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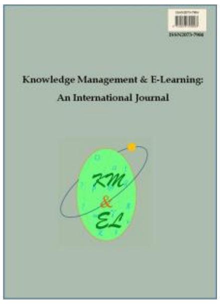

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Classroom or online learning? Impact of experiential learning in business process management education

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Abstract: This paper presents an empirical study with 150 graduate students at a business school to analyse the educational impact of experiential learning about process-oriented thinking in the classroom versus online learning setting. The results show that both learning settings are effective in increasing student performance but the increase in student performance in the face-to-face setting is twice as much as that in the e-learning setting. While learning time has no impact on student performance in this study, active engagement in the learning process has a positive impact in the online learning setting, but not in the face-to-face setting. Contrary to general findings, the results of this study indicate that a face-to-face setting is preferable for experiential learning about process-oriented thinking. Practical implications are that online learning can be used for general understanding while classroom learning is preferred for deeper understanding in the context of experiential learning about process-oriented thinking.

Keywords: Process orientation; Experiential learning; e-Learning; Classroom learning

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1. Introduction

Business process management (BPM) is a concept how to manage activities for production and service delivery effectively within organizations. Learning the logic of process orientation by employees (including graduate students as future employees) is a key to apply BPM to organizations. The logic of process orientation comprises how processes and a process-oriented organization across function should be designed (Hammer & Champy, 1993; Harmon, 2019; Tang, Pee, & Iijima, 2013). Understanding this logic allows to understand BPM concepts better and to apply these concepts properly. Although business processes have been the subject of curricula in many business schools for a long time, graduates are found to have insufficient process-oriented thinking and inadequate process management capabilities (Seethamraju, 2012).

Thus, understanding how the logic of process orientation can be taught is of major importance for practice as well as for research (Brazanga & Korac-Kakabadse, 2000).

Literature on learning the logic of process orientation is still rare. Most work has been done on learning to work in a specific process with the aim to perform work efficiently from the very beginning. Authors either developed conceptual models about how to achieve this goal with a specific learning style (e.g., Krumeich, Wert, & Loos, 2012) or provided empirical evidence on different learning modes (e.g., Letmathe, Schweitzer, & Zielinski, 2011). While being very practical, the focus of such work is on teaching specific process execution knowledge. Furthermore, the results cannot be transferred to other domains as the usefulness of a learning style in general is context-dependent (Sadeghi et al., 2012).

Within the domain of process-oriented thinking, there is empirical evidence that experiential learning is superior to using documents and having no learning support (Leyer, Hirzel, & Moormann, 2015, 2018; Leyer & Wollersheim, 2013; Wollersheim, Leyer, & Spörrle, 2016). However, experiential learning organized in the classroom setting has been limited by physical constraints in these studies. E-learning, featured by its flexible and rich learning environments, provides an alternative for implementing experiential learning (de Figueiredo & Mauri, 2013). By virtue of its benefits of just-in-time delivery, universal accessibility, and cost efficiency and also driven by the Covid pandemic e-learning is being increasingly adopted in educational institutions and organizational environments (Armstrong & Sadler-Smith, 2008; Turnbull, Chugh, & Luck, 2021). However, further studies are needed to investigate the effects of these methods on learning performance in the respective learning domains (Aljawarneh, 2020; Arbaugh, Dearmond, & Rau, 2013). Hence, the research objective of this contribution is which effects experiential learning via e-learning has in order to learn the logic of process orientation.

We conduct an experimental study with coherent learning groups in identical classroom and e-learning settings in the area of learning process-oriented thinking. Our findings show that a classroom setting is superior to e-learning in this context. We conclude that the nature of the subject requires face-to-face interaction to understand and learn such a complicated content, which is a major contribution of this paper.

The article is organized as follows: In section 2 we provide the theoretical background covering the context "process orientation" as well as the method "experiential e-learning". Based on theoretical arguments we then derive our hypotheses. Section 3 describes the setting of the implemented training program including curriculum and learning procedure. The subsequent methodology to evaluate the learning results of participants is described in section 4. In section 5, the results are presented including the results regarding our hypotheses. The results are discussed in section 6 and a conclusion is drawn in section 7.

2. Theoretical background

2.1. Dimensions of process orientation

The logic of process orientation covers how processes should be designed and executed in an organization (Davenport & Short, 1990; Hammer, 2001; Hammer & Champy, 1993; Harmon, 2019; Rosemann & vom Brocke, 2015). This idea involves the organization as a whole, i.e. the network of processes, employees, machines, and IT systems (Lindau, 1997). According to this view, organizations should be designed along their value chain processes. The dimensions that can be identified to describe process orientation are depicted in Fig. 1.

