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A System Dynamics-Based Interactive Learning Environment for Online Formative (Self-)Assessment of Wanna-Be Entrepreneurs' Performance Management Capabilities

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Abstract: Background: Many scholars emphasize the way in which sustained organizational development requires a shift in focus from the individual traits of the entrepreneur to the building of an organization that utilizes the collective contributions of its employees. To achieve this, entrepreneurs must adopt the role of a facilitator and empower their employees to perform at their best. There are numerous factors that influence one's decision to pursue a career in entrepreneurship, such as the beliefs and desires that individuals possess. Entrepreneurs possess diverse self-perceptions, and this plays a crucial role in their motivation to start a new business. Studies on entrepreneurial self-perception examine the elements, such as personal identity and capabilities—particularly the ability to effectively manage company drivers—which ultimately shape one's decision to embark on a new venture. Launching a startup is not merely an act; rather, it represents a substantial reflection of an individual's self-concept and identity. Consequently, an individual's perceived social identity has a substantial influence on their choice to pursue entrepreneurship, as they view the venture as an extension of themselves. Methods: An online interactive learning environment (ILE) designed to assess the performance management capabilities of wanna-be entrepreneurs, in accordance with the formative assessment paradigm, has been developed. Results: The procedures for carrying out the formative (self-) assessment of wanna-be entrepreneurs' performance management capabilities will be detailed. Two concrete assessment cases, with the aim of making clearer what kind of outcomes the ILE can generate, will be presented. Conclusions: The ILE could contribute in the encouragement of wanna-be entrepreneurs to participate in entrepreneurship educational programs.

Keywords: interactive learning environment; formative assessment; entrepreneurship; educational entrepreneurship; performance management capabilities

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1. Introduction

Many scholars have emphasized the way in which sustained organizational development requires a shift in focus from the individual traits of the entrepreneur to the building of an organization that utilizes the collective contribution of its employees (Zahra and Garvis 2000). While having a strong entrepreneurial personality is crucial for the initial survival and success of a venture (Ceresia and Mendola 2019, 2020), entrepreneurs who can effectively engage and leverage the talents and skills of their workforce are more likely to achieve positive outcomes for the organization (Shepherd et al. 2015).

To achieve this, entrepreneurs must adopt the role of a facilitator and empower their employees to perform at their best. By creating an environment that promotes collaboration, innovation, and continuous learning, entrepreneurs can channel their entrepreneurial characteristics towards driving organizational growth and success and promoting and optimizing employees' performance. This entails fostering a positive work environment, establishing explicit goals and objectives, allocating resources and offering support to employees, and implementing efficient processes and systems. A skilled entrepreneur acts as a facilitator, empowering and motivating employees to reach their maximum potential and ultimately bolstering the organization's overall performance. This approach aligns with the resolution of the ancient debate in the field of international entrepreneurship regarding whether individuals possess innate entrepreneurial traits or if their abilities, knowledge, and expertise are cultivated through education and practical experience. Scholars argue that education and training have a significant influence on entrepreneurial activity (Ceresia 2018). They propose that one can acquire the entrepreneurial role through cultural and experiential means, emphasizing the way in which entrepreneurship is not solely based on heritable skills, but is rather a discipline that can be learned (Gibb 1987; Lichtenstein and Lyons 2001; Shaw and Sørensen 2019). Therefore, specific education and training—entrepreneurship education (EE)—programs are decisive for the development of entrepreneurial abilities (Hahn et al. 2017; Nabi et al. 2017; Kuratko and Morris 2018; Bauman and Lucy 2019).

1.1. Entrepreneurial Skills, Competencies and Capabilities

The investigation of entrepreneurial skills is crucial in today's rapidly evolving business environment. As economies and industries undergo transformations, the demand for individuals with entrepreneurial skills continues to rise. These skills are essential for fostering innovation, driving economic growth, and creating job opportunities (Prufer and Prufer 2020). One of the primary reasons for the significance of identifying entrepreneurial skills is their role in driving innovation. Entrepreneurs excel at identifying gaps in the market and developing unique solutions to address them (Mayanja et al. 2021; Yeganegi et al. 2019). They possess a keen ability to identify opportunities, challenge the conventional norms, and think creatively (Zahra et al. 2006).

The entrepreneurial skill map, proposed by Pennetta et al. (2023), categorizes skills into four main groups: core entrepreneurial, managerial, technical, and personal. Core entrepreneurial skills empower individuals to identify market opportunities and take action by applying their ability to innovate; technical skills are industry-specific proficiencies that are vital for delivering products or services; personal skills enable entrepreneurs to be aware of, and responsive to, the business environment; finally, managerial skills involve essential capabilities for effectively managing and overseeing organizations on a daily basis.

1.2. Performance Management as a Key Managerial Skill for Entrepreneurs

Among the various managerial skills, performance management has been deemed as one of the most crucial for entrepreneurs to succeed. Performance management skills are crucial for entrepreneurs as they play a vital role in the success of their business ventures. These skills enable entrepreneurs to set clear goals, measure progress towards those goals, and make informed decisions based on performance data. Performance management skills are invaluable for entrepreneurs as they facilitate goal alignment, enhance productivity, support decision-making, promote employee engagement, ensure accountability and transparency, and drive continuous improvement. By actively managing performance, entrepreneurs can steer their businesses towards success and stay efficient, competitive, and resilient in a dynamic business environment (Aas and Alaassar 2018; Kokina et al. 2017; Sakhdari et al. 2020).

1.3. The Influence of Self-Perceptions and Beliefs on Entrepreneurial Entry Decisions

There are numerous factors that influence one's decision to pursue a career in entrepreneurship, contrary to the commonly held belief that personal wealth is the main motivator. These factors include various individual's beliefs and desires, which also play a significant role in determining whether they choose managerial roles instead. Entrepreneurs possess diverse self-perceptions, and this plays a crucial role in their motivation to start a new business. Studies on entrepreneurial self-perception examine the elements, such as personal identity and capabilities—particularly the ability to effectively manage company drivers—which ultimately shape one's decision to embark on a new venture. Launching a startup is not merely an act; rather, it represents a substantial reflection of an individual's self-concept and identity. Consequently, an individual's perceived social identity has a substantial influence on their choice to pursue entrepreneurship since they view the venture as an extension of themselves (Gatewood et al. 1995; Fauchart and Gruber 2011).

The main aim of this paper is to introduce an online system dynamics-based interactive learning environment (ILE) designed to assess the performance management capabilities of wanna-be entrepreneurs, in accordance with the formative assessment paradigm. Through a simulated business environment, participants have the opportunity to virtually manage their own company while taking on various roles that mirror real-life scenarios related to the HR-performance relationship. The ILE has a feature that allows the assessment of such capabilities by measuring key indicators that determine the feasibility, effectiveness, and efficiency of their decision-making when running a firm within a specific operational context. From this standpoint, implementing a practical approach that enables entrepreneurs to confidently evaluate their capabilities for managing organizational performance in a protected environment (simulations) would streamline the process of determining whether they possess the essential prerequisites for launching a new business with success.

The procedures for carrying out the (self-)assessment of wanna-be entrepreneurs' performance management capabilities will be detailed. Some concrete assessment cases will also be presented with the aim of making it clearer what kind of outcomes the ILE can generate. Finally, some considerations will be made regarding the contribution that this tool can offer in the field of talent management and for the purposes of encouraging wanna-be entrepreneurs to participate in entrepreneurship educational (EE) programs.

