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# Self-based learning fuels social-based learning—but not the other way around: insights from a cross-lagged panel study on informal workplace learning

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**Introduction:** According to conceptual research on informal learning, the dimensions of the multidimensional construct of informal workplace learning (IWL) interact dynamically. This study adopts a conservation of resources perspective to empirically examine the largely unexplored assumption that self-based IWL (i.e., experimentation and reflection) and social-based IWL (i.e., feedback seeking and modeling) are interrelated over time.
**Methods:** Using a three-wave survey design with a four-week lag, the study analyzed data from a final sample of 321 employees.
**Results:** Findings from a structural equation model employing a cross-lagged panel design indicate that self-based IWL is consistently and significantly positively related to social-based IWL over time. However, contrary to expectations, no significant time-lagged association was found in the reverse direction, from social-based IWL to self-based IWL.
**Discussion:** Overall, this evidence suggests that engaging in self-based IWL may act as a catalyst for employees to pursue social-based IWL opportunities, whereas relying primarily on social-based IWL does not appear to stimulate further self-based IWL. The findings provide novel insights into the sequential dynamics of IWL dimensions and have important implications for the design of workplace learning interventions aimed at fostering sustainable learning processes.

KEYWORDS

**self-based learning, social-based learning, work-related learning, informal workplace learning, cross-lagged panel analysis**

## Introduction

Informal workplace learning (IWL) is responsible for the majority of work-related learning and is essential for employees and organizations, especially in times of radical change in the world of work that require continuous learning (Beier et al., 2025; Cerasoli et al., 2018; Kauffeld et al., 2025; Kortsch et al., 2024; Tannenbaum and Wolfson, 2022). Previous research agreed that IWL is a multidimensional construct (e.g., Decius et al., 2023a; Tannenbaum and Wolfson, 2022), which is characterized by experimenting, reflecting, and seeking feedback (Decius et al., 2025). Models of IWL, such as those by Marsick and Watkins (1990), Tannenbaum et al. (2010), and Decius et al. (2019), proposed that IWL consists of self-based and social-based dimensions. Social-based IWL includes learning activities such as modeling and feedback seeking that require social interactions, while self-based IWL, such as experimenting and reflecting, does not require anyone other than the learner (Decius and Hein, 2024).

Despite theoretical assumptions that IWL dimensions interact, there is a lack of empirical evidence. Many studies have not distinguished the IWL dimensions or have aggregated subscales with self-based and social-based components (e.g., Noe et al., 2013), although differential relationships exist between both IWL dimensions, such as with social support (Decius et al., 2023c) or achievement goals (Decius and Hein, 2024). For instance, according to meta-analytic findings, coworker support tends to be more important for social-based IWL than for self-based IWL (Decius et al., 2023c). Of the few studies that have differentiated between self-based and social-based IWL, most used a cross-sectional research design that does not allow for causal conclusions (for an overview, see Cerasoli et al., 2018, and Decius et al., 2023c). In such studies, specific components of self-based and social-based IWL are often correlated in the low to medium range (e.g., Decius et al., 2021).

However, Tannenbaum et al. (2010) suggested in their dynamic model of informal learning that self-based learning activities such as experience/action and social-based learning activities such as feedback seeking tend to trigger each other. The learning process could begin with any learning activity, whether self-based or social-based, and could be followed by any other learning activity. Due to a lack of evidence on these assumed dynamics, it is difficult for scholars to establish an overarching theory that could explain the underlying mechanisms of the IWL process. Furthermore, practitioners who hope to initiate the IWL process by activating a single trigger do not know whether they should use their limited resources to promote self-based IWL (e.g., creating experimental spaces) or social-based IWL (e.g., creating spaces for social exchange)—or whether this makes no difference because both IWL dimensions mutually reinforce each other positively anyway. Testing this causal assumption requires a longitudinal cross-lagged design. To address this gap, the present study examines the research question whether self-based IWL positively predicts social-based IWL over time, and conversely, whether social-based IWL predicts subsequent engagement in self-based IWL, thereby empirically testing the reciprocal dynamic between both dimensions using a three-wave cross-lagged panel design.

Our study aims to contribute to the theoretical understanding of the dimensions of IWL. Previous conceptual IWL research has focused particularly on the description of IWL, not on its underlying processes. Taking a resource perspective (Hobfoll et al., 2018), our study opens up opportunities to delineate the theoretical mechanisms of the interplay between the IWL dimensions over time and to investigate boundary conditions of the relationships in future research. In addition, we discuss potential practical implications for promoting IWL in organizations (e.g., through work design approaches; Parker, 2017).

# Theoretical background

## Two dimensions of informal workplace learning

IWL is widely recognized as the most prevalent form of work-related learning (Cerasoli et al., 2018; Tannenbaum and Wolfson, 2022). Unlike formal training, IWL is neither institutionally organized nor externally guided; rather, it is triggered by everyday tasks and challenges that employees encounter (Kyndt and Baert, 2013; Marsick and Watkins, 1990). One conceptualization, focusing on field-based learning, defines IWL as an intentional, self-directed, and problem-solving–oriented process of behavioral and cognitive activities embedded in the work context, undertaken without formal structures or pedagogical support (Decius, 2024). IWL enables employees to develop new competencies by experimenting with solutions, seeking feedback, and reflecting on their actions (Decius et al., 2025).

IWL is not only distinct from formal learning, such as structured courses and seminars, but also from self-regulated learning, in which learners set their own learning goals, monitor their progress, and adjust their learning strategies accordingly (Sitzmann and Ely, 2011). Because IWL emerges from work tasks and challenges rather than defined learning goals as in self-regulated learning (Decius and Decius, 2022), it involves a lower cognitive load than self-regulated learning and promotes a stronger integration of work and learning (Decius et al., 2024a). This practical nature accounts for its immediate applicability in the workplace, bypassing the well-documented "transfer problem" often associated with formal training programs (Saks and Belcourt, 2006). Informal learning is considered beneficial for positive outcomes such as competence development, innovation, job performance, wellbeing, and employability, in both blue-collar and white-collar contexts (Abel et al., 2016; Cerasoli et al., 2018; Decius et al., 2021, 2024a; Tannenbaum and Wolfson, 2022).