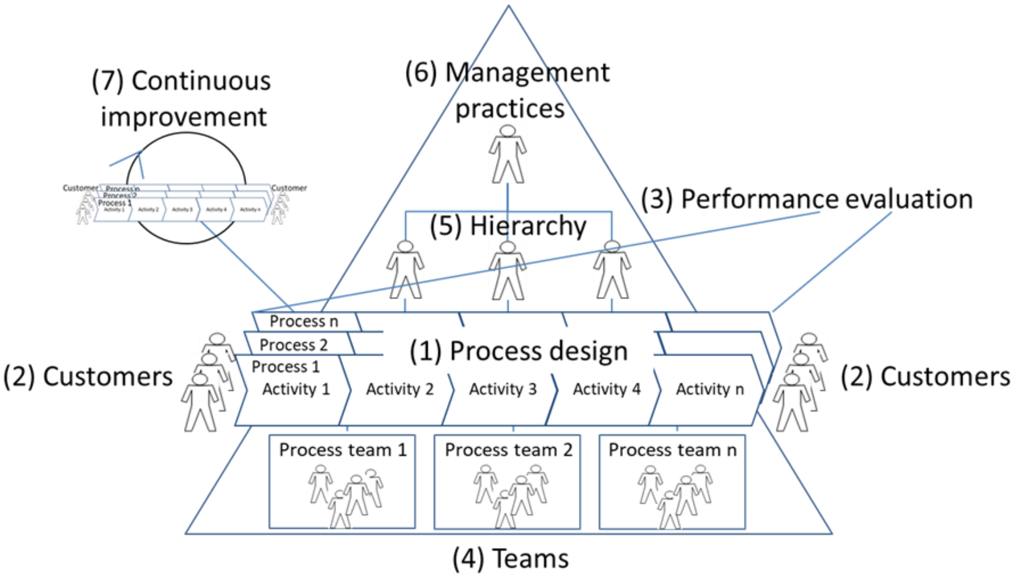

Fig. 1. Dimensions of process orientation, Adapted from Leyer et al. (2014)

The dimensions can be described as follows (Davenport & Short, 1990; Hammer & Champy, 1993):

(1) *Process design*: Tasks within a process should be ordered properly, handovers and employees involved are kept to a minimum, and goals are aligned to one category such as time, cost, or quality (Leyer & Wollersheim, 2013).

(2) *Customers*: Starting and end point for a process should be the customer, i.e. his order (Bowen & Youngdahl, 1998). The process should then include every activity that is necessary to fulfill the order (service or product delivery).

(3) *Performance evaluation*: The individual goals of employees to evaluate their performance should be aligned to the goals of the process the employees are working in (Piercy & Rich, 2009).

(4) *Teams*: Team building should avoid arranging employees according to functions (de Souza & Pidd, 2011).

(5) *Hierarchy*: The number of hierarchical levels ranging from team members to the top management should be kept to a minimum (Hammer & Champy, 1993).

(6) *Management practices*: Managers in the hierarchy should mainly be coaches enabling the employees to perform the tasks independently (Jolayemi, 2008). Accordingly, the operative working time of managers should be kept to a minimum.

(7) *Continuous improvement*: Permanent improvement of processes should be cross-functional to avoid uncoordinated improve¬ments. In the latter case, for example, there might be no effect for customers if the bottleneck is not in the part of the process that is improved (Maleyeff, 2009).

2.2. Experiential learning

Experiential learning or learning by doing is not a new instructional theory and has been promoted and applied in educational practice for decades. Through experiential learning, learners have more opportunities to be involved in and reflect on the experience, and make meaning from the experience (Arbaugh et al., 2013). Experiential learning is particularly important for learning of tacit and highly contextualized knowledge (e.g., business process knowledge), that is usually embedded in practical experience, and is more procedural rather than declarative in structure (Sternberg & Horvath, 1999). By situating learning in concrete experiences, learners can shape and make explicit their knowledge in a specific context via active exploration, meaningful reflection, and explicit articulation with expert support (Gherardi, Nicolini, & Odella, 1998).

In business education, experiential learning has become increasingly important as graduating students are expected to build skills at all levels within the business and professional environment (McCarthy & McCarthy, 2006). Experiential learning has now been regarded as a key component for many business programs, although its effects on improving learners' knowledge and skills were not widely reported (Clark & White, 2010). In the context of business process management, experiential learning is considered promising since business processes are complex in most situations and knowledge for managing business processes remains tacit and highly embedded in work practices. Studies in the domain of process orientation focus on role play simulations as an effective approach to improve student learning of improvement methods for business process management in addition to facilitating student engagement and social learning (Börner, Moormann, & Wang, 2012; Leyer et al., 2018). Other studies reported that the learning-by-doing approach was more effective than using documented knowledge for student learning of process-oriented thinking (Leyer & Wollersheim, 2013) and that a combination can be beneficial, but should include learning-by-doing (Wollersheim et al., 2016). Other work highlighted the benefits of experiences with action learning focusing on the related domain of business engineering (Leyer & Moormann, 2017; Moormann, 2015). Empirical evidence regarding experiential learning informs about the benefits of experiential learning for process-oriented thinking but falls short, however, in terms of e-learning.

2.3. e-Learning for experiential learning

The effectiveness of e-learning has been repeatedly reported that learning outcomes between face-to-face and online learning usually do not differ significantly (Bernard et al., 2004; Means et al., 2009; Tallent-Runnels et al., 2006). Only the meta-review of Sitzmann et al. (2006) shows that e-learning allows for a stronger learning effect regarding declarative knowledge. Thus, online learning appears attractive for cost and convenience reasons as long as it is as effective as classroom learning.

With respect to experiential learning, e-learning offers flexible ways for learners to receive extensive experience and to work with peers independent of place and time. New learning media or environments such as virtual reality and computer simulations allow learners to access critical situations that may not occur frequently or would be too expensive or too dangerous in reality. Virtual worlds and immersive simulations were reported to bring considerable changes in engaging learners into authentic learning contexts and activities (Dede, 2009). Computer simulations were found to lead to higher levels of acquisition of domain knowledge than more direct forms of instruction in many studies (Smetana & Bell, 2012). Meanwhile, it is noted that experiential learning requires learners to work with multiple information in complex processes that may place high cognitive demand on learners; more attention should be given to guidance and feedback that facilitate the learning process (Kirschner, Sweller, & Clark, 2006).

