The Effects of Self-Regulated Learning Processes on E-Learning Outcomes in Organizational Settings

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ABSTRACT: This paper focuses on employees’ e-learning processes during online job training. A new categorization of self-regulated learning strategies, that is, personal versus social learning strategies, is proposed, and measurement scales are developed. The new measures were tested using data collected from employees in a large company. Our approach provides context-relevant insights into online training providers and employees themselves. The results suggest that learners adopt different self-regulated learning strategies resulting in different e-learning outcomes. Furthermore, the use of self-regulated learning strategies is influenced by individual factors such as virtual competence and goal orientation, and job and contextual factors such as intellectual demand and cooperative norms. The findings can (1) help e-learners obtain better learning outcomes through their active use of varied learning strategies, (2) provide useful information for organizations that are currently using or plan to use e-learning.
for training, and (3) inform software designers to integrate self-regulated learning strategy support in e-learning system design and development.

**KEY WORDS AND PHRASES:** e-learning, job training, learning outcomes, learning processes, self-regulated learning strategies, social cognitive theory.

Employee training has become an effective way to enhance organizational productivity. It is even more important today given the fast-changing nature of current work practices. Research has shown that 50 percent of all employee skills become outdated within three to five years [67]. The cycle is even shorter for information technology (IT) professionals because of the high rate of technology innovation. On the one hand, this phenomenon requires organizations to focus more on building internal capabilities by providing different kinds of job preparation and training. On the other hand, it suggests that a growing number of employees are seeking learning opportunities to regularly upgrade their skills and competencies. Consequently, demand is growing for ongoing research to determine optimal training approaches with real performance impact.

Unlike traditional courses provided by educational institutions that are focused on fundamental and relatively stable knowledge, corporate training programs must be developed within short time frames because their content quickly becomes outdated. Furthermore, for many large organizations, especially multinationals with constantly growing and changing global workforces, the management of training and learning has become increasingly complex. Difficulties arise due to the wide range of courses, the high volume of course materials, the coordination of training among distributed work locations with the potential for duplicated training services, the need to satisfy varied individual learning requests and competency levels, and above all, the need to contain costs while deriving value from training expenditures.

The development of information systems (IS) has contributed immensely to solving workplace training problems. E-learning has emerged as a cost-effective way to deliver training at convenient times to a large number of employees in different locations. E-learning, defined as a virtual learning environment in which learners’ interactions with learning materials, peers, and instructors are mediated through ITs, has become the fastest-growing form of education [4]. The American Society for Training and Development found that even with the challenges of the recent economic crisis, U.S. organizations spent $134.07 billion on employee learning and development in 2008 [74], and earlier evidence suggested that close to 40 percent of training was delivered using e-learning technologies [73]. E-learning has been extended from its original application in IT skill training to common business skill training, including management, leadership, communication, customer service, quality management, and human resource skills.

Despite heavy investments in e-learning technologies, however, recent research suggests that organizations have not received the level of benefit from e-learning that was
originally anticipated [62]. One credible explanation has emerged from educational psychology showing that learners are neither motivated nor well prepared for the new e-learning environment [14]. Early IS research on e-learning focused on the technology design aspects of e-learning but has subsequently broadened to include all aspects of e-learning inputs (participant characteristics, technology design, instructional strategies), processes (psychological processes, learning behaviors), and outcomes (learning outcomes) [4, 55, 76]. However, less IS research has focused on the psychological processes users engage in that improve or limit their e-learning outcomes [76].

In this research, we contribute to the understanding of e-learning processes by bridging two bodies of literature, that is, self-regulated learning (SRL) in educational psychology and e-learning in IS research. More specifically, we focus on two research questions:

**RQ1**: How do learners’ different e-learning processes (e.g., using different SRL strategies) influence their learning outcomes?

**RQ2**: How is a learner’s use of SRL strategies influenced by individual and contextual factors salient within a business context?

To address the first question, we extend prior research on SRL and propose a new conceptualization that distinguishes two types of SRL strategies: personal SRL strategies, such as *self-evaluation* and *goal setting and planning*, for managing personally directed forms of learning; and social SRL strategies, such as *seeking peer assistance* and *social comparison*, for managing social-oriented forms of learning.

Prior research (e.g., [64, 88]) suggests that the use of SRL strategies in general can improve learning outcomes. We propose to explore, describe, and measure a new type of SRL strategy—social SRL strategy—and to determine if it has an equally important influence on learning outcomes as the more widely studied personal SRL strategy. We theorize that both types of SRL strategies are influential during the learning process and expect they have different effects on e-learning outcomes.

To examine the role of SRL strategies in e-learning, we situated the new constructs in a nomological network based on prior research [76]. This led to our second research question, which also deals more specifically with e-learning in business organizations. While research conducted in educational institutions can definitely inform business training practices, differences in the business context such as job requirements and competitive pressures may affect e-learning outcomes. From prior research we selected four antecedent factors that we hypothesize to be important influences on individual use of SRL strategies (both personal and our newly proposed social strategies). The first two are individual factors. Learners’ goal orientation refers to the individual’s framing of the activity as either a performance or a mastery activity, where the former is associated with flawless performance and the latter is associated with developing capability [28]. Virtual competence, the second factor, reflects the individual’s capability to function in a virtual environment [78]. We also include two contextual factors that are particularly applicable to organizational settings: the intellectual demands of learners’ jobs and the group norms perceived by learners about cooperation among work group members.
In summary, this study contributes to e-learning research by focusing on adult learners’ SRL processes in job training contexts. It expands the nomological network of e-learning by identifying and elaborating social SRL strategy as an additional form of SRL strategy that is distinct from personal SRL strategy. We further test how different types of SRL strategies applied by learners during the e-learning process affect three types of e-learning outcomes. Our results suggest that learners using different SRL strategies achieve different learning outcomes and learners’ attributes and contextual factors do matter.

Theoretical Background

Social Cognitive Theory and Self-Regulation

Learning is the process of acquiring, enhancing, or modifying an individual’s knowledge, skills, and values [39]. In this study, we apply social cognitive theory to investigate e-learning processes in organizational settings. Self-regulation is a distinctive feature of social cognitive theory and plays a central role in the theory’s application [56]. It refers to a set of principles and practices by which people monitor their own behaviors and consciously adjust those behaviors in pursuit of personal goals [8]. SRL is thus a proactive way of learning in which people manage their own learning processes. Research has shown that self-regulated learners (i.e., individuals who intentionally manage their learning processes) can learn better than non-self-regulated learners in traditional academic and organizational training settings because they view learning as a systematic and controllable process and are willing to take greater responsibility for their learning [30, 64, 88, 92, 93].

The definition of SRL as the degree to which individuals are metacognitively, motivationally, and behaviorally active participants in their own learning process is an integration of previous research on learning strategies, metacognitive monitoring, self-concept perceptions, volitional strategies, and self-control [86, 89]. According to this conceptualization, SRL is a combination of three subprocesses: metacognitive processes, which include planning and organizing during learning; motivational processes, which include self-evaluation and self-consequences at various stages; and behavioral processes, which include selecting, structuring, and even creating social and physical environments that are best for learning [89, 91].

As a psychological process, self-regulation is difficult for researchers to investigate directly. However, the patterns of actions (also termed “strategies”) conducted by self-regulated learners during their learning processes can be observed and summarized. These actions reflect learners’ internal metacognitive and motivational SRL processes and demonstrate their behavioral SRL processes. Research on the patterns of these actions can help learners become more self-reliant and effective by decoding their sometimes unconscious learning behaviors.

SRL strategies have been identified as effective ways to enhance learning in traditional settings (e.g., [88]); however, only a few studies have been done in e-learning
contexts. For example, a study conducted by Santhanam et al. [64] suggests that self-regulated learners perform better than others in e-learning because e-learning provides more learner control and requires more learner initiative. Another study by Gravill and Compeau [30] concludes that the application of SRL strategies is positively related to e-learning outcomes.