The conceptual foundations of IWL can be traced to experiential learning theory (Kolb, 1984), which frames learning as a cyclical process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. Typical IWL activities—such as trying out solutions, reflecting on one's actions, and seeking feedback—map onto these stages and illustrate how employees convert everyday work experiences into actionable knowledge and skills. The emphasis on experience and iterative meaning-making in experiential learning theory is echoed in IWL frameworks (e.g., Marsick and Watkins, 1990; see Decius, 2024, for an overview).

A key conceptional framework that also characterizes IWL as a cyclical and iterative process was proposed by Tannenbaum et al. (2010). Their dynamic model identifies four central components—(a) learning intention, (b) experience/action, (c) feedback, and (d) reflection—that interact dynamically, where each component can trigger or reinforce the others. For instance, an employee's learning intention can prompt them to seek immediate feedback, while receiving feedback can, in turn, enhance reflection, potentially increasing future learning motivation. This model highlights the continuous interplay of motivational, behavioral, and cognitive factors in learning outside of structured training contexts.

Building on this perspective, Decius et al. (2019) introduced the Octagon Model of IWL, which refines and expands the dynamic model by distinguishing eight subcomponents. Specifically, the model differentiates between intrinsic and extrinsic learning intentions, subdivides experience/action and reflection into distinct types, and distinguishes between direct feedback (i.e., seeking input on one's own performance) and vicarious feedback (i.e.,

learning from information exchange with others). This more granular perspective acknowledges that specific forms of reflection, feedback, and learning motivation influence IWL in different ways. Both models emphasize that IWL emerges from a combination of individual ("self-based") and interactional ("social-based") processes, allowing employees to learn in socially embedded and personalized ways.

Self-based IWL encompasses autonomous learning activities driven by individual initiative, cognition, and reflection (Decius and Hein, 2024). In line with the Octagon Model (Decius et al., 2019), it includes anticipatory reflection, subsequent reflection, and trying and applying one's own ideas, all of which occur without external input. Employees engage in these processes by analyzing upcoming challenges, assessing completed tasks, or experimenting with solutions, fostering iterative improvement and deeper understanding. Through continuous experimentation and reflection, employees enhance their ability to adapt to new or unexpected challenges, which is particularly beneficial in dynamic work environments (Beier et al., 2025; Decius et al., 2022; Graßmann and Decius, 2023; Kauffeld et al., 2025; Schaper et al., 2023; Tannenbaum and Wolfson, 2022).

In contrast, social-based IWL involves learning through interactions with colleagues, supervisors, or other workplace actors. It includes direct feedback, vicarious feedback, and model learning (Decius and Hein, 2024). Feedback serves as a key mechanism, triggering reflection and refining experiential learning processes (Marsick and Watkins, 1990; Tannenbaum et al., 2010). Employees engage in these processes by observing colleagues, seeking and processing feedback, and modeling effective behaviors, fostering collaborative learning, adaptive problem-solving, and shared expertise development.

Social-based IWL allows employees to adjust and optimize their work methods by learning from the successes and failures of others and integrating best practices into their own workflows. Regular knowledge exchange and collaborative learning foster a shared commitment to continuous improvement, which, in turn, can reinforce the organization's learning culture—highlighting the potential reciprocal relationship between IWL and organizational learning culture (Crans et al., 2021; Kortsch et al., 2019).

## A resource perspective on the interaction between self-based and social-based IWL

IWL models, such as the Dynamic Model of Informal Learning (Tannenbaum et al., 2010) and the Self-Regulated Informal Learning Cycle (Decius et al., 2025), suggest that self-based and social-based IWL interact over time. The Conservation of Resources (COR) theory (Hobfoll, 1989, 2011) provides a conceptual foundation for understanding these reciprocal relationships. According to COR theory, individuals strive to obtain, retain, and protect valuable resources, and the threat of resource loss is a primary motivator of behavior. Proactive behaviors such as IWL can be viewed as strategies to build and conserve resources, leading to gain spirals over time. Consequently, self-based and social-based IWL can be seen as complementary mechanisms that reinforce each other within a dynamic learning cycle, building a learning caravan (i.e., sequences of consecutive learning activities; Decius et al., 2025).

Self-based IWL involves autonomous learning activities such as problem-solving, reflection, and experimentation (Decius and Hein, 2024). COR theory suggests that engaging in self-based IWL allows individuals to acquire and develop personal resources, such as skills and knowledge, which can then be invested in social interactions to gain further resources (Hobfoll, 1989). Employees who invest in self-based IWL develop an initial level of expertise, allowing them to engage in more meaningful social learning interactions, such as seeking feedback or learning through modeling. For example, employees who have already built a foundation of domain knowledge and problem-solving skills through self-based IWL can ask more targeted questions and seek higher-quality feedback. This sequence of individual experimentation followed by social interaction is typical of informal learning cycles (Tannenbaum et al., 2010). An initial self-based learning process may therefore prompt employees to actively leverage social learning resources to validate and refine their knowledge (Decius et al., 2025; Tannenbaum et al., 2010). We thus hypothesize:

Hypothesis 1 (H1): Self-based informal workplace learning has a positive time-lagged association with social-based informal workplace learning.