2. The Role System Dynamics-Based Interactive Learning Environments in Fostering Formative Assessment

2.1. System Dynamics-Based Interactive Learning Environment, Constructivism and Learning

Scholars agrees that learning occurs when learners actively engage with a system to reconstruct their mental models, beliefs, and habits (Phillips 1995; Pfeffer and Sutton 2000). Constructionists believe that it is crucial for learners to actively engage with the subject matter by experiencing and experimenting with it, instead of solely depending on the delivery of factual information, theories, formulas, and examples. They argue that learning is enhanced through feedback and an understanding of the consequences of our actions (Driscoll 2000). Transmission models of teaching do not offer this feedback, whereas interactive and constructionist approaches prioritize experimentation, which provides valuable feedback through close engagement with the material (Thomke 2003).

However, a major obstacle for the constructionist approach is that we cannot directly acquire practical knowledge or conduct experiments on crucial systems. In many cases, the impact of our decisions takes longer to manifest than the time available for learning, training, or even our own lifespan or career. Furthermore, there are certain scenarios where it is impractical or too costly and high-risk to conduct experiments, specifically when it is necessary to assess the consequences of ineffective utilization of company resources (Sterman 2014).

Simulations provide a potential solution to the problem since, by manipulating time and space, they can enable learners to simulate lengthy periods of time or significant events in a short span, such as simulating decades in the airline industry or a century of climate change within minutes. For addressing problems that require fast results, are expensive, unethical, or simply impossible to experiment with, simulations become the primary, and sometimes the only, means of understanding complex systems and identifying influential factors (Sterman 2014).

2.2. Formative Assessment and Learning

Many scholars recognize the importance of formative assessment and feedback in supporting learning (Black and Wiliam 2006). Research by Hattie (2012) shows that formative assessment is highly effective in promoting student achievement and that the integration of formative assessment into teaching enhances student performance. Formative assessment also facilitates the development of skills such as explaining, interpreting, and reasoning. Timely and informative feedback, provided through formative assessment, offers various benefits. Formative assessment plays a crucial role in a teacher's ability to adjust their lessons and ensure student comprehension. Formative assessment, also known as assessment for learning, refers to evaluations of student performance that are intended to help students achieve their learning goals (Spector et al. 2016). This is different from formative evaluation, which involves judging how to improve the effectiveness of a program over time. While summative assessments aim to judge how well students have learned at the end of a teaching sequence, formative assessments focus on forming judgments about students' progress in order to inform future instruction. Formative assessments, which provide timely and informative feedback to students, can be considered a form of learning or assessments as learning, as they aim to help students improve their understanding (Spector 2015).

Formative Self-Assessment

There are alternative ways to nurture student learning beyond the conventional feedback loop between teacher and student. In addition to teacher feedback, self-assessment and peer assessment play significant roles in providing valuable feedback that aids students in their improvement. Students can benefit from reflecting on their own performance or by providing feedback to their peers. This type of feedback, known as self-assessment and peer assessment, is a significant part of the assessment process. By combining evidence-centered design, formative assessment frameworks, and computerized assessments, teachers and students can enhance their learning experiences. These approaches also aid in the evaluation and validation of assessments through technology. According to Sadler and Good (2006), students need to develop the ability to evaluate their own work by recognizing and comparing it with high-quality work. This kind of self-assessment promotes meta-cognition and self-regulation skills, which are essential for effective learning.

2.3. System Dynamics-Based Interactive Learning Environment as a Tool for Formative Assessment

Ellis (2013) and other researchers have highlighted the historical limitation of improving formative assessment due to the prevalence of face-to-face courses, which has made it difficult to capture and analyze learning interactions and outcomes for formative feedback and assessment. With technological advancements, there are now countless opportunities to gather and analyze performance and assessment data. These data provide valuable insights into students' progress across various educational activities.

Certain automated systems, such as the system dynamics-based ILEs, have the capability to capture data. However, what is truly important is the effective utilization of this data, as it can greatly benefit both learners and teachers (Spector 2014; Spector et al. 2016).

3. Method

An online interactive learning environment (ILE) designed to assess the performance management capabilities of wanna-be entrepreneurs, in accordance with the formative assessment paradigm was developed.

3.1. The Theoretical Foundation of the ILE

The proposed ILE is focused on the high-performance cycle (HPC) model described by Locke and Latham (1990). The HPC is a conceptual model that explains workplace motivation by incorporating goal setting theory, and offers a foundation for implementing interventions (Latham and Locke 2007). In essence, the HPC asserts that an employee's motivation is influenced by particular obstacles and requirements, such as challenging and specific goals. The main relationships among model variables and the goal moderators and mediators are mentioned in Figure 1.

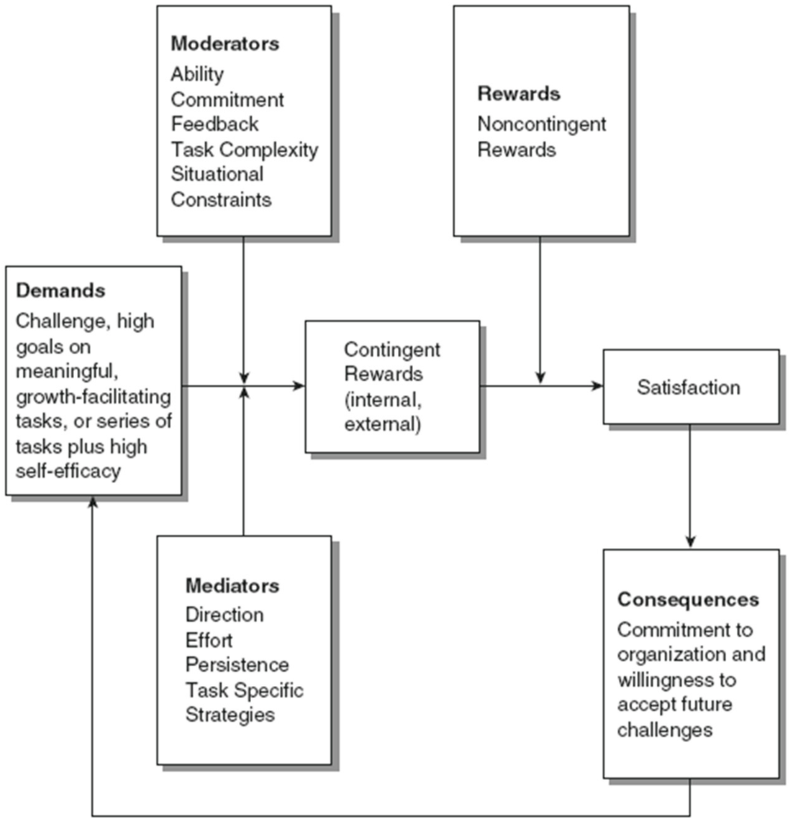

Figure 1. The high-performance cycle (HPC) model proposed by Locke and Latham (1990).

The impact of goals, expectancies, and self-efficacy on performance is widely recognized and has been comprehensively studied (Latham and Locke 1991; Locke and Latham 2002, 2004). Having high goals and self-efficacy increases individuals' perseverance in tasks compared with those with low goals and self-efficacy. Those with high goals are motivated to achieve their goals, while individuals with high self-efficacy have belief in their ability to succeed, which encourages them to persist even when faced with difficulties. High goals and self-efficacy also lead to greater effort and intensity in tasks that have time limits. Moreover, goals serve as a guiding force, directing attention and action towards actions that are relevant to achieving the goal, while disregarding actions that do not contribute to goal attainment. Additionally, goals inspire individuals to create plans in order to achieve their goals, which indirectly impacts performance. In a study involving a complex management simulation task, it was observed that both goals and self-efficacy enhance the quality of analytical strategies employed by participants, suggesting that goals, self-efficacy, and strategies all independently influence performance.