A New Categorization of Self-Regulated Learning Strategies: Personal Versus Social

Prior studies in both traditional classroom settings and e-learning settings treat SRL strategies as a collection of learning-related activities but do not develop SRL as a multidimensional construct as originally proposed in the theory of self-regulation. Moreover, these studies focus mainly on self-directed learning processes. They either exclude social learning activities from empirical investigations (e.g., [30, 59, 64]) or implicitly include one or two social learning activities in measures that predominantly focus on individuals’ personal learning processes (e.g., [21, 63]). In fact, learning happens more often in dyads, groups, and communities than by individual learners, and the e-learning environment often includes social interaction and negotiation [43, 44]. Prior research suggests that social forms of learning (e.g., interaction with classmates and instructors, participation in class discussion) have a positive influence on e-learning outcomes [1, 7, 10, 49, 80]. Learners who are good at conducting social forms of learning can overcome some e-learning drawbacks such as social isolation, and with the help obtained from others, they can learn more effectively than those who engage only in personally directed forms of learning.

Findings in both SRL and e-learning research support the argument that learners need to employ specific strategies for managing the social forms of learning that involve not only learners themselves but also their peers, instructors, and colleagues. However, prior studies have not generated a sufficient theoretical grounding to guide future research. Hence, we propose a new categorization of SRL strategies that distinguishes between two types of actions: personal SRL strategies, which manage personally directed learning that does not involve social interactions with others, and social SRL strategies, which manage the social forms of learning. Our conceptualization of social SRL strategies represents our extension of the nomological network of e-learning processes.

Consistent with the structure identified and empirically validated by Zimmerman and Martinez-Pons [90, 91] on SRL in traditional learning settings, personal SRL strategies include nine subdimensions: self-evaluation, organizing and transforming information, goal setting and planning, seeking information, keeping records and monitoring, environmental structuring, self-consequences, rehearsing and memorizing, and reviewing.

Social SRL strategies may be even more important in e-learning than in traditional classrooms given that e-learners and instructors are physically separated. E-learners face a number of unique challenges such as asynchronicity, text-based discussions,
multiple conversations, information overload, and isolation. The social SRL strategies explored in our study can be instrumental in assisting e-learners to cope with such challenges (e.g., [82, 89]). Based on prior research on self-regulation and several qualitative studies on learning strategies in e-learning settings, we propose that social SRL strategies include six subdimensions: seeking social assistance (from peers, instructors, managers, and IT professionals), social comparison, and social interaction.¹

Although some studies suggest that the use of SRL strategies in general can enhance e-learning outcomes, they do not explain what factors motivate learners’ use of SRL strategies during the e-learning process (e.g., [64]). In this study, we review potential factors that may influence individuals to use SRL strategies (both personal and social) and select a relevant subset to investigate.

Research Model and Hypotheses Development

In this section, we present our research model, which was developed to test the effects of using personal versus social SRL strategies on cognitive, affective, and skill-based e-learning outcomes. We also investigate the influences of two individual factors (goal orientation and virtual competence) and two contextual factors (intellectual demands of an individual’s current job and the cooperative group norm) on learners’ choices of SRL strategies and describe why we chose these particular factors out of a myriad of influences.

According to social cognitive theory [8], people’s learning ability is developed under the influence of the environment, behavior, and cognition. These three factors are reciprocally related, reflecting a complex interplay. Most studies that use social cognitive theory, while acknowledging this richness, focus on unidirectional relationships as a means of teasing out the various effects that occur (e.g., [30, 64, 78]). In our study, we also focus on unidirectional relationships and treat individual and contextual factors as antecedents because they reflect personal traits and the environment’s influence on behaviors. The model is illustrated in Figure 1.

Learning outcomes can be classified into three groups: cognitive outcomes, affective outcomes, and skill-based outcomes [45, 68]. Cognitive outcomes include acquisition of declarative knowledge and knowledge organization; affective outcomes include learners’ perception of satisfaction, attitude, and appreciation of the learning experience; skill-based outcomes include skill development and compilation [45]. All three kinds of outcomes are essential because every improvement in learning and performance is the result of a combination of all three types of learning outcomes.

E-learning outcomes have been commonly measured by an individual’s learning effectiveness (cognitive outcomes) and satisfaction (affective outcomes) [3, 5, 6, 49, 55]. Skill-based outcomes that have been frequently investigated and measured as skill development in organizational training research [23] were largely missing in prior e-learning research due to frequently used school settings. To provide a comprehensive view, we include all three aspects of e-learning training outcomes as dependent variables.
Self-regulated learning Strategies

Our model views personal and social SRL strategies as the principal antecedents to learning outcomes. Prior research shows that students who self-regulate their learning processes can achieve better learning outcomes regardless of the nature of the course [92, 93], but the effectiveness of learning depends on their ability to use these strategies in a specific context [66]. Hence, the key to success in learning is to ensure that learners intentionally adopt and use SRL strategies to manage and direct their learning activities and adjust their learning responses to new or changing conditions.

In e-learning, learners are required to take much more responsibility for initiating and directing their own efforts to acquire knowledge and skills rather than relying on teachers as in traditional classroom learning. Learners’ use of SRL strategies can be even more effective in e-learning than in a traditional classroom because of the lower level of program control and absence of factors such as peer pressure and instructors’ close monitoring [35, 85]. Therefore, learners’ ability to leverage SRL strategies is extremely important in such a learner-centered environment.

Self-regulated learners proactively seek out information when needed and take actions to master knowledge. They make adjustments and find solutions when they encounter obstacles such as difficult learning materials or poor study conditions. They set goals and their own study pace and self-evaluate their performance. We classify these personally directed learning behaviors as “personal SRL strategies.” Research has confirmed that personal SRL strategies improve knowledge acquisition and skill development in both traditional classroom and e-learning settings [30, 64]. Moreover, given learners’ perceptions of having more control over the learning process, the use of personal SRL strategies is expected to increase learner satisfaction with e-learning [53, 55]. Thus, we propose the following hypothesis:

![Research Model Diagram]
Hypothesis 1: Learners’ use of personal SRL strategies during the e-learning process is positively associated with learning outcomes in terms of (a) declarative knowledge acquisition, (b) skill development, and (c) learner satisfaction.

Learning rarely occurs in isolation; it is a personal process but is shaped by the context in which one lives. When learners interact with others, they are likely to be challenged by ideas that are inconsistent with their existing knowledge or beliefs. During discussions and debates with peers or instructors, learners actively engage in cognitive restructuring, which potentially leads to improvement or revision of their mental models [48]. In this way, social forms of learning help learners achieve better cognitive and skill-based learning outcomes.

E-learners who use teachers and peers as social resources achieve better results as indicated by their perceived learning, knowledge acquisition, exam scores, task performance, or skill development [1, 10, 49, 80]. Prior research also shows that social support and social interaction among learners can increase learner satisfaction by reducing the feeling of isolation [49, 80]. In this way, e-learners who use social SRL strategies to manage their social resources and initiate social learning activities such as seeking social support will be more satisfied with e-learning. Thus, we hypothesize the following:

Hypothesis 2: Learners’ use of social SRL strategies during the e-learning process is positively associated with learning outcomes in terms of (a) declarative knowledge acquisition, (b) skill development, and (c) learner satisfaction.

Individual Factors

According to social cognitive theory [8], individual and contextual factors are assumed to affect learners’ behavior. The importance of individual differences in learning has long been acknowledged by educational psychologists [69]. Two major antecedents to SRL were suggested by learning theorists: learners’ goal orientation and their self-efficacy related to the specific learning context [65]. A recent literature review on e-learning research also identifies learner characteristics such as virtual competence as a major input factor that influences e-learning processes [76]. In adult education and training research, several basic individual motivational factors such as goal orientation have been consistently reported to be distinct antecedents of adult learners’ participation in training and their training behaviors (e.g., [36, 42]).