Conversely, social-based IWL, which includes exchanging ideas with others, observing colleagues, and seeking direct feedback, can foster job resources that enhance employees' ability and motivation to engage in self-based learning (Decius et al., 2023b). COR theory emphasizes that social interactions provide access to valuable resources, such as information and support, which can be utilized to enhance personal competencies (Hobfoll, 1989). When employees interact with experienced colleagues or seek constructive feedback, they gain task-relevant insights that trigger reflective thought processes and encourage the independent application of new knowledge (Decius et al., 2025; Tannenbaum et al., 2010). Furthermore, model learning—observing colleagues' effective behaviors—enables employees to apply learned strategies independently and refine them through self-based IWL (see Bandura, 1986). This sequence of social interactions, followed by experimentation or reflection, is considered a typical example of informal learning cycles (Tannenbaum et al., 2010). We thus hypothesize:

Hypothesis 2 (H2): Social-based informal workplace learning has a positive time-lagged association with self-based informal workplace learning.

Taken together, the two hypotheses reflect a theoretically grounded assumption of bidirectional relationships between self-based and social-based IWL over time. To empirically test these hypotheses, we applied a three-wave cross-lagged panel design that allows for examining directional effects while controlling for prior levels of each construct. The methodological details of the study design, sample, and data analysis are outlined below.

# Methods

## Sample

For sample size determination, we ran a power analysis using G*power version 3.1.9.7 (Faul et al., 2007). Based on previous research that reported correlations between self-based and social-based IWL in two samples ($r = 0.24$ and $r = 0.38$; Decius and Hein, 2024), we anticipated small to medium effect sizes. Using a conservative estimate of $r = 0.24$, a target power of 0.95, and an alpha level of 0.01, the analysis indicated a minimum required sample size of $N = 295$. However, to account for an expected attrition rate of $\sim$ 15% across measurement points, we aimed for a larger initial sample. Participants were recruited via the Prolific platform and compensated at increasing rates across time points: $8/h at Time 1, $10/h at Time 2, and $12.70/h at Time 3. To ensure that participants had opportunities for both self-based and social-based IWL, we applied Prolific filters that restricted participation to native English speakers who worked in small teams and had regular social interactions with colleagues. At Time 1, a total of 427 participants took part in the study. Of these, 12 failed the attention check, resulting in a cleaned sample of 415 for this time point. At Time 2, 380 participants completed the survey, with 15 failing the attention check, leaving a remaining sample of 365. At Time 3, 329 employees participated, and after excluding eight who failed the attention check, the final sample size was 321.

To evaluate potential attrition bias, we conducted a MANOVA with all six IWL items (three self-based, three social-based) as dependent variables and dropout status (retained vs. dropped out) as the grouping factor. Results indicated no significant multivariate differences, $F_{(6,382)} = 0.697$, $p = 0.652$. In addition, we examined demographic variables, as prior research has shown that patterns of informal learning may vary by demographic characteristics (Cerasoli et al., 2018; Decius and Schaper, 2021; Kyndt and Baert, 2013). Dropout status did not correlate significantly with gender ($r = -0.03$, $p = 0.601$), organizational tenure ($r = 0.08$, $p = 0.100$), number of completed projects ($r = -0.08$, $p = 0.110$), or education ($r = -0.05$, $p = 0.292$), but showed small correlations with age ($r = 0.15$, $p = 0.003$) and work experience ($r = 0.13$, $p = 0.009$).

Of the final sample, 206 participants (64.2%) identified as male, 113 (35.2%) as female, and 2 (0.6%) as non-binary. The age of the participants ranged from 20 to 69 years ($M = 39.62$, $SD = 11.03$). Work experience varied between 1 and 50 years ($M = 18.08$, $SD = 10.95$), while organizational tenure ranged from 1 to 41 years ($M = 7.51$, $SD = 7.41$). Participants were also asked how many projects they had successfully completed within the past 5 years, with responses ranging from 0 to 352 ($M = 14.45$, $SD = 25.44$).

Regarding educational qualifications, 0.3% of participants had attended some high school without obtaining a diploma, while 9.0% had graduated from high school. A completed vocational training was reported by 6.5%, and 5.0% held an associate degree or an equivalent qualification. The largest group (50.5%) had earned a bachelor's degree or an equivalent qualification, followed by 25.2% with a master's degree and 3.4% with a doctorate or an equivalent qualification.

## Measures

At all three measurement points, spaced 4 weeks apart, we used six-point Likert scales (1 = *Not agree at all*, 2 = *Largely not agree*, 3 = *Rather not agree*, 4 = *Rather agree*, 5 = *Largely agree*, 6 = *Fully agree*) to measure both dimensions of IWL. The 4-week interval was chosen based on prior work by Decius et al. (2023b), who empirically derived this lag for IWL research in accordance with Dormann and Griffin (2015) methodological recommendations on optimal time intervals in panel studies.

Measuring IWL appropriately over time requires that participants refer to experienced learning situations as specifically as possible when answering the items. Therefore, the participants should consider the last 2 weeks of work as a specific time frame. We also asked the participants to think of a current work project ("First of all, please think of the project you are currently working in. If you are working in several projects, please choose the most complex and tricky one.") and to enter the name of the project in a text field. We displayed this individually selected project name as part of the instruction to answer the IWL items: "For rating the following statements, please think back to the last 2 weeks of >project<".

### Self-based IWL

We used the three items from the scale by Decius et al. (2023a) that measure self-based IWL: "I used my own ideas to improve tasks at work," "Before starting a new task, I thought about how I could do my work best," and "When I had finished a new task, I thought about what I still could do better next time."

### Social-based IWL

We used the three items from the scale by Decius et al. (2023a) that measure social-based IWL: "I looked at how others work in the company to improve my work," "I asked my colleagues when I was not sure how well I worked," and "I asked my colleagues about the methods and tricks they used at work."

