immediately pressing for some participants, which echoes literature emphasizing that perceived relevance is central to teachers' engagement and transfer (Darling-Hammond et al., 2017). The Foundation Institute appeared to function as a cognitive and conceptual base, giving participants a shared language and framework before they moved into more autonomous design and implementation during the project cycle.

The project cycle, in which participants designed, and iteratively refined classroom projects aligned with the competencies, played a central role in bridging theory and practice. Teachers described revising assessments, restructuring units, and introducing new student-driven routines based on their projects, and some reported observable changes in student outcomes. This aligns with research on project-based and situated professional learning, which emphasizes authentic, classroom-embedded tasks and iterative enactment as critical for durable change.

Learning communities and weekly meetings provided social support, accountability, and a space for joint problem-solving. Participants reported that sharing work-in-progress, exchanging feedback, and seeing peers' projects increased their motivation to persist and helped them adapt ideas to their own contexts (Kanawapee et al., 2022). Instructor feedback and faculty mentorship further supported transfer by making expectations explicit, focusing attention on specific aspects of the competencies, and helping participants interpret challenges and adjust their designs (Orr & Sonnadara, 2019). Together, these features are consistent with established characteristics of effective TPD including sustained duration, active learning, collaboration, and coaching while operationalizing them through a competency-based, project-oriented structure.

Facilitators and barriers of transfer

Despite high motivation to transfer, participants encountered familiar contextual barriers when attempting to apply their learning (Abdollahi & Daneshmandi, 2017). Facilitators included supervisory support, discretion to try new approaches, alignment of program timing and format with teachers' schedules, and the structure of the project cycle itself (Abdollahi & Daneshmandi, 2017; Darling-Hammond et al., 2017; Parker, 2015). Teachers who reported strong support from department heads, freedom to experiment, and sufficient time to pilot and refine new practices described more extensive and sustained application of DEJIE-related ideas.

Barriers reflected broader organizational and systemic constraints. Participants pointed to misalignment between some project designs and their students' developmental levels, resistance to change among colleagues or within school culture, and chronic time pressures as key obstacles (Valoyes-Chávez, 2019). These factors resonate with prior research showing that organizational support, perceived fit with local conditions, and available time strongly shape whether and how teachers implement new practices, regardless of their individual motivation or confidence. The pattern observed here that participants were highly motivated and saw value in the

program yet still struggled with structural constraints underscores the importance of designing TPD not only for individual learning but also with attention to school- and system-level conditions for transfer.

Implications

Competency-Based TPD Design That Supports Transfer

The findings of this study point to several design principles for project-based, competency-based TPD that can strengthen learning and transfer in ways consistent with the DEJIE model and the literature on effective TPD. A clearly structured foundational cognitive phase such as the DEJIE Foundation Institute appears important for building shared language, deepening awareness of core competencies, and boosting early confidence before teachers move into more autonomous project work. Programs should therefore begin with sustained, conceptually rich learning opportunities that situate competencies in teachers' real classroom problems, rather than brief, one-off workshops.

Designing competencies that are tightly aligned with teachers' everyday practice is also essential. Participants' strong uptake of TfJ and TLaD, and their more limited use of GSLD, underscore that competencies are most likely to be enacted when they speak directly to perceived instructional challenges, student needs, and local contexts. Competency frameworks for TPD should thus be co-designed or iteratively refined with practitioners to ensure they are concrete, contextually meaningful, and adaptable across grade levels and subject areas.

Embedding competency development in project-based cycles where teachers design, implement, and revise classroom projects appears particularly powerful for promoting transfer. In DEJIE, the project cycle created authentic performance tasks that required teachers to test ideas with students, collect feedback, and make iterative adjustments, which participants linked to changes in assessments, routines, and student outcomes. Competency-based TPD designs should therefore incorporate extended project cycles that culminate in concrete products and public sharing (e.g., showcases), making evidence of competency and transfer visible and actionable.

Sustained feedback and coaching structures are another critical design element. In DEJIE, instructor feedback and faculty mentorship helped participants interpret criteria, focus on specific aspects of competencies, and navigate implementation challenges, reinforcing both confidence and motivation to transfer. Competency-based TPD should build in regular, competency-referenced feedback loops (e.g., written comments on artifacts, coaching sessions) that focus on performance in authentic tasks rather than only on completion or attendance.