Based on the above and our social cognitive theory foundation, and considering our organizational e-learning context, we investigate two individual factors, virtual competence (with virtual self-efficacy as one of its components) and goal orientation as two major antecedents to SRL. Both have been recognized as strong determinants of various e-learning processes, and we include them as a way of establishing the validity of our proposed social SRL strategy concept. We recognize that other individual factors such as learning style may also play a role in e-learning. However, because our research focus is primarily on the psychological processes of personal and social
SRL strategies and not on a comprehensive test of all antecedents associated with e-learning, we made our choice based on what we interpreted to be a parsimonious yet important set of factors in motivating self-regulatory behaviors.

Virtual Competence

Individual competence is an important antecedent of individual performance [70]. Moreover, it appears that individuals need different competencies in order to succeed in different settings [69]. E-learning is a new learning environment characterized by embedded virtualness [55] in which learners’ performance is likely to be affected by a type of competence that is unique to this environment, namely, virtual competence.

Virtual competence is a type of individual competence in leveraging virtual settings to their maximum potential [78]. It is defined as the knowledge, skills, and abilities that individuals possess in order to perform in any virtual environment. According to Wang and Haggerty [78], three components combine to form virtual competence in virtual environments: virtual self-efficacy (including computer self-efficacy and remote work self-efficacy), virtual media skill, and virtual social skill. The construct has been validated in prior empirical studies conducted in different settings [77, 79]. One study in an e-learning setting has shown that virtual competence has a positive effect on e-learning effectiveness and learner satisfaction [77]. However, the mechanisms by which this particular type of individual competence affects learning outcomes is still unknown.

E-learning is a computer-mediated learning environment; hence, the learning activities are shaped by the student’s ability to manage the technical environment of the course [82]. In other words, faithful appropriation of the e-learning technologies might help individuals to improve their e-learning process [33]. Using social cognitive theory, we propose that virtual competence affects individuals’ learning behaviors such as adopting and applying SRL strategies during the e-learning process, which in turn affects their learning outcomes.

Individuals with high virtual competence are skilled in using technologies, making them more comfortable with and capable of applying personal SRL strategies that involve only human–computer interactions. Virtual competence also influences the degree of an individual’s willingness to make efforts and to persist in coping with the new environment. In addition to transferring many SRL strategies from traditional learning contexts, learners must create some idiosyncratic SRL strategies that are only applicable in e-learning environments.

Individuals who have higher virtual competence are more likely to adapt and create new personal SRL strategies in e-learning. For example, higher virtual competence learners find fast computers with high-speed Internet connections for their online learning tasks (environmental structuring strategy). They also know how to use some simple strategies to reduce potential risks and technology-related frustration. For instance, they back up their digital documents regularly to avoid possible data loss (keeping records strategy) [82].
Hypothesis 3a: Learners’ level of virtual competence is positively associated with their use of personal SRL strategies during the e-learning process.

The use of social SRL strategies in an e-learning environment also depends on individuals’ virtual competence. According to the conceptualization of virtual competence as an aggregate or formative multilevel construct, it includes virtual social skill as one of the three components [78]. Virtual social skill, defined as individuals’ knowledge of and skills in building social relationships with others within virtual environments, will influence their social behaviors in any virtual context. Because social SRL strategies are used by learners for the purpose of managing their social learning activities, this type of action will be influenced by the virtual competence they bring into the e-learning setting. Individuals with high levels of virtual competence can recognize the subtle nuances of different virtual social interactions and are good at maintaining relationships with others in the virtual learning environment [77].

However, the lack of virtual competence may constrain the use of social SRL strategies in e-learning. For instance, seeking social assistance as one type of social SRL strategy could be limited by poor communication skills or by an inability to use various technical features. In this case, low virtual competence may diminish individuals’ help-seeking effectiveness and reduce the potential of e-learning.

Furthermore, individuals with a high level of virtual competence can not only utilize existing social SRL strategies but also create new ones for managing their social forms of learning. For example, they are more likely to actively participate in online discussions and improve their assignments based on peers’ comments (social interaction and social comparison strategies).

Hypothesis 3b: Learners’ level of virtual competence is positively associated with their use of social SRL strategies during the e-learning process.

Goal Orientation

In order for learners to self-regulate their learning, they must have goals, standards, or criteria against which to measure their progress [57]. Orientation is the most common characteristic of goals associated with learning. Learning (or mastery) goal orientation and performance goal orientation represent two different perceptions of achievement and different purposes for engaging in the learning process. They are distinct constructs with different definitions and causal relationships to other factors rather than two subdimensions of goal orientation [28]. Learners with different goal orientations might take different actions, that is, use different SRL strategies, to meet the specific standards by which they judge their own performance or success [28, 57].

A learning goal orientation is based on the belief that effort leads to improvement in outcomes and that ability is malleable [28]. A high degree of learning goal orientation indicates a strong desire to perform challenging work, to learn new skills, and to develop alternative strategies when working on difficult tasks. A low degree of learning goal orientation indicates little concern for mastering tasks or gaining competency.

Individuals with high learning goal orientation have more positive attitudes toward learning and training [38, 41]. They set goals for intrinsic reasons such as improving
their level of understanding and learning, or taking on a particular challenge. They are interested in the learning process and believe that intelligence is malleable and can be developed. Accordingly, they are likely to believe that they can control and regulate their own learning process by using a variety of personal SRL strategies. Previous research has shown that learning goal orientation has a positive influence on individuals’ use of personal SRL strategies in both traditional learning (e.g., [28, 57, 66] and e-learning contexts [30]:

*Hypothesis 4a: Learning goal orientation is positively associated with individuals’ use of personal SRL strategies during the e-learning process.*

Although previous studies have focused more on personal than on social SRL strategies according to the categorization proposed in this study, we believe that learning goal orientation has a positive influence on individuals’ use of social SRL strategies as well. Consistent with their belief that competence can be improved, individuals with a strong learning goal orientation are more likely to explore all possible means, including consulting with their instructors, peers, and IT professionals (seeking social assistance) and actively participating in online discussions (social interaction) in order to improve their learning. Hence, we hypothesize the following:

*Hypothesis 4b: Learning goal orientation is positively associated with individuals’ use of social SRL strategies during the e-learning process.*

Performance goal orientation is focused on the attainment of favorable judgments of competence. It can be further separated into two subscales of performance approach and performance avoidance [26]. Performance approach orientation indicates an action-oriented approach to ensure one performs better than others or gains recognition for a job well done. Performance avoidance is a passive subdimension of performance goal orientation and indicates a strong desire to avoid any actions, in this case, the use of any SRL strategy. Because performance avoidance has been associated with termination of learning [26], we do not include it in this study.

Learners with a strong performance approach goal orientation set standards of success based on external judgments such as test scores, rewards, or performance levels relative to their peers. They believe that ability is demonstrated by succeeding with little effort [28]. Thus, it is expected that individuals with a strong performance approach goal orientation are less likely to use any personal SRL strategies that require high cognitive effort, such as organizing and transforming information, goal setting and planning, monitoring, and self-evaluation, even though they might be capable of using them [28, 66].

*Hypothesis 5a: Performance approach goal orientation is negatively associated with individuals’ use of personal SRL strategies during the e-learning process.*

The negative relationship between performance approach goal orientation and the use of SRL strategies has been tested by studies that either focus on certain types of personal SRL strategies [28] or on an unbalanced combination of mostly personal but few social SRL strategies [30, 66]. Thus, it is not clear how performance approach goal orientation affects individuals’ use of social SRL strategies.
In general, individuals with performance approach goal orientation believe their knowledge base is fixed and hence are not interested in the process of learning to improve skills but, rather, concentrate more on demonstration of their skills to impress others [12]. They do not enjoy the learning experience and are less likely to use social SRL strategies for the purpose of improving the overall learning process. Moreover, performance approach goal orientation indicates an intention of gaining favorable judgments for one’s competencies or performing better than others. In other words, individuals with performance approach goal orientation focus on other people’s judgment of their performance in completing tasks and look for approval. As a result, they are less likely to seek assistance from peers, colleagues, and instructors and are not interested in interacting with others for learning purposes. In fact, rather than getting recognition for performance, help-seeking activities might expose their weaknesses and lack of competence in front of others.