## Analysis strategy

For testing the hypotheses, we calculated a latent cross-lagged panel (CLP) model using the software R (version 4.4.1; R Core Team, 2024) with the package lavaan (Rosseel, 2012). The advantage of a CLP model is that we can examine the reciprocal relationships between self-based IWL and socially-based IWL in a single model, while taking into account the stability of the constructs over time (i.e., autoregressions). For model fit evaluation, we relied on $\chi^2$ and the following global model fit criteria (see Kline, 2023): comparative fit index (CFI), standardized root mean square (SRMR), root mean square error of approximation (RMSEA).

As a prerequisite for calculating CLP models, measurement invariance across time must be present for the repeatedly measured constructs (Somaraju et al., 2022). To evaluate measurement invariance across time, we conducted model comparisons between

10.3389/forgp.2025.1580957

the configural, metric, scalar, and residual invariance models using chi-square difference tests and comparing the CFI values. In the metric invariance model, factor loadings were constrained to be equal across time, ensuring that the relationships between items and the latent construct remained stable. In the scalar invariance model, we additionally constrained item intercepts to be equal, testing whether mean differences in observed scores reflected true changes in the latent construct rather than systematic biases. Finally, in the residual invariance model, residual variances were also constrained to be equal across measurement occasions, allowing us to assess whether observed score differences were solely attributable to changes in the latent construct.

## Results

Table 1 shows the descriptive statistics of all constructs at time 1, 2, and 3, including means, standard deviations, correlations, and McDonald's Omega as indicator of scale reliability.

For the assessment of measurement invariance over time, we followed methodological recommendations (Somaraju et al., 2022) and utilized the chi-square difference test along with the CFI difference, which should not exceed 0.002. Regarding measurement invariance in self-based IWL (see Table 2), model comparisons revealed that the metric invariance model did not significantly differ from the configural invariance model, nor did the scalar invariance model differ from the metric invariance model. However, the residual invariance model differed significantly from the scalar invariance model. Thus, configural, metric, and scalar invariance were established, but residual invariance was not supported.

Regarding measurement invariance in social-based IWL (see Table 2), the model comparisons showed that the metric invariance model did not significantly differ from the configural invariance model. However, the scalar invariance model differed from the metric invariance model, indicating a lack of scalar invariance. While the residual invariance model did not significantly differ from the scalar invariance model, the hierarchical nature of invariance testing suggests that, from a conservative perspective, only configural and metric invariance should be assumed (see Chen, 2007). Overall, the results indicate that the IWL scales are largely measurement invariant over time. However, particularly for social-based IWL, the CLP results should be interpreted with caution.

The calculation of the CLP model yielded a satisfactory fit, according to Kline (2023), $\chi^2_{(106)} = 196.107$; $p < 0.001$; CFI = 0.964; RMSEA = 0.051, 90 % CI = [0.040, 0.063]; SRMR = 0.050. Figure 1 presents the standardized regression coefficients of the latent model. Self-based IWL and socially-based IWL are correlated between $\beta = 0.37$ and 0.58 across the three measurement points Self-based IWL demonstrated higher stability over time, with autoregressive coefficients of $\beta = 0.77$ and 0.78, compared to social-based IWL, which had autoregressive coefficients of $\beta = 0.59$ and 0.62.

Regarding the hypotheses, self-based IWL showed significant positive cross-lagged associations with social-based IWL from time 1 to time 2 and from time 2 to time 3, both at $\beta = 0.17$, supporting Hypothesis 1. In contrast, social-based IWL did not exhibit any

TABLE 1 Descriptive Statistics and Correlations

| No. | Construct | M | SD | Skew | Kurtosis | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Self-based IWL t1 | 4.63 | 0.72 | −0.47 | 1.18 | **0.69** | | | | | | | | | | |
| 2 | Self-based IWL t2 | 4.48 | 0.78 | −0.58 | 1.13 | 0.51** | **0.74** | | | | | | | | | |
| 3 | Self-based IWL t3 | 4.60 | 0.71 | −0.40 | 0.57 | 0.56** | 0.49** | **0.65** | | | | | | | | |
| 4 | Social-based IWL t1 | 4.36 | 0.92 | −0.65 | 0.87 | 0.33** | 0.42** | 0.30** | **0.79** | | | | | | | |
| 5 | Social-based IWL t2 | 4.15 | 0.99 | −0.60 | 0.69 | 0.29** | 0.73** | 0.32** | 0.54** | **0.84** | | | | | | |
| 6 | Social-based IWL t3 | 4.25 | 0.99 | −0.43 | 0.01 | 0.32** | 0.53** | 0.40** | 0.57** | 0.60** | **0.83** | | | | | |
| 7 | Age | 39.3 | 11.0 | 0.57 | −0.36 | −0.02 | −0.23** | 0.01 | −0.27** | −0.31** | −0.30** | - | | | | |
| 8 | Gender[a] | 1.35 | 0.48 | 0.61 | −1.66 | −0.07 | −0.05 | −0.09 | −0.05 | −0.05 | −0.13* | 0.00 | - | | | |
| 9 | Work experience in years | 18.1 | 11.0 | 0.59 | −0.39 | −0.00 | −0.22** | 0.01 | −0.26** | −0.31** | −0.30** | 0.94** | −0.01 | - | | |
| 10 | Organizational tenure in years | 7.51 | 7.41 | 1.68 | 2.81 | 0.03 | −0.10 | 0.11 | −0.13* | −0.16* | −0.12* | 0.58** | −0.03 | 0.59** | - | |
| 11 | Projects completed within past 5 years | 17.5 | 60.6 | 14.0 | 220.0 | 0.05 | −0.03 | −0.09 | −0.04 | −0.03 | −0.01 | 0.06 | −0.04 | 0.09 | 0.12* | - |
| 12 | Education level[b] | 4.86 | 1.24 | −1.06 | 0.667 | −0.05 | 0.06 | −0.05 | 0.06 | 0.10 | 0.08 | −0.15 | −0.07 | −0.24** | −0.13 | −0.11* |

$N = 321$; IWL, informal workplace learning; t, time; McDonald's Omega as an indicator of scale reliability is presented on the diagonal in bold. IWL dimensions were measured on six-point Likert scales. $^*p < 0.05$, $^{**}p < 0.01$.