Finally, collaborative learning communities emerged as central to maintaining motivation and supporting adaptation to diverse contexts. Weekly meetings and peer pods in DEJIE enabled teachers to share projects, troubleshoot barriers, and normalize the difficulties of change, which participants described as motivating and sustaining for transfer efforts. Designing TPD as an ongoing, collaborative community of practice rather than as isolated individual experiences can help address variation in

teacher characteristics and contexts by providing social resources for sense-making and problem-solving.

Implementation Strategies to Enhance Transfer

The results also highlight that even well-designed competency-based, project-based TPD cannot fully achieve its potential without supportive organizational conditions. Participants' experiences point to several implementation strategies that programs and school systems can adopt to address environmental barriers and amplify transfer.

First, early and explicit leadership buy-in is crucial. Participants who reported strong support from supervisors described more extensive and sustained application of DEJIE-related practices, whereas resistance or indifference from colleagues and leadership constrained transfer. Requiring or strongly encouraging participants to secure a brief support statement from principals or department heads articulating permission to experiment, flexibility in certain routines, and openness to new practices could signal institutional commitment and make room for change in daily schedules.

Second, TPD providers can help participants anticipate and address organizational resistance and time constraints by integrating implementation planning into the program itself. Building on DEJIE's project cycle, teachers could be guided to develop concise action plans that (a) specify targeted competencies and classroom changes, (b) identify anticipated barriers (e.g., schedule, curriculum pacing, parent or colleague concerns), and (c) outline strategies for communicating with stakeholders about the rationale and benefits of new practices. Structured opportunities to rehearse "elevator pitches" or design short sharing sessions (e.g., department meetings, informal workshops) can equip teachers to explain their projects and emerging evidence of impact, potentially reducing resistance and garnering peer interest.

Third, scheduling and delivery decisions should be made with time for enactment and reflection in mind. Participants noted that the DEJIE timeline and virtual format facilitated planning, experimentation, and revision, especially when aligned with natural planning periods (e.g., summer, early semester). TPD implementers should therefore coordinate program timelines with school calendars to provide windows in which teachers can realistically try out and refine new practices, rather than adding intensive work to peak periods of instructional demand.

Across these strategies, the core implication is that competency-based, project-based TPD must be conceived not only as an instructional design problem but also as an organizational change effort. Aligning program structures (e.g., foundational phase, project cycles, feedback, communities) with supportive school-level conditions (e.g., leadership endorsement, time, and openness to innovation) is necessary to move from increased awareness, confidence, and motivation to sustained changes in classroom practice and student learning.

Conclusions

The findings from this study suggest that a project-based, competency-based TPD program such as DEJIE can meaningfully support teachers' professional growth

by clarifying practice-oriented competencies, increasing awareness of those competencies, and sustaining already high levels of confidence, motivation to learn, and motivation to transfer across the program, while also fostering authentic attempts to enact new practices in classrooms. Across data sources, foundational learning in the cognitive phase, the project cycle of classroom-based design experiments, and opportunities for peer collaboration, feedback, and mentorship emerged as central to teachers' reports of learning and application, particularly around the TfJ and TLdD competencies, which they perceived as closely aligned with their instructional challenges and students' needs. At the same time, participants' experiences showed that high motivation and perceived value are not sufficient on their own: organizational conditions such as leadership support, time, and contextual fit strongly shaped whether and how learning was transferred, highlighting the importance of designing competency-based TPD not only around clear, authentic performance expectations but also with explicit attention to the school environments in which teachers work.

Limitations and Future Research

This case study offers a rich, multi-source portrait of one competency-based, project-based TPD program, but several limitations constrain the conclusions and point to directions for future research. The very small sample, reliance on volunteers who completed all data collection points, and single-program context limit generalizability, and the quantitative analyses are underpowered, so the observed effect-size patterns in awareness, motivation, and transfer intentions should be treated as suggestive rather than definitive. In addition, without a comparison or control group, it is not possible to disentangle the specific contribution of the competency-based, project-based design from other influences such as participants' pre-existing motivation, concurrent school initiatives, or broader contextual changes. Future work should therefore examine similar programs with larger and more diverse samples, incorporate more rigorous designs (e.g., comparison groups or mixed-method quasi-experiments), and follow teachers over longer periods to investigate how, and under what organizational conditions, competency gains and transfer efforts are sustained and whether they translate into measurable changes in classroom practice and student outcomes.

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