Hypothesis 5b: Performance approach goal orientation is negatively associated with individuals’ use of social SRL strategies during the e-learning process.

Job and Contextual Factors

In addition to the individual characteristics that might affect learners’ use of different SRL strategies in e-learning, prior research suggests that job and contextual factors also play a role in influencing individuals’ learning behavior in organizational settings. Although organizational culture or climate may influence individuals’ training and later the transfer of training to job situations (e.g., [72]), we chose to focus on individuals’ immediate work environment (group norms) so we can investigate how learners’ social learning activities were directly affected during training. Therefore, in this study, we include the perceived intellectual demands of an individual’s current job as a job-related factor based on the work of Houle [36] and the cooperative group norm as an important contextual factor because of its direct influence on individual behavior in social contexts [2, 11].

Intellectual Demands

Intellectual demands reflect the cognitive load perceived by individuals in performing their jobs [31]. Intellectually demanding jobs require individuals to constantly upgrade their skills and maintain a close fit between themselves and the demands of their jobs [25]. Such jobs are more challenging compared to daily routines and require more cognitive attention; thus they are more likely to trigger controlled and effortful learning, which forces individuals to pursue varied strategies to manage the learning processes.

The knowledge sourcing literature shows that individuals facing higher perceived intellectual demands tend to seek more information from published knowledge resources and consult other experienced colleagues more frequently [31]. Following the same logic, when individuals participate in training for the purpose of meeting their immediate job requirements, they are highly motivated to learn and more will-
ing to apply personal SRL strategies such as *goal setting and planning* and *seeking information* during the learning process, and they do not hesitate to leverage their social resources by *seeking social assistance* from colleagues, instructors, and fellow trainees (e.g., using social SRL strategies).

**Hypothesis 6:** Learners’ perception of intellectual demands in their jobs is positively associated with their use of (a) personal SRL strategies and (b) social SRL strategies in the e-learning process.

**Cooperative Group Norm**

A group norm is defined as legitimated and socially shared standards against which the appropriateness of behavior can be evaluated [11]. It is an individual’s perception of social expectations from other group members regarding his or her own behavior. Although not explicit or written, group norms often have a strong and consistent influence on group members’ behaviors [27]. In this study, we investigate the group norm that emphasizes cooperation and encourages social interaction among employees and its influence on individuals’ uses of social SRL strategies during e-learning training.

Cooperative group norms reflect people’s perceptions about group members’ shared objectives, mutual interests, commonalities, and the interaction among members. Individuals who perceive a group norm that encourages cooperation and social interaction will be more likely to use social SRL strategies such as *seeking social assistance* and *social interaction*. They are also more persistent when encountering difficulties, which increases the frequency and quality of the communication and interaction with others and in turn improves learning outcomes.

One of the major platforms for conducting social learning activities in e-learning is the online discussion forum, which provides an additional venue to apply social SRL strategies. Online discussion forums are effective in enriching the process of acquiring, sharing, and exchanging knowledge among participants [47]. Group norms favoring cooperation and social interaction encourage individuals’ participation in online discussion forums [84], which increases the likelihood of learners using social SRL strategies such as *participating in online discussions* and conducting *social comparisons* based on others’ comments and feedback posted online.

**Hypothesis 7:** Individuals’ perception of a cooperative group norm that encourages social interaction is positively associated with their use of social SRL strategies during the e-learning process.

**Methodology**

**Measurement Development**

We began our research by developing a new measurement inventory of SRL strategies (especially for social SRL strategies), given that there were a limited number of previously validated measures in e-learning contexts. We did so by following the
standard conceptual validation procedures prescribed by Churchill [20] and Moore and Benbasat [50] and drawing upon the construct validation studies conducted by Zimmerman and Martinez-Pons [90, 91] in traditional learning environments. The new measures include personal and social forms of learning, making it possible to explore the effects of both types of SRL strategies on e-learning outcomes.

We conceptualize personal and social SRL strategies as formative multidimensional constructs following the criteria of Petter et al. [54] for formative measures. First, we view the construct of SRL strategies as being formed from the dimensions rather than the other way around; that is, we do not see personal or social SRL strategy as an underlying concept that gives rise to the specific strategies (such as keeping records or rehearsing and memorizing) but, rather, we view them as being the combination of the dimensions that are measured. Moreover, we view a change in the dimensions (an increase in seeking peer assistance, for example) as resulting in an increase in SRL strategy. This is consistent with how SRL strategies are defined in the psychology literature [90] and indicates that the multidimensional construct is formative rather than reflective [46, 54]. Second, from a content validity perspective, the dimensions of SRL strategies are not interchangeable. The strategy of seeking peer assistance is quite distinct from the strategy of social comparison. The former involves relying on peers for provision of needed information, whereas the latter represents a motivational process of comparing one’s progress and learning activities with those of peers’ and the efforts to meet peers’ expectations and standards. Third, we do not necessarily expect high correlations between the various personal and social SRL strategy dimensions. Because the dimensions represent distinct aspects of SRL strategy, they may or may not be correlated. This is typical of formative constructs [16, 24, 46, 54]. Finally, and again arising from their uniqueness, we see the SRL strategy indicators as having different potential antecedents and outcomes. This means that in different studies and different contexts, the weights for the items could be different depending on various conditions. These four aspects collectively determine that personal and social SRL strategies are best modeled as formative, rather than reflective, multidimensional constructs.

The first step in our measurement development was to generate new measurement items that capture each of the dimensions within personal and social SRL strategy constructs as specified. Items were collected, adopted, and created based on existing research, thus assuring strong content validity [21, 30, 59, 63, 66, 82, 87]. In total, 64 items for the 9 subdimensions of personal SRL strategies and 30 items for the 6 subdimensions of social SRL strategies were generated at this stage.

In the second step, we identified ambiguous items and removed duplicate items. Twelve judges composed of senior doctoral students (many with online learning or teaching experience) performed two rounds of card sorting exercises following Moore and Benbasat [50] to make preliminary assessments of construct, convergent, and discriminant validity. We calculated the interrater reliability and the placement ratio of each item within its domain and either modified or dropped items with a low placement ratio after each round of sorting to reduce ambiguity and strengthen convergent and discriminant validity. More specifically, 7 items from personal and 2 items from social SRL strategies were dropped after the first round. In the second round, 17 items from personal and 5 items from social SRL strategies were dropped, resulting in 63 items
We conducted a pilot study at a company that provides online training courses to employees on behalf of organizations that do not have their own e-learning systems and online training facilities (a third-party supplier). This provided us with access to practitioner-based expertise in assessing the validity of our instrument and as well as pilot data from employees in workplace settings. Because both the pilot and main study were conducted in China, the questionnaire was developed in English and then translated into Chinese through a “double back-translation” process [13]. The items were first translated into Chinese and then translated back into English by people other than those who did the initial translation. Several rounds of adjustments in the translation were made to ensure linguistic equivalence, consistent with the guidelines established by Brislin [13].

Thirty-seven employees participated in the pilot study, giving a response rate of 53 percent. The respondents completed the questionnaire and provided feedback about the process and measures. Overall, they reported that the questionnaire was relatively clear and easy to complete. Follow-up interviews with four respondents were conducted with specific questions on the items of either personal or social SRL strategies. The interviewees expressed agreement that each item represented its intended dimension, which indicates a certain level of face validity. Then we tested the item reliability of each subdimension. The Cronbach’s alphas of 15 subdimensions were all above 0.7, indicating sufficient item reliability and internal consistency of each reflective measure [52].

The pilot study made it possible for us to test the measurement scale and improve its wording according to the respondents’ comments. Although a few items were identified as somewhat repetitive, we decided to keep them in the main study based on their acceptable item reliability. We thus tested our research model using the new measurement scale of SRL strategy with 63 refined items under 15 subdimensions in the main study.