[a]Gender: 1 = male, 2 = female.

[b]Education levels are: 1 = Some high school education, no diploma, 2 = Highschool graduate, 3 = Completed vocational training, 4 = Associate degree or equivalent, 5 = Bachelor's degree or equivalent, 6 = Master's degree or equivalent, 7 = Doctorate degree or equivalent.

TABLE 2 Measurement invariance results over time.

| Construct/model | $\chi^2$ | *df* | CFI | RMSEA | SRMR | AIC | BIC | Comparison | $\Delta df$ | $\Delta\chi^2$ | *p* | $\Delta$CFI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Self-based informal workplace learning | | | | | | | | | | | | |
| InvMod 1: configural invariance | 17.131 | 15 | 0.998 | 0.021 | 0.021 | 6,783.601 | 6,930.688 | | | | | |
| InvMod 2: metric invariance | 21.730 | 19 | 0.997 | 0.021 | 0.032 | 6,780.201 | 6,912.202 | InvMod 2 vs. InvMod 1 | 4 | 0.331 | 0.331 | 0.001 |
| InvMod 3: scalar invariance | 29.933 | 25 | 0.995 | 0.025 | 0.035 | 6,776.404 | 6,885.776 | InvMod 3 vs. InvMod 2 | 6 | 8.203 | 0.224 | 0.002 |
| InvMod 4: residual invariance | 43.940 | 31 | 0.987 | 0.036 | 0.044 | 6,778.411 | 6,865.154 | InvMod 4 vs. InvMod 3 | 6 | 14.007 | 0.030 | 0.008 |
| Social-based informal workplace learning | | | | | | | | | | | | |
| InvMod 1: configural invariance | 32.918 | 15 | 0.987 | 0.061 | 0.026 | 7,542.955 | 7,690.041 | | | | | |
| InvMod 2: metric invariance | 37.132 | 19 | 0.987 | 0.055 | 0.033 | 7,539.169 | 7,671.169 | InvMod 2 vs. InvMod 1 | 4 | 4.214 | 0.378 | <0.001 |
| InvMod 3: scalar invariance | 54.123 | 25 | 0.979 | 0.060 | 0.046 | 7,544.159 | 7,653.531 | InvMod 3 vs. InvMod 2 | 6 | 16.990 | 0.009 | 0.008 |
| InvMod 4: residual invariance | 61.470 | 31 | 0.978 | 0.055 | 0.046 | 7,539.507 | 7,626.250 | InvMod 4 vs. InvMod 3 | 6 | 7.348 | 0.290 | 0.001 |

$N = 321$. InvMod, invariance model; AIC, Akaike information criterion; BIC, Bayes information criterion; CFI, comparative fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square.

significant cross-lagged associations with self-based IWL, neither from time 1 to time 2 nor from time 2 to time 3. Therefore, Hypothesis 2 was not supported by the data.

# Discussion

## Theoretical implications, limitations, and future research directions

IWL is considered a multidimensional construct (Decius et al., 2023a; Noe et al., 2013; Tannenbaum and Wolfson, 2022). At a higher level, self-based and social-based IWL dimensions can be distinguished (Decius and Hein, 2024). In our study, we examined the conceptual assumptions that these dimensions interact and can trigger each other (Decius et al., 2025; Tannenbaum et al., 2010). The results of the CLP model show, as expected, that engagement in self-based IWL activities such as experimentation and reflection leads to the occurrence of social-based IWL such as feedback seeking and modeling over time. This finding aligns with the assumptions of the dynamic model of informal learning, which posits that employees typically seek feedback following a self-based learning process. Otherwise, "they may falsely assume that their own understanding or competence assessment is accurate, or, conversely, may incorrectly lose confidence or interest if they fail to recognize their own progress" (Tannenbaum et al., 2010, p. 308). We admit that the positive time-lagged relationship between self-based and social-based IWL is rather moderate ($\beta = 0.17$). However, this association is substantial in CLP models, which control for autoregressive effects. According to Orth et al. (2024), who proposed the following benchmarks for effect sizes in CLP models—$\beta = 0.03$ as small, $\beta = 0.07$ as medium, and $\beta = 0.12$ as large—our observed effect is noteworthy and supports the role of self-based IWL as a predictor of social-based IWL.

Theoretically, we justified the positive relationship between self-based IWL and social-based IWL drawing on COR theory (Hobfoll, 1989, 2011). We argued that self-based IWL activities such as experimentation and reflection contribute to the accumulation of key personal resources, such as self-efficacy and domain-specific knowledge, which can then be strategically invested in social learning interactions and make employees more inclined to socially evaluate their work by seeking feedback. COR theory posits that individuals strive to build and protect their resource reservoirs, and investing resources in social-based IWL (e.g., feedback seeking, collaborative problem-solving) can be seen as a means of gaining additional resources that further support learning and adaptation (Hobfoll et al., 2018). Future research could explicitly test this hypothesized causal chain by examining whether resource gain acts as a mediator in this relationship.