When individuals reach a certain level of performance, they may receive incentives or rewards, which can lead to certain outcomes. Numerous studies have shown that, when performance is rewarded under specific conditions (contingent rewards), it often results in satisfaction. It has been consistently observed that subjective reports of organizational commitment strongly correlate with satisfaction. When individuals are satisfied and content, they are more likely to show greater dedication and willingness to remain with the organization and embrace new opportunities. Therefore, when exposed to stimulating challenges, it is expected that their performance will be elevated (Latham and Locke 2007). The HPC offers an answer to the longstanding inquiry regarding the relationship between job satisfaction and performance. Contrary to asserting that job satisfaction has a direct influence on job performance, the HPC proposes that job satisfaction affects an employee's dedication to their organization, and that this devotion ultimately results in their willingness to tackle future challenges. Hence, the recursive aspect of the HPC, as depicted in Figure 1, is emphasized.

3.2. The Stucture of the ILE

The proposed ILE, called "Michele's Company", is an engaging online game designed for both single or multiple players. In this game, participants aim to achieve their assigned goals or analyze system behaviors resulting from the decisions they make.

3.2.1. The ILE Interface

The interface presents players with information regarding the company profile (Table 1), the tasks assigned to students in multiplayer games (Table 2), and the roles and responsibilities of team members in multiplayer games (Table 3). The ILE dashboard displays the current and assigned goals, as well as the values of various other variables, such as:

- Performance: current and expected (desired) performance;
- Performance moderators: employee goal commitment; employee competence; employee well-being and employee self-efficacy;
- Performance Mediators: personal goals; expectancy of goal attainment and performance beyond expectation effect;
- Income statement: revenues; costs and profit.

Table 1. Michele's company profile.

Michele lives in Paris and is 70 years old. For the past 50 years, he has worked as the CEO of the family business. The company was founded by his grandfather, Louis, in 1910 in a small warehouse on the outskirts of Paris. The company specializes in the production and wholesale of designer furniture. Under Michele's leadership, the company has experienced significant growth and has become a solid presence in the industry. As of 2022, the company had 900 employees and closed its balance sheet with a turnover of €81 million and a gross profit of just over €12 million. However, in the last 3 years, Michele has been feeling tired and, despite his reluctance, has decided to retire. Since he has no children or other interested relatives to take over the management of the company, he must choose between selling the company or appointing an external CEO. After much contemplation, Michele decides to appoint an administrator. His wife, Joanna, is in agreement with this decision. He knows that his husband would not tolerate the idea of seeing the company he has dedicated his entire professional life to close. Michele chooses to appoint engineer Joseph Dreyfuss as the new CEO. Joseph has been Michele's right-hand man for the past 15 years, and Michele has a great deal of trust in him. Since he does not intend to influence Joseph's managerial decisions, Michele tasks the new CEO with building his own team of executives in the field of human resources, which Michele has always considered to be strategic for achieving performance objectives. In 2018, the company acquired a simulation model, a business intelligence tool that allows for the estimation of future turnover based on decisions made by the company's management, with a particular focus on goal-oriented and strategic human resources development processes.
Engineer Dreyfuss is honored that Michèle chose him and feels a great sense of responsibility in leading the company towards a new phase of development. He recognizes the need to steer the company without Michèle's influence and decides to prioritize the development of an intervention plan in the field of human resources to improve company performance. He firmly believes that focusing on human resources is crucial in achieving corporate objectives. To implement his plan, engineer Dreyfuss appoints three new managers to head three specific areas within the human resources department: • Talent management area. • Organizational well-being area. • Personnel motivation area.
Together with the newly appointed managers, engineer Dreyfuss uses a simulator to carefully review and revise the company's human resource strategies. He promotes a collaborative approach to ensure that the new strategies align with the company's goals and objectives.

Table 2. The students' tasks (in the multiplayer game).

Some teams will be formed, each made up of four people. Each team's objective is to: • Identify the cause-and-effect relationships underlying the trends (behaviors or outcomes) displayed by the system. • Manage the directional levers and the five human resource practices in order to increase company results.

Table 3. Roles and responsibilities of TEAM members (in multiplayer game).

The four members of each team will elect the CEO. The CEO will appoint the following managers from among the remaining three people: • Talent manager. • Well-being manager. • Motivational manager. The CEO is responsible for coordinating the activities of the entire group and implementing assigned goals. The talent manager is tasked with planning talent acquisition strategies, developing internal promotion policies, and negotiating contracts and is also responsible for managing the following human resource practices: training, recruitment, and selection. The motivational manager oversees employees, helping them learn new skills, perform job tasks, and achieve shared goals and is responsible for the following human resource practices: employee involvement and reward system. The well-being manager is in charge of defining workplace well-being strategies and programs within the organization and is responsible for the following human resource practice: employee well-being.

The interface of the ILE displays a causal loop diagram (CLD) that illustrates the primary causal relationships among system variables. The CLD is a valuable tool for representing the feedback structure of systems and serves various purposes such as:

- Rapidly capturing ideas about the reasons behind dynamic behaviors.
- Gathering and documenting the cognitive models of individuals or teams.
- Conveying the important feedback loops that are thought to contribute to a problem.

3.2.2. The CLD of the ILE

A CLD includes variables connected by arrows, representing the causal influences between them. The diagram also identifies significant feedback loops. Figure 2 presents the causal loop diagram (CLD) of the ILE, illustrating the connections between variables through causal links depicted by arrows. Each causal link is given a polarity, either positive (+) or negative (-), to indicate how the dependent variable changes in response to changes in the independent variable. Additionally, the diagram highlights important loops by assigning loop identifiers, which differentiate between positive (reinforcing) or negative (balancing) feedback. A positive link suggests that an increase in the cause leads to a larger increase in the effect compared with what it would have been otherwise, while a decrease in the cause results in a greater decrease in the effect compared with what it would have been otherwise. Conversely, a negative link indicates that an increase in the cause leads to a decrease in the effect to below what it would have been otherwise, and a decrease in the cause causes an increase in the effect to a level above what it would have been otherwise.

In order to simplify the process of understanding the underlying feedback structure of the considered phenomenon (HPC), the causal loop diagram is drawn using the elements at the core of the stock-and-flow model. Moreover, some endogenous variables of the HPC model (such as contingent rewards) have been made exogenous in order to allow students to use them as human resource management practices on which to make decisions. The CLD provides valuable assistance to students as they seek to comprehend the intricacies of relationships within a system. These relationships are often non-linear and involve time delays between causes and effects.

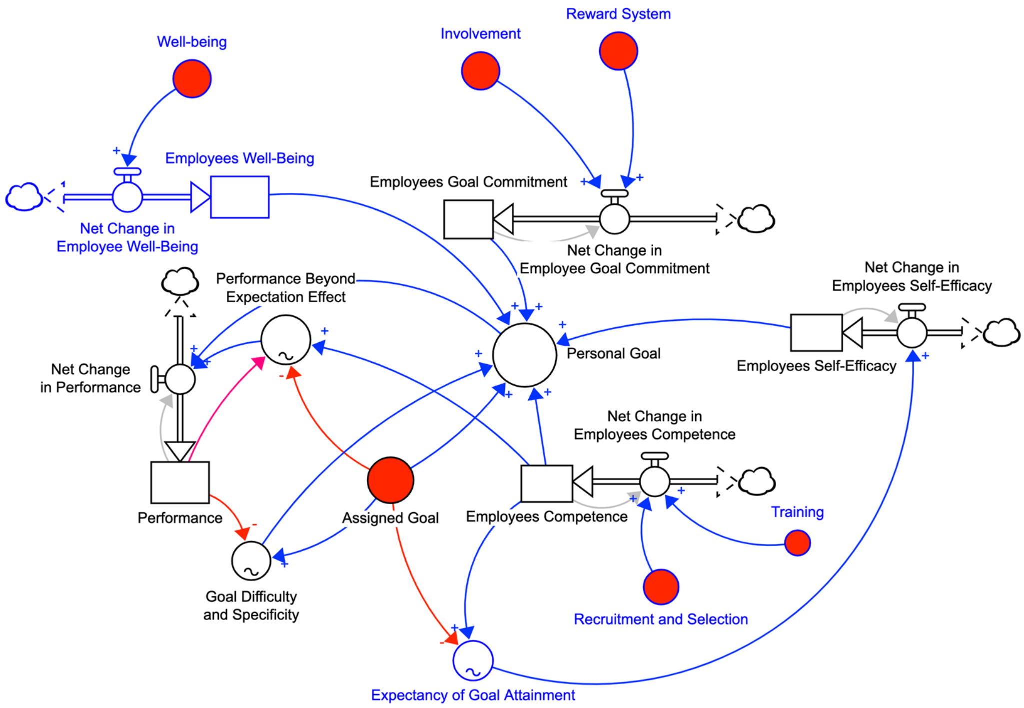

Figure 2. The causal loop diagram of the ILE.