Measurement

Except for the newly developed measures for SRL strategies, the measurement of other constructs included in this study were either adopted or adapted from previous studies. Items were adjusted to seven-point Likert scales where applicable.

Six items adapted from Alavi [3] were used to measure declarative knowledge acquisition. Skill-based outcomes were measured by three items adapted from the job performance measurement scale commonly used in organizational studies. We measured the third dependent variable, learners’ satisfaction with e-learning environments (affective outcomes), by four items adopted from Alavi et al.’s [5] scale.

We followed Wang and Haggerty [79] to measure individual virtual competence, treating it as a second-order formative construct with four dimensions as formative indicators [46]. Each dimension—computer self-efficacy, remote work self-efficacy, virtual media skill, and virtual social skill—represents a first-order construct. As
first-order constructs, computer self-efficacy, remote work self-efficacy, virtual media skill, and virtual social skill were measured by reflective indicators.

Learning goal orientation was measured using the eight-item scale provided by Button et al. [15]. Performance goal orientation is commonly separated into two subscales of performance approach and performance avoidance [26]. Only performance approach orientation was included in this study, and it was measured using a five-item scale from Button et al. [15].

The intellectual demands of an employee's current job position were measured using the four-item scale developed by Gray and Meister [32]. Cooperative norm was measured using a six-item scale provided by Chatman and Flynn [17].

Control Variables

We controlled for the effects of individuals' perceived voluntariness for participating in the training. This variable represents the learners' degree of freedom when selecting training opportunities on the basis of their own needs and desires and might influence the outcomes of the participation [34]. We measured it using a three-item scale adapted from Venkatesh and Davis [75]. Individuals' previous e-learning experience may also affect their e-learning outcomes [49]. Therefore, we included prior e-learning experience as a control variable and measured it by asking the respondents to report the number of online training courses they had previously taken.

We also included demographic information as control variables. Gender, age, and education level were found to be important in adult education studies [14]. Because the current study was conducted in an organizational setting focusing on job training, we controlled for employees' job type and job tenure as well.

Data Collection

Data were collected at a large international organization with headquarters located in eastern China. This organization currently has offices in more than 50 cities across greater China, Japan, Korea, Europe, and the United States and has about 10,000 employees. Like many other global organizations that emphasize the growth of human capital, this company provides its employees with a comprehensive training and skills development program. Training topics range from business management to pure technical subjects, and most training courses are provided entirely online. Employees choose training courses according to their current job requirements or long-term career goals.

The e-learning system is the Cisco WebEx Training Center, which provides employees a common learning platform with similar instructional design elements. The organization's instructional design across its training domains is consistent with the constructivism view of learning as suggested by educational psychologists and commonly adopted in e-learning [47]. The design supports learner-centered active learning and assumes that learners learn better when they discover things themselves.

Under the constructivism view of design, the e-learning system contains technology features that facilitate employee engagement and self-control of the learning activities.
Trainees are able to choose the pace and sequence of sessions instead of following the instructor’s plan. The system also includes features that enable collaboration between the learner and the instructor and other participants. Although most training courses were delivered through predeveloped course materials rather than real-time video conferencing, trainees can interact with each other at the online discussion forum and through built-in instant messaging tools. Consistent with the core business of the company, employees are used to virtual environments and actively participate in a variety of online forums and virtual communities on the company’s intranet. Employees conduct most of their training activities during personal time by accessing their account at the Training Center through the Internet. Their interactions with instructors and fellow trainees may be either synchronous or asynchronous.

An invitation to participate, including a description of the research study and the link to the online survey, was posted on the online forum in the WebEx Training Center. The invitation was kept on top of the first page of the forum for two weeks to increase its exposure. As an incentive for participation, employees who filled out the survey questionnaire received a small gift (worth about $5).

In all, 551 employees clicked on the survey link during the two-week period. Among them, 232 employees actually filled out the survey. After discarding 20 unfinished surveys, 212 usable questionnaires were brought to the data analysis. The respondents’ ages ranged from 18 to 46 years, and the average was 27.7. Males represented 41.8 percent of the respondents. The average work experience was four years, and most of the respondents (83 percent) had at least a college education. The sample represented more than six types of job positions within the organization, including management, technical, clerical or secretarial, sales, professional, and other. More than half of the respondents (63.4 percent) had some degree of e-learning experience. Thus, the respondents in this study had a broad range of age, education level, job type, work experience, and e-learning experience.

The study focused on training conducted through IT instead of training on IT. The survey respondents were online trainees learning across a number of topics. We elected not to narrow our focus to a single learning topic for a variety of reasons. First, prior research shows no difference between more or less technical courses in terms of e-learning outcomes [10]. Second, in a recent study, Wan et al. [77] included “course subject” as a control variable but found no effects on e-learning outcomes. Finally, e-learning is usually offered across a high number of knowledge domains in organizational settings, and it seems reasonable that most organizations are interested in how to achieve e-learning success broadly versus narrowly by subject. Hence, in this study we did not distinguish the training topics but instead focused on learning behaviors of this employee group within their firm’s e-learning context.

Results

We conducted the data analysis using Partial Least Squares (PLS). Compared with Amos and LISREL, PLS is advantageous in predicting and can better handle formative constructs such as virtual competence and SRL strategies in the current model [9, 19].
Furthermore, the current sample size (212) does not meet the minimum sample size required for the Amos model of this study but does surpass the accepted threshold for PLS. We used SmartPLS version 2.0.M3 [61].

Measurement Model

Our model has three second-order constructs with formative indicators (virtual competence, personal SRL strategies and social SRL strategies). To assess the measurement quality and prepare for testing the structural model, we first estimated a model that included all the first-order constructs (two types of goal orientations, intellectual demands, cooperative norm, and three types of e-learning outcomes) and all dimensions of the three second-order constructs with paths pointing to the corresponding constructs. In this way, (1) each item used in this study can be examined by its loading on the intended construct and cross-loadings on other constructs within the same model, and (2) a latent variable score needed when testing the structural model can be calculated for each dimension of the second-order constructs [18].

After examining the loadings and cross-loadings for all the items, we dropped 16 items that had loadings below 0.7 [37]. Among the 16 items, four items (including two reverse-coded items) were dropped from existing measurement scales, one each from virtual social skill, performance goal orientation, intellectual demands, and cooperative norm. Twelve items (six in self-learning strategies and six in social learning strategies) were dropped from the 63 items we developed for measuring SRL strategy.

From a practical perspective, an excessive number of items is undesirable in data collection and increases the number of parameters when the construct is embedded within a broader structural model. During the assessment of item quality in our measurement development stage, we were conservative and some items that were flagged due to their low interrater reliability or repetitiveness were kept to the main study for theoretical reasons. However, with sufficient data points collected in the main study (212 respondents), the newly developed items can be assessed within a measurement model using rigorous statistical criteria. The 12 items of SRL strategy that did not satisfy the criteria (most were previously flagged in the card sorting exercises and the pilot study) were dropped with more confidence after being examined one by one to ensure that (1) the content was covered by other items, and (2) there were at least two items left for each dimension.

Then we used the latent variable scores from this estimation as indicators to represent the dimensions of the second-order constructs and estimated the structural model as illustrated in Figure 1. Table 1 shows the descriptive statistics and correlations, with the square roots of the average variances extracted (AVEs) shown on the diagonal of the constructs in the structural model.