Unexpectedly, however, the results of the CLP model do not indicate a positive cross-lagged relationship in the opposite direction, from social-based IWL to self-based IWL. This is also surprising in that—albeit in formally instructed learning contexts—activities such as reflection interventions and guided reflexivity after feedback leads to improved learning outcomes (Anseel et al., 2009; Gabelica et al., 2014). Based on the assumptions of COR theory (Hobfoll, 1989, 2011), we had similarly argued that resources gained through social-based IWL would create a gain cycle,

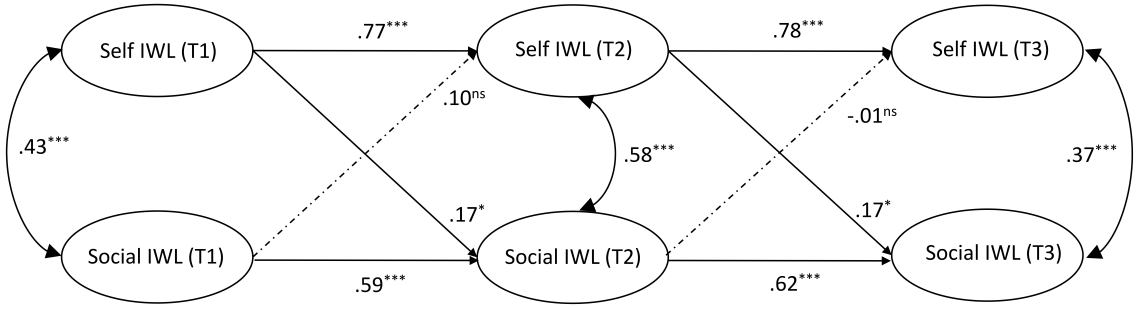


FIGURE 1
Cross-lagged structural equation model of self-based and social-based informal workplace learning. ns, non-significant, *$p < 0.05$; ***$p < 0.001$.

facilitating further self-based IWL. One possible explanation is that social interactions do not necessarily result in meaningful resource gain, particularly if individuals lack sufficient initial resources to effectively process and internalize the feedback received (Hobfoll et al., 2018). Another explanation is that social-based IWL may predominantly serve to prevent resource loss (e.g., by seeking reassurance rather than deepening knowledge), thereby not leading to further investment in self-based learning. Future studies should clarify whether social-based IWL generates resources that are not invested in self-based activities, or whether the assumed resource gain does not occur in the first place.

Beyond the resource-based mechanisms proposed by COR theory, self-determination theory (Deci et al., 2017) may offer a complementary lens to further understand the mechanisms underlying IWL. This theory emphasizes that autonomous motivation arises when individuals experience autonomy, competence, and relatedness—three basic psychological needs that have been shown to be positively associated with work-related learning (Decius et al., 2024b). Engaging in self-based IWL—such as experimentation and reflection—can foster perceptions of autonomy and competence, which in turn may enhance the motivation to seek feedback or engage in modeling. Future research could explore whether the satisfaction of these psychological needs mediates the relationship between self-based and social-based IWL.

Building on these theoretical perspectives, but in addition to potential mediating mechanisms such as resource gain or need satisfaction, future research should also examine contextual moderator variables that may influence the relationship between self-based and social-based IWL. For example, organizational characteristics (e.g., learning culture, error climate), leadership behaviors (e.g., feedback orientation, supportiveness), or sector-specific factors (e.g., safety regulations, innovation demands) may shape whether and how learning in one domain facilitates learning in the other (Crans et al., 2021; Tannenbaum and Wolfson, 2022; Zia et al., 2022a). A supportive work environment might enhance the translation of self-based insights into productive social interactions, while in high-pressure or hierarchical contexts, employees may avoid seeking feedback even after reflecting on their own performance. Similarly, the relationship may differ across industries: whereas knowledge-intensive sectors might reward self-initiated learning that leads to collaboration, more routine-based environments may not foster such dynamics. Investigating such boundary conditions could contribute to a more context-sensitive understanding of IWL.

Another reason for the lack of effect of social-based IWL on self-based IWL could lie in the ambiguity of social support processes inherent in social-based IWL. In an optimal work environment, an employee requesting feedback would receive only helpful comments and support from colleagues and supervisors. However, the effectiveness of feedback depends on multiple conditions—such as usefulness, fairness, valence, and value of the feedback (Anseel et al., 2015; Hagemann and Decius, 2024)—which are not always met in organizations. Even well-intentioned feedback is not invariably helpful; shaped by organizational culture and the framing of feedback situations, employees may perceive it either as a genuine learning opportunity or as a disguised form of control. Practitioners often describe feedback as a double-edged sword—capable of fostering growth or triggering threat responses—depending on how learning is culturally interpreted and socially enacted within the workplace context (Paulsen et al., 2024). Here, the distinction between perceived support and received support (Haber et al., 2007) becomes crucial. For instance, an organizational climate *perceived* as supportive, manifested in a positive error culture and a positive learning culture (Kortsch and Kauffeld, 2019; Newman et al., 2017), is regarded both conceptually and empirically as conducive to IWL (Decius et al., 2021, 2022; Tannenbaum and Wolfson, 2022). Yet the reality of actually *received* support is more nuanced. Research on unhelpful workplace social support identifies various forms of social support that are not truly supportive, such as impractical social support, which is unreasonable and misinforming, or imposing social support, which is unwanted and forced on the recipient (Deelstra et al., 2003; Gray et al., 2020). Future research should adopt a more differentiated perspective on the previously assumed positive relationship between social support and IWL (Cerasoli et al., 2018) by distinguishing both different sources of support (e.g., support from colleagues, supervisors, and the organization) as well as perceived and received support, and by differentiating the two dimensions of self-based and social-based IWL.

Additional explanatory approaches could consider the dual nature of feedback seeking: on the one hand, it entails psychological costs due to the social evaluation of the seeker. On the other hand,

employees might tend to rely on the support of others as if being served by a butler, perceiving no need for subsequent, potentially cognitively demanding self-based learning activities (Decius, 2024). Moreover, the desire to avoid mistakes could serve as a contextual factor explaining why employees frequently seek feedback but subsequently engage less in independent experimentation. In line with this, a study with university employees revealed that self-based informal learning is positively linked to a proactive learning goal orientation, while social-based informal learning is associated with a normative avoidance orientation (Decius and Hein, 2024).