Through the utilization of the CLD, students have the ability to effortlessly attribute importance to patterns (behaviors) that arise from the system. This includes considering the influence of scenario variables, such as current performance, and the decisions they make during the simulation. For a comprehensive understanding of the feedback structure of the ILE, please refer to the complete model equations outlined in Appendix A.

3.2.3. The ILE Dashboard

The simulation interface (Figure 3) encompasses both the user controls for manipulating the simulation and the visual outputs that display the effects of the simulation.

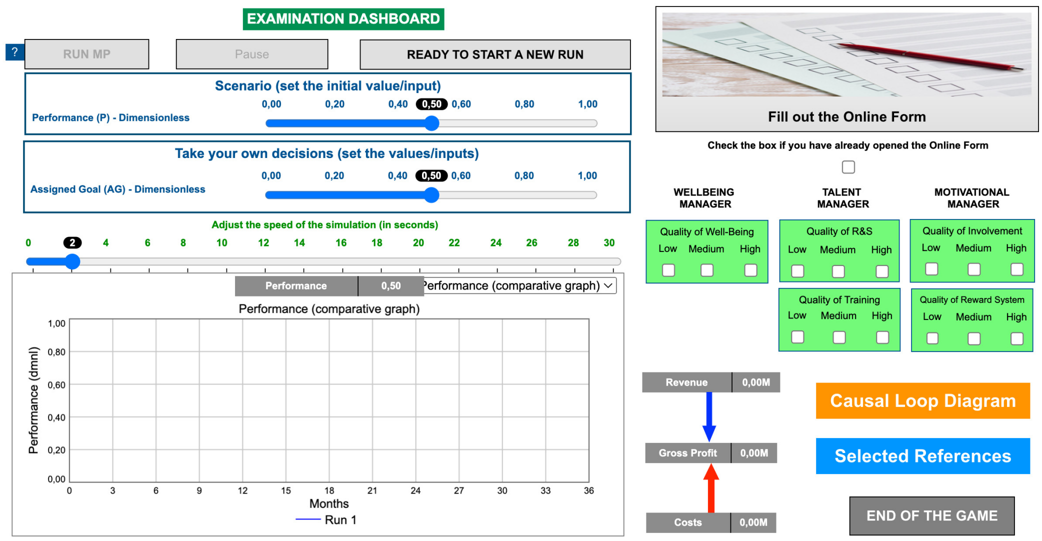

Figure 3. The ILE dashboard.

Another way to describe the simulation interface is to say that it acts as the channel through which simulation inputs and outputs are generated and illustrated.

During each run, player(s) make several types of decisions. They can: (a) change the initial value of the performance (scenario); (b) set the value of the assigned goal (expected or desired performance); or (c) manage the available human resource management practices to achieve the assigned goal.

At the conclusion of each run, the player(s) is required to fill out an online form, providing an explanation of the (theoretical) reasons for the system's behavior, based on the scenario and decisions made.

3.2.4. The ILE Features to Support the Online Formative Assessment Procedures

The online formative assessment is made possible by two main functionalities offered by the software (Stella Architect by isee System) with which the ILE was built and by the online platform that enables publishing the ILE on the web (isee Exchange): authentication and data collection.

Authentication enables the teacher to regulate access to one's simulations and grant entry exclusively to individuals (participants) of one's choosing. Instead of having the ability to effortlessly view one's published interface via a web browser, individuals will be required to log into the isee Exchange first. Additionally, they must have received an invitation from the teacher to access the simulation. If someone unauthorized tries to view one's published interface, they will encounter an error message.

Data collection is an effective method used to monitor and record user behavior during a published simulation. As users engage with the simulation, their activity is transmitted to the isee Exchange at various points, such as when the simulation is paused or upon its completion. The process of setting up data collection for multiplayer games is identical to that of single user simulations. As all players participate in the same run, the user's name is reported as the game's name or team name.

3.3. "Black Box" versus "Glass Box": Which Is More Beneficial for a System Dynamics-Based ILE?

The simulation activity is generally carried out after conceptually studying the phenomenon that is the subject of the simulation itself, in our case, HPC. However, this process can also be completely or partially reversed, thus allowing the participant to carry out simulations without having a preliminary and/or extensive knowledge of the underlying structure (cause-and-effect relationships between system variables and the value of parameters assigned to these relationships) that generates the observable behaviors of the system. The question of whether to anticipate (study) the theory and models of the considered phenomenon before inviting participants to launch the first simulations is related to the reflection on the didactic value of proposing an educational model characterized by an "glass box" or "black box" system.

The terms "black box" and "glass box" are used to describe the level of visibility into the structure of a system for the user. A black-box program only shows the inputs and outputs, while hiding everything in between. In contrast, a glass-box program allows the user to also see the internal workings (the feedback structure of the system).

Traditionally, the glass-box approach has been favored in education as it provides learners with full visibility into the system. However, in educational simulations, the opposite is often true. For simulations that aim to teach complex skills—such as performance management capabilities—or promote conceptual discovery, making the underlying model visible can hinder learning (Davidsen 1996; Spector et al. 2001). In these cases, a black-box approach may be more effective. However, providing learners with a transparent approach that allows them access to both causal and structural representations of a complex system is highly advantageous for learning. This transparency can be particularly helpful after an initial session of simulations, which are conducted without disclosing the underlying feedback structure of the system (Spector and Davidsen 1997).

Incorporating opportunities for reflection into the learning process enhances learning outcomes. This can be achieved by asking learners to explain their decisions in certain sentences. The act of pausing for reflection not only promotes interaction among small groups (teams), which aligns with the collaborative nature of the learning environment, but also prevents learners from merely manipulating parameters without fully grasping the complexities of the system. Although it may initially feel burdensome, this pause offers learners valuable chances to collaborate and reflect. Learners are encouraged to document alternative decisions and provide explanations for why they were not chosen. This is made possible by the ILE in multiplayer mode, enabling teams to temporarily exit the active game, make different decisions, project into the future, and then return to the game to finalize their decision.

4. Results

In this paragraph, the formative (self-)assessment potentialities of the ILE will be concretely illustrated. Students can easily access the ILE by logging into the isee Exchange platform. The ILE provides a diverse set of educational tools, including the CLD, papers, simulation dashboard, and charts. These tools are available for use in both single-player and multiplayer game modes.

4.1. Promoting Formative (Self-)Assessment through the ILE

The primary purpose of the ILE is to promote formative (self-)assessment, allowing users to run simulations and observe how the system reacts to their chosen scenarios and decisions. This enables participants to monitor and analyze the results, comparing different scenarios and decisions in order to evaluate the effectiveness of their strategies. In fact, during simulations, participants have the opportunity to actively intervene and modify system variables, observing how these changes impact overall performance. This allows for the experimentation and testing of different strategies and tactics in a risk-free environment. Simulations also provide the chance to explore hypothetical future scenarios and evaluate the long-term effects of current decisions. By taking this long-term perspective, participants can make more cautious decisions and adopt sustainable strategies, without the financial or operational risks associated with the real world.