The results demonstrate satisfactory item reliability, internal consistency, convergent validity, and discriminant validity for all the reflective constructs/dimensions. First, all the current items had loadings above 0.7 on their respective constructs, indicating acceptable item reliability [37]. Second, internal consistency scores for the reflective constructs/dimensions were all above 0.84, higher than the commonly used
Table 1. Means, Standard Deviations, and Intercorrelations of Constructs (N = 212)

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Number of items</th>
<th>Mean</th>
<th>SD</th>
<th>VC</th>
<th>LGO</th>
<th>PGO</th>
<th>ID</th>
<th>CN</th>
<th>Personal</th>
<th>Social</th>
<th>CO</th>
<th>SO</th>
<th>AO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual competence (VC)*</td>
<td>4</td>
<td>5.61</td>
<td>0.85</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning goal orientation (LGO)</td>
<td>8</td>
<td>6.19</td>
<td>0.93</td>
<td>0.48</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance goal orientation (PGO)</td>
<td>3</td>
<td>5.65</td>
<td>1.06</td>
<td>0.43</td>
<td>0.58</td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intellectual demand (ID)</td>
<td>3</td>
<td>6.02</td>
<td>1.12</td>
<td>0.32</td>
<td>0.43</td>
<td>0.27</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperative norm (CN)</td>
<td>5</td>
<td>5.55</td>
<td>1.29</td>
<td>0.32</td>
<td>0.26</td>
<td>0.16</td>
<td>0.23</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal SRL strategies (Personal)*</td>
<td>9</td>
<td>5.54</td>
<td>0.94</td>
<td>0.52</td>
<td>0.55</td>
<td>0.49</td>
<td>0.28</td>
<td>0.30</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social SRL strategies (Social)*</td>
<td>6</td>
<td>4.86</td>
<td>0.97</td>
<td>0.57</td>
<td>0.27</td>
<td>0.14</td>
<td>0.33</td>
<td>0.44</td>
<td>0.49</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive outcomes (CO)</td>
<td>6</td>
<td>6.21</td>
<td>0.95</td>
<td>0.51</td>
<td>0.41</td>
<td>0.41</td>
<td>0.31</td>
<td>0.29</td>
<td>0.54</td>
<td>0.43</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill-based outcomes (SO)</td>
<td>3</td>
<td>6.20</td>
<td>0.91</td>
<td>0.36</td>
<td>0.36</td>
<td>0.23</td>
<td>0.14</td>
<td>0.11</td>
<td>0.43</td>
<td>0.34</td>
<td>0.51</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>Affective outcomes (AO)</td>
<td>4</td>
<td>6.16</td>
<td>0.99</td>
<td>0.16</td>
<td>0.25</td>
<td>0.12</td>
<td>0.34</td>
<td>0.25</td>
<td>0.30</td>
<td>0.36</td>
<td>0.35</td>
<td>0.36</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Notes: SD = standard deviation; NA = not applicable. Boldface values on the diagonal represent the square root of the average variance extracted. Off-diagonal elements are correlations between measures. For adequate discriminant validity, the elements in each row and column should be smaller than the boldface value in that row or column. * For formative constructs, it is not appropriate to calculate average variance extracted and internal consistency reliability, because such constructs do not reflect the underlying measures but are formed based on them. Thus, the concept of the average degree to which items correlate with the construct does not apply.
0.70 cutoff [52, 81]. Third, the AVE, which measures the amount of variance that a construct shares with its indicators, was above the 0.5 threshold for all the reflective constructs/dimensions, suggesting satisfactory convergent validity [18]. Fourth, all the items loaded more highly on their intended constructs than they loaded on any other construct, and the differences were greater than 0.10, indicating acceptable discriminant validity [9, 83]. The average correlation among the measures of each construct (shown on the diagonal of the correlation matrix of Table 1) was greater than the construct’s correlation with any other construct, providing additional evidence for adequate discriminant validity.

According to Chin [18], reliability, convergent validity, and discriminant validity are not meaningful for formative constructs, because there is no assumption that formative indicators will co-vary. Indeed, theoretically formative constructs are composed of a summed aggregate of their indicators, and indicators are included based on the construct’s theoretical meaning, with each indicator capturing a specific domain of content [16, 54]. In this case, common statistical indices of measurement quality, such as reliability and discriminant validity, are not applicable [22]. Therefore, as prescribed, we examined the weights of the formative indicators.

The weights of each dimension of the three formative constructs are listed in Table 2. The significance of the weights indicates the importance of the indicator/dimension to the construct in a particular research setting. Three of the nine dimensions of personal SRL strategy and four of the six dimensions of social SRL strategy were significant in this research setting. We did not drop any of the dimensions based on this analysis, because each of the dimensions is theoretically important to the content validity of the construct [16]. We did, however, examine the zero-order correlations between the items and the construct (the loadings) as a way of further understanding the results we observed [16]. The loadings (presented in Table 2) show that despite their low weights, all the dimensions are correlated with their respective construct. For three of the items (environmental structuring, seeking manager assistance, and seeking IT assistance), the correlations are small, but all are positive and significant. Thus, the analysis suggests that each of the dimensions is related to the second-order factor as predicted, although overlap between the dimensions makes only a subset significant in the assessment of weights. In such conditions, Cenfetelli and Bassellier [16] suggest retaining the dimensions for content validity reasons and using further research to understand and perhaps remove the overlap. Therefore, future research that tests these constructs in varied settings is needed to further validate the items and the structure (dimension) of the measurement scales.

**Structural Model**

We tested our research hypotheses by examining the size and significance of the structural paths in the PLS analysis and the percentage of variance explained. Figure 2 and Table 3 summarize the results and show that 10 out of the 15 hypotheses proposed in this study were supported by the data. Overall, our model indicates that both personal and social SRL strategies improve learning outcomes, although differently across
the three types of outcomes measured. Further, the individual and context factors we examined do play a role in learners’ choice of using either personal or social SRL strategies during e-learning.

This study includes seven control variables, three of which had significant effects on the learning outcomes. Voluntariness of participating in training positively affects learner satisfaction ($\beta = 0.25, p < 0.01$). Age is positively related to respondents’ skill-based learning outcomes ($\beta = 0.14, p < 0.05$). Job tenure is positively associated with respondents’ cognitive learning outcomes ($\beta = 0.17, p < 0.05$).

In total, 49 percent of the variance in personal SRL strategies and 43 percent in social SRL strategies were explained by the antecedents included in the model. The two types of SRL strategies explain 36 percent of the variance in cognitive learning outcomes, 25 percent in skill-based learning outcomes, and 28 percent in affective learning outcomes. After removing the effects of control variables, the two types of SRL strategies explain 32 percent of the variance in cognitive learning outcomes, 20 percent in skill-based learning outcomes, and 11 percent in affective learning outcomes.

Table 2. Weights for Formative Constructs

<table>
<thead>
<tr>
<th>Construct/dimension</th>
<th>Weights</th>
<th>Loadings$^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Virtual competence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer self-efficacy</td>
<td>0.06</td>
<td>0.39</td>
</tr>
<tr>
<td>Remote work self-efficacy</td>
<td>0.45**</td>
<td>0.81</td>
</tr>
<tr>
<td>Virtual social skill</td>
<td>0.20</td>
<td>0.76</td>
</tr>
<tr>
<td>Virtual media skill</td>
<td>0.62***</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>Personal SRL strategies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-evaluation</td>
<td>0.42**</td>
<td>0.81</td>
</tr>
<tr>
<td>Organizing and transforming</td>
<td>0.04</td>
<td>0.76</td>
</tr>
<tr>
<td>Goal setting and planning</td>
<td>0.05</td>
<td>0.75</td>
</tr>
<tr>
<td>Seeking information</td>
<td>0.31**</td>
<td>0.82</td>
</tr>
<tr>
<td>Keeping records and monitoring</td>
<td>0.06</td>
<td>0.81</td>
</tr>
<tr>
<td>Environmental structuring</td>
<td>0.15*</td>
<td>0.44</td>
</tr>
<tr>
<td>Self-consequences</td>
<td>0.06</td>
<td>0.73</td>
</tr>
<tr>
<td>Rehearsing and memorizing</td>
<td>0.13</td>
<td>0.69</td>
</tr>
<tr>
<td>Reviewing</td>
<td>0.12</td>
<td>0.65</td>
</tr>
<tr>
<td><strong>Social SRL strategies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seeking peer assistance</td>
<td>0.52***</td>
<td>0.78</td>
</tr>
<tr>
<td>Seeking instructor assistance</td>
<td>0.53***</td>
<td>0.70</td>
</tr>
<tr>
<td>Seeking manager assistance</td>
<td>−0.16</td>
<td>0.22</td>
</tr>
<tr>
<td>Seeking IT expert assistance</td>
<td>−0.10</td>
<td>0.33</td>
</tr>
<tr>
<td>Social comparison</td>
<td>0.25*</td>
<td>0.55</td>
</tr>
<tr>
<td>Social interaction</td>
<td>0.23*</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Notes: Significance assessed through a bootstrap procedure (500 subsamples). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

$^1$ We also report loadings here for the purpose of discussion.
Figure 2. Results of PLS Analysis
* p < 0.05; ** p < 0.01; *** p < 0.001; n.s. = not significant.