Regarding modeling in an ideal work environment, an employee would only adopt positive behaviors from colleagues. However, in reality, a "dark side" of IWL is also possible—when employees adopt behaviors that may be effective in the short term but harmful in the long run (Cerasoli et al., 2018; Decius, 2020). An example of this is a blue-collar worker disabling a safety mechanism on a colleague's advice to complete tasks more quickly (Decius, 2024). In such cases, the worker is likely aware that this action violates organizational rules and norms but may consciously avoid subsequent reflection or experimentation beyond the colleague's suggestion to evade ethical responsibility—cognitively attributing the decision to the colleague instead.

Both the Self-regulated Informal Learning Cycle (Decius et al., 2025) and the Dynamic Model of Informal Learning (Tannenbaum et al., 2010) assume interactions between individual IWL components such as experimentation and experience, feedback seeking, modeling, and reflection. We must acknowledge that the models do not make any overarching distinction between self-based IWL and social-based IWL, even though this distinction is at least briefly mentioned in Decius et al. (2025). Future research should not only conduct an experimental replication of our study but also extend it by examining the IWL components separately.

Although we conceptually distinguish between self-based and social-based dimensions, we acknowledge that some conceptualizations of IWL additionally include a third dimension: learning from non-interpersonal sources, such as manuals, e-learning platforms, or online searches (e.g., Kortsch et al., 2019; Noe et al., 2013). While our operationalization of self-based IWL emphasizes experiential learning and reflection rather than media-based information acquisition, we consider it conceptually consistent to subsume non-interpersonal sources under the self-based dimension—particularly when such resources are actively selected, cognitively processed, and integrated through reflection and experimentation (Decius et al., 2025). In line with this, Eraut (2011) noted that manuals and similar materials were useful primarily for a minority of employees who "thrived on learning from manuals, while the others did all they could to avoid them" (p. 10), underscoring that informational sources do not necessarily constitute a distinct mode of learning but depend on how they are used.

However, this need not contradict existing conceptualizations (Kortsch et al., 2019; Noe et al., 2013), but rather reflects different underlying perspectives, as distinguished by Decius (2024): source-based approaches, which include non-interpersonal resources, and process-oriented approaches, to which the distinction between self-based and social-based IWL belongs. For example, reading a manual may be considered self-based learning if it involves active sense-making, while watching a training video together with a colleague may constitute social-based learning depending on how it is enacted. From this angle, media and materials may be better understood as contextual moderators that shape the conditions under which informal learning processes occur—thus, source-based and process-oriented approaches can be seen as complementary rather than competing perspectives.

From a methodological perspective, we would also like to note that, although the CLP model represents a robust methodological design that controls for the baseline levels of the measured constructs, it can only approximate the testing of causal assumptions. A definitive test of causality regarding the sequence of different IWL components can only be achieved through experimental designs, which we strongly encourage future research to adopt.

Furthermore, our study employed a non-random, online sample of professionals recruited via Prolific. While participant selection was restricted to individuals working in small teams and engaging in regular peer interactions—ensuring contextual relevance to our research questions—this sampling strategy limits the generalizability of our findings across cultures, languages, and organizational settings. Generalizability may be particularly limited in sectors with distinct informal learning norms, such as manufacturing or service work (Cerasoli et al., 2018). Prior research has shown that informal learning in these contexts often depends on different structural and interpersonal conditions—for instance, job characteristics and social support among blue-collar workers (Decius et al., 2021, 2023b), or self-directedness and time management skills among low-qualified employees (Kyndt et al., 2013). We therefore encourage future studies to replicate our findings in specific organizational contexts, especially among non-desk-based workers.

In addition, although we implemented several procedural remedies to mitigate social desirability and common method bias (e.g., full anonymity, attention checks, validated multi-item scales), the reliance on self-report data inevitably carries a residual risk of bias. Nevertheless, recent empirical evidence indicates that Prolific participants consistently yield higher data quality than those from other online platforms, such as MTurk and CloudResearch, particularly with regard to attentiveness, data completeness, and demographic diversity (Douglas et al., 2023; Peer et al., 2022).

While the CLP model we used controls for prior levels of the constructs and helps mitigate common method bias through temporal separation, it does not fully account for stable between-person traits that may influence both IWL dimensions. Future studies could include relevant dispositional control variables, such as learning goal orientation, proactive personality, or self-efficacy—which has already been shown to strengthen the relationship between transformational leadership and IWL (Zia et al., 2022b)—to better rule out third-variable explanations. Moreover, applying a random-intercept CLP model with at least four waves and larger samples could provide a clearer distinction between within-person processes and stable trait-level effects (Orth et al., 2024; Mulder, 2023).

Other methodological limitations include the partially low McDonald's Omega values for the internal consistency of the scales used (especially for self-based IWL at time 1 and time 3, see

Table 1), and the partial lack of measurement invariance over time (see Table 2). The results should therefore be interpreted with caution. Although our study experienced a moderate level of attrition over time, comparable rates have been observed in similar multi-wave IWL research (e.g., Decius et al., 2023b). Given the non-significant differences in IWL and most demographic variables between participants who dropped out and those who remained, the likelihood of systematic bias appears low. While small positive correlations were observed with age and work experience, these effects were minor in size and do not suggest meaningful selective attrition.