2.4. Hypotheses

The focus of e-learning does not only involve the adoption of new technology together with its impact on learning and instruction, but also the instructional strategies and methods for an effective integration of new technology and learning programs (Graham, 2011; Redpath, 2012). The main concerns related to e-learning may include learner engagement, accommodation of diversified learning needs, support of self-directed learning, facilities for virtual collaboration, etc. With respect to experiential learning, e-learning allows for flexible ways for learners to access task-oriented learning activities, to reflect on their actions, and to discuss issues and problems with fellow members in a learning community (Wang et al., 2013).

As prior work (Feng et al., 2012; Wang et al., 2013) proposes a positive effect of e-learning in an experiential learning program, the following hypothesis is formulated:

H1: Applying e-learning in an experiential learning environment for learning the logic of process orientation leads to a significant increase of the learning effect.

Comparing the effectiveness of learning between online and face-to-face settings, meta-analyses (Bernard et al., 2004; Means et al., 2009; Tallent-Runnels et al., 2006) show that typically pure online instructions are similarly effective as classroom settings. The exception on declarative knowledge discovered by Sitzmann et al. (2006) is not relevant for understanding the logic of process orientation as it can be assigned to procedural knowledge.

Based on these general findings we formulate the following hypothesis:

H2: An e-learning setting leads to the same learning effect as a face-to-face setting regarding experiential learning of the logic of process orientation.

The meta-analysis of Means et al. (2009) also considers learning time of participants as an important moderator of learning performance. The analyzed studies show that more time spent leads to a higher learning effect in average. In other learning contexts, learning time is also considered as being important to be analyzed (Watson & Sutton, 2012). Thus, the third hypothesis is formulated as follows:

H3: The more learning time participants invest in the e-learning setting the higher is the learning effect regarding the logic of process orientation.

Additionally, in experiential learning, learners shape and make explicit their knowledge within a social environment (Centobelli & Cerchione, 2023; Chu, Wang, & Yuen, 2011; Gherardi et al., 1998; Lave, 1988; Wenger, 1998). The authors highlight that a higher social exchange leads to better learning results. This connection is reflected in the fourth hypothesis:

H4: The more exchange with other participants the higher is the learning effect regarding the logic of process orientation.

3. Training program for learning the logic of process orientation

3.1. Design of the curriculum

Participants were asked to perform a series of tasks that are based on the dimensions of generic process knowledge defined in section 2.1. Table 1 gives an overview on the linkage between tasks and dimensions.

Table 1
Overview on the experiential tasks

Number	Dimension	Experiential tasks
1	Process design	Order activities, assign roles to activities, set goals for roles in activities
2	Customers	Identify where the customer is relevant
3	Performance evaluation	Select goals for performance evaluation
4	Teams	Form teams with employees
5	Hierarchy	Select a hierarchical structure in which the teams are operating
6	Management	Define type of average workload of managers
7	Continuous improvement	Select projects for continuous improvement

The tasks regarding the process design, i.e., dimension 1, followed the approach of Leyer and Wollersheim (2013) from which also the training example has been adapted (Fig. 2). The participants were asked to rank predetermined activities to define a meaningful process. Having done this, a role should be assigned to each activity. The possible roles were provided, but it was not necessary to assign every one of them. The last step was to define goals that the employees should follow while performing the respective activities to achieve a high efficiency. Goals had to be assigned freely and the same goal could be assigned to more than one activity.

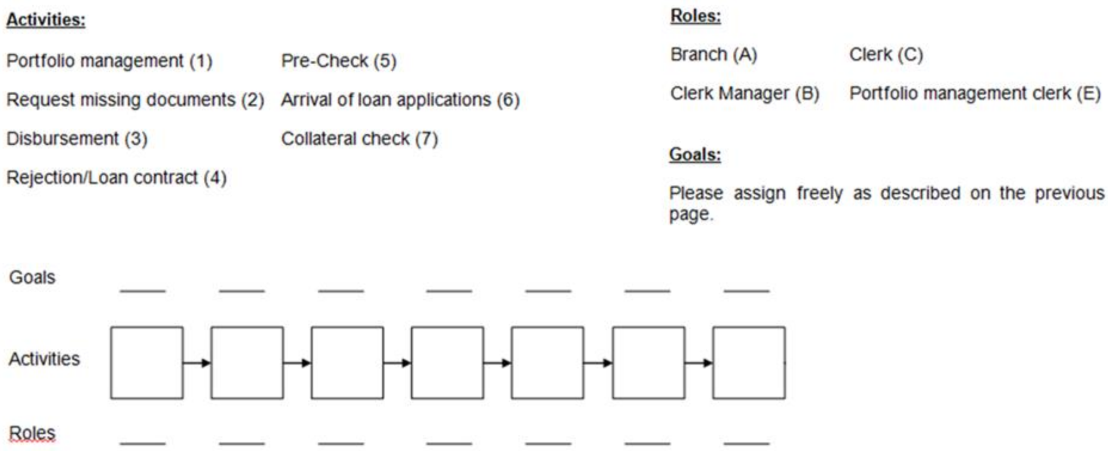

Fig. 2. Task regarding the process design, Adapted from Leyer and Wollersheim (2013)

The next tasks went beyond a single process. In terms of organizational structure, another example was chosen to create two different contexts. This ensured the independency of answers between the process and the organizational level. Fig. 3 shows the example of a hospital with three operating processes, three functional areas, and nine employees working in this fictitious hospital. The figure depicts the example of the setting provided for the dimensions 2 to 7.