Discussion

Our empirical study provides broad support for our research model. The results show that learners’ use of personal SRL strategies is positively associated with cognitive and skill-based learning outcomes but not affective outcomes. Learners’ use of social SRL strategies is positively associated with cognitive and affective outcomes but not skill-based outcomes. This suggests a significant variance among the effects of SRL strategies on learning outcomes captured by this study based on learners’ retrospective reporting of their accumulated use of SRL strategies during the training period.

Personal Self-Regulated Learning Strategies

Previous research has shown that using personal SRL strategies improves certain types of learning outcomes in e-learning [30, 64]. This study adopts a multidimensional perspective on learning outcomes and extends it by testing the effects of personal strategies on three types of learning outcomes. The results suggest that personal SRL strategies support different learning outcomes.

Our results show that learners’ use of personal SRL strategies is positively associated with their declarative knowledge acquisition and skill development. By using personal SRL strategies, learners consciously manage their e-learning processes and structure their learning environments, self-evaluate their knowledge acquisition and skill development progress, and devote their cognitive efforts to understanding
the training materials and conducting more skilled actions through practice. These self-directed activities benefit learners’ knowledge acquisition and skill development during online training.

However, the results show no effect of using personal SRL strategies on learners’ satisfaction with the e-learning environment. When using personal SRL strategies, learners focus more on personally directed forms of learning that emphasize

<table>
<thead>
<tr>
<th>Variables</th>
<th>$R^2$</th>
<th>$\beta$</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive outcomes</td>
<td>0.36</td>
<td>0.43***</td>
<td>✓</td>
</tr>
<tr>
<td>Personal SRL strategies $\rightarrow$ cognitive outcomes (H1a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social SRL strategies $\rightarrow$ cognitive outcomes (H2a)</td>
<td></td>
<td>0.21**</td>
<td>✓</td>
</tr>
<tr>
<td>Skill-based outcomes</td>
<td>0.25</td>
<td>0.37***</td>
<td>✓</td>
</tr>
<tr>
<td>Personal SRL strategies $\rightarrow$ skill-based outcomes (H1b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social SRL strategies $\rightarrow$ skill-based outcomes (H2b)</td>
<td>n.s.</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Affective outcomes</td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal SRL strategies $\rightarrow$ affective outcomes (H1c)</td>
<td>n.s.</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Social SRL strategies $\rightarrow$ affective outcomes (H2c)</td>
<td>0.25**</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Personal SRL strategies</td>
<td>0.49</td>
<td>0.44***</td>
<td>✓</td>
</tr>
<tr>
<td>Virtual competence $\rightarrow$ personal SRL strategies (H3a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning goal orientation $\rightarrow$ personal SRL strategies (H4a)</td>
<td>0.25**</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Performance goal orientation $\rightarrow$ personal SRL strategies (H5a)</td>
<td>n.s.</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Intellectual demand $\rightarrow$ personal SRL strategies (H6a)</td>
<td>n.s.</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Social SRL strategies</td>
<td>0.43</td>
<td>0.50***</td>
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<tr>
<td>Virtual competence $\rightarrow$ social SRL strategies (H3b)</td>
<td></td>
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<tr>
<td>Learning goal orientation $\rightarrow$ social SRL strategies (H4b)</td>
<td>n.s.</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Performance goal orientation $\rightarrow$ social SRL strategies (H5b)</td>
<td>−0.17*</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Intellectual demand $\rightarrow$ social SRL strategies (H6b)</td>
<td>0.16*</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Cooperative group norm $\rightarrow$ social SRL strategies (H7)</td>
<td>0.27***</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Notes: ✓ = supported; ✗ = not supported. * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$; n.s. = not significant.
metacognitive processes such as seeking information and motivational processes such as self-evaluation. These strategies are used as instrumental tools for improving knowledge, skills, and abilities and do not seem to be associated with personal feelings and perceptions of liking or pleasure with the learning environment.

Social Self-Regulated Learning Strategies

Little prior research has tested the effects of social SRL strategies on e-learning outcomes after controlling for the effects of personal SRL strategies. The expansion of the nomological network of self-regulation and the measurement development of social SRL strategies allowed us to contribute to social cognitive theory development and empirically investigate e-learners’ social learning process and its effect on varied e-learning outcomes.

The results show that learners’ use of social SRL strategies is positively associated with their declarative knowledge acquisition and satisfaction with e-learning. By using social SRL strategies, learners seek assistance from others and get answers to their training-related questions, compare their own progress with others, and interact with other trainees to reduce loneliness during online training. These social learning activities benefit learners’ declarative knowledge acquisition through written conversations that require formal and systematic language by which knowledge is codified and transferred [51]. In addition, although the interactions are initiated mainly for learning purposes, the perceptions of social support and recognition can reduce the feeling of isolation and hence increase learners’ satisfaction with e-learning.

However, the results show no effect of using social SRL strategies on learners’ skill development. Although quick answers or feedback from others can solve the learners’ immediate problems and transfer some declarative knowledge, they may not help skill development that requires continued practice to integrate the knowledge into skilled acts [45]. Learners’ practice of using a skill in different situations and individualizing their skilled acts are mainly a personally directed learning process. Hence, the use of social SRL strategies has no effect on skill-based outcomes.

Virtual Competence and Goal Orientation

Two individual factors, virtual competence and goal orientation, were proposed in this study to influence learners’ use of SRL strategies. The data support some, but not all, of the arguments.

Virtual competence is showed to be an influential factor in e-learning. Learners with higher virtual competence are able to leverage the virtual learning environment and use both personal and social SRL strategies to facilitate their e-learning processes.

The results confirmed prior research findings on goal orientation, indicating that individuals with higher learning goal orientation will use more personal SRL strategies. However, although theoretically those with higher learning goal orientation are likely to explore all possible means to improve their learning, our data did not support the argument that they would use more social SRL strategies.
Individuals with a learning goal orientation engage in self-instruction and enjoy the challenge [12]. They might perceive that using social SRL strategies such as seeking assistance and participating in online discussions are “shortcuts” and less challenging. Furthermore, compared to full-time students, adult learners (even those with strong learning goal orientation) have much less time and energy to spend on learning because of the demands of other tasks and personal responsibilities. Although self-regulation often improves performance, engagement in such processes demands extra attention [40]. Individuals with learning goal orientation enjoy the learning process, but the use of personal SRL strategies might be sufficient to satisfy their needs, making it undesirable and sometimes impossible to engage in additional strategies (i.e., social learning strategies) given their limited time and cognitive efforts during learning. This might explain the insignificant results between learning goal orientation and the use of social SRL strategies.

The hypothesis that people with performance approach goal orientation will use fewer personal SRL strategies is not supported by the data. Similar results were reported in previous research on learning and training. For example, although negative effects of learners’ performance approach goal orientation on the use of SRL strategies or metacognitive learning strategies (classified as “personal SRL strategies” in this study) were consistently proposed based on the theory of goal orientation, they were not verified in the empirical results [28, 30, 58].

Those with higher performance approach goal orientation, however, will use fewer social SRL strategies because they are not interested in the learning process per se but rather focus on gaining more favorable judgments of their competencies or performance from others. Although they may use some social SRL strategies to complete the learning tasks and perform better to impress others, individuals with higher performance approach goal orientation are more concerned about exposing weaknesses during social interactions or feeling inadequate when seeking assistance.