To deepen the understanding of IWL processes, future research could integrate qualitative approaches such as thematic analysis of semi-structured interviews or the critical incident technique to capture subjective learning experiences and contextual nuances. In addition, intensive longitudinal methods like experience sampling or diary studies could help uncover within-person learning dynamics in real time (Rausch et al., 2022; Seifried and Rausch, 2022). One specific aspect requiring closer investigation is the choice of time lag in longitudinal designs. While our four-week interval was chosen based on empirical and methodological guidance, it is important to note that Decius et al. (2023b) derived this lag specifically for examining reciprocal effects between IWL and work characteristics, following Dormann and Griffin (2015) recommendations for identifying optimal panel lags. However, it remains uncertain whether the same interval is appropriate for capturing dynamic interactions within IWL—such as transitions from self-based to social-based learning. Some processes (e.g., feedback seeking triggered by experimentation) might unfold over shorter timeframes, whereas others may accumulate more gradually (Decius et al., 2025). Future research should investigate whether different IWL processes operate on distinct temporal cycles and adjust their measurement intervals accordingly to improve methodological alignment and theoretical precision.

## Practical implications

Our findings underscore that self-based IWL (e.g., experimentation and reflection) provides a more sustainable platform for employee development than social-based IWL (e.g., feedback seeking and modeling). While social-based IWL can offer quick knowledge gains, it does not reliably prompt deeper experimentation or reflection. Organizations should therefore prioritize creating conditions that foster self-based IWL, as this IWL dimension appears to support ongoing personal and professional growth also via social interactions. Especially in times of economic difficulties, recession, tariffs and protectionism, when the (financial) resources of companies are often scarce, it makes sense to focus human resource development on self-based IWL.

A first step is to establish a work environment that supports independent exploration and active sense-making. Providing employees with autonomy and adequate time for experimentation can help preserve and build personal resources—such as energy, mastery, and self-confidence—that are essential for sustained engagement and adaptive learning (Hobfoll, 1989; Hobfoll et al., 2018). Similarly, structured opportunities for reflection—through debriefings or guided self-assessment tools—not only enable employees to process and retain what they have learned more thoroughly, but also support cognitive resource recovery in less demanding settings (Gabelica et al., 2014; Hobfoll, 2011). From a leadership perspective, shared leadership approaches can further enable employees to take initiative, try new strategies, and openly discuss setbacks, thereby fostering a work climate that facilitates resource gain spirals.

Crucially, investing in a psychological safety culture can amplify the positive effects of self-based IWL. When individuals feel secure enough to take risks, they are more inclined to test new ideas, even if mistakes occur (Newman et al., 2017). A strong error culture reinforces this by framing failures as opportunities for growth rather than occasions for blame (van Dyck et al., 2005). In such an environment, experimentation and reflection thrive, preparing employees to seek feedback and learn from role models when it truly adds value.

While social-based IWL remains an integral element of learning at work, it should complement rather than substitute self-directed exploration. For instance, mentoring programs or peer feedback can help employees refine insights gained from experimentation, but they do not necessarily trigger additional self-based learning. Hence, organizations may wish to balance social learning initiatives with deliberate efforts to promote self-reliant, reflective practice, as part of a sustainably effective IWL cycle (Decius et al., 2025).

A further conclusion can be drawn regarding the frequently criticized annual appraisals between managers and employees (Sarkar, 2016). Many managers assume that the feedback they provide will naturally lead to social-based (informal) learning processes. Even if this occurs, our findings highlight a crucial missing link: the connection to self-based IWL, without which an informal learning process remains incomplete. In addition to providing feedback opportunities and a continuous dialogue with their employees throughout the year, managers should cultivate an environment that actively promotes self-based IWL. This means that managerial tools for employee interaction should extend far beyond performance reviews, incorporating strategies that encourage independent learning and reflection.

Furthermore, the recruitment and selection processes offer a strategic avenue for identifying candidates who already demonstrate a proactive and self-directed learning orientation (Raemdonck et al., 2022). Even thorough onboarding programs cannot fully compensate for a fundamental lack of self-directed learning motivation, especially in dynamic work environments that demand ongoing skill development (London and Smither, 1999). By emphasizing psychological safety, a positive error culture, and opportunities for independent experimentation and reflection, organizations can leverage self-based IWL as a catalyst for long-term adaptability and performance.

Finally, this article provides valuable insights into the promotion of employability, an area of increasing importance for many HR practitioners. Among various forms of work-related learning—such as informal, formal, and self-regulated learning—IWL appears to have the strongest impact on internal employability, both quantitatively (i.e., the ability to secure another job within the organization) and qualitatively (i.e., the ability to

attain a better position within the organization) (Decius et al., 2024a). Based on our findings, HR professionals aiming to enhance employability within their organizations may leverage self-based IWL as a foundation, which can naturally be followed by social-based IWL. However, the reverse approach—prioritizing social-based IWL first—may not be as effective.

## Conclusion

The findings of the present study highlight the pivotal role of self-based IWL activities in driving subsequent social-based IWL. Experimentation and reflection appear to prime employees to seek feedback and learn from colleagues, underscoring how personal initiative can prompt broader social engagement. The absence of a reverse effect suggests that social-based IWL alone may not ignite deeper, self-based exploration or trial-and-error behavior. Theoretically, this points to self-based IWL as a foundational mechanism in learning cycles, offering a refined perspective on how IWL processes unfold. From a practical perspective, organizations can foster a conducive learning culture by prioritizing structures that encourage experimentation (e.g., granting autonomy, supportive error climate) and reflection (e.g., providing dedicated debriefing sessions, teaching reflection skills). By creating an environment where employees feel safe to take risks, test new approaches, and revisit outcomes, workplaces may nurture a self-sustaining ecosystem of learning. Such efforts may ultimately enhance both individual skill development and broader organizational adaptability.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

Ethical approval was not required for the studies involving humans because online survey data collected via the Prolific platform were used only. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

JD: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Visualization, Writing – original draft, Writing – review & editing. MK: Conceptualization, Data curation, Funding acquisition, Methodology, Project administration, Resources, Writing – review & editing. AS: Conceptualization, Funding acquisition, Methodology, Resources, Validation, Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

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## Publisher's note



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