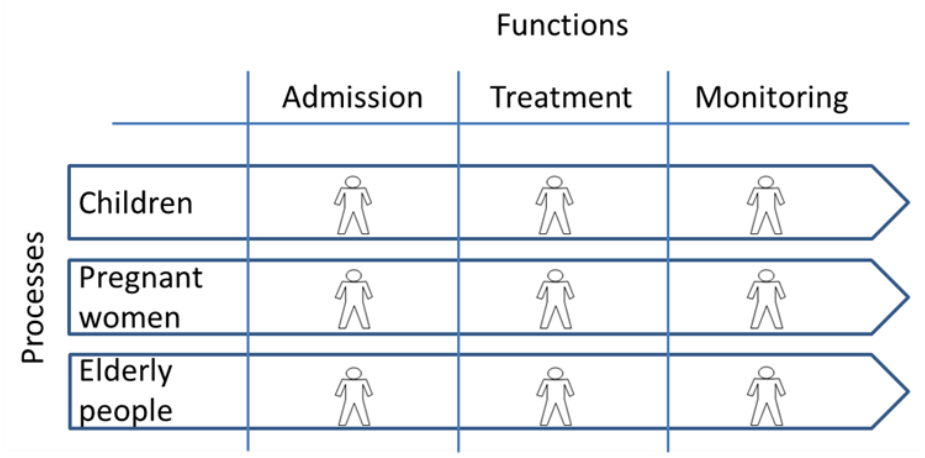

Fig. 3. Structure of the training task related to organizational design, Adapted from Leyer et al. (2014)

The first task in this environment was to define where the customer focus is seen as relevant. The participants had the choice of nine options: before each process (three options), after each process (three options), and during the process (three options). As the given process is a service process, customers are relevant before, during, and after the process.

The second task was to indicate which goals should be used to evaluate the performance of employees. Options were provided for each function (three options) and for each process (three options). To ensure a rectified interest of employees in an efficient process, the evaluation should be based on the overall process goals.

The third task was to arrange the nine employees to teams with each team consisting of two employees as a minimum. Thus, the minimum of teams was two and the maximum four teams.

Depending on the previous number of teams, the participants were provided options to build a hierarchy. The lowest level consisted of the teams and the highest of the Chief Executive Officer (CEO). For two teams chosen, two options with one hierarchical level (CEO is the direct head of teams) and two hierarchical levels (additional team managers) were provided. In case of three and four teams, an additional option with three hierarchical levels (CEO, department leaders, and team managers) was provided.

Regarding the management practices within the hierarchy, the participants were asked to allocate total daily workload to supervise employees, coordination with other managers, project tasks, operative work related to selling and processing products, and administrative work, e.g., documentation (Alsmadi, Almani, & Jerisat, 2012; Tsang & Antony, 2001). While the time spent for leading employees should be maximized, operative working time should be minimized (Jolayemi, 2008).

Finally, the participants were asked to decide on the budget for a continuous improvement project. The following five options were given: (1) one project with the aim of a massive reduction of working time in the process "Children" focusing on the function "Admission", (2) three projects with the aim of reducing working time in every functional area of the process "Children", (3) five projects with the aim of a reduction of working time in every functional area of the process "Children" as well as in the function "Admission" across all three processes, (4) two projects aiming at reducing the waiting times between the functions in each process, and (5) one project with the aim of reducing the overall cycle time in each process. From a process-oriented point of view, the evaluation ranged from option 1 being the worst to option 5 being the best alternative.

3.2. Learning procedure

The schedule for delivering the content on the logic of process orientation was integrated in an academic course on Principles of Management. This course was taught in the classroom. Regarding the topic of process orientation, students were separated into an e-learning group and a face-to-face group. The participants were informed about the schedule in advance and reminded of the respective date by e-mail. Although being part of the overall curriculum, participation was incentivized with receiving 10 % of the overall grade when fully participating. The schedule was different for the e-learning and the face-to-face setting, although both schedules contained the same elements. However, in the context of e-learning, a period of one week was set during which participants could flexibly access the learning environment according to their individual schedules. There was a fixed period of time for the face-to-face setting. The participants had as much time as required for the pre- and post-test but the training phase was limited to 70 minutes. The same timeframe was communicated to the e-learning participants as a recommendation. In both cases, the post-test took place one week after the training phase to avoid a repetition bias.

3.2.1. Pre-test

The participants had to take a pre-test to determine the level of existing knowledge. They had to perform each of the tasks described in the previous section in the given order. The examples regarding the process and organizational structure had a higher complexity than in the training phase, but the logic as described in the previous section was the same. Thus, within the process design twelve activities had to be ordered, a maximum of six roles to be assigned to these activities, and twelve goals to be defined. The example chosen was a customer serving process in a restaurant (activities: prepare table, handout menus, take order, prepare ordered drinks, serve drinks, prepare required ingredients for meals, cook ordered meals, arrange meals on plates, serve meals, remove plates, bring the bill, collect money; roles: manager, guests, bartender, kitchen help, cook, waiter). Regarding the organizational design, a repair shop was chosen with four processes (motor bikes, cars, trucks, and busses) and four functions (receipt, inspection, repair, and delivery) resulting in a total number of 16 employees working in the shop.