Furthermore, participating in simulations helps students gain experience in making complex decisions and enhances their analytical and problem-solving skills. Overall, the ILE offers a safe and interactive platform for students to learn from their actions, make more informed decisions, and refine their decision-making abilities.

However, the authentication and data collection features of the platform also allow the teacher to carry out formative assessment. In fact, as already mentioned, the ILE allows the recording of the values that all of the variables of the system assume in the temporal horizon in which the simulation takes place (in this case, 36 months), including "directional" variables (that is, the managerial levers, such as assigned performance and the five human resource management practices) whose values can be modified at any time within the simulation's time range (36 months).

Comparing the behaviors exhibited by the system in the light of the decisions made by the participants with the explanations provided by them to justify these behavioral patterns, it becomes quite easy for the teacher to assess how well a student is able to master the subject matter.

4.2. Two Cases of Formative (Self-)Assessment

Two different simulation sessions consisting of four runs each were conducted in single-player mode using the proposed ILE. In each run, participants made decisions regarding scenario variables such as initial performance and assigned objectives, as well as model parameters like changes in assigned objectives and actions on human resource management levers.

The ILE displays the results of each run, including the performance achieved and the corresponding gross profit earned by the company over a 36 month period. Gross profit is determined by the difference between revenue generated and costs incurred. As costs include investments in human resource management practices, participants must consider not only which HR practices are most effective in achieving desired results, but also the sustainability of these investments and their ability to add value to the company.

The ILE also allows for both self-assessment and formative assessment, with a teacher or tutor interacting with participants to facilitate learning.

These simulations were conducted by the author solely for the purpose of demonstrating the process of (self-)formative assessment.

4.2.1. First Simulation Session

Before starting the simulation, the task given to the participant can be dual: (a) to optimize the company's resources in order to maximize the described performance and gross profit results or (b) to conceptually justify the trends shown by the variables of the business system in light of the decisions made, explicitly referring to the theory of HPC and goal setting.

These two tasks can also be assigned concurrently to a participant. Table 4 illustrates the results produced by each run of the first simulation session (performance values and gross profit realized by the company) in light of the decisions made by the participant.

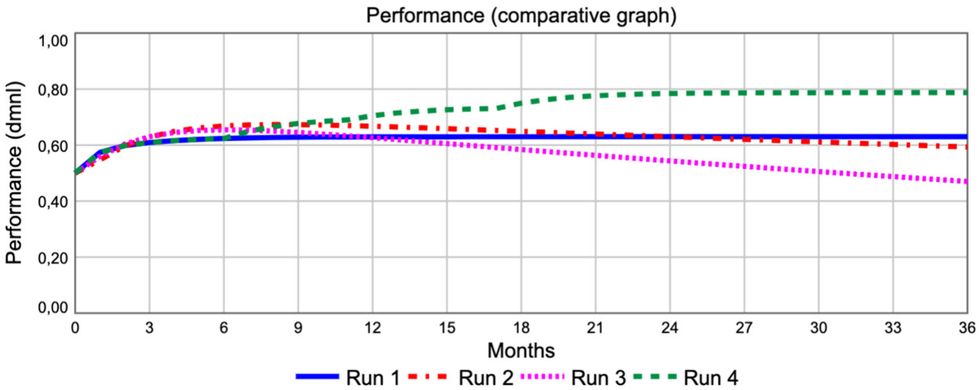

Figure 4. The graphs of the first simulation session.

Table 4. Overview of simulation results (first session).

RUN	Initial Condition	Change in						Results	Graphs
		AG	WB	T	I	RS	R&S		
1	P = 0.50; AG = 0.60							P = 0.63; GP = 15.12 M	See Figure 4
2	P = 0.50; AG = 0.80							P = 0.59; GP = 15.37 M	
3	P = 0.50; AG = 1.00							P = 0.59; GP = 13.93 M	
4	P = 0.50; AG = 0.60	0.8 T = 6°mo	M T = 16°mo	H T = 10°mo		M T = 10°mo		P = 0.79; GP = 16.73 M	

P = performance; AG = assigned goal (desired performance); T = time; mo = month; WB = well-being; T = training; I = involvement; RS = reward system; R&S= recruitment and selection; L = low; M = medium; H = high; GP = gross profit: M = millions of EUR.

Run #1

In this first run, the participant decides that the initial value of performance is 0.5 (all model parameters oscillate between 0 and 1) and that the assigned performance goal is 0.6. No decisions to modify the model parameters are made during the simulation. The results show a performance value of 0.63 and a gross profit value of 15.12 M.

The performance trend during the considered operating period (36 months) is shown in Figure 4. It can be observed that the model generates a performance value that not only reaches the set goal of 0.6 but even exceeds it. The student should therefore notice this unexpected deviation (although it can be qualified as positive for the company) and try to justify it based on the HPC theory and goal setting.

Specifically, the most appropriate reference would be the theory of performance beyond expectation (Bass 1985), which occurs when individuals are not only motivated (express a high level of organizational commitment and commitment to the assigned goal) but also believe they possess all the necessary competencies to achieve the goal, which is therefore perceived as realistically attainable. The more the student is able to justify the patterns produced by the system by making explicit and specific references to the scientific literature on the observed phenomenon, the more they demonstrate their progress in consolidating their learning.

Run #2

In this second run, the participant decides that the initial performance value is set at 0.5 and that the target performance to be assigned is 0.8. During the simulation, no decisions are made to modify the model parameters. The results show a performance value of 0.59 and a gross profit value of 15.37 M.

The trend of performance during the considered operating period (36 months) is shown in Figure 4. It can be observed that the model generates a performance value that does not reach the desired target (0.8), although the gross profit value exceeds that observed in Run #1.

The student should justify the significant deviation between assigned goals and achieved goals by referring to the goal setting theory, which highlights how a goal perceived as excessively challenging can demotivate individuals, as it is considered unattainable based on the company's current resources and professional abilities.

Furthermore, if the participant were to conduct a comparative evaluation of the results produced by Run #1 and Run #2, they may observe how setting goals that initially seem achievable can yield appreciable results only in the short and medium term (0–18 months), and then experience a dramatic drop in performance once it becomes evident that the assigned goals are unattainable.

This explains how the higher gross profit value obtained in Run #2 compared with Run #1 is a direct consequence of the significant initial effort made by the staff to achieve the (excessively challenging) goal, but at the cost of increasing demotivation and lack of confidence in achieving the assigned goals (from month 18 to month 36). The decision to assign a performance target of 0.8 starting from 0.5—in the absence of other decisions to support the achievement of such a challenging goal—should therefore be evaluated as unsustainable over time.

Run #3

In this third run, the participant decides that the initial value of performance should be set at 0.5 and that the assigned performance goal be set at 1 (maximum value). No decisions to modify the parameters of the model are made during the simulation. The results show a performance value of 0.59 and a gross profit value of 13.93 M.

The performance trend during the considered operating period (36 months) is shown in Figure 4. It can be observed that the model generates a performance value that does not reach the desired goal (1), and that the gross profit value is significantly lower than that observed in Run #2.

The student should justify this difference by attributing it to the higher speed in which the personnel in Run #3 perceive their inability to reach the objective, triggering dynamics of demotivation and distrust much earlier than in during Run #2.

Run #4

In this fourth run, the participant decides that the initial value of performance will be 0.5, and that the assigned performance target will be 0.6. During the simulation, decisions are made that modify the model parameters related to certain human resource management practices (employee well-being, training activities, and reward system). The results show a performance value of 0.79 and a gross profit value of 16.73 M.