**Intellectual Demands and Cooperative Norm**

The results show that people who have intellectually demanding jobs tend to use more social SRL strategies such as seeking assistance from others, participating in online discussions, and having more social interactions during training. For them, the purpose of training is to acquire job-related knowledge and skills that could be directly used to finish the tasks at hand and improve job performance.

Research on knowledge sourcing behaviors suggests that individuals facing higher perceived intellectual demands will try to import the required knowledge from other employees rather than developing it through direct interaction with the environment [31]. Similarly, when participating in training, these individuals might prefer to use social SRL strategies to get answers and support from experienced peers and instructors instead of going through the more time-consuming self-directed learning. This might explain the nonsignificant relationship between the intellectual demands of the job and the use of personal SRL strategies.

In online training, most learners tend not to know each other or ever meet face to face. A cooperative group norm can help foster a work environment that encourages
interaction among co-workers. Individuals who are used to asking for and receiving help from others are likely to behave the same way in training. This study shows that a cooperative group norm that promotes interaction can be carried on into training and encourage learners to use more social SRL strategies to facilitate their learning processes.

Overall, our findings indicate that personal and social SRL strategies affect e-learning outcomes differently and the choice of SRL strategy is influenced by learners’ virtual competence, goal orientation, the intellectual demands of their jobs, and the perceived cooperative norm at workplaces. Our new construct and measurement of social SRL strategies makes it possible to investigate both types of learner behaviors in the context of e-learning. We have also been able to explain how individual and contextual factors influence SRL processes and how personal and social SRL processes affect e-learning outcomes.

Implications

Our results indicate that e-learning providers should promote the use of both types of SRL strategies by drawing employees’ attention to the benefits of managing their e-learning processes through their own initiative and by interacting with others. According to social cognitive theory, people engage in some degree of SRL, but what matters is the quality and extent to which they use these strategies in a specific context [64]. Hence, individuals’ adjustment and adaptation to e-learning are crucial to reach optimal learning outcomes. Appropriate managerial interventions such as pretraining instruction are needed to guide the adjustment and adaptation to particular training situations and instruct learners to apply both types of SRL strategies more effectively.

Since individual virtual competence is vital to e-learning, some pretraining interventions about basic knowledge of information and communication technologies are required for those with low virtual competence. For learners with high virtual competence, some proactive interventions such as training on the special technological and design features of the e-learning system in use would reduce frustration and enhance the e-learning process. In addition, some studies suggest adopting virtual worlds in e-learning [29], which would require an even higher level of individual virtual competence.

Pretraining protocols can be designed specifically for individuals with either learning goal orientation or performance approach goal orientation. For those with a strong learning goal orientation, providing instruction in personal SRL strategies would improve their ability to manage the personally directed learning. On the other hand, for people with a strong performance approach goal orientation, providing instruction in social SRL strategies such as social comparison could reduce their bias toward this type of strategy and encourage them to be more active in social forms of learning.

In addition to the actions individuals can take, online learning also lends itself to technological prompts and guidance that can be built into features of the system. E-learning software designers could benefit from applying our study results by in-
cluding some general instructions about SRL strategies in the orientation to using the system and at various stages in delivery of the program. For example, adding a chart feature that indicates the learners’ training progress as they go can promote skills in self-evaluation. Also, at appropriate points during the course, automatic prompt features could periodically remind learners to apply SRL strategies—to adjust the learning environment, or to seek social interaction if the learner is taking too long to complete an activity. Software designers could also incorporate tools that support the use of various SRL strategies, especially those newly created strategies that only apply to e-learning. For example, designers need to develop interesting and friendly interfaces for online forums and make them more attractive to learners.

In addition, instructors need to be trained on both personal and social SRL strategies for properly governing, directing, and facilitating interactions among learners. Through interaction with instructors and fellow trainees, learners could get timely feedback on their use of SRL strategies, ultimately resulting in better learning outcomes.

Managers can further improve learning outcomes by fostering a cooperative norm in the workplace, which facilitates social forms of learning and encourages the use of online training resources such as discussion forums. By actively cultivating a cooperative norm, managers can also facilitate learners’ help-seeking behavior, which reduces some difficulties in learning.

Limitations and Future Research

A potential limitation of this study is our use of retrospective self-reported data for measuring learners’ SRL strategies rather than qualitative research methods such as structured diaries or direct observations. Although qualitative research methods can provide richer and more immediate descriptions of learners’ SRL learning processes, quantitative research methods that propose and validate new measurement scales and provide statistical results through model testing are equally important. Future research using multiple research methods could extend and deepen our knowledge of SRL processes in e-learning.

A second limitation is that data were collected using a cross-sectional survey; therefore, causal relationships described in the research model cannot be fully established. Future research would ideally use longitudinal data to capture learning processes over time. One interesting possibility with longitudinal data would be to examine the relationship between personal and social SRL strategy use as individuals move through the learning process. Also in our study, all the measures were self-reported. Because they would not be comparable across different learning topics, we did not use objective measures of employees’ training outcomes (e.g., exam scores). Future research studies using objective measures could potentially reduce some risks of cross-sectional survey design.

Nonresponse bias is sometimes a problem with Web-based surveys. However, a study investigating nonresponse in online employee surveys shows that nonresponse bias
is less a problem if the source of nonresponse is unrelated to the research topic [71]. Our study focuses on individuals’ learning processes and their effect on learning outcomes, and thus we did not measure the sorts of constructs that are typically related to the reasons people intentionally withhold participation, such as attitudes toward management or level of commitment to the organization. Hence, nonresponse bias is less likely to affect our results.

The common method bias often seen in survey design is also not an issue in this study. Common method bias was tested following a method suggested by Podsakoff and Organ [60]. All the scales used in the current study were examined in a factor analysis. The results of the principal component factor analysis revealed that there were 24 factors with eigenvalues greater than 1.0, which accounted for 83.6 percent of the total variance. Furthermore, the first factor identified did not account for the majority of the variance (only 20.5 percent). These results indicate that common method bias was not a serious problem in this study.

A third limitation of our study is that the data were collected at one organization in China, which may reduce the generalizability of the results to other settings or countries. However, the single-organization focus helps investigate individuals’ learning processes by controlling for potential disparities in the e-learning technologies adopted by different organizations in a multi-organization study. The single focus also helps to control for fundamental aspects of instructional design, such as the philosophic view of teaching, and eliminates other extraneous variations. Future research could include these factors after individuals’ learning processes are better understood.

Conclusions

This study was designed to gain a better understanding of individuals’ e-learning processes in organizational settings. We expanded on the theory of self-regulation by exposing social SRL processes in greater theoretical and empirical depth and then examined how the use of both personal and social SRL strategies contribute to e-learning processes and outcomes. Furthermore, the use of SRL strategies is influenced by several individual factors such as individuals’ virtual competence and goal orientation and by job and contextual factors such as intellectual demand and cooperative norms. The findings of this study can help e-learners obtain better learning outcomes by intentionally adopting appropriate SRL strategies to manage their learning processes. The results may also benefit organizations that want to improve their return on e-learning investments by (1) selecting e-learning systems with features that support both personal and social SRL strategies, (2) providing managerial interventions that persuade learners to adopt SRL strategies, and (3) cultivating cooperative norms that encourage social interaction among employees.

Notes

1. The identification and validation of social SRL strategies can be found in the following section.
2. Given the overlap (i.e., correlation) between the dimensions, we did consider modeling the two SRL strategy constructs as reflective. We rejected this notion, however, for two reasons. First, conceptually, the SRL strategy constructs are clearly formative as they are seen as arising from, rather than causing, their dimensions. Second, when formative constructs are misspecified as reflective, analysis has shown that structural model paths are significantly inflated [54]. Thus, converting our constructs would risk overstating the relationships between SRL strategies and learning outcomes.

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