3.2.2. Training phase

The participants were provided with a training setting regarding each experiential task. After performing each task, the participants were provided a visual best practice solution from a process-oriented point of view. Additionally, an explanatory text was added and the reasons for the best practice were explained based on the chosen example. Thus, an experiential environment was provided in which participants were allowed to experience first and to receive feedback afterwards. Additionally, a forum was provided in which participants could exchange their experiences and ask questions. To initiate discussion, sample solutions (not best practices) were provided for each task, and the participants could discuss why these solutions did not fit the logic of process orientation.

3.2.3. Post-test

The post-test had the same structure as the pre-test to ensure comparability. However, other examples were used to avoid that the participants simply repeat their answers from the pre-test. Regarding the process design, an examination process was used (activities: design exam exercises, design exam, adjust layout, prepare sample solution, copy exams, handout exams, collect exams, sort exams, mark exams, record grading, control grading, publish grading; roles: lecturer, examination office, invigilator, secretariat, student assistant, students) following the setting of Leyer and Wollersheim (2013). Concerning the organizational design, the example of a parcel delivery company was applied based on four processes (letters, parcels, bulky goods, express documents) and four functions (acceptance, routing, transport, distribution).

3.3. Setting of the learning environments

Within the e-learning system, the participants could access the learning tasks and the discussion forum. The participants could use drag-and-drop features to perform their tasks. These tasks could be worked on independently and repeatedly.

Within the face-to-face setting, the participants performed each task, including the training, on paper. The latter was provided. After each step, documents were collected to prevent participants from looking into previous material, which was also not allowed in the e-learning setting. Sample solutions were displayed using a beamer so that everyone could join the discussion at the same time.

The main differences between the e-learning and the face-to-face setting are depicted in Table 2. The first three differences are related to the individual learning process while the following three refer to the exchange of learners with their peers and the instructor (Redpath, 2012).

Table 2
Differences between the e-learning and the face-to-face setting

e-Learning	Face-to-face
Flexible learning time within a given period	Fixed learning time
Individual learning order	Fixed learning order
Possibility of repeating training tasks	Each training task is performed once
Indirect contact to instructor and participants	Direct contact to instructor and participants
Delayed feedback from instructor and participants (as not everyone sits in front of the system all the time or at the same time)	Instant feedback from instructor and participants
Explanations limited to provided content	More personal explanation from instructor

To ensure the comparability of both learning environments, the educator was the same in both cases as he plays a major role on cognitive presence in both classroom and online environments (Daspit & d'Souza, 2012).

4. Measures and data sources

4.1. Independent measures

These measures cover the learning setting as well as personal characteristics. In particular, the first independent measure is the learning setting (nominal variable: e-learning and face-to-face) following hypothesis 1 and 2. The second independent measure is the learning time in the e-learning setting according to hypothesis 3. The third independent variable was measured by four items on course interaction from Arbaugh (2000) for both settings on a 5-point Likert scale. Moreover, participation was measured with two items on a 5-point Likert scale for the classroom setting and tracked based on retrieving forum information and participation in discussion in the e-learning setting.

4.2. Dependent measures

The dependent measures indicate the level of knowledge regarding the logic of process orientation. They are linked to the tasks described in the curriculum section. Each measure is represented on a scale from 0 to 1 to allow for comparison and aggregation. A complete process-oriented view leads to 1, a function-oriented view to 0, and a neither/ nor decision to 0.5. The dimensions were measured as follows (in case of sub-measures the average was calculated):

- *Level of knowledge regarding the logic of process orientation*: This variable is calculated as the average of process design, customers, performance evaluation, teams, hierarchy, management practices, and continuous improvement.
- *Process design*: For measuring the process design, we followed the approach of Leyer and Wollersheim (2013). This measure is the average of the sub-measures sorting activities into the required order, assigning roles, and assigning goals.
- *Customers: The first task is evaluated by two sub-measures*. The first sub-measure relates to whether the view of the customer is process-oriented or function-oriented. For every assignment of customers before and after the four provided processes, 0.125 was added (process-driven). 0.25 was subtracted in case of customers assigned to the four functions (function-oriented). If the score was negative it was set to 0. The second sub-measure covers the end-to-end view. Here, participants received 0.25 points for each time when assigning customer relevance (before and after) to a process.
- *Performance evaluation*: Each single selection of a process goal being relevant for evaluating the performance of employees was rated with 0.25. In case of a functional goal the score was reduced by 0.125 and set to 0 if the overall score was negative.
- *Teams*: The participants could assign the 16 employees to teams. The minimum number of teams built was two and the maximum was eight (two employees per team). Two sub-measures were used: Each employee in a team working in the

same process (minimum two) was rated with 0.0625. Within the second sub-measure, the percentage was calculated how many of the chosen teams consist of employees working in one process only.

- *Hierarchy*: Two to four teams could be managed in an organizational structure with one to three hierarchical levels (rating 1, 0.5, and 0; ascending) while five to eight teams could be managed with one to four hierarchical levels (rating 1, 0.66, 0.33, and 0; ascending). The best solution in both cases was to have one hierarchical level as a ratio of 1:16 is reasonable to handle for one manager in small firms (Colombo & Delmastro, 1999).
- *Management practices*: Participants could assign 100% working time (represented as 0 to 1) to “Leading employees”, “Coordination with other managers”, “Project tasks”, “Operative work” related to products (incl. time with customers) and “Administrative work” (e.g., documentation). The measure is then calculated as the average of time assigned to “Supervising employees” and a reverse coding of time for “Operative work” (i.e., 1 – the value).
- *Continuous improvement*: The five options for projects were rated as follows: option 1 – rating 0; option 2 – rating 0.25; option 3 – rating 0.5; option 4 – rating 0.75; option 5 – rating 1.