The performance trend during the considered operational period (36 months) is shown in Figure 4. It can be observed that the model generates a performance value that is much higher than expected, along with a corresponding high gross profit value. These trends can be justified by referring to the theory of performance beyond expectation (insert bibliographic reference), as well as the positive role played by action on the moderators of the relationship between goals and performance (employee motivation, competence, and perceived well-being) through investment in human resource management practices (interventions on employee well-being, training activities, and enhancement of the reward system).

4.2.2. Second Simulation Session

Table 5 illustrates the results produced by each run of the second simulation session (performance values and gross profit realized by the company) in light of the decisions made by the participant.

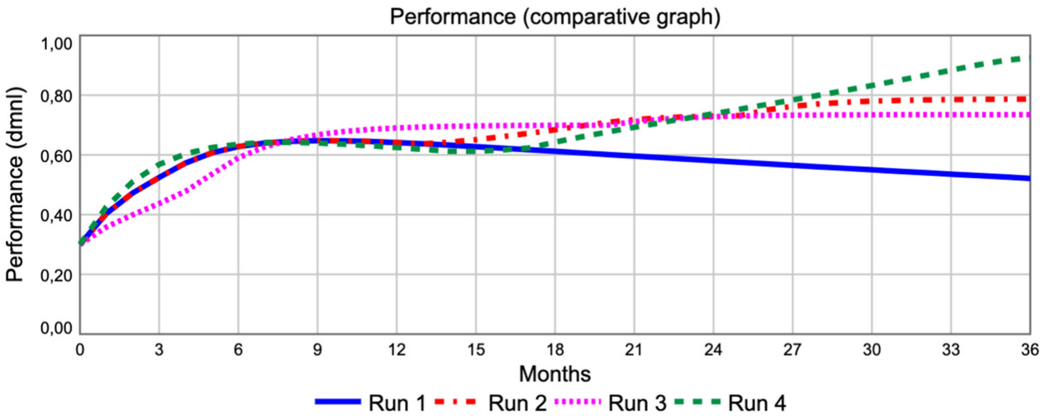

Figure 5. The graphs of the second simulation session.

Table 5. Overview of simulation results (second session).

RUN	Initial Condition	Change in						Results	Graphs
		AG	WB	T	I	RS	R&S		
1	P = 0.30; AG = 0.90							P = 0.52; GP = 14.00 M	See Figure 5
2	P = 0.30; AG = 0.90		H T = 16°mo	H T = 12°mo	M T = 24°mo		M T = 12°mo	P = 0.79; GP = 14.91 M	
3	P = 0.30; AG = 0.70	0.9 T = 12°mo	H T = 16°mo	H T = 18°mo	M T = 24°mo	M T = 18°mo	M T = 18°mo	P = 0.73; GP = 14.58 M	
4	P = 0.30; AG = 1.00	0.9 T = 12°mo	H T = 16°mo	H T = 12°mo	H T = 16°mo	H T = 12°mo	H T = 16°mo	P = 0.93; GP = 14.59 M	

P = performance; AG = assigned goal (desired performance); T = time; mo = month; WB = well-being; T = training; I = involvement; RS = reward system; R&S= recruitment and selection; L = low; M = medium; H = high; GP = gross profit: M = millions of EUR.

Run #1

In this first run of the second simulation session, the participant decides that the initial value of performance is set at 0.3 and assigns a performance target of 0.9.

During the simulation, decisions are made that modify the model parameters related to certain human resource management practices (worker well-being, training activities, commitment, and rewarding system). The results show a performance value of 0.79 and a gross profit value of 14.91 M. The performance trend during the considered operational period (36 months) is shown in Figure 5.

These trends should be justified by referring to the observations already made regarding the Run #3 of the first simulation session (Section 4.2.1, Run #3).

Run #2

In this second run, the participant decides that the initial value of performance is set at 0.3 and that the assigned performance target is 0.9. No decisions to modify the model parameters are made during the simulation. The results show a performance value of 0.52 and a gross profit value of 14.00 M. The performance trend during the operational period of 36 months is shown in Figure 5.

These trends should be justified by referring to the observations already made regarding Run #4 of the first simulation session (Section 4.2.1, Run #4), but it should be noted that the differences observed through the comparative evaluation between these two runs are due to the different timing of human resource management interventions.

The same considerations made for Run #2 (Section 4.2.2, Run #2) should also be made for the results obtained in Run #3 and Run #4 of this second simulation session (the performance trends during the operational period are shown in Figure 5).

5. Discussion

There are several obstacles that impede learning in complex dynamic systems. These obstacles stem from the intricate nature of the system itself, the long-term effects and possible delayed outcomes of decisions, and the existence of non-linear relationships within the system (Sterman 2000). However, the use of simulation-based learning environments can help overcome these barriers by compressing dynamics that would normally occur over extended periods of time. This allows for more effective learning in this domain by bypassing traditional obstacles. Sterman (2000) explains that the process of learning involves receiving feedback, but this process is hindered by several barriers in complex dynamic systems. Simulation-based learning environments can be instrumental in surmounting various obstacles, such as the intricacy of the system, the delayed effects of decisions, and the unforeseeable connections within it. These environments allow for compressing time and simulating dynamics that would otherwise occur over extended periods. Consequently, they help surmount traditional barriers, facilitating successful learning in this field.

5.1. The Transferability of the Adopted Methodology: Some Examples of ILE Applied to Different Contexts and Target Groups

The target of an interactive learning environment can vary depending on the specific context, but, generally, the goal is to provide learners with an engaging and effective way to acquire knowledge and develop skills in a particular subject or topic. Interactive learning environments can be used for various types of learners, from K-12 students to adults in corporate training programs, and can cover a wide range of subject areas, such as business management, mathematics, science, language learning, social sciences, entrepreneurial and vocational skills.

Some ILEs focused on different scientific domains are briefly presented below. This list is proposed merely as an example and without any claim to be exhaustive of the complexity and richness of the literature on the subject.

Bianchi and Bivona (2000) proposed an ILE that simulates the budgeting process of a small business. The aim of this ILE is to help learners grasp the concept of budgeting from a system-dynamics point of view, rather than relying solely on the traditional accounting perspective.

van Dijkum and Landsheer (2000) developed an ILE focused on juvenile criminal behavior. The significance of the domain lies in the fact that if an educational setting can successfully help young people understand the economic disadvantages of criminal activities, it could potentially make a significant impact on society as a whole.

The Sloan School of Management of the Massachusetts Institute of Technology has created six flight simulators focused on different scientific fields to facilitate the teaching of management principles through simulations. These simulators have distinct features, as briefly outlined in Table 6.

Table 6. The ILEs with some key attributes developed by the MIT Sloan School of Management (adapted from Sterman 2014).

ILE Title	Salt Seller	Eclipsing the Competition	Platform Wars	Fishbanks	CleanStart	World Climate
Strategic issues addressed	Pricing dynamics in imperfectly competitive markets	Strategy in the presence of learning curves and scale economies	Strategy in multisided platform markets; direct and indirect network externalities	Strategy for open access renewable resources	Entrepreneurship; marketing, product development, financing, employee ownership	Climate policy; negotiations; collective action
Scientific domains	Economics, strategy, decision making	Economics, strategy, technology and innovation, energy management, environmental management, sustainability	Economics, strategy, technology and innovation, system dynamics	Economics, strategy, negotiations, sustainability, environmental management, public policy, resource economics	Entrepreneurship, human resources, economics, strategy, sustainability	Economics, strategy, negotiations, sustainability, environmental management, public policy, resource economics

5.2. The Role Played by the Teacher and Learner in the Use of Interactive Learning Environments and the Benefits Generated for Them

The trainer and the learner using an interactive learning environment wears different "clothes" (roles) at the same time and they can also obtain appreciable benefits from using interactive learning environments, as respectively and briefly described in Tables 7 and 8.

Table 7. The different roles played by teacher and learner using ILE.

Trainer		Learner	
Facilitator	The role of a facilitator is crucial in the learning process. They act as a guide who introduces new information and concepts to learners, presenting it in a clear and organized manner. They break down complex topics into simpler parts and provide explanations and examples to help learners grasp the content. Facilitators also guide learners through different learning activities and exercises, ensuring they understand and apply what they have learned. They create a supportive and interactive learning environment where learners feel comfortable asking questions and seeking further clarification.	Self-Directed Learner	The individual sets learning objectives based on their career goals and job requirements, then creates a learning plan to achieve those objectives. They research and select courses, webinars, or books that align with their learning plan, and actively engage in the learning experience to acquire new knowledge and skills.
Assessor	The role of an assessor is to evaluate learners' progress and provide feedback on their performance. Assessors design and administer various forms of assessments, such as quizzes, assignments, projects, or exams, to gauge learners' understanding and mastery of the subject matter. They provide constructive feedback to learners, highlighting areas of strength and areas that need improvement. Assessors also assign grades or scores to learners' work, objectively measuring their competence. This role helps learners understand their strengths and weaknesses, encouraging them to focus on areas that require further development.	Participant and Collaborator	The individual participates in training sessions and interactive learning activities, asking thoughtful questions and actively contributing to discussions. They apply what they have learned to real-world scenarios, seeking out feedback and coaching to improve their performance. The individual works with their peers to solve problems and complete projects, sharing their expertise and supporting others' learning. They actively listen to feedback and apply it to improve their understanding of the subject matter.

Table 7. *Cont.*

Trainer		Learner	
Collaborator	The role of a collaborator is to foster a culture of collaboration and peer-to-peer interaction in the learning environment. Collaborators encourage learners to work together in groups, engaging in discussions, sharing ideas, and solving problems collectively. They create opportunities for learners to collaborate on projects, assignments, or group activities, promoting teamwork and the exchange of diverse perspectives. Collaborators facilitate effective communication and cooperation among learners, creating a supportive social environment that enhances the learning experience.	Referee and Self-Assessor	The individual provides constructive feedback to their peers, helping them to identify areas for improvement and offering suggestions for future learning opportunities. The individual regularly assesses their progress, identifying areas where they need to improve and setting new learning objectives. They seek out feedback from their peers and reflect on their own performance to adjust their learning strategy.
Advisor	The role of an advisor is to provide personalized guidance and support to learners. Advisors take into account learners' unique needs, interests, and goals, tailoring the learning experience to meet their specific requirements. They offer individualized advice on course selection, career planning, or further educational opportunities. Advisors also provide mentorship and counseling, helping learners overcome challenges, set realistic goals, and make informed decisions. By offering personalized guidance, advisors assist learners in maximizing their potential and achieving their desired outcomes.	Performer and Leader	The individual applies the knowledge and skills acquired during training to perform their job duties with proficiency and confidence, seeking out additional learning opportunities to stay up-to-date on best practices and trends. The individual shares their expertise with others, mentoring and coaching team members to improve their performance. They advocate for continuous learning and professional development within their organization, encouraging their peers to adopt these learning styles as well.

Table 8. The different benefits for teacher and student using ILE.

Trainer		Learner	
Enhanced Student Engagement	Interactive learning environments actively involve learners, promoting better educational outcomes and improved student engagement, which, in turn, ensures that learners have a better learning experience.	Personalized Learning	Interactive learning environments can adapt to suit learners' individual learning styles, making the learning experience more personalized and effective
Real-time Assessment	Interactive learning environments provide instant feedback to learners, which helps instructors to identify areas that require attention and adjust their teaching strategies accordingly.	Interactive Learning Experience	Interactive learning environments offer learners the opportunity to engage actively in the learning process, facilitating better retention of knowledge.
Increased Efficiency	Interactive learning environments enable instructors to manage larger class sizes, delivering content more efficiently and cost-effectively.	Real-time Feedback	Interactive learning environments provide learners with instant feedback, which helps them to identify gaps in their knowledge and improve immediately.
Improved teaching skills	Interactive learning environments allow instructors to refine and practice their teaching skills, with vicariously gained role-playing experiences.	Collaborative Learning	Interactive learning environments encourage learners to work collaboratively, which has proven benefits for memory retention and enhanced peer learning.

As highlighted in Tables 7 and 8, ILEs offer significant benefits for both the instructor and the learner. Instructors can manage larger class sizes, assess learners' progress in real-time, practice their teaching skills, and provide learners with personalized learning experiences. Learners, on the other hand, can engage actively in the learning process, receive real-time feedback, and benefit from collaborative learning experiences. The interactive learning environment offers an immersive and engaging experience that maximizes the learning potential of both parties (Solórzano-García et al. 2022; Yen and Lin 2022).

Furthermore, because the ILE in single-player mode invites the student to manage multiple directional levers and that the ILE in multiplayer mode encourages them to discuss and agree with their colleagues over the strategies to adopt in order to achieve the expected objectives, this teaching methodology stimulates the development of plural-entrepreneurial abilities in the student (Burger-Helmchen 2008).

6. Conclusions

The paper presents a new interactive learning environment that aims to improve the skills and knowledge of aspiring entrepreneurs in effectively managing complex performance management capabilities. This environment plays a crucial role in guiding and supporting the formative self-assessment process for these individuals.

The ILE utilizes causal feedback loop diagrams, which incorporate the stock and flow "language" to visually demonstrate the interconnectedness of various elements within the system. This diagram helps learners better understand the structure of the model and how it influences the behavior of the system. These features of ILE enhance the users' formative self-assessment process.

This ILE has the potential to enhance learning and knowledge transfer in performance management through the application of a system dynamics model and simulation. As a result, it could be effectively utilized in entrepreneurship education programs. In fact, the ILE encourages users to engage in formative self-assessment by running simulations and observing how the system responds to their chosen scenarios and decisions. This allows participants to assess and analyze the outcomes, comparing various scenarios and decisions to gauge the effectiveness of their entrepreneurial strategies. During simulations, participants can actively intervene and modify variables within the system, witnessing how these changes impact overall performance. Simulations also provide the opportunity to explorhe ypothetical future scenarios and assess the long-term consequences of present decisions.

To further advance the development of this educational methodology, the next phase would involve expanding the system barriers by including additional significant variables from the HPC model. These variables could encompass proximal and distal learning and performance goals, personality variables, and the framing effect. Alternatively, integration with other pertinent entrepreneurial components, such as opportunity assessment decisions, decisions pertaining to exploiting opportunities, and entrepreneurial exit decisions, should also be considered. These enhancements could further incentivize wanna-be entrepreneurs to participate in entrepreneurship educational programs.