4.3. Control variables

Perceived satisfaction of the participants was measured using five items (also adapted to the classroom setting) from Arbaugh (2000) on a 5-point Likert scale. In addition, usefulness (four items adapted from Arbaugh (2000)), flexibility (three items adapted from Arbaugh (2000)) and net benefits (two items adapted from Wang, Wang, and Shee (2007)) were measured for the e-learning environment using also the 5-point Likert scale.

5. Results from the learning phase

5.1. Descriptives

A total of 150 graduate students participated in the learning phase with 80 students in the e-learning and 70 in the face-to-face setting. Gender was almost equally distributed with 55.3% being male and 44.7% female. As the study was conducted at a business school with a strong professional focus, the majority of the participants (95.1% of 143 as 7 were not answering this question) has already gained sufficient professional experience (M = 24.81 months, SD = 20.67, Min = 1, Max = 108) to have a basic understanding how business reality works.

Average training time of the participants in the e-learning setting was 23.1 minutes (SD: 14.5 minutes). The time spent on process design (11 minutes) and on organizational design (12.1 minutes) was almost the same. The average repetition of training units was 1.17 (SD = .32) indicating a low desire of repeating the training content. In the face-to-face setting the learning time was limited to 70 minutes without any repetition.

Active exchange in the e-learning setting was performed by 18 participants (22.5 %), who contributed 37 comments. However, 51 participants (63.8 %) had a look into the forum comments and on the provided sample answers. In the face-to-face setting, 32 participants (45.7 %) had an active part in the discussion while everyone listened to the comments in class.

Table 3 provides an overview on the means and standard deviations as well as the correlations between the variables analyzed. This overview allows to get an impression of the dataset.

Table 3
Descriptive statistics, reliabilities, and correlations among variables

		M	*SD*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	Learning setting	1.47	0.50	-	.92**	.20*	.08	-	-	-	.32***	.00	.15	.25**	.12	.23**	.25**	-.16*
(2)	Learning time	45.73	25.73	.79***	-	.23**	.09	.05	.11	.12	.32***	.00	.15	.18*	.16	.24**	.26**	-.11
(3)	Personal exchange	3.39	0.70	.19**	.17**	-	.54***	.35**	.26*	.37**	.12	.01	.16*	.00	.09	.01	.02	.02
(4)	Perceived satisfaction	3.10	0.81	.04	.05	.34***	-	.74***	.61***	.86***	.14	-.03	.22**	.06	.18*	-.15	.03	.11
(5)	Usefulness	3.45	0.90	-	.06	.19*	.54***	-	.44***	.71***	.16	-.16	.13	.14	.21	-.13	-.02	.22
(6)	Flexibility	3.56	1.11	-	.06	.09	.43***	.34***	-	.60***	.09	-.04	.18	-.02	.17	-.22	.08	.10
(7)	Net benefits	2.99	1.01	-	.15	.14	.69***	.53***	.45***	-	.24*	-.09	.08	.20	.26*	-.08	.04	.24*
(8)	Overall perfor-mance on the logic of process orienta-tion (differences)	0.17	0.19	.26***	.24***	.06	.07	.09	-.01	.13	-	.09	.48***	.60***	.58***	.60***	.40***	.31***
(9)	Process design	-0.01	0.13	.07	.04	.03	-.03	-.12	-.06	-.09	.10	-	.13	.00	-.13	.02	.16*	-.16
(10)	Customer	0.18	0.46	.14*	.12	.08	.13*	.06	.07	.01	.32***	.11	-	.12	.01	.07	.16*	.00
(11)	Performance evaluation	0.27	0.51	.22**	.14*	-.02	.02	.07	-.08	.12	.44***	.05	.07	-	.15	.19*	.13	.04
(12)	Teams	0.16	0.55	.11	.11	.06	.10	.15	.11	.19*	.41***	-.08	-.01	.11	-	.23**	.06	.18*
(13)	Hierarchy	0.32	0.43	.18*	.17*	-.01	-.11	-.13	-.19*	-.05	.45***	.04	.08	.15*	.16*	-	.20*	.12
(14)	Management practices	0.16	0.19	.21**	.20**	-.01	-.01	.02	.08	.02	.25***	.15**	.11	.09	.04	.12*	-	.10
(15)	Continuous improvement	0.21	0.49	-.04	-.01	.03	.09	.17	.09	.22*	.28***	-.09	.02	.04	.17*	.14*	.10	-

Note. N = 150; M = Mean, SD = Standard Deviation; Above main diagonal: Pearson correlations; below main diagonal: Spearman's nonparametric rank correlations; * $p < .05$; ** $p < .01$; *** $p < .001$; two-tailed tests

5.2. Hypotheses

Mean values and standard deviations of the performance scores as well as differences between the pre-test and post-test in both settings are reported in Table 4.

In order to confirm similar levels of knowledge in the different dimensions, we compared the values of the pre-test between e-learning and face-to-face. The results show that participants are on similar levels for process design ($T(133.616) = 1.599$, *ns*), customer ($T(148) = .662$, *ns*), performance evaluation ($T(147.973) = 1.668$, *ns*), teams ($T(148) = .794$, *ns*), management practices ($T(148) = .462$, *ns*) and continuous improvement ($T(148) = -.507$, *ns*), but not for hierarchy ($T(148) = 2.292$, $p < .05$).

Hypothesis H1, that applying e-learning to understand the logic of process orientation leads to a significant increase of knowledge, can be confirmed ($T(79) = -5.709$, $p < .001$). Each dimension except "team arrangement" ($W(769.5, 1121.5)$, *ns*) and "process design" ($T(79) = 0.462$, *ns*) showed significant results (end-customer focus: $T(79) = -1.861$, $p < .05$; goals compensation: $W(285, 750)$, $p < .01$; hierarchy building: $W(319.5, 1391.5)$,

$p < .001$; management practices: $T(79) = -6.150$, $p < .001$; continuous improvement projects: $W(221, 682)$, $p < .01$).

Table 4
Performance scores of the measures in both settings

Measure	e-Learning						Face-to-face					
	Pre-test		Post-test		Difference [%]	Signifi-cance	Pre-test		Post-test		Difference [%]	Signifi-cance
	Mean	SD	Mean	SD			Mean	SD	Mean	SD		
Overall performance on the logic of process orientation	.495	.112	.609	.184	23.0	*p* < .001	.452	.144	.686	.164	51.8	*p* < .001
Process design	.711	.087	.705	.098	-0.8	*ns*	.689	.106	.681	.138	-1.2	*ns*
Customer	.351	.347	.466	.377	32.7	*p* < .01	.280	.367	.504	.389	80.0	*p* < .001
Performance evaluation	.289	.351	.444	.395	53.6	*p* < .01	.200	.303	.609	.463	204.5	*p* < .001
Teams	.387	.372	.480	.456	24.0	*ns*	.340	.350	.568	.442	67.1	*p* < .001
Hierarchy	.486	.324	.714	.327	46.9	*p* < .001	.363	.334	.788	.289	117.1	*p* < .001
Management practices	.515	.158	.637	.153	23.6	*p* < .001	.503	.163	.716	.176	42.3	*p* < .001
Continuous improvement	.725	.237	.816	.241	12.6	*p* < .01	.746	.281	.875	.247	17.3	*p* < .01

Note. ns = Not Significant

Hypothesis H2 stating that an e-learning setting leads to the same learning effect than a face-to-face setting cannot be confirmed ($p < .001$ (3.805), $R^2 = 0.163$). This result holds true for the following dimensions: end-customer focus: $p < .05$ (2.264), $R^2 = 0.075$; goals compensation: $p < .01$ (2.631), $R^2 = 0.049$; management practices ($p < .001$ (3.381), $R^2 = 0.180$); continuous improvement projects ($p < .001$ (5.439), $R^2 = 0.176$). The results for the other three dimensions are not significant. Thus, the hypothesis can be confirmed for these sub-measures (process design: *ns* (-0.802), $R^2 = 0.92$; team arrangement: *ns* (1.276), $R^2 = 0.008$; hierarchy building: (*ns* (1.772), $R^2 = 0.023$). Table 5 shows the average of the individual learning effects in both settings. In this case the individual learning effect is calculated for each participant as the difference between post- and pre-test. Thus, numbers are different from Table 5 as the average stated there is based on pre- and post-test independently.

Hypothesis H3 cannot be confirmed (*ns* (1.729), $R^2 = 0.180$), which holds true for each sub-dimension.

Overall, H4 is supported in the e-learning environment but not in the classroom environment. Within the classroom environment, self-rated participation degree in discussion had no influence on performance (*ns* (0.133), $R^2 = 0.210$). Thus, individual personal exchange between participants had no effect which would have been an assumed benefit of a classroom environment. Exchange of participants with the instructor had no positive impact on the overall performance (*ns* (0.871), $R^2 = 0.165$), but possibilities of interaction were rated higher in the classroom (M = 3.64; SD = 1.111) than in the e-learning environment (M = 2.94; SD = 0.911) (*U*(1683), $p < .001$). When comparing e-learning and classroom instruction in terms of course interaction, the following differences were found: e-learning M = 3.25; SD = 0.695; classroom M = 3.54; SD = 0.680; $T(147) = -2.526$; $p < .05$.

There were no statistical differences of the results with regard to the moderating variables.

Table 5
Individual learning effects

Measure	Average of individual learning effect (e-learning)	Average of individual learning effect (face-to-face)	Percentage face-to-face is better than e-learning [%]
Overall performance on the logic of process orientation	.114	.234	105.2
Process design	-.006	-.005	16.6
Customer	.116	.252	117.2
Performance evaluation	.155	.409	163.9
Teams	.093	.227	144.1
Hierarchy	.228	.425	86.4
Management practices	.121	.213	76.0
Continuous improvement	.288	.129	-44.8

6. Discussion

The results show that experiential learning via e-learning is helpful to learn the logic of process orientation. The effect is quite convincing as the learners' knowledge on the logic of process orientation can be increased by almost 20 %. However, the achieved learning level of 59.6 % still leaves room for improvement. In comparison to a face-to-face setting the learning effect was almost half. This result is different to findings by Bernard et al. (2004), Means et al. (2009) and Tallent-Runnels et al. (2006), who observe the same efficiency of e-learning as classroom learning. Moreover, in comparison with Sitzmann et al. (2006), our results indicate that for learning procedural knowledge the effect is contrary to learning declarative knowledge. One explanation for this difference can be learning time. The prior mentioned studies found positive effects of learning time on efficiency. However, Means et al. (2009) state that they are not sure whether the effect is time-driven or due to the learning setting itself. The relationship of time and learning effect could not be found in our context of learning the logic of process orientation. We can clearly state that learning time had no effect on efficiency and, thus, our results point to a difference in efficiency that can be traced to the learning setting.

Another difference between our study and previous studies is that knowledge on the logic of process orientation is more focused on learning how something should be designed. The 27 relevant studies analyzed by Means et al. (2009), comparing e-learning and face-to-face settings, focused mainly on learning how to perform concrete tasks in different contexts. Having a look at the highlighted differences between the e-learning and the face-to-face setting, it seems that learning a certain way to think requires more personal exchange. Other students and the instructor were available in the moment they were needed to support the learning process. Also, feedback could be provided without significant delays. The advantages of e-learning in terms of repetition of learning content and flexibility in terms of learning sequence seem promising but were not used intensively in the given context.

The outcome of online learning is associated with a combination of a number of pedagogical (e.g., pedagogy, curriculum, learning materials, learner engagement or time spent on learning, interactions among learners, role of the instructor, instructional support) and technological factors (Graham, 2011; Means et al., 2009; Zhao et al., 2005). Regarding the logic of process orientation, the results show that active personal exchange had no benefit in a classroom setting. However, there could be an indirect effect with participants benefiting through the discussion triggered and made by others. Thus, more explanation or exchange between the participants could be helpful to enhance the learning effect.

Learning outcomes depend not only on participation but also on the quality of the experience including meaningful reflection and useful guidance and feedback (Dewey, 1938; Moon, 2004). These elements are also important for learning the logic of process thinking. In any way, other ways to create a further learning effect have to be found for both settings. Special attention should be given to the organizational context of BPM. The students had a relatively high previous knowledge with regard to process design (except continuous improvement projects). This knowledge had not been enhanced but was already on a sufficient level compared to the other dimensions for which a learning effect could be observed. The other dimensions of organizational design should be promoted more intensively to increase understanding of the organizational role of BPM.

Regarding learning time, it is revealed that participants spent less learning time in the e-learning setting than in the face-to-face setting. However, learning time is not an issue as the learning effect does not increase significantly through spending more learning time. Thus, applying experiential learning in e-learning seems to be a useful addition to a regular curriculum in information systems. Students do not have to spend too much time in learning knowledge on the logic of process orientation that helps them understand and link further concepts better.

Having a look at the dimensions, it is revealed that there is a huge difference among the performance scores. There is no learning effect at all related to “process design” in both settings. The level of previous knowledge is comparably high in the pre-test (only continuous improvement has a higher average) and the post-test (only continuous improvement and hierarchy building have higher levels; additionally, hierarchy building in the face-to-face setting). Thus, it seems that a learning effect can be achieved up to a certain level with the chosen setting. This is underlined by the already existing high level for process design as the pre-test indicates. However, regarding the seventh dimension (continuous improvement) there is the exception as a significant learning effect is observed despite a high level of previous knowledge.

Despite the promising results, some limitations should be taken into account when generalizing our results: First, the data analysis is based on quantitative data from the e-learning system only. Further data from the participants with respect to their learning experience, motivation, and personal exchange outside the e-learning system could be added. Second, different contexts have been used in the pre-test and post-test. There could be an influence that some participants have a better understanding of one of the two settings. But settings should not be the same as there could be a memorizing bias. Third, a long-term learning effect was not investigated. A one-week break was used to make sure that the participants still remembered the ideas. But it could be that after a month or half a year participants have (partly) forgotten the logic of process orientation. Fourth, it could be that students in the different groups shared experiences during the data collection period. This effect was not under our control.

7. Conclusion

Theoretical implications of our results can be seen in the extension of experiential learning theory in the context of learning process-oriented thinking. It can be stated that experiential learning within an e-learning-setting is effective to learn process-oriented thinking, but the procedural nature of such knowledge requires more personal interaction. Such logic is complicated to understand and learn, and so we can contribute to the fact that, contrary to the general theory, experiential learning in a classroom setting is better suited for process-oriented thinking. Furthermore, we contribute that learning time has no influence on efficiency in e-learning within our context.

Experiential learning requires a careful design of activities and instructional support that allows students to achieve meaningful learning experiences and satisfactory learning outcomes. With regard to the design of a curriculum in a business school to learn the logic of process orientation, the results lead to two main implications: (1) Courses in management should be accompanied with experiential e-learning on knowledge about the logic of process orientation. Experiential e-learning is a feasible alternative to a face-to-face setting but allows for more flexibility. Students should complete such an e-learning module at the beginning or throughout a course on Principles of Management to understand the context and background of BPM better. (2) A course on BPM should begin with a face-to-face session on the topic to deepen the knowledge on processes and allow for a more profound understanding. Here, special emphasis should be put on spending time for discussion and feedback to enhance the learning effect.

The average working time of participants of two years also allows drawing valuable conclusions on learning of employees in an organizational context. Transforming an organization from function- to process-orientation should be prepared and accompanied by experiential online learning targeting every employee. This procedure is expected to generate a general understanding when changing the organization in such a fundamental way. Employees being involved in specific transformation projects should be trained by means of additional face-to-face seminars to ensure a deeper understanding and thus a higher success when actively being involved in changes.

In order to extend the achieved results, additional qualitative analyses how the learning effect can be increased should be conducted. Here, the focus should be put on how participants could be encouraged to exchange ideas online and whether this facilitates learning the logic of process orientation. Additionally, ways should be found to measure participation objectively in the face-to-face setting rather than relying on subjective answers.

Author Statement

The authors declare that there is no conflict of interest.

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