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Appendix A. Full Model Equations

Variable Name	Equation	Properties	Units
Stock variables			
Costs(t)	Costs(t − dt) + (Costs_Inflow) × dt	INIT Costs = 0	EUR
Employees_Competence(t)	Employees_Competence(t − dt) + (Net_Change_in_Employees_ Competence) × dt	INIT Employees_Competence = 0.7	Dimensionless
Employees_Goal_Commitment(t)	Employees_Goal_Commitment(t − dt) + (Net_Change_in_Employee_Goal_ Commitment) × dt	INIT Employees_Goal_Commitment = 0.7	Dimensionless
"Employees_Self-Efficacy"(t)	"Employees_Self-Efficacy"(t − dt) + ("Net_Change_in_Employees_ Self-Efficacy") × dt	INIT "Employees_ Self-Efficacy" = 0.7	Dimensionless
"Employees_Well-Being"(t)	"Employees_Well-Being"(t − dt) + ("Net_Change_in_Employee_ Well-Being") × dt	INIT "Employees_ Well-Being" = 0.7	Dimensionless
Performance(t)	Performance(t − dt) + (Net_Change_in_Performance) × dt	INIT Performance = 0.5	Dimensionless
Revenue(t)	Revenue(t − dt) + (Revenue_Inflow) × dt	INIT Revenue = 0	EUR
Flow variables			
Costs_Inflow	(Revenue_Inflow × 0.85) + (Overall_effort_for_HR_practices × Cost_for_HR_practice)/Time_to_Costs		EUR/Months
Net_Change_in_Employee_ Goal_Commitment	MIN(1 − Employees_Goal_Commitment; Reward_System + Involvement) /EGC_ Adjustment_Time		Dimensionless/ Months
"Net_Change_in_Employee_ Well-Being"	MIN(1 − "Employees_Well-Being"; "Well-being")/WB_Adjustment_Time		Dimensionless/ Months
Net_Change_in_Employees_ Competence	MIN(1− Employees_Competence; (Training + Recruitment_ and_Selection))/EC_Adjustment_Time		Dimensionless/ Months
"Net_Change_in_Employees_ Self-Efficacy"	MIN(1 − "Employees_Self-Efficacy"; ("Employees_Self-Efficacy" × Expectancy_of_Goal_Attainment × "EGA_on_S-E_Effect")-"Employees_ Self-Efficacy")/"E_S-E_ Adjustment_Time"		Dimensionless/ Months
Net_Change_in_Performance	((Personal_Goal × Performance_Beyond_Expectation_Effect) − Performance)/Performance_ Adjustment_Time		Dimensionless/ Months
Revenue_Inflow	(Performance × Revenue_ for_Performance)/Time_to_Revenue		Euros/Months

Variable Name	Equation	Properties	Units
	Auxiliary and input variables		
Activate_1_YR_PAUSE	0		Dimensionless
Activate_I[Low]	−0.2 × "Activate_I-Low"		Dimensionless
Activate_I[Medium]	0.05 × "Activate_I-Medium"		
Activate_I[High]	0.2 × "Activate_I-High"		
"Activate_I-High"	0		Dimensionless
"Activate_I-Low"	0		Dimensionless
"Activate_I-Medium"	0		Dimensionless
Activate_R&S[Low]	−0.1 × "Activate_R&S-Low"		Dimensionless
Activate_R&S[Medium]	0.05 × "Activate_R&S-Medium"		
Activate_R&S[High]	0.1 × "Activate_R&S-High"		
"Activate_R&S-High"	0		Dimensionless
"Activate_R&S-Low"	0		Dimensionless
"Activate_R&S-Medium"	0		Dimensionless
Activate_RS[Low]	−0.2 × "Activate_RS-Low"		Dimensionless
Activate_RS[Medium]	0.05 × "Activate_RS-Medium"		
Activate_RS[High]	0.2 × "Activate_RS-High"		
"Activate_RS-High"	0		Dimensionless
"Activate_RS-Low"	0		Dimensionless
"Activate_RS-Medium"	0		Dimensionless
"Activate_T-High"	0		Dimensionless
"Activate_T-Low"	0		Dimensionless
"Activate_T-Medium"	0		Dimensionless
Activate_Training[Low]	0 × "Activate_T-Low"		Dimensionless
Activate_Training[Medium]	0.1 × "Activate_T-Medium"		
Activate_Training[High]	0.2 × "Activate_T-High"		
Activate_WB[Low]	−0.2 × "Activate_WB-Low"		Dimensionless
Activate_WB[Medium]	0.05 × "Activate_WB-Medium"		
Activate_WB[High]	0.2 × "Activate_WB-High"		
"Activate_WB-High"	0		Dimensionless
"Activate_WB-Low"	0		Dimensionless
"Activate_WB-Medium"	0		Dimensionless
Assigned_Goal	0.5		Dimensionless
Cost_for_HR_practice	2,500,000		EUR/ Dimensionless
"E_S-E_Adjustment_Time"	1		Months
EC_Adjustment_Time	1		Months
"EGA_on_S-E_Effect"	IF Expectancy_of_Goal_Attainment = 1 THEN ("Employees_Self-Efficacy" + (1 − "Employees_Self-Efficacy")) × 1.02 ELSE 1		Dimensionless
EGC_Adjustment_Time	1		Months

Variable Name	Equation	Properties	Units
Expectancy_of_Goal_Attainment	GRAPH(MIN(1; (Employees_Competence/Assigned_Goal))) Points: (0.5000, 0.98), (0.5500, 0.982), (0.6000, 0.984), (0.6500, 0.986), (0.7000, 0,988), (0.7500, 0.99), (0.8000, 0.992), (0.8500, 0.994), (0.9000, 0.996), (0.9500, 0.998), (1.0000, 1)		Dimensionless
Goal_Difficulty_and_Specificity	GRAPH(Assigned_Goal/Performance) Points: (0.000, 1.000), (0.125, 1.000), (0.250, 1.000), (0.375, 1.000), (0.500, 1.000), (0.625, 1.000), (0.750, 1.000), (0.875, 1.000), (1.000, 1.000), (1.125, 1.077), (1.250, 1.189), (1.375, 1.000), (1.500, 0.900), (1.625, 0.776630599122), (1.750, 0.733049523696), (1.875, 0.702415575137), (2.000, 0.679)		Dimensionless
Gross_Profit	Revenue-Costs	REPORT IN TABLE AS STOCK	EUR
Involvement	MIN((1 − Employees_Goal_Commitment); SUM(Activate_I))		Dimensionless
Online_Form_is_active	0		Dimensionless
Overall_effort_for_HR_practices	"Well-being" + Involvement + Training + Reward_System + Recruitment_and_Selection		Dimensionless
Performance_Adjustment_Time	3		Months
Performance_Beyond_Expectation_Effect	GRAPH(IF Employees_Competence > Assigned_Goal AND Assigned_Goal >= 0.6 THEN Performance × 2 ELSE 0) Points: (0.7000, 1), (0.7300, 1.005), (0.7600, 1.01), (0.7900, 1.015), (0.8200, 1.02), (0.8500, 1.025), (0.8800, 1.03), (0.9100, 1.035), (0.9400, 1.04), (0.9700, 1.045), (1.0000, 1.05)		Dimensionless
Personal_Goal	MIN(MIN(MIN(MIN((Assigned_Goal × Goal_Difficulty_and_Specificity); Employees_Competence); Employees_Goal_Commitment); "Employees_Well-Being"); "Employees_Self-Efficacy")	REPORT IN TABLE AS STOCK	Dimensionless
Recruitment_and_Selection	MIN((1 − Employees_Competence); SUM(Activate_R&S))		Dimensionless
Revenue_for_Performance	4,500,000		EUR/ Dimensionless
Reward_System	MIN((1 − Employees_Goal_Commitment); SUM(Activate_RS))		Dimensionless
Sim_Duration	2		Seconds
TIME_GAME	TIME × Activate_1_YR_PAUSE		Months
Time_to_Costs	1		Months
Time_to_Revenue	1		Months
Training	MIN((1 − Employees_Competence); SUM(Activate_Training))		Dimensionless
WB_Adjustment_Time	1		Months
"Well-being"	MIN((1 − "Employees_Well-Being"); SUM(Activate_WB))		Dimensionless

Run Specs	
Start Time	0
Stop Time	36
DT	1/1
Fractional DT	True
Save Interval	1
Sim Duration	36
Time Units	Months
Pause Interval	0
Integration Method	Euler
Keep all variable results	True
Interaction Mode	Flight Simulation
Run By	Run by Module
Calculate loop dominance information